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KARPAGAM
ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)
Pollachi Main Road, Eachanari Post, Coimbatore - 641 021, Tamilnadu, India.
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This is to certify that the enclosed pages (2 to 5387) consists of the Syllabi followed for various programmes offered between the academic years 2016-2017.

REGISTRAR
Karpagam Academy of Higher Education
(Deemed to be University Under Section 3 of UGC Act 1956)
Pollachi Main Road, Eachanari Post,
Coimbatore - 641 021.

KARPAGAM ACADEMY OF HIGHER EDUCATION
CBE-21

KARPAGAM ACADEMY OF HIGHER EDUCATION

Deemed to be University

(Established Under Section 3 of UGC Act 1956)

Eachanari Post,Pollachi Main Road,Coimbatore -641021

M.Sc.APPLIED ASTROLOGY COURSE (2016-2017)

REGULATION 2016

COURSE OF STUDY AND SCHEME OF EXAMINATION

&

SYLLABUS

DEPARTMENT OF ASTROLOGY
FACULTY OF ARTS, SCIENCE AND HUMANITIES
PG PROGRAMME CBCS M.Sc APPLIED ASTROLOGY

Course Code	Name of the Course	Objectives & Out Comes		Instruction hours / week			Credit(s)	Mamimum Marks		
		PEOs	POs	L	T	P		CIA	ESE	TOTAL
SEMESTER - I										
16ASP101	அடிப்படை ஜோதிடவியல் - I Fundamentals of Astrology-I	**1**	**1**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP102	ஜோதிடவியலில் கோள்கள் - I Planets in Astrology-I	**1**	**1,8**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP103	பிரஸன்ன ஜோதிட முறைகள் - I Horary Astrological methods I	**3**	**5**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP104	ராசிகள் பாவகங்கள் நட்சத்திரங்கள்-I Rasi – Bhava – Star Constelations -I	**1**	**2**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP105B	அடிப்படை வாஸ்து – 1 Fundamental Vasthu -I	**2**	**4**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP111	பலன் சொல்லும் முறைகள் - I Predictive methods in Astrology-I	**1,2**	**4,10**	**0**	**0**	**4**	**2**	**40**	**60**	**100**
16ASP112	Practical - I	**1,2**	**11**	**0**	**0**	**4**	**2**	**40**	**60**	**100**
	Total						**24**	**280**	**420**	**700**
SEMESTER II										
16ASP201	அடிப்படை ஜோதிடவியல் -II Fundamentals of Astrology-II	**1**	**1**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP202	ஜோதிடவியலில் கோள்கள் -II Planets in Astrology-II	**1**	**1**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP203	பிரஸன்ன ஜோதிட முறைகள் - II Horary Astrological methods-II	**2**	**5**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP204	ராசிகள் பாவகங்கள் நட்சத்திரங்கள்II Rasi – Bhava – Star Constelations-II	**1**	**2**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP205B	Modern vasthu II	**2**	**4**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP211	பலன் சொல்லும் முறைகள் - II Predictive methods in Astrology-II	**2**	**2,6**	**0**	**0**	**4**	**2**	**40**	**60**	**100**
16ASP212	Prediction - II	**3**	**6,11**	**4**	**0**	**4**	**2**	**40**	**60**	**100**
	Total						**24**	**280**	**420**	**700**

				SEMESTER III						
16ASP301	புதிய ஜோதிட முறைகள் Modern Astrological Methods	**2**	**3,6**	**4**	**0**	**0**	**4**	**40**	**60**	
16ASP302	ஜோதிடவிதிகளில் முகூர்த்தங்கள் - Muhurtha in Astrology	**3**	**7**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP303	மருத்துவ ஜோதிடம் Medical Astrology	**3**	**8**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP304	ஜோதிட கணித முறைகள் Casting Horoscope	**1**	**9**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP305	Dasabukthi Predictions	**1**	**11**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP306B	Ashtavargam	**2**	**10**	**4**	**0**	**0**	**4**	**40**	**60**	**100**
16ASP312	Practical - III	**1,8**	**11**	**0**	**0**	**4**	**4**	**40**	**60**	**100**
							28	**280**	**420**	**700**
				SEMESTER IV						
16ASP491	Project	**2.3**	**2,11**	**0**	**0**	**0**	**15**	**80**	**120**	**200**

The following are the Elective papers

List of Elective Papers		
S.No	Course Code	Subjects
1.	16ASP105(A)	எண்கணிதம் (Numerology)
2.	16ASP105(B)	ஆடிப்படை வாஸ்த்து – I (Fundamentals of Vasthu – I)
3.	16ASP105(C)	அங்கலட்சனம் மற்றும் மச்சங்கள் (Samuthrika Lakshanam)
4.	16ASP205(A)	நவரத்தினங்கள் (Gemology)
5.	16ASP205(B)	நவீன வாஸ்த்து – II (Modern Vasthu – II)
6.	16ASP205(C)	கைரேகை சாஸ்திரம் (Palmistry)
7.	16ASP306(A)	தாஜிகம் (Thajigam)
8.	16ASP306(B)	அஷ்டவர்க்கம் (Astavargam)
9.	16ASP306(C)	16 வர்க்க சக்கரங்களும் பலன்களும் (Predictions through 16 Varga Chakras)

Programme outcomes

1) சோதிட முதுகலை மாணவர்கள் வானவியல் பற்றிய, சோதிடவியல் பற்றிய வரலாற்றை அறிவதால் இத்துறையின் பழமையையும் பெருமையையும் புரிந்து கொள்வார்கள்
2) சோதிடவியலின் அடிப்படைத்தன்மைகள் இராசி காரகத்துவங்கள், கோள்களின் காரகத்துவங்கள், பாவக காரகத்துவங்கள் ஆகியவற்றை பற்றிய ஆழ்ந்த அறிவு சாதக பலன்கள் நிர்ணயிப்பத்தில் முக்கிய பங்கு வகிக்கும்.
3) சோதிடவியலுக்கு பெரும் புகழ் சேர்த்த சோதிட அறிஞர்களின் பலன் கூறும் முறைகளை தெரிந்து கொள்வதினால் இத்துறையில் பல சாதனைகள் பல செய்ய ஆர்வம் ஏற்படும்
4) எண்கணிதம், வாஸ்து, கைரேகை, நவரத்தினங்கள், அங்கலட்சணங்கள் ஆகிய துணைப்பாடங்களுக்கு சோதிடவியலே ஆதாரம் என்பது புலப்படும்.
5) சாதகம் இல்லாதவர்களுக்கு பலன்கள் சொல்லும் வகையில் பிரசன்ன முறைகள் மூலம் பலன்கள் அறிந்து கொள்ளலாம்.
6) நாடி முறை, ஜெயமினி முறை, கிருஷ்ணமூர்த்தி பத்ததி முறை, மேலைநாட்டு முறை ஆகிய முறைகளில் பலன்கள் சொல்லப்படுவது சோதிட துறையின் வளர்ச்சிக்கு ஆதாரங்கள் ஆகும்.

7) நல்ல முகூர்த்தங்களில் ஆரம்பிக்கும் செயல்கள் நல்ல பலன்களைத் தரும், தீய முகூர்த்தங்களில் ஆரம்பிக்கப்படும் செயல்கள் துன்பத்தை விளைவிக்கும் என்பதை உணரமுடியும்.
8) மருத்துவ சோதிடத்தின் மூலம் நோய் ஏற்படும் உடல் பாவகம், நோயின் தன்மை, நோய் ஏற்படும் காலம், நோய் தீர்க்கும் முறைகள் ஆகியவற்றை தெளிவாக அறிய முடியும்.
9) சோதிட கணித முறைகளை அறிந்து கொள்வதின் மூலம் இக்கால விஞ்ஞானம், கணினி முதலியன அழிந்தாலும் சோதிட கணித முறைகள் அழியாமல் பாதுகாக்க முடியும்.
10) அஷ்டவர்க்கங்கள், தாஜிகம், பதினாறு வர்க்க சக்கரங்கள் பற்றிய அறிவு, சாதக பலன்களை சொல்லுவதில் துல்லியத்தை நிர்ணயிக்க உதவும்.
11) கல்வி, திருமணம், தொழில், புத்திரபேறு முதலியவை பற்றிய கேள்விகளுக்கு தெளிவான பலன்களை சொல்ல முடியும்.

Programme Specific outcomes

12) தனிமனிதனின் பிரச்சனைகளுக்கு சோதிட ரீதியில் சரியான தீர்வை கொடுக்க முடியும்.
13) எதிர்காலத்தில் நடக்கக்கூடிய நன்மை, தீமைகளை முன் கூட்டியே அறிந்து, அதற்காக முன் எச்சரிக்கை நடவடிக்கைகளை எடுத்துக் கொள்ள முடியும்.
14) சோதிட சாஸ்திரம் தனிமனிதனின் வளர்ச்சிக்கும், நாட்டின் வளர்ச்சிக்கும் ஒரு வழிகாட்டியாக அமையும்.

Programme Educational Objectives (PEOs)

PEO 1 : சோதிடவியல் முதுகலைப்பட்ட தாரிகளுக்கு வானவியல் அறிவு, சோதிடவியலின் வரலாறு, சோதிடவியலின் அடிப்படைத் தன்மைகள், கோள்கள், இராசிகள், பாவகங்கள் பற்றிய அறிவு உள்ளதால் கால தேச வர்த்தமானங்களுக்கு ஏற்ற வகையில் பலன்கள் கூறுவதற்கான திறமைகள் வளரும்.

PEO 2 : சாதக பலன்கள் சொல்லுவதற்கு சோதிட சாஸ்திரத்தில் பல முறைகள் உண்டு. அனைத்து முறைகளிலும் நன்கு பயிற்சி அளித்து, இத்துறையில் வலிமை உள்ளவர்களாக மாற்ற முடியும். இவர்கள் இத்துறையில் புதிய கண்டுபிடிப்புகளை கண்டுபிடிக்க முடியும். சோதிடத்தின் துணை சாஸ்த்திரங்களான கைரேகை, வாஸ்து, எண்கணிதம் முதலியவற்றிலும் அறிவு வளரும்.

PEO 3 : இது ஒரு தெய்வீக கலை என்பதால் சோதிட முதுகலை பட்டதாரிகள் ஒழுக்கத்தில் சிறந்தவர்களாகவும், சோதிட அறிவில் தன்னிகரற்றவர்களாகவும் மாற்றம் ஏற்படும். தற்காலத்தில் சமுதாயத்தில் ஏற்படும் அனைத்து தனி மனித பிரச்சனைகளுக்கும் தீர்வு காணமுடியும்.

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PEO 1	X	X			X		X							
PEO 2		X	X	X	X				X	X	X			X
PEO 3						X	X	X			X	X	X	X

KARPAGAM ACADEMY OF HIGHER EDUCATION

DEPARTMENT OF ASTROLOGY

Marks Allocation

Continuous Internal Assessment (CIA):

The performance of students in each will be continuously assessed by the repective faculty as per the guidelines given below:

Theory Courses

S.No	Category	Maximum Marks
1.	Attendance	5
2.	Test-I#	10
3.	Test-II#	10
4.	Journal Paper Analysis & Presentation	15
Continuous Internal Assessment : Total		40

- The Mark obtained in the seminar should be entered in automation software on or before 60th working day of the semester.
- # Test answer scripts in should be evaluated and marks awarded should be entered in automation software on or before 4th working day after the last date

Practical Courses (Astrology):

S.No	Category	Maximum Marks
1.	Attendance	5
2.	Observation Work	5
3	Record Work	5
4.	Model Examination (Related with astrology)	15
5.	Viva –Voce [Comprehensive]	10
Continuous Internal Assessment : Total		40

- Includes Viva-voce Conducted during every regular practical class and the model exam practical.
  Every practical exercise/experiment and records should be maintained.

UNIVERSITY EXAMINATIONS

End Semester Examination(ESE): ESE will be held at the end of each semester for each course.The question paper is for a maximum of 60 marks.

Pattern of ESE Question Paper:

Instruction	Remarks
Maximum Marks	60 marks for all Semester Examination
Duration	3 Hours
Part –A	10 out of 15 two mark Questions (10x2=20 Marks) (Not exceeding 3 questions from each unit)
Part-B	5 Eight mark Questions(5x8=40 Marks) • One Question from any one of the units is compulsory. It shall be oriented to analysis/design/application/case studies. • 4 Questions are in ‘either –or’ choice. • (One Question each from the remaining 4 units)

Admission eligibility: Any degree passed in a recognized university

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16ASP101	Fundamentals of Astrology – 1	Semester – I 4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0	Marks Internal : 40, External : 60 Total : 100 End Semester Exam : 3 hrs

நோக்கங்கள் :

1) ஜோதிடத்தின் தோற்றம் எந்த நாட்டில் ஏற்பட்டது என்பதில் தெளிவு உண்டாகும்.

2) வானசாஸ்த்திர வளர்ச்சியை வரலாற்று ரீதியாகக் கற்றுக் கொள்வதால் ஆய்வு மனபான்மை உண்டாகும்.

3) இந்திய ஜோதிடத்தை அறிந்து கொள்வதால் இந்தியர்களின் ஜோதிடத்திறமை எவ்வாறு இருந்துள்ளது என்று உணரலாம்.

4) வேதாங்க ஜோதிடம், அதர்வன ஜோதிடம் ஆகியவற்றில் சொல்லப்பட்டுள்ள கருத்துக்களை தெரிந்துக் கொள்ளலாம்.

5) அயல் நாட்டு ஜோதிடவியலின் வரலாற்றை தெரிந்துக் கொள்வது.

6) நாஸ்ட்ரடாமஸ் போன்ற தீர்க்க தரிசிகளை பற்றி தெரிந்துக் கொள்வது.

பயன்கள்

1) இந்திய ஜோதிடத்தின் வரலாற்றை அறிந்து கொள்வதால் நமது கலாச்சாரத்தின் தொன்மையை அறியலாம்.

2) இந்தியர்களின் வானசாஸ்த்திர புலமை, ஜோதிடவியல் புலமை ஆகியவற்றை அறிந்துக் கொள்வதால் ஆய்வு மேற்படிப்புகளில் பயனுள்ள முடிவுகளை எடுக்க முடியும்.

3) ஜாதகத்தை கணிப்பதற்கு பஞ்சாங்க நூல் வேண்டும், பஞ்சாங்க நூல்கள் வானசாஸ்த்திரத்தின் அடிப்படையில் உருவாக்கப்பட்டவைகளாகும்: எனவே பஞ்சாங்க நூல்கள் யாரால் எப்படி உருவாக்கப்பட்டவை என்ற அறிவு அவசியமாகிறது.

4) பராசரர் போன்ற ரிஷிகளின் பெருமைகள் நமக்கு புரியும்.

5) வேதங்கள், புராணங்கள், இதிகாசங்களின் பெருமை புரியும்.

6) இந்திய ஜோதிட வரலாற்றை அயல் நாட்டு ஜோதிட வரலாற்றோடு ஒப்பு நோக்க முடியும்.

UNITS:

1. வானியலும் ஜோதிடமும்

வானசாஸ்திரம் - கோள்களின் அமைப்புக்கள்
சூரிய குடும்பம் - பூ கோளமும் வான் கோளமும்

2. ஜோதிடத்துடன் தொடர்புகள்

பூமியின் இயக்கமும் ஜோதிடமும். இராசி சக்கரம் என்னும் மகா அற்புதம். இராசி மண்டலமும், நட்சத்திரப் பிரிவுகளும்.

3. ஜோதிட வரலாறு - பாபிலோனியா - எகிப்து – கிரேக்கம்

ஈரல் ஜோதிடம் - ஜோதிடவியலின் தோற்றம் - வானவியல் ஜோதிடம் - பூவுலகில் கோள்களின் தாக்கம் தனிமனித ஜாதகம் - சகுனங்கள்.

4. **மேலை நாடுகளின் சோதிட வரலாறு**

சுமேரியர் - மெசபதோமியர் - பாபிலோனியா – சால்தியா. எகிப்து – கிரேக்கம் - வானசாஸ்திர மறுமலர்ச்சி – நிக்கோலஸ் கோபர் நிகஸ் - கலிலியே கலில் - ஜொகன்னஸ் கெப்ளர் - ஐசக் நியூட்டன்.

5. **ஜோதிட வரலாறு - இந்தியா**

வேதாங்க ஜோதிடம் - வேதகால மாதங்கள் - வேதகால திதிகள் - முகூர்த்தங்கள் - பதினெட்டு சித்தாந்தங்கள் - இந்திய வானசாஸ்த்திர அறிஞர்கள். வராகமிகிரார்.

குறிப்புதவி நூல்கள்

1.	Hindu Astrology and the West	B.V.Raman.
2.	கிருக்ஷ்ணமூர்த்தி பத்ததி முறை	K.S. கிருஷ்ணமூர்த்தி
3.	வானசாஸ்திரம்	M.L. ராஜா
4.	வானியலும் ஜோதிடமும்	M.K. தாமோதரன்
5.	Ancient Hindu Astrology for the Modern Western Astrologer (1986)	James T.Braha

16ASP102 Planets in Astrology – 1 Semester – I
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்

1) கோள்களின் வடிவங்கள், நிறங்கள், குணங்கள், தன்மைகள் இவைகளை தெரிந்துக் கொள்வது அவசியமாகும்.
2) கோள்கள் குறிப்பிடும் உடல் உறுப்புக்கள் மற்றும் நோய்கள் பலன்கள் கூறுவதில் முக்கிய பங்குவகிக்கின்றன.
3) கோள்கள் குறிப்பிடும் தொழிகள் எவை என்பதை தெரிந்துக் கொண்டு, ஜாதகர்களை சரியான வழியில் வழிகாட்ட முடியும்.
4) நாம் கூறும் பலன்கள் எக்காலகட்டத்தில் நடைபெறும் என்பதை அறிய தசா, புத்தி, கோசாரம் பற்றிய அறிவு நமக்கு தேவைப்படுகிறது.
5) கோள்களின் இணைவு மூலம் ஜாதகரின் வாழ்க்கையில் ஏற்படும் பலன்களை அறிவது.
6) கோள்களின் காரகத்துவங்கள் பார்வைகள் மூலம் ஜாதக பலன்களை மிக துல்லியமாக கணிக்க முடியும்.

பயன்கள்

1) ஜாதக பலன்கள் நிர்ணயிப்பதில் கோள்களின் காரகத்துவங்களுக்கு முக்கிய பங்குண்டு.
2) கோள்களின் தன்மைகள், குணங்களின் அடிப்படையில் ஜாதகங்களின் தன்மையும், குணங்களும் இருக்கும் என்பதில் சந்தேகம் இல்லாமல் பலன்கள் கூறமுடியும்.
3) கோள்கள் குறிப்பிடும் உடல் உறுப்புகளில் மிக துல்லியமாக நோய்களை கணித்து கூறமுடியும்.
4) கோள்களின் சேர்க்கையை கொண்டு விதவிதமான தொழில்களை ஜாதகர்களுக்கு சுட்டி காட்ட முடியும். தசா, புத்தி, கோசத்தை கொண்டு நிகழ்ச்சிகள் நடக்கும் காலத்தை நிர்ணயிக்கலாம்.
5) கோள்களின் பலத்தைக் கொண்டு ஜாதக பலன்களை முடிவு செய்ய முடியும்.
6) 2,10க்கு அதிபதியான கோள்களை கொண்டு ஜாதகர் எந்த தொழில் மூலம் பணம் சம்பாதிப்பார் என்பதை அறிய முடியும்.

UNITS

1. கோள்களின் குணங்கள்

கோள்கள் - வடிவங்கள் - நிறங்கள் - இருப்பிடம் - கோள்களின் உருவம் - பாலினம் - சமித்து – திக்கு, மலர் - ரத்தினம் - தானியம் - உலோகம் - சுவை நீச்ச ராசி - மூலத்திரிகோண ராசிகளட – உச்ச ராசிகள் - கோள்களின் நட்சத்திரங்கள்.

2. கோள்களின் காரகங்கள்

குணங்கள் - தன்மைகள் - கோள்கள் குறிக்கும் இடங்கள் - வீட்டு உபயோக பொருட்கள் - உறவுகள் - விலங்கினங்கள் - மரங்கள் - மனிதர்களின் குணாதிசயங்கள் - பஞ்சபூத தன்மை – நவரத்தினங்கள்.

3. கோள்கள் குறிப்பிடும் உடல் உறுப்புக்கள் மற்றும் நோய்கள்.
காலபுருஷ ராசியும் -உடல் உறுப்புக்களும - கோள்கள் சுட்டும் உடல் பாகங்கள்-நோய்கள் - முக அவயங்கள் - உடலின் உட்புற உறுப்புகள்.

4. கோள்கள் குறிப்பிடும் தொழில்கள்
பத்தாம் பாவமும் தொழில்களும் - பத்தாம் பாவத்தில் நின்ற கோள்கள் - சுட்டும் தொழில்கள் - பத்தாம் பாவக - நவாம்ச அதிபதி -குறிப்பிடும் தொழில்கள்-உதாரண ஜாதகங்களுடன் விளக்கம் - வேலைகள்

5. கோள்கள் குறிப்பிடும் திசாக்கள் - திசாக்களின் வகைகள் - திசா, புத்தி, அந்தரம் - **சூட்சமாகணிதம்** - தசாபுத்தி பலன்கள் . குறிப்பாக சனிதசா – சனி புத்தி தரும் பலன்கள் - ஏழரைநாட்டுசனி

குறிப்பதவி நூல்கள்

1.	உத்திரகாலாமிருதம்	S.A.குமாரஸ்வாமி ஆச்சாரியார்.
2.	Prasana Marga	B.V.Raman
3.	Pointer to Profession	T.P.Trivedi & R.Asthana
4.	Brihat Parasara Hora Sastra	G.C.Sharma
5.	ப்ருஹத் ஜாதகம்	C.G.ராஜன்
6.	குடும்பஜோதிடம்	ஸ்ரீராமய்யங்கார்-ஸ்ரீஸ்ரீனிவாஸாசாரியார்
7.	Mundane Astrology	B.V.Raman
8.	ஜோதிடமும் நவகிரகங்களும்	முருகு இராசேந்திரன்

16ASP103 | Horary Astrological Methods – 1 | Semester – I
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 | Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்

1) ஜாதகம் இல்லாதவர்களுக்கு ஜாதக பலன்கள் சொல்வதற்காகவும், பிறப்பு ஜாதகத்தில் பிறந்த நேரம் சரியாக இல்லாத போது பலன்கள் மாறுவதை, பிரஸன்னம் தடுக்கும்.

2) பிரசன்ன ஜோதிடமுறையில் கேள்வியாளரின் நிலை, ஆடை தொடும் உறுப்பு முதலியவை கொண்டு பலன் அறியலாம்.

3) பலவகையான ஆருட லக்னங்கள் கண்டுபிடித்தல், சகுனம், நிமித்தங்கள், அஷ்டமங்கல பிரஸன்னம் ஆகியவற்றின் மூலம் ஜோதிடத்தின் ஆழத்தை புரிந்துக் கொள்ள முடியும்.

4) சகுனம், நிமித்தங்களின் மூலம் ஜாதகரின் கேள்விகளும் பதில் கூற முடியும்.

5) வெற்றிலை ஜோதிடம் மூலம் ஜாதகரின் கடந்த காலம், நிகழ்கால பலன்களை தெளிவாக கூற முடியும்.

6) அஷ்ட மங்கல பிரசன்னம் மூலம் ஜாதகரின் குறிப்பிட்ட கேள்விகளுக்கு பதில்கள் கூற முடியும்.

பயன்கள்

1) பலன்கள் கூறுவதில் மிக துல்லியத்தை கொடுப்பது பிரசன்ன ஜோதிடமாகும்.

2) பிறப்பு ஜாதகம் இல்லாமலும், கேட்கப்பட்ட கேள்விகளுக்கு பதில் சொல்ல முடியும்.

3) பிரஸன்னத்தின் மூலம் நம் முன்னோர்களின் நிலையையும், நம்முடைய பூர்வ கர்மங்களின் நன்மை, தீமைகளை பற்றிய தன்மையையும் தெளிவாக புரிந்துக் கொள்ளலாம்.

4) இப்பிறப்பில் செய்யப்பட்ட நல்வினை, தீவினை ஆகியவை பற்றியும் பிரஸன்னத்தின் மூலம் அறியலாம்.

5) அஷ்ட மங்கல பிரசன்னம் மூலம் கேள்வியாளர் பிரச்சினைகளை எளிதாக கண்டு பிடிக்க முடியும்.

6) விவாஹ பிரசன்னம், நஷ்ட பிரசன்னம், ஆயுள் பிரசன்னம், ரோக பிரசன்னம் மூலம் கேள்வியாளரின் கேள்விகளுக்கு பதில்கள் கூற முடியும்.

UNITS

1. **பிரசன்னத்தில் ஜோதிடர் கேள்வியாளர் பங்கு.**
ஜோதிடருக்கான கோட்பாடுகள் - கேள்வியாளர் கொண்டுவரும் பொருட்கள் - கேள்வி கேட்பவர் நிற்கும் திசைகள் - தொடும் அங்கங்கள் - அதற்கான பலன்கள் - ஜோதிடரின் சுவாசம்.

2. **கேள்வியாளரின் நிலை- ஆடை மற்றும் லட்சணங்கள்.**
கால்களை எடுத்து வைத்தல் - கால்களை ஆட்டுதல் - தயக்கம் - மூன்றாம் நபர் கடந்து செல்லுதல் - கைகளை பிசைதல் - தன்னை அடித்துக் கொள்ளுதல் - மரண தொடர்பு கர்மங்கள்- நிற்கும் போது, உட்காரும் போது உள்ள நிலைகள்.

3. **பிரசன்னத்தில் லக்னம் நிர்ணயித்தல்**

ஆறு வித ஆருட லக்னங்கள் ஸ்வா்ணாருடம் - உதயாரூடம் - உதய வா்ன அம்ஸ ஆருடம் - சாத்திர ஆருடம் - அங்கஸ் பரஷ்ட ஆருடம் - சந்திர ராசி.

4. **பிரசன்ன வகைகள் - அக்ஷ்டமங்கலம்**
தெய்வானுக்கிரகம் - குலதெய்வானுக்கிரகம் - பிதுா் சாபம் - மாதா் சாபம் - சா்ப்ப தோஷம் - வாக்தோஷம் - திருஷ்ட தோஷம் - சத்ரு தோஷம்- பிராமண தோஷம் - குரு, குருபத்னி சாபம் - விஷபோஜனம் - வாஸ்து தோஷம்.

5. **சோழிப்பிரசன்னம்-** தேங்காய்- ஆரூடம்- பலகரைசோதிடம் - பஞ்ச பட்சி முறை நட்சத்திரங்களுக்குரிய பட்சிகள் - பஞ்ச பட்சிகளின் தொழில் முறை, படுபட்சிபலன் கூறும் முறைகள் ஆறு விதிகள்

குறிப்புதவி நூல்கள்

1. Prasana marga(1999) B.V.Raman
2. பிரசன்ன ஜோதிடம் (2006) K.S. கிருஷ்ணமூா்த்தி
3. அஷ்டமங்கல தேவபிரசன்னம் (2011) அ.அமிா்தலிங்கம்
4. சோழிப்பிரச்ன ஆருடம் எம். நடராஜன்
5. Prasanna Tantra (2001) B.V.Raman
6. பிரசன்ன ஆரூடம் சுப. சுப்ரமணியன்
7. ஷட் பஞ்சாசிகா (2002) எஸ்.ஏ.குமாரசாமி ஆச்சாரி

16ASP104	Rasi – Bhava – Star Constellations- 1	Semester – I 4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்

1) பன்னிரு ராசிகளின் காரகத்துவங்களை தெரிந்துக் கொள்வதால் பலன்களை தெளிவாக முடிவு செய்ய முடியும்.
2) ராசிகளின் தன்மை, வடிவம், இருப்பிடம், மரங்கள், மிருகங்கள் என்பவை பலன் சொல்வதில் முக்கிய பங்கு வகிக்கின்றன.
3) பன்னிரு பாவகங்களின் காரகத்துவங்களும் தெளிவாக புரிந்துக் கொண்டால் மட்டுமே ஜாதகப் பலன்களை வரையறுத்து கூற முடியும்.
4) 27 நட்சத்திரங்களின் தன்மை, குணம், வடிவம் இவைகளும் பலன் கூறுவதில் முக்கிய பங்கு வகிக்கின்றன.
5) ராசியில் நிற்கும் கிரகம் பாவகத்தில் மாறி நின்றால் பலன்கள் மாறுவதை அறிய முடியும்.
6) பாவாதிபதிகள் மாறி நிற்பதால் ஏற்படும் ஜாதக பலன் மாற்றங்களை அறிவது.

பயன்கள்

1) சூர்யாதி, சந்திராதி, பஞ்ச மஹா புருஷ யோகங்கள் பற்றி தெரிந்துக் கொள்வதால் ஜாதகருக்கு எப்படிபட்ட யோகத்தின் அடிப்படையில் பலன்கள் நடைபெறும் என்பதை கூறமுடியும்.
2) கேள்வியாளர்களின் கேள்விக்கு ஏற்ற பதிலை சொல்வதற்கு மேஷம் முதல் மீனம் வரையுள்ள இராசிகளின் தன்மை மற்றும் காரகத்துவங்களும், 12 பாவகங்கள் எதை குறிப்பிடுகின்றன என்பனவற்றை பற்றிய அறிவு வேண்டும்.
3) கோள்கள் நிற்கின்ற நட்சத்திரங்களின் அடிப்படையில் பலன்கள் மாறுவதை காணமுடியும்.
4) ஒரு கோள் எந்த ராசியில், எந்த பாவகத்தில் எந்த நட்சத்திரத்தில் அமர்கின்றது என்பதை பொருத்து பலன்கள் சொல்ல முடியும்.
5) லக்னம், லக்னாதிபதி எந்த நட்சத்திரத்தில் நிற்கின்றதோ அதை பொருத்து ஜாதகரின் பலன்கள் நிர்ணயிக்க முடியும்.
6) கோள்களின் நிலை தெரியாமலேயே லக்னத்தை கொண்டு பலன்களை வரையறுக்க முடியும்.

UNITS

1. பன்னிரு ராசிகள் காரகத்துவம்

மேக்ஷம் முதல் மீனம் வரை பன்னிரு ராசிகளின் இருப்பிடம் -வடிவம் - சிறப்பு அம்சங்கள். பன்னிரு ராசிகளுக்கும் ஆதிபத்ய முறையில் பலன்கள். ஒவ்வொரு ராசியில் உள்ள நட்சத்திர அடிப்படையில் பயன்கள். ஒவ்வொரு ராசியிலும் ஆட்சி, உச்சம், நீச்சம் அடையும் கிரகங்களை கொண்டு பலன்கள்.

2. பாவகங்களின் காரகத்துவம்

பன்னிரு பாவகங்கள் குறிப்பிடும் நிலைகள். பன்னிரு பாவகங்கள் குறிக்கும் - உயிர்காரத்துவங்கள். உடல் உறுப்புகள் - நன்மை, தீமைகள். ஒவ்வொரு பாவகமும்

குறிப்பாக உணர்த்தும் காரத்துவங்கள். மறைவு ஸ்தனங்கள்- தனஸ்தானம் - லாபஸ்தானம் - களத்திர ஸ்தானம்.

3. **பல வகையான யோகங்கள் சூர்யாதி, சந்திராதி, பஞ்ச மஹா புருச யோகங்கள்**

பத்ரயோகம் - மாளவியா யோகம் - சச யோகம் - ஹம்சயோகம் - ருஷயோகம்.

4. இருபத்தியேழு நட்சத்திரங்களின் அமைப்பு

அசுவனி முதல் ரேவதி வரை இருபத்தியேழு நட்சத்திரங்களின் வடிவம்-நட்சத்திரங்கள் ராசியின் தன்மை, ராசி அதிபதியின் தன்மைக்கு ஏற்ற வகையில் பலன்கள் தரும் முறைகள்.

5. **இருபத்தியேழு நட்சத்திரங்களின் குணம் மற்றும் தன்மைகள்**

பாவாதிபதிகள் நட்சத்திரங்களில் நிற்பதால் ஏற்படும் பலன்கள். கோள்கள் நட்சத்திரங்களில் உச்ச நீச்சம் அடைவதால் ஏற்படும் பலன்கள்.

குறிப்புதவி நூல்கள்.

1.	உத்திரகாலாமிர்தம்	S.A.குமாரஸ்வாமி ஆச்சாரியார்
2.	பிருஹத் பராசரா ஹோரா சாஸ்த்திரா	G.C.Sharma
3.	நட்சத்திர சிந்தாமணி I ,II, III	சரஸ்வதி மகால் நூலகம் தஞ்சாவூர்
4.	Book of Natkshatras	Prash Trivdi
5.	இருபத்தியேழு நட்சத்திரகோவில்கள்	K.P. வித்யாதரன்

16ASP105 (A)	Numerology - 1	Semester – I 4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்:

1) எண் கணிதம் பற்றிய அடிப்படையான கருத்துக்களை தெரிந்துக் கொள்ள வேண்டும்.
2) 1 முதல் 9 வரையுள்ள எண்கள் எந்தெந்த கிரகங்களை குறிக்கின்றது என்ற அறிவை பெற வேண்டும்.
3) 1 முதல் 30 தேதிகளில் பிறந்தவர்கள் எப்படிபட்ட குணாதிசயங்களுடன் வாழ்கிறார்கள் என்பதை இந்த எண்கணித சாஸ்திரம் நமக்கு தெளிவாக விளக்கும்.
4) பிறவி எண், விதி எண், பெயர் எண்களின் கூட்டு தொகை இவைகளை கொண்டு பலன் கூறும் முறையை தெரிந்துக் கொள்ளலாம்.
5) எண் கணிதம், ஜோதிட சாஸ்திரம் ஆகிய இரண்டிற்கும் உள்ள தொடர்பை அறிதல்.
6) ஒருவரின் பெயரை கொண்டு வாழ்நாள் முழுவதும் பலன்களை அறிதல்.

பயன்கள்:

1) எண் கணித சாஸ்திரத்திற்கு ஜோதிட சாஸ்திரமே அடிப்படை என்ற கருத்தை தெளிவாக புரிந்துக் கொள்ளுதல்.
2) பெயர்களின் சப்தங்களுக்கு எவ்வளவு வலிமை உண்டு என்பதை உதாரணங்களின் மூலம் தெரிந்துக் கொள்ளலாம்.
3) விதி எண் நாம் அனுபவித்துக் கொண்டிருக்கின்ற இன்ப துன்பங்களை படம் பிடித்து காட்ட கூடியது.
4) எண் கணிதம் மூலம் பெயர் மாற்றம் செய்து ஜாதகர்களின் வாழ்க்கை துன்பங்களை நீங்குவது.
5) பெயரில் திருத்தங்கள் செய்வதன் மூலம் பல அறிய பலன்களை அடைய முடியும்.
6) ஜாதகர் பிறந்த தேதியையும், கூட்டு எண்ணையும் கொண்டு வாழ்நாள் பலன்கள் சொல்ல முடியும்.

UNITS

1. எண்கணிதம் பற்றிய முக்கிய குறிப்பு, எண்களின் பொருள்

எண்கள் குறிக்கும் கோள்கள் - ஆங்கில எழுத்துக்கள் எண்களின் குணதிசயங்கள். பெயர் வைக்கும் முறை பெயர்களின் எண்களி சுட்டு எண்.

2. எண்களில் விளக்கங்கள் (எண்களின் ஆற்றல்)

பெயர்களின் கூட்டு எண்களின் பலன்கள் - வாழ்வில் ஏற்றம் தரும் எண்கள், கஷ்டத்தை தரும் எண்கள் - உயர்வை தரும் எண்கள்.

3. எண்களின் செயல்பாடு – எண் நிறம், தன்மை, அதிபதி

1,2,3 ஆகிய எண்களை பிறவி எண்களாக கொண்டவர்களின் பலன்கள். பிறப்பு ஜாதகத்தை கொண்டு பெயர் அறியும் முறை.

4. பிறவி எண், விதி எண் பெயர் என அறியும் முறை

பிறவி எண், விதி எண் இரண்டையும் சேர்த்து பலன்கள் நிர்ணயம் முறைகள். ஒரு எண்ணுக்கு நன்மையும், தீமையும் ஏற்படுத்தும் எண்கள்.

5. 9 கோள்களின் வக்கர எண்கள் பலவீன எண்கள்

எண்கணித ஜோதிட˙ பரிகாரங்கள். நோய்கள் மற்றும் பல பிரச்சினைகளை தீர்க்கும் முறை. வாழ்வின் ஏற்ற தாழ்வுகளை மாற்றும் பெயர் மாற்றம்.

குறிப்புதவி நூல்கள்

1. அதிஷ்டவிஞ்ஞானம் பண்டிட் ஸேதுராமன்
2. Lucky Numerology Veejay Raj
3. எண்கணித ஜோதிடம் ஸ்வாமி
4. எண் ஜோதிடம் சிவராசா

16ASP105 (B) Fundamental Vasthu – 1 Semester – I
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) வீடு கட்டுவதற்கும், கட்டிடம் கட்டுவதற்கும் நிலம் தேர்வு செய்தல் அவசியமாகும். இப்பாடப் பகுதியில் தெளிவாக தெரிந்துக் கொள்ளலாம்.
2) நிலத்தின் வடிவம், கோணங்கள், சல்லியம் கண்டு பிடித்தல் முதலியவை இடத்தை தேர்வு செய்வதில் முக்கிய பங்கு வகிக்கின்றது.
3) வீடு அல்லது கட்டிடம் கட்டுவதற்கு ஒவ்வொரு அளவுகளும் எவ்வளவு அளவு இருக்க வேண்டும் என்பதை பற்றிய அறிவும் இதன் மூலம் கிடைக்கும்.
4) ஜோதிட சாஸ்திரமே வாஸ்து சாஸ்திர அடிப்படையாகும்.
5) வீட்டில் ஒவ்வொரு அறையும் அமையக் கூடிய இடங்களை முடிவு செய்ய முடியும்.
6) அறைகள் அமைப்பு, ஜன்னல் அமைப்பு மூலம் பலன்கள் அறிய முடியும்.

பயன்கள் :

1) வீடுகள், கட்டிடங்கள் எந்த திசையை பார்த்த வண்ணம் இருக்க வேண்டும், தலைவாசல், பின்வாசல் ஆகியவற்றின் திசைகள் வீட்டில் தங்கியுள்ளவர்களுக்கு எவ்வித பலனை தரும் என்பதை இப்பாட பகுதியில் தெரிந்துக் கொள்ளலாம்.
2) வீட்டிற்குள் நடப்பதையும், நடக்க போவதையும் அக்கட்டிடத்தின் வாஸ்துவின் மூலம் தெரிந்துக் கொள்ள முடியம்.
3) வாஸ்து சாஸ்திரம் நமது தலை எழுத்தை மாற்றும் சக்தி படைத்தது.
4) ஆரோக்கியமான வாழ்விற்கு துணைபுரியும்
5) செல்வம் நிறைந்த வாழ்விற்கு துணைபுரியும்
6) கல்வி, ஒழுக்கம் நிறைந்த வாழ்விற்கு துணை புரியும்.

UNITS

1. நிலம் தேர்வு செய்தல்

வாஸ்து என்பதன் பொருள் - நிலத்தின் தன்மை – நிறம் - மணம் - சுவை – அமைப்பு - வசிக்கதக்க விலக்கத்தக்க நிலம் சல்லியம். வாஸ்து புருஷனின் புராணகால வரலாறு. வீடுகட்ட சிறந்த மனைகள் - வீடுகட்ட விலக்கத்தக்க மனைகள்.

2. நிலத்தின் வடிவம்

நிலத்தின் வடிவம் - சதுரம் - செவ்வகம் - வட்டம் - முக்கோணம் - நீள் சதுரம் - சக்கரம் - கிண்ணம் பானை – பலவித கோணங்கள் - தன்மைகள் - மனைகளின் அமைப்பு – மனைகளின் வடிவங்களால் ஏற்படும் பலன்கள் - மனைகளின் வடிவத்தை சீர்திருத்தம் செய்தல்.

3. நிலத்தடி சோதனை

சல்லியம் கண்டுபிடித்தல் - பிரச்னம் - சகுனம் - நிமித்தம் - நட்சத்திரம் - வாயிலாகச் சல்லியம் கண்டுபிடித்தல் - நீக்குதல் - கஜ பிருஷ்டம் - கூர்ம பிருஷ்டம் - தைத்ய பிருஷ்டம் - நாக பிருஷ்டம்.

4. நிலத்தை அளத்தல் ஆயம் கணித்தல்

அங்குல அளவு - கை அளவு - பொதுவான அளவு முறைகள் - ஆயம் கணித்தல் - பலன் - பார்வை – கதவு நிலம் அதிபதி – கால்நடைகள் - ஒன்பது வர்க்கம் கணக்கிடுதல் - திசைகளை நிர்ணயித்தல் - வீடு கட்டத் தகுதியான பாகங்கள்

5. கட்டுமானம்

வீடு – உயரம் - தலைவாசல் - ஒற்றை அறை - இரட்டை அறை – பதினாறு வகையான கட்டுமானம் - நிலத்தின் தோஷம் - திசை – மரம் - அஸ்திவாரம் - கதவு - சன்னல் - மனையடி சாஸ்திரம்.

குறிப்புதவி நூல்கள்

1. கே.எஸ். சுப்பிரமணிய சாஸ்திரிகள், மய மதம், சரசுவதி மகால் நூலகம், தஞ்சாவூர்
2. உரை எஸ். கிருஷ்ணமூர்த்தி சாஸ்திரிகள், வாஸ்து வித்யை, சரசுவதி மகால் நூலகம்
   தஞ்சாவூர்
3. கோவிந்தசாமி ரெட்டியார், காக்கையர் சிற்பம், சண்முகனந்தா புக் டிப்போ, சென்னை
4. ஆர். பாஸ்கரன் குருஷி, _ காச புஜண்டர் சித்தர் வாஸ்து சாஸ்திரம், காஞ்சிபுரம்
5. என். தாமோதரன், வாஸ்து வளம், _ மீனா பப்ளிஷர்ஸ், திருச்சி
6. பல வகையான சோதிட இணைய தளங்கள்

16ASP105 (C) Samutrika Lakshanam Semester – I
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்

1) பொதுவான முகத்தின் லட்சணத்தை கொண்டு ஜாதகரின் குணாதிசயங்களை சொல்ல முடியும்.
2) ஜோதிடத்திற்கும் அங்கலட்சணத்திற்கும் நெருங்கிய தொடர்பு உள்ளது. ஒரு மனிதனை பார்த்து அவனுடைய ஜாதக கட்டங்களை எழுதுகின்ற அளவிற்கு அறிவை வளர்க்க முடியம்.
3) உடலின் வலிமை, நிறம், உயரம், மச்சங்களின் பலன்கள் அந்த ஜாதகரின் வாழ்கையில் நடக்கும் நிகழ்ச்சிகளை தெரிவிக்கும்.
4) ஒருவரை பார்த்த மாத்திரத்தில் அவருடைய குணங்களை சொல்வது நோக்கமாகும்.
5) சமுதாயத்தில் எச்சரிக்கை உணர்வோடு வாழ்வது.
6) நம்மை பற்றிய, மற்றவர்கள் பற்றிய எதிர்கால பலன்களை தெரிந்துக் கொள்வது.

பயன்கள்:

1) ஒரு மனிதனை பார்த்த மாத்திரத்தில் அவனுடைய குணம், இறந்த கால வாழ்க்கை, நிகழ்கால வாழ்க்கை எதிர்கால வாழ்க்கை பற்றி தெரிந்துக் கொள்ளலாம்.
2) மனித உடலின் அங்கங்களின் வடிவம், அமைப்பு, நிறம், அளவு, தன்மை முதலியவற்றை தெளிவாக புரிந்துக் கொண்டால் அம்மனிதனை பற்றிய அனைத்து மறைக்கப்பட்ட உண்மைகளையும் நம்மால் சொல்ல முடியும்.
3) மனிதர்கள் மட்டும் இன்றி வளர்ப்பு பிராணிகளுக்கு அங்கலட்சனம் பார்க்கப்பட்டன. அவைகள் எஜமானனுக்கு எவ்வகையில் உதவும் என்பதும் சொல்ல முடியும்.
4) ஒரு மனிதனின் ஆயுள் ஆரோக்யத்தை சொல்ல முடியும்.
5) திருமண வாழ்க்கையை புரிந்துக் கொள்ளலாம்.
6) வேலை, தொழில் அமைப்பு, புத்ர பாக்யங்களை தெரிந்துக் கொள்ளலாம்.

UNITS

1. பொதுவான முக லட்சணம்
மூக்கின் லட்சணங்கள் - வாயின் லட்சணங்கள் - உதடுகளின் லட்சணம் - பற்களின் லட்சணங்கள் - காதுகளின் அமைப்பு.

2. அங்கத்துடிப்புகள்
நாக்கின் லட்சணங்கள் - காதுகளின் அமைப்பு. கன்னங்கள் - சிரிப்பும் அழுகையும் - முகவாய்க்கட்டு – கழுத்தின் லட்சணங்கள்.

3. தலை முடியின் லட்சணம்
தாடி மீசைகளின் லட்சணங்கள் - முதுகின் லட்சணங்கள் - தோள்களின் லட்சணங்கள் கைகளின் லட்சணங்கள் - மணிக் கட்டுகள் உள்ளங்கைகள் - புறங்கைகள்.

4. நெற்றியின் லட்சணம், கண்களின் லட்சணங்கள்

கைரேகை லட்சணங்கள் - விரல்கள் லட்சணங்கள் - நகங்களின் லட்சணங்கள் - இடும்பும் வயிறும் - தொடைகளின் லட்சணங்கள் - ஆண்குறியும் விதைகளும் - கால்களின் லட்சணங்கள் - கணுக்கால்கள்.

5. உடல் மச்சங்களும் பலன்களும் , மச்சங்களின் வடிவ லட்சணங்களும் பலன்களும்

சாமுதிரிகா லட்சணமும் ஜோதிடவியல் சம்பந்தமும் - மச்சங்களின் வகைகள் - ராசி சக்கரத்தை கொண்டு மச்சகளின் இருப்பிடத்தை நிர்ணயித்தல்.

குறிப்புதவி நூல்கள்

1. **C.M.Srivastava, Samudrik shastra, Manoj publications**
2. **K.C. Sen, Hast samudrika shastra, D.B. Taraporevala sons**
3. **கே.என். சரஸ்வதி, பிருஹத் ஸம்ஹிதை, கடலங்குடி பப்ளிகேஷன்ஸ்**

16ASP111 Predictive methods in Astrology - 1 Semester – I
4H – 4C

Instruction Hours / Week: L : 0 T : 0 P : 4 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) பல்வேறு சிறப்பு லக்னங்களை கொண்டு பலன் சொல்லும் முறைகள் இங்கே செய்முறை பயிற்சியின் மூலம் தெளிவாகிறது.
2) நாம் சொல்லும் பலன்கள் எக்கால கட்டங்களில் நடக்கும் என்பதை தசாபுத்தி கோட்சார அடிப்படையில் கால நிர்ணயம் செய்வதை இப்பாடப்பகுதி தூண்டும்.
3) பல்வேறு முறைகளில் பலன் சொல்வது நோக்கமாகும்.
4) ஜாதகம் இல்லாதவர்களுக்கு பலன்கள் சொல்வது.
5) இன்றைய ஜோதிட வளர்ச்சியை, புதிய கண்டுபிடிப்புகளை ஏற்றுக் கொள்வது.
6) ஜெய்மினி முறையில் பலன்கள் கண்டுபிடிப்பது.

பலன்கள் :

1) பலன்கள் கூறுவதற்கு பல முறைகள் உண்டு என்பதை தெரிந்துக் கொண்டு அவைகளை பயன்படுத்தி பார்ப்பது இங்கே அனுபவத்தை அதிகரிக்கும்.
2) அஷ்ட வர்க்க முறையிலும், ஷட்பல முறையிலும், எண்கணித முறையிலும் பலன்களை சொல்லுவதற்கு நம்மால் முடியும்.
3) ஏதேனும் ஒரு முறையில் நாம் சொல்லும் பலன்களை வேறுமுறையில் சோதித்து அறியலாம்.
4) நமக்கு தெரிந்த முறையில் பலன் கூறி பழகலாம்.
5) எந்த முறையில் பலன் கூறினாலும் பலன் ஒன்றாக தான் இருக்கும் என்பதை நிருப்பிக்கலாம்.
6) எளிமையான முறையில் பலன்கள் நிர்ணயம் செய்யலாம்.

UNITS

1. லக்ன பலன் கூறுதல்
பல்வேறு சிறப்பு லக்னங்களைக் கொண்டு பலன் சொல்லுதல் - கேந்திர திரிகோண அதிபதிகளின் தொடர்புகளைக் கொண்டு பலன் சொல்லுதல்.

2. தசாபுத்தி - கோட்சார முறைகளைப் பயன்படுத்தி பலன் கூறல்.
தசாக்கோள் - புத்திகோள் நிலைகள் - நின்ற நட்சத்திரம் - கோட்சார சனி – குரு நிலைகளைக் கொண்டு பலன் கூறுதல்

3. எண்கணித முறையில் பலன் கூறுதல் - பிறப்பு எண் - விதி எண் அடிப்படையில் பலன்கள் கூறுதல்.

4. அஷ்டவர்க்க முறையில் பலன் கூறுதல் - நவகிரக அஷ்டவர்க பலன்கள் - நவகிரக கச்சயா பலன்கள்.

5. ஷட்பலம் முறையில் பலன் கூறுதல் - நவகிரகங்களின் பலம் பலஹீனத்தை கொண்டு பலன் கூறுதல்.

குறிப்புதவி நூல்கள்

1.	பிருஹத் பராசர ஹோரா சாஸ்திரம்	G.C.Sharma
2.	பஞ்ச பட்சி	புலிப்பாணி சுந்தரவரதாச்சாரியார்
3.	Bhirugu Nandi Nadi	R.G.Rao
4.	Predictive steller Astrology	K.S.Krishnamurthi
5.	ஜோதிடத்தில் பலன் கூறும் முறைகளும் கோட்சார சூட்சுமங்களும்	நக்கீரர் எஸ். நடராசன்
6.	சாதகாலங்காரம்	கீரனூர் நடராசன்
7.	குமாரசாமியம்	ஸ்ரீகுமாரசுவாமி
8.	ஸர்வார்த்த சிந்தாமணி	கடலங்குடி நடேச சாஸ்திரிகள்
9.	மேலைநாட்டு சோதிடர்கள் சொல்லும் ஜோதிடம்	எஸ்.பி. சுப்ரமணியன்
10.	How to predict your future (1995)	James Braha
11.	பஞ்ச பட்சி சாத்திரம்	ஜாண் பி.நாயகம்

16ASP112 | Practical - I | Semester – I 4H – 4C

Instruction Hours / Week: L : 0 T : 0 P : 4 | Marks Internal : 40, External : 60 Total : 100 End Semester Exam : 3 hrs

நோக்கங்கள்:

1) தாரா பலனை நிர்ணயிப்பதின் மூலம் ஜாதகத்தின் பலனை மிகவும் துல்லியமாக கூற முடியும்.
2) சிறுவயது ஜாதகர்களின் எதிர்கால படிப்பை பற்றிய தெளிவு நன்கு புலனாகும்.
3) திருமண வாழ்க்கையின் தாரதரத்தை நிர்ணயிக்க முடியும்.
4) ஒரு லக்னம்(அ) சந்திரன் நின்ற ராசிக்கு கேந்திர திருகோண அதிபதிகளின் நிலை கொண்டு பலன்கள் கூறலாம்.
5) கோள்களின் பலத்தை அறிந்துக் கொள்ள திக்பலம் பயன்படும்.
6) பல்வேறு முறைகளில் பலன் சொல்வது நோக்கமாகும்.

பயன்கள்

1) நிலம், நீர்,நெருப்பு இராசிகளை இராசி கட்டங்களில் பிரித்து அறிவதன் மூலம் பலன் சொல்லும் முறையில் பல அரிய விஷயங்களை வெளி கொண்டுவர முடியும்.
2) ஷட் பலங்களில் திக் பலத்தின் முக்கியத்துவம் புரியும்.
3) கோள்கள் நிற்கும் நட்சத்திரத்தை கொண்டு தாரா பலன்கள் நிர்ணயித்து கோள்களின் வலிமையை அறியலாம்.
4) மனிதர்களுக்கு மிக இன்றியமையாதது கல்வியும், திருமண வாழ்க்கையும், தொழிலும் ஆகும். இவைகளை இந்த செய்முறை பாட பகுதியின் மூலம் நன்கு அறிந்தும் கொள்ளலாம்.
5) எந்த முறையில் பலன் கூறினாலும் பலன் ஒன்றாக தான் இருக்கும் என்பதை நிருப்பிக்கலாம்.
6) எளிமையான முறையில் பலன்கள் நிர்ணயம் செய்யலாம்.

UNITS

1. தாரா பலனை வரையறுத்தல் - ஜென்மதாரை – சம்பத் தாரை – விபத் தாரை –சௌம்ய தாரை- பிரத்வர தாரை – சாதக தாரை – நைதன தாரை – மைத்ர தாரை.
2. கல்வி பலனை வரையறுத்தல் - பள்ளி கல்வி – கல்லூரி படிப்பு – மேற்படிப்பு- ஆராய்ச்சி படிப்பு- மருத்துவபடிப்பு – பொறியியல் படிப்பு.
3. வாழ்க்கை முறையும் குடும்ப நலனும் - குடும்ப வாழ்க்கை அமையும்முறை – பணம் வரும் முறை.
4. நிலம், நீர், நெருப்பு, காற்று, இராசிகளை இராசிக்கட்டத்தில் பிரித்து காட்டுதல் - தன்மைகள்.
5. கேந்திர கோண ராசிகளின் பலன்களை வரையறுத்தல் - 1,4.7.10 ராசிகள். 5.9 ராசிகள் இவைகள் இணைந்த பலன்கள்.

குறிப்புதவி நூல்கள்

1.My Experiences in Astrology B.V. Raman

2. Important Combinations B.V. Raman

3. Hindu predictive Astrology B.V. Raman

16ASP201 Fundamentals of Astrology – 1I Semester – II
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) தமிழ் இலக்கியங்களில் உள்ள ஜோதிட குறிப்புக்கள் ஜாதக அலங்காரம், குமாரசுவாமியும், புலிப்பாணி 300, நாடி ஜோதிட நூல்கள் முதலிய நூல்களை பற்றி தெரிந்துக் கொள்வதால் தமிழகத்தில் ஜோதிடவியலின் ஆழத்தை பிரிந்துக் கொள்ள முடியும்.
2) பராசரர், ஜெயமினி, பிருகு முதலிய ரிஷிகளின் ஜோதிட கொள்கைகளை பற்றி அறிந்துக் கொள்வது மாணவர்களின் அறிவை வளர்ச்சியடைய செய்யும்.
3) கிருஷ்ணமூர்த்தி பத்ததி அவர்களின் புதிய ஜோதிட முறையின் மூலம் துல்லியமான பலன்களை கூறலாம்.
4) கல்யாணவர்மா, ஸ்ரீபதி, வராகமிஹிரர் போன்ற வடமொழியில் ஜோதிட நூற்கள் எழுதியவர்களின் ஜோதிட புலமைகளை அறிவது.
5) சி.ஜி. ராஜன் போன்ற தமிழக ஜோதிடர்களின் புலமைகளை அறிவது.
6) பி.வி.ராமன் போன்றவர்களின் அனுபவ ஜோதிட அறிவை புரிந்துக் கொள்வது.

பலன்கள்:

1) கல்யாணவர்மா, ஸ்ரீபதி, வராகமிஹிரர் ஆகிய ஜோதிட மேதைகளின் ஜோதிட நூற்களை படிப்பதன் மூலம் ஜோதிடத்தில் ஆழ்ந்த அறிவு உண்டாகும்.
2) ஜெயமினி, பராசரர் முதலிய ரிஷிகளின் ஜோதிடவியல் பங்களிப்புகள் ஜோதிடவியலின் தெய்வீக தன்மையையும், நம்பக தன்மையையும் அதிகப்படுத்துகின்றன.
3) நாஸ்டர்டாம், அகஸ்தியர் முதலிய ஜோதிட மேதைகளின் பலன் கூறும் முறைகள் இன்றளவிலும் ஒரு ஆச்சர்யமாகவே பார்க்கப்படுகின்றன.
4) கர்கர், பிருகு போன்ற ரிஷிகளின ஜோதிட அறிவை அவர்களின் நூற்களின் மூலம் அறிந்துக் கொள்ள முடியும்.
5) சாதக சந்திரிகை போன்ற பழம் பெரும் நூற்களின் பெருமைகள் புரியும்.
6) ஜோதிட வல்லுனர்களின் ஜோதிட புலமை என்பது மாணவர்களுக்கு ஒரு வரபிரசாதமாக அமையும்.

UNITS

1. **தமிழ்ச் சோதிட நூல்கள்**
பழந்தமிழ் இலக்கியங்களில் ஜோதிட குறிப்புக்கள் - சாதக அலங்காரம்- குமாரசுவாமியம்- புலிப்பாணி 300 - நாடிஜோதிட நூல்கள் - ப்ருகு நந்தி நாடி- சப்த ரிஷி நாடி –ஜினேந்திர மாலை- ஜோதிடப் பேரகராதி – ஜாதக சூடாமணி- சந்திரகாவியம்.

2. **இந்திய ஜோதிடர்களின் சோதிடக் கொள்கைகள்**
பராசரர் - ஜெயமினி – கர்கர் - பிருகு – சாதக சந்திரிகை – பராசர ஹோரா சாஸ்த்ரம் - ஜெயமினி சூத்திரங்கள் - கர்க ஹோரை – பிருகு சம்ஹிதை – நந்திவாக்யம்.

3. **கல்யாணவர்மா - ஸ்ரீபதி – வராகமிஹிரர்**- சாராவளி – சுகர்நாடி – சர்வார்த்த சிந்தாமணி - ஜாதக பாரி ஜாதகம் - சித்தாந்த திருக்கணிதம்.

4. தற்கால ஜோதிடவளர்ச்சி

கிருஷ்ணமூர்த்தி பத்ததி – பி.வி. ராமன் - கிருஷ்ணமூர்த்தி பத்ததி நூற்கள் - பிஇவி.ராமன் நூற்கள்.

5. **சி.ஜி. ராஜன் நூற்கள்** - இந்தியா – ரஷ்யா – அமெரிக்கா பற்றிய நாஸ்டர்டாம் கூற்றுக்கள்.

குறிப்புதவி நூல்கள்

1.	Hindu Astrology and the west	B.V.Raman.
2.	கிருக்ஷ்ணமூர்த்தி பத்ததி முறை	கே.எஸ். கிருஷ்ணமூர்த்தி
3.	வான சாஸ்திரம்	எம். எல். ராஜா.
4.	வானியலும் ஜோதிடமும்	எம். கே. தாமோதரன்
5.	Ancient Hindu Astrology for the Modern Western Astrologer (1986)	James T.Brahe
6.	Tryst with Astronomy	V.Jayabal சோதிட ஆய்வு திரட்டு -1(2013) கற்பகம் பல்கலைக்கழகம் கோயம்புத்தூர்

16ASP202	Planets in Astrology – 1I	Semester – II 4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) பன்னிரு ராசிகளில் கோள்கள் அடையும் ஆட்சி, உச்சம், நீச்சம், பகை, மூலத்திரிகோணம் ஆகிய பலன்கள் கோள்களின் பலத்தை அறிவதில் முக்கிய பங்கு வகிக்கின்றன.
2) பாவகத்தில் கோள்கள் நின்ற பலன்களும் ஜாதகத்திற்கு பலன் சொல்வதற்கு துணையாக இருக்கும்.
3) கோள்களின் இணைவு பலன்கள் ஜாதகபலன் நிர்ணயத்திற்கு பெரும் பங்காற்றுகின்றது.
4) திசா புத்தி கோட்சார பலன்கள் நிகழ்ச்சிகள் நடக்கும் காலகட்டத்தை துல்லியமாக எடுத்துரைப்பதாகும்.

பயன்கள் :

1) கோள்களின் பார்வைகள், சிறப்பு பார்வைகள் ஜாதகரின் வாழ்க்கையில் எப்படிப் பட்ட தாக்கத்தை ஏற்படுத்துகின்றன என்பதை தெரிந்துக் கொள்ள முடியும்.
2) கோள்களின் வலிமையை கொண்டு அக்கோள் ஜாதகருக்கு எவ்வளவு பலனை தரும் என்பதை கணிக்கலாம்.
3) பாவகங்களில் நிற்கும் கோள்களின் தன்மைகளுக்கு ஏற்ற வகையில் ஜாதகனின் வாழ்க்கை அமைகிறது.
4) தர்ம, அர்த்த, காம, மோட்ச திரிகோணங்களில் நிற்கும் கிரகங்களை கொண்டு ஜாதகனின் பிறவியின் நோக்கம் தெரிந்துக் கொள்ளலாம்

UNITS

1. கோள்களின் பலன்கள்

ஆட்சி, உச்சம், நீசம், திரிகோணம், கேந்திரம் வர்க்கப்பலன்கள் - பன்னிரு ராசிகளில் கோள்கள் அடையும் ஆட்சி – உச்ச- நீச- பகை- மூலத்திரிகோண பலன்கள்

2. பாவகத்தில் கோள்களின் பலன்கள்

தர்ம - அர்த்த - காம்ய - மோட்ச - கேந்திர - கோண பலன்கள் - நட்சத்திரங்களின் கோள்கள் நின்ற பலன்கள்.

3. கோள்களின் பார்வை பலன்கள் மற்றும் கோட்சார பலன்கள்

கோள்களின் பொதுப் பார்வைகள் - சிறப்பு பார்வைகள் குரு – சனி – செவ்வாய் - ராகு - கேதுக்களின் பார்வைகள் - கோள்களின் கோட்சாரப் பலன்கள்.

4. கோள்கள் இணைவு பலன்கள்

இரண்டு அல்லது அதற்கு மேற்பட்ட கோள்கள் இணைதல் மற்றும் பலன்கள்- யோகி கோள் - அவயோகி கோள்.

5. கோள்களின் திசா புத்தி பலன்கள்

போதகர் - காரகன் - பாசகன் - வேதகன்.

குறிப்புதவி நூல்கள்

1.	உத்திரகாலாமிருதம்	S.A.குமாரஸ்வாமி ஆச்சாரியார்.
2.	Prasana Marga	B.V.Raman
3.	Pointer to Profession	T.P.Trivedi & R.Asthana
4.	Brihat Parasara Hora Sastra	G.C.Sharma
5.	ப்ருஹத் ஜாதகம்	C.G. ராஜன்
6.	குடும்பஜோதிடம்	ஸ்ரீராமய்யங்கார்-ஸ்ரீஸ்ரீனிவாஸாசாரியார்
7.	Mundane Astrology	B.V.Raman
8.	ஜோதிடமும் நவகிரகங்களும்	முருகு இராசேந்திரன்
9.	How to Judge a Horoscope – Vol –I & II	B.V. Raman

16ASP203 | Horary Astrological Methods – 1I | Semester – II
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 | Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்

1) கேள்வியாளர்களின் தூரப் பயணங்களை பற்றியும், தனது தொழிலில் ஏற்படும் ஏற்ற தாழ்வுகள் பற்றியும் பிரஸன்ன முறையில் பலன்கள் கூறப்படும்.
2) புத்திர பேறு அறிதல் பற்றிய கேள்விகளுக்கு பிரஸன்ன முறையில் பதில்கள் சொல்வதற்கு பயிற்ச்சியளித்தல்.
3) விவாஹ பிரஸன்ன முறையில் திருமணத்தை பற்றிய அனைத்து கேள்விகளுக்கும் பதில் கூற முடியும்.
4) ரோக பிரஸன்ன முறையில் ஜாதகருக்கு ஏற்பட்ட நோயை அறிந்து அதற்கு பரிகாரமும் சொல்ல முடியும்.
5) சகுனம், நிமித்தங்களின் மூலம் ஜாதகரின் கேள்விகளும் பதில் கூற முடியும்.
6) வெற்றிலை ஜோதிடம் மூலம் ஜாதகரின் கடந்த காலம், நிகழ்கால பலன்களை தெளிவாக கூற முடியும்.

பயன்கள் :

1) ஜாதகம் இல்லாதவர்களும் ஜோதிடத்தின் மூலம் பலன்களும் பரிகாரங்களும் தெரிந்துக் கொள்ளலாம்.
2) நிகழ் காலத்தில் ஏற்படுகின்ற தொழில் தடை, திருமண தடை முதலியவைகளை முன்கூட்டியே அறிந்து அவைகளுக்கு தீர்வும் அளிக்கலாம்.
3) குழந்தை ஆணா? பெண்ணா? எக்கால கட்டத்தில் பிறக்கும், அக்குழந்தையால் பெற்றோர்களில் வாழ்க்கையில் ஏற்படும் மாற்றங்கள் ஆகியவை தெரிவுப்படுத்தப்படும்.
4) நோய் வருவதற்கு காரணம், அதை தீர்க்கும் முறையும் சொல்லப்படும்.
5) அஷ்ட மங்கல பிரசன்னம் மூலம் கேள்வியாளர் பிரச்சினைகளை எளிதாக கண்டு பிடிக்க முடியும்.
6) விவாஹ பிரசன்னம், நஷ்ட பிரசன்னம், ஆயுள் பிரசன்னம், ரோக பிரசன்னம் மூலம் கேள்வியாளரின் கேள்விகளுக்கு பதில்கள் கூற முடியும்.

UNITS

1. **பிரசன்ன முறையில் நீண்ட தூரப் பயணங்களை அறிதல்**
   பிராணத்திற்கு ஏற்ற காலம் - பிரயாணத்தில் ஏற்படும் தடைகள் - கஷ்டங்கள் - கண்டங்கள்- நோய்கள்.

2. **பிரசன்ன முறையில் தொழில் அறிதல்**
   வேலை கிடைக்குமா? கிடைக்காதா? வேலை கிடைக்கும் காலம் - எத்துறை சார்ந்த வேலை அமையும்.

3. பிரசன்ன முறையில் திருமண விவரம் அறிதல்

ஏழாம் பாவகத்தைக் கொண்டு மனைவியை அறிதல் - சுக்கிரனின் பங்கு திருமண காலம் -மனைவியின் குணங்களை அறிதல்- பல்வேறு பொருத்த நிலைகள்-

4. பிரசன்ன முறையில் புத்திர பேறு அறிதல்

குழந்தைப்பேறு அறிதல் - சந்தானவிருத்தி அறிதல்.
நிசேகம் லக்னம் குறித்தல் - குழந்தைப் பேறு அறிதல் - சந்தான விருத்தி

5. பிரசன்ன முறையில் நோய் மற்றும் வழக்கு அறிதல்

பிரசன்னத்தில் நோய்கள் அறிதல் - பல்வேறு வகையான நோய்களுக்கு- கோள்களின் நிலைகள் - கர்ம விபாக முறையில் பரிகாரங்கள் - நோய் வருங்காலம் - தீர்தல்

குறிப்புதவி நூல்கள்.

1. Prasana Marga (1999) — B.V.Raman
2. பிரசன்ன ஜோதிடம் (2006) — K.S. கிருஷ்ணமூர்த்தி
3. அஷ்டமங்கல தேவபிரசன்னம் (2011) — அ.அமிர்தலிங்கம்
4. சோழிப்பிரச்ன ஆரூடம் — எம். நடராஜன்
5. Prasna Tantra (2001) — B.V.Raman
6. இலகு ஜாதகம் — எஸ். ஏ. குமாரசுவாமி ஆச்சாரி
7. பிரசன்ன ஆரூடம் — சுப. சுப்ரமணியன்

16ASP204 Rasi – Bhava – Star Constellations- II Semester – II
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்:

1) கோள்கள் பன்னிரு ராசிகளில் ஏற்படுத்தும் பலன்கள் ஜாதகனை எவ்வகையில் பாதிக்கிறது.
2) கோள்கள் பன்னிரு பாவகங்களில் நிற்பதால் ஏற்படும் பலன்கள் ஜாதகனை எப்படி செயல்பட வைக்கின்றன.
3) லக்னம் முதல் பன்னிரு பாவாதிபதிகள் பாவகங்களில் மாறி நிற்பதால் ஏற்படும் பலாபலன்கள் ஜாதகனுக்கு எப்படிப்பட்ட தாக்கத்தை உண்டு செய்கின்றது.
4) நட்சத்திரங்களில் கோள்கள் நிற்பதால் ஏற்படும் பலன்கள், ஜாதக பலன்களில் ஒரு முக்கிய திருப்பு முனையாகும்.
5) ராசியில் நிற்கும் கிரகம் பாவகத்தில் மாறி நின்றால் பலன்கள் மாறுவதை அறிய முடியும்.
6) பாவாதிபதிகள் மாறி நிற்பதால் ஏற்படும் ஜாதக பலன் மாற்றங்களை அறிவது.

பயன்கள்:

1) பன்னிரு பாவகங்களில் பாவாதிபதிகள் மாறி நிற்பதால் ஏற்படும் பலன்கள், ஜாதகனை அடையும் முறைகள் தெளிவாக எடுத்து சொல்ல முடியும்.
2) பாவாதிபதிகள் தான் நிற்கும் நட்சத்திரங்களை பொருத்து பலன்களை மாற்றியமைக்கும் தன்மை பெற்றவை. இவைகளை தெளிவாக பார்க்க முடியும்.
3) கோள்களின் இலக்ன ஆதிபத்திய பலன்கள், எதிர்பாராத மாற்றங்களை ஏற்படுத்துவதை உணர முடியும்.
4) ஒரு கோள் எந்த ராசியில், எந்த பாவகத்தில் எந்த நட்சத்திரத்தில் அமர்கின்றது என்பதை பொருத்து பலன்கள் சொல்ல முடியும்.
5) லக்னம், லக்னாதிபதி எந்த நட்சத்திரத்தில் நிற்கின்றதோ அதை பொருத்து ஜாதகரின் பலன்கள் நிர்ணயிக்க முடியும்.
6) கோள்களின் நிலை தெரியாமலேயே லக்னத்தை கொண்டு பலன்களை வரையறுக்க முடியும்.

UNITS

1. **பன்னிரு ராசிகளில் கோள்கள் நிற்கும் பலன்கள்.**
பன்னிரு ராசிகளில் சூரியன் முதல் ஒன்பது கோள்கள் நிற்பதால் ஏற்படும் பலன்கள்- கோள்களின் சேர்கையால் ஏற்படும் பலன்கள்.

2. **பன்னிரு பாவகங்களில் ஒன்பது கோள்கள் நிற்பதால் ஏற்படும் பலன்களை வரையறுத்தல் - விளக்கம் கூறுதல்.**
சூரியன் - சந்திரன் - செவ்வாய்- புதன் - குரு- சுக்கிரன் - சனி –ராகு – கேது - தனித்தனியே மற்றும் சேர்க்கை பெற்று ஏற்படுத்தும் பலன்கள்.

3. **பன்னிரு பாவகங்களில் பாவாதிபாதிகள் மாறி நிற்பதால் ஏற்படும் பலன்களை வரையறுத்தல்**
பன்னிரு பாவகங்கள் பாவகங்களின் ஆதிபத்தியம் -லக்னம் முதல் பன்னிரு பாவகங்களில் பாவாதிபதிகள் நிற்பதால் ஏற்படும் பலன்கள் .

4. **நட்சத்திரங்களில் கோள்கள் இருப்பதால் ஏற்படும் பலன்கள்.**

இருபத்தியேழு நட்சத்திரங்களும் உரிய கோள்களும் -
இருபத்தியேழு நட்சத்திரங்களில் கோள்கள் நிற்பதால் ஏற்படும் பலன்கள்..

5. **நட்சத்திரங்களில் நின்ற கோள்களின் இலக்ன ஆதிபத்தியப் பலன்கள்**
ஓவ்வொரு லக்னத்திலும் பிறந்தவர்களின் பலன்களை ஆதிபத்ய முறையில் வரையறை செய்தல்.

குறிப்புதவி நூல்கள்

1. உத்திரகாலாமிர்தம் — S.A.குமாரஸ்வாமி ஆச்சாரியார்
2. பிருஹத் பராசரா ஹோரா சாஸ்த்திரா — G.C.Sharma
3. நட்சத்திர சிந்தாமணி I ,II, III — சரஸ்வதி மகால் நூலகம் தஞ்சாவூர்
4. Book of Natkshatras — Prash Trivedi
5. இருபத்தி ஏழு நட்சத்திர கோயில்கள் — கே.பி. வித்யாதரன்

16ASP205 (A) Gemology Semester – II
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) நவ இரத்தினங்கள் பற்றி பல நூல்களில் கூறியுள்ள செய்திகளை தெரிந்துக் கொள்வதால், இவைகளை பற்றிய முக்கியத்துவமும், அத்தியாவசியமும் நமக்கு விளங்கும்.
2) இரத்தின கற்களிலிருந்து ஏற்படும் பல விதமான கதிர் வீச்சுக்கள் எவ்வகை தாக்கத்தை மனிதர்களிடத்தில் ஏற்படுத்துகின்றன.
3) ஓவ்வொருவருடைய ஜாதக பலனை கொண்டு யோககாரகனின் இரத்தினத்தை அணிவதால் ஏற்படும் மாற்றங்கள் பற்றி அறியலாம்.
4) நவகிரகங்களுக்கும் நவ ரத்தினங்களுக்கும் உள்ள தொடர்பை அறியலாம்.
5) நவமணியின் வகைகளை, வைரங்களின் வகைகளை அறிவது.
6) நவரத்தின வியாபரத்தின் மூலம் பொருளீட்டுவது.

பயன்கள் :

1) மாணிக்கம், முத்து, பவளம், மரகதம் ஆகிய கற்களின் குணாதிசயங்களை தெரிந்துக் கொள்வது.
2) இவைகளை எந்த ஜாதகர் அணிந்துக் கொண்டால் எப்படிபட்ட பலன்களை அவர் பெறுவார்.
3) வைரம், நீலம், கோமேதகம், வைடூரியம் ஆகிய கற்களின் குணதியசங்களை புரிந்துக் கெர்வது.
4) இவைகளை பயன்படுத்தும் முறைகளை சோதித்து பார்த்து ஜாதகர்களுக்கு அறிவுரை வழங்குவது.
5) எந்த லக்னத்தில் பிறந்தவர் எந்த ரத்தினத்தை அணியலாம் என்பதை கண்டுபிடிப்பது.
6) பிறப்பு ஜாதகத்தில் உள்ள தோ'ங்களை நீக்க பயன்படும்.

UNITS

1. இரத்தினம் பற்றி பல நூல்கள் கூறியவை – நாகமணியின் வகைகள்,
இரத்தினக்கற்கள் மற்றும் வைரங்கள் வகைள்

2. சோதிடமும் இரத்தினக் கற்களும்
யோகக்காரர்களும், இரத்தின கற்களும், விபரீத ரத்தினம், இரத்தினக் கற்களும் தசா காலங்களும், இலக்னாதிபதியும் இலக்ன கற்களும்

3. கிரகங்களின் இயற்கையான நட்பு, பகை, சமம் போன்ற விவரங்கள் பரஸ்பர பகை கிரகங்களுக்கான இரத்திரங்கள், விரல்களும் இரத்தினக் கற்களும், ஆருட லக்னமும் கற்களும்

4. இரத்தினக் கற்கள் பற்றிய விவரங்கள்
மாணிக்கம், முத்து, பவளம், மரகதம்

5. கனகபுஷ்பராகம்

வைரம், நீலம், கோமேதகம், வைடுரியம்

குறிப்புதவி நூல்கள்:

Gemology Cornelius S. Huribut

16ASP205 (B) Modern Vasthu -II Semester - II
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) வீட்டின் நுழைவாயில், பின்வாயில் அமைக்கும் முறை, ஜன்னல்கள், மாடிபடிக்கட்டுகள் அமைக்கும் முறைகளை தெரிந்துக் கொள்வது.
2) வீட்டின் ஒவ்வொரு பகுதியும் எந்தெந்த கோள்களின் ஆதிக்கத்தில் வருகிறது.
3) வீட்டில் வசிப்பவர்களின் ஜாதகத்திற்கும் அவ்வீட்டின் வாஸ்துவிற்கும் உள்ள தொடர்பு.
4) தெருத்தாக்கம் அவ்வீட்டில் வசிப்பவர்களின் வாழ்க்கையில் ஏற்படுத்தும் விளைவுகள்.
5) ஜோதிட சாஸ்திரமே வாஸ்து சாஸ்திர அடிப்படையாகும்.
6) வீட்டில் ஒவ்வொரு அறையும் அமையக் கூடிய இடங்களை முடிவு செய்ய முடியும்.
7) அறைகள் அமைப்பு, ஜன்னல் அமைப்பு மூலம் பலன்கள் அறிய முடியும்.

பயன்கள்:

1) இரண்டு(அ)முன்று மாடி கட்டிடங்கள் அமைப்பதற்கான விதிகளும் அதன் பயன்பாடுகளும்.
2) ஆழ்துளைக்கிணறு, படுக்கை அறை, குளியல் அறை, வாசல் , பூஜை அறை, வமையல் அறை இவைகள் அமைக்கும் முறைகளும், இவைகள் வீட்டில் வசிப்பவர்களின் மீது ஏற்படுத்தும் தாக்கங்களும்.
3) வாஸ்து குறைபாடுகளுக்கு பரிகாரங்களின் மூலம் தீர்வு,
4) ஆரோக்கியமான வாழ்விற்கு துணைபுரியும்
5) செல்வம் நிறைந்த வாழ்விற்கு துணைபுரியும்
6) கல்வி, ஒழுக்கம் நிறைந்த வாழ்விற்கு துணை புரியும்.

நவீன வாஸ்த்து – II

UNITS:

1. கர்ப்பம் - விளக்கம்- சம எடை- நற்பலன்- தலம் - படிகட்டுகள்- சமையல் அறை- வரவேற்பு அறை- கழிவரை அமைத்தல் - வாஸ்து பூஜைக்குரிய காலம்.

2. திசையை நிர்ணயிக்கும் முறை, வாஸ்து, பிரமிட் மருத்துவ மனைகள், வீட்டுச் சுற்றுப் புறத்தில் இடம் வாங்குதல்
பிளாக்குகள் - முதல் தரமான மணை, இரண்டாம் தரமான மனை, மூன்றாம் தரமான மனை, நான்காம் தரமான மனை, எட்டுத் திசைகள்

3. வாயில்களின் எண்ணிக்கை- வீட்டிற்கு வாசல் - ஜன்னல்கள்- அலமாரிகள்- உச்ச நீசங்கள் - சம உயர அமைப்பு - கிழக்கு வாசல் வீடுகள் -மேற்கு வாசல் வீடுகள்- தெற்கு வாசல் வீடுகள் - வடக்கு வாசல் வீடுகள்.

4. முதுகுத் தாக்கம், தெருத்தாக்கம் - தெருப்பார்வை பலன்கள் - வடகிழக்கு வாசல் வீடுகள் - வடமேற்கு வாசல் வீடுகள் - தென் கிழக்கு வாசல் வீடுகள் - தென்மேற்கு வாசல் வீடுகள்.

5. இருபக்க, மூன்று பக்க கட்டிடங்கள்- வீட்டிற்கு படிகள் அமைப்பது- கிணறு மற்றும் ஆழ்துளைக் கிணறு- படுக்கை அறை- குளியல் அறை- வாசல் - ஜோதிடத்திற்கும் வாஸ்து சாஸ்திரத்திற்கும் உள்ள தொடர்புகள்.

குறிப்புதவி நூல்கள்:

1. கே.எஸ். சுப்பிரமணிய சாஸ்திரிகள், மய மதம், சரசுவதி மகால் நூலகம், தஞ்சாவூர்
2. உரை எஸ். கிருஷ்ணமூர்த்தி சாஸ்திரிகள், வாஸ்து வித்யை, சரசுவதி மகால் நூலகம் தஞ்சாவூர்
3. கோவிந்தசாமி ரெட்டியார், காக்கையர் சிற்பம், சண்முகனந்தா புக் டிப்போ, சென்னை
4. ஆர். பாஸ்கரன் குருஷி, _ காச புஜண்டர் சித்தர் வாஸ்து சாஸ்திரம், காஞ்சிபுரம்
5. என். தாமோதரன், வாஸ்து வளம், _ மீனா பப்ளிஷர்ஸ், திருச்சி
6. வாஸ்து சாஸ்திர வாஸ்தவங்கள், கௌரு திருப்பதி ரெட்டி, பிரஜகித்தா பப்ளிசர்ஸ், ஹைதராபாத்
7. பல வகையான சோதிட இணைய தளங்கள்

16ASP205 (C)	Palmistry	Semester – II 4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்:

1) கைரேகை சாஸ்திரம் பற்றிய வரலாறு, பழங்கால நூல்களில் உள்ள குறிப்புகளை தெரிந்து கொள்வது.
2) கைரேகைகளின் வகைகள், கைகளின் வகைகள், கையில் உள்ள ரேகைகளுக்கும் கோள்களுக்கும் உள்ள சம்பந்தத்தை அறிதல்.
3) ஆயுள் ரேகை, புத்தி ரேகை, புதன் ரேகை ஆகியவற்றின் பலன்கள். இந்த ரேகைகளின் அமைப்புகள் ஏற்படுத்தும் தாக்கங்கள்.
4) குருமேடு, சூரிய மேடு, சுக்கிர மேடு, சனிமேடு, புதன் மேடு ஆகிய மேடுகளின் அமைப்பும் பலன்களும்.
5) கைரேகையை கொண்டு வாழ்நாள் பலன்களை சொல்வது.
6) கைகளில் உள்ள குறிகளை கொண்டு பல வியக்க தக்க பலன்களை சொல்வது.

பயன்கள் :

1) ஜோதிட சாஸ்திரத்திற்கும் கைரேகை சாஸ்திரத்திற்கும் உள்ள தொடர்பை புரிந்துக் கொள்ளுதல்.
2) பிறப்பு ஜாதகம் இல்லாதவர்களுக்கு கைரேகை மூலம் பலன்களை சொல்லுதல்.
3) தோஷ பரிகாரங்கள் செய்த பிறகு கைரேகையில் ஏற்படும் மாற்றங்களை கவனித்தல். கையில் உள்ள ஒவ்வொரு குறிகளுக்கும் பலன்களை எடுத்துரைத்தல்.
4) கையில் உள்ள ரேகைகளை கோள்களுடன் இணைத்து பலன் சொல்ல முடியும்.
5) கைகளில் உள்ள மேடுகளை கோள்களுடன் இணைத்து பலன்கள் கூற முடியும்.
6) ரேகைகளின் இணைவு, குறிகளின் இடம் இவைகளின் மூலம் பலன்கள் துல்லியமாக கூற முடியும்.

UNITS

1. கைரேகை சாஸ்திரம் பற்றிய குறிப்புகள் , ரேகைகளின் வகைகள்
கைரேகை சாஸ்திரம் பற்றிய வரலாறு

2. கைகளின் பிரிவுகளும், குணங்களும்
கைகளில் காணப்படும் சில முக்கிய கோடுகளும் குறிகளும்

3. விரல்கள், விரல் நுனிகள், விரலின் கணுக்கள் பற்றிய விவரங்கள்
கையில் உள்ள ரேகைகளுக்கும் கோள்களுக்கும் உள்ள சம்பந்தத்தை அறிதல்.

4. கைகளின் மேடுகளும், பலன்களும்
சூரியமேடு, குரு மேடு, சுக்கிர மேடு, சனி மேடு, புதன் மேடு

5. ரேகைகளும், பலன்களும்

ஆயுள் ரேகை, புத்தி ரேகை, புதன் ரேகை போன்றவைகள்

குறிப்புதவி நூல்கள்:

1. Indian palmistry Sulabh Jain
2. Palmistry Renita cheiro
3. All the secrets of palmistry prof. Dayanand

16ASP211 Predictive Methods in Astrology - II Semester – II
4H – 4C

Instruction Hours / Week: L : 0 T : 0 P : 4 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்:

1) பல்வேறு லக்னங்களை கொண்டு மாணவர்கள் பலன் சொல்லும் முறையை தெரிந்துக் கொள்ள வேண்டும். ராசியைக் கொண்டு பலன் கூறும் முறை.
2) பன்னிரு பாவாதிபதிகளின் நிலைகள் கொண்டு பலன் கூறுதல், கோள்களின் சேர்க்கை, பார்வை பலன்களின் தாக்கம் ஆகியவற்றை புரிந்துக் கொள்ளுதல்.
3) நாடி முறை, ஜெய்முனி முறை, கிருஷ்ணமூர்த்தி பத்ததி முறை ஆகிய பல முறைகளில் பலன்கள் காணும் விதத்தை தெரிந்துக் கொள்ளுதல்.
4) பல்வேறு முறைகளில் பலன் சொல்வது நோக்கமாகும்.
5) ஜாதகம் இல்லாதவர்களுக்கு பலன்கள் சொல்வது.
6) இன்றைய ஜோதிட வளர்ச்சியை, புதிய கண்டுபிடிப்புகளை ஏற்றுக் கொள்வது.

பயன்கள்:

1) எந்தமுறையில் பலன்கள் சொன்னாலும், ஒரே மாதிரியான பலன்கள் ஜாதகருக்கு சொல்ல முடியும். பலன்களில் மாற்றங்கள் ஏற்படாது என்பதை புரிந்துக் கொள்வது.
2) பலன்காணுவதற்கு நாமும் புதிய முறைகளை கண்டு பிடிக்கலாம் என்ற எண்ணம் வளரும்.
3) ஒரு முறையில் கண்டுபிடித்த பலன்களை மறுமுறையில் உறுதி செய்வது.
4) நமக்கு தெரிந்த முறையில் பலன் கூறி பழகலாம்.
5) எந்த முறையில் பலன் கூறினாலும் பலன் ஒன்றாக தான் இருக்கும் என்பதை நிருப்பிக்கலாம்.
6) எளிமையான முறையில் பலன்கள் நிர்ணயம் செய்யலாம்.

UNITS

1. **பராசரர் முறையில் பலன் கூறுதல்**
பல்வேறு லக்னங்களைக் கொண்டு பலன் கூறுதல் - ராசியைக் (சந்திரன்) கொண்டு பலன் கூறுதல் பன்னிரு பாவாதிபதிகளின் நிலைகளைக் கொண்டு பலன் அறிதல் - கோள்களின் பார்வையைக் கொண்டு பலன் கூறுதல்

2. நாடி முறை
நாடி விதிகள்- நாடி பார்வை முறைகளை கொண்டு பலன் கூறுதல்

3. ஜெய்முனி முறை
ஜெய்முனி பார்வை - சிறப்பு லக்னங்கள்

4. உத்திரகாலமிர்த முறையில் பலன் கூறுதல்

5. **கிருஷ்ணமூர்த்தி பத்ததி முறையில் பலன் கூறுதல்.**
உப நட்சத்திரங்கள் - குறிகாட்டிகள்

குறிப்புதவிநூல்கள்

1.	பிருஹத் பராசர ஹோரா சாஸ்திரம்	G.C.Sharma
2.	பஞ்ச பட்சி	புலிப்பாணி சுந்தரவரதாச்சாரியார்
3.	Bhirugu Nandi Nadi	R.G.Rao
4.	Predictive steller Astrology	K.S.Krishnamurthi
5.	நாடி ஜோதிட நுணுக்கங்கள்	ஆர். தங்கவேலு
6.	நாடியில் தொழிலும் கல்வியும்	ஏ. அமிர்தலிங்கம்
7.	நாடி ஜோதிட விளக்கங்கள்	சிவதாசன்ரவி
8.	ஜீவன காரகன் சனி	குரு இராமசுப்பு
9.	பிரச்னை தீர்க்கும் திருத்தலங்கள்	கே.பி.வித்யாதரன்

16ASP212 Pratical –II Semester – II
4H – 4C

Instruction Hours / Week: L : 0 T : 0 P : 4 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்:

1) ஜாதகரின் தொழில் நிர்ணயம் செய்வதில் நாடி ஜோதிட விதிகளின் எளிமையை புரிந்துக் கொள்வது.
2) தொழில் முனைவோர் ஜாதகங்களை கொண்டு, அவர்கள் அத்தொழில் செய்வதற்கான காரண காரியங்களை அலசுதல்.
3) பொறியாளர், மருத்துவர் ஜாதகங்களை ஆய்வு செய்து, தொழில்களுக்கான விதிகளை புரிந்து கொள்ளுதல்.
4) ஜாதகர்களில் கைரேகையின் வலிமையைக் கொண்டு தொழிலின் வலிமையை கண்டறிதல்.
5) கோள்களின் பலத்தை அறிந்துக் கொள்ள திக்பலம் பயன்படும்.
6) பல்வேறு முறைகளில் பலன் சொல்வது நோக்கமாகும்.

பயன்கள் :

1) இளம் வயதினர் ஜோதிடர்களை அணுகும் போது, பிற்காலத்தில் அவர்கள் செய்ய போகும் தொழிலை முன்கூட்டியே வரையறுப்பதற்கு உதவும்.
2) ஒரு ஜாதகர் தான் செய்ய போகும் ஒன்றுக்கும் மேற்பட்ட தொழில்களை வரையறுத்துக் கூறலாம்.
3) தொழிலில் ஏற்படும் ஏற்ற தாழ்வுகள், தொழில் தன்மை, மாற்றங்கள், சொந்த தொழிலா? அடிமை தொழிலா? தொழிலால் ஏற்படும் பெயரும், புகழும் போன்ற பல கருத்துக்களை சொல்ல முடியும்.
4) மனிதர்களுக்கு மிக இன்றியமையாதது கல்வியும், திருமண வாழ்க்கையும், தொழிலும் ஆகும். இவைகளை இந்த செய்முறை பாட பகுதியின் மூலம் நன்கு அறிந்தும் கொள்ளலாம்.
5) எந்த முறையில் பலன் கூறினாலும் பலன் ஒன்றாக தான் இருக்கும் என்பதை நிருப்பிக்கலாம்.
6) எளிமையான முறையில் பலன்கள் நிர்ணயம் செய்யலாம்.

UNITS

1. நாடி ஜோதிட அடிப்படையில் தொழில் குறித்து பலனைக் கூறுதல்
2. தொழில்முனைவோர் ஜாதகங்களை வரையறுத்தல்
3. பொறியாளர் ஜாதகங்களை வரையறுத்தல்
4. கைரேகை மூலம் பலன் உரைத்தல்
5. மருத்துவர் ஜாதகங்களை வரையறுத்தல்

குறிப்புதவி நூல்கள்

1.My Experiences in Astrology B.V. Raman

2. Important Combinations B.V. Raman

3. Hindu predictive Astrology B.V. Raman

16ASP301	Modern Astrological Methods	Semester – III 4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0   Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) நம் நாட்டு ஜோதிட பலன் கூறும் முறைகள் அல்லாமல் மேல்நாட்டு பலன் கூறும் முறைகளையும் மாணவர்கள் தெரிந்துக் கொள்ளுதல்.
2) மழை அறிதல், இயற்கை பேரிடர் ஆகிய இகலோக ஜோதிடத்தின் அடிப்படை தன்மைகளையும் மாணவர்கள் அறிந்துக் கொள்ள வேண்டும்.
3) பலன் அறியும் முறைகளில் கிருஷ்ணமூர்த்தி பத்ததியின் புதிய கண்டுபிடிப்புகளை படிக்கும் நோக்கிலும், ஆய்வுமனபான்மையை வளர்க்கும் நோக்கிலும் இப்பாட திட்டம் அமைக்கப்பட்டுள்ளது.
4) பாவக ஆரம்ப முனைகள் நிற்கும், குறிகாட்டும் பாவகங்களின் மூலம் பலன்கள் முடிவு செய்வது.
5) புதிய கண்டுபிடிப்புகளை ஊக்குவிக்க முடியும்.
6) புதிய கண்டுபிடிப்புகளின் மூலம் ஜாதக பலன்கள் துல்லியமாக கூறுவது.

பயன்கள்:

1) மாணவர்கள் புதிய ஜோதிட பலன் கூறும் முறைகளை படிப்பதினால், புதிய ஜோதிட சார்ந்த கண்டு பிடிப்புகளுக்கு வழிவகுக்கும்.
2) மாணவர்கள் காலதேச வர்த்தமாணங்களுக்கு ஏற்ற வகையில் பலன் கூறமுடியும்.
3) மற்ற துறைகளில் புதிய கண்டு பிடிப்புகளுக்கு ஏற்ற கோள்களின் காரகத்துவ பலன்களை நிர்ணயிக்க உதவும்.
4) நாட்டுக்கு பலன்கள் கூற முடியும்.
5) நாட்டில் ஆட்சி மாற்றங்கள், இயற்கை பேரிடர்கள் இவைகளை முன் கூட்டியே சொல்ல முடியும்.
6) மேல்நாட்டு ஜோதிட முறைகளை நம் நாட்டு ஜோதிடமுறைகளோடு ஒப்பிட முடியும்.

UNITS

1. மேல்நாட்டு ஜோதிட முறைகள்
அடிப்படை - பார்வை பலன்கள் - உலகியல் ஜோதிடமுறைகள் - ராசிகளுக்குரிய நாடுகள் - மற்றும் ஊர்கள் - பன்னிரு ராசிகளின் செயல்கள்- மழை அறிதல் - இயற்கை பேரிடர்.

2. கிருஷ்ணமூர்த்திபத்ததி முறை விளக்கம்
249 உப நட்சத்திர விளக்கம் -அயனாம்சம்- பாவக கணித முறைகள் - கோள்கள்-

3. கிருஷ்ணமூர்த்திபத்ததி கணித முறைகள்
கணித முறைகள் - தசாபுத்தி கணித முறைகள் -கே.பி முறையில் பாவக சக்கரம் வரைதல் - குறிகாட்டிகள்.

4. பாவக ஆரம்ப முனை விளக்கம்

பன்னிரு பாவகங்களில் பாவக ஆரம்பமுனை நிற்றல் குறித்து விளக்கம்- ஆளும் கோள்கள் குறித்து விளக்கம் - பார்வை முறைகள் - பன்னிரு பாவகங்கள் குறிப்பிடுவது - கோள்கள் குறித்து விளக்கம்.

5. ஒன்று முதல் பன்னிரெண்டு பாவகங்கள் வரை பலன்கள் விளக்கம்.
ஒன்று முதல் பன்னிரெண்டு பாவகங்கள் வரை- உதாரண ஜாதகங்கள் மூலம் விளக்கம்.

குறிப்புதவி நூல்கள்

1.	ஜோதிட பொக்கிக்ஷம் 1முதல் 6 தொகுதி	கிருக்ஷ்மன் அன் கோ சென்னை
2.	Tables of Houses	கிருக்ஷ்மன் அன் கோ சென்னை
3.	ஆளும் கிரகங்களும் அற்புதங்களும்	கிருக்ஷ்மன் அன் கோ சென்னை
4.	பிருகத் சம்ஹிதை 1 மற்றும் 2 தொகுதி	கடலங்குடி பப்ளிகேசன்ஸ்
5.	மேலைநாட்டு சோதிடர்கள் சொல்லும் ஜோதிடம்	எஸ்.பி. சுப்ரமணியன்
6.	How to Predict your future (1955)	James Braha

16ASP302 Muhurtha in Astrology Semester – III
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) நல்ல முகூர்த்தங்களில் ஒரு செயலை ஆரம்பித்தால், அச்செயல் நல்ல பலன்களையே தருகின்றது என்பதை மாணவர்கள் புரிந்துக் கொள்வது.
2) வாழ்வியல் சடங்குகளின் முக்கியத்துவமும், அவைகளை சுபமுகூர்த்தங்களில் செய்வதால் ஏற்படும் நற்பலன்களையும் தெரிந்துக் கொள்ளுதல்.
3) மூகூர்த்தங்களில் உள்ள தோஷங்கள், தோஷங்கள் குறைந்த முகூர்த்தங்களை தேர்ந்தெடுப்பது. தோஷக்களுக்கான பரிகார கர்மாங்களை தெரிந்துக் கொள்வது.
4) பஞ்சாங்க சுத்தி பற்றி அறிந்து கொள்வது.
5) முகூர்த்த விதிகளை பற்றி புரிந்துக் கொள்வது.
6) மக்கள் செய்யும் காரியம் வெற்றி அடைய உதவுவது.

பயன்கள்:

1) தசவிதப் பொருத்தங்களினால் ஏற்படும் விளைவுகளை பட்டியலிட்டு பார்த்து, பொருத்தம் பார்ப்பதின் முக்கியத்துவத்தை உணர்த்தல்.
2) முகூர்த்த விதிகளை கையாளும் முறையும் அவைகளை கடைபிடிப்பதால் ஏற்படும் பலன்களை அறிதல்.
3) மனித வாழ்வில் நடைபெறும் அனைத்து நிகழ்ச்சிகளுக்கும் கோள்களுக்கு தொடர்பு உண்டு என்பதை மாணவர்கள் உணரமுடியும்.
4) திருமண வாழ்வில் பின்னால் வரும் ஆபத்தை முன்கூட்டியே அறிவது.
5) சரியான முகூர்த்த நேரங்களை கண்டுபிடித்து நல்ல செயல்களை செய்ய உதவ முடியும்.
6) வாழ்வியல் சடங்குகளுக்கு நல்ல நேரம் குறித்தல்.

UNITS

1. வாழ்வியல் சடங்குகளுக்கான முகூர்த்தங்கள். I
பதினாறு சடங்குகள் - சடங்குகளின் முக்கியத்துவம்- சடங்குகளின் பயன்கள்

2. வாழ்வியல் சடங்குகளுக்கான முகூர்த்தங்கள். II
திருமண முகூர்த்தம் - பயணங்களுக்கான முகூர்த்தம் - கிரகப்பிரவேசத்திற்கு முகூர்த்தம் குறித்தல்.

3. சுப முகூர்த்த்ங்கள்
அமிர்தாதி யோகங்கள் - அதியமிர்தம் - சுப திதிகள்- சுப யோகங்கள்

4. அசுப முகூர்த்தங்கள்
தத்த யோகம் - நாச யோகம் - அங்கி யோகம் - வாரசூன்யம் -எரிநாட்கள்- சர்வநாச யோகம் - கிழமை பிறந்த நாள்.

5. திருமணப்பொருத்தம்

தசவிதப்பொருத்தங்கள்- கிரஹப்பொருத்தம் கோள்களின் நிலையைப் பொருத்து திருமணப்பொருத்தம். புனர்பூ நிலை - சகூஷ்டாகூஷ்டகம் - குரு சுக்கிர மூட நிலை - சுக்கிர செவ்வாய்நிலை - சூரியன் ' செவ்வாய் நிலை - குரு சந்திர நிலை.

குறிப்புதவி நூல்கள்

1.	முகூர்த்த சிந்தாமணி	கிரிகூஷ் சந்த் சர்மா
2.	காலபிரகாசிகை	சரஸ்வதி மகால் நூலகம். தஞ்சாவு'ர்.
3.	காலவிதானம்	சரஸ்வதி மகால் நூலகம். தஞ்சாவு'ர்.
4.	திருமணயோக பொருத்த திறவுகோல்	சிவதாசன்ரவி
5.	Muhurtha	B.V. Raman
6.	முகூர்த்தங்கள் - ஓர் ஆய்வு	Dr. L.ஏழுமலை

16ASP303	Medical Astrology	Semester – III 4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) மனிதர்களுக்கு ஏற்படும் நோய்களுக்கும். கோள்களுக்கும் உள்ள தொடர்புகளை மாணவர்கள் புரிந்துக் கொள்வது.
2) உடலில் குறிப்பாக எந்த இடத்தில் நோய்யின் தாக்கம் உண்டு. அந்த நோய்யின் வலிமை, தன்மை ஆகியவற்றை நிர்ணயிப்பது.
3) நோய்களுக்கும் பாவகங்களுக்கும் உள்ள தொடர்பு. இராசிகளுக்கும் உடல் உறுப்புகளுக்கும் உள்ள தொடர்பு ஆகியவற்றை அறிதல்.
4) நோய் வரும் காலம், நோய்க்கான பரிகாரங்கள் முதலியவற்றை அறிதல்.
5) ஜாதகரின் நோயை எந்த மருத்துவ முறையில் குணபடுத்தலாம் என்ற வழியை அறிவது.
6. ஜாதகத்தை கொண்டு நோய் எதிர்ப்பு சக்திகளுக்கான வழிமுறையை சொல்வது.

பயன்கள்:

1) மனிதனின் உடலில் ஏற்படும் நோயை கண்டுபிடிக்க உதவும், மேலும் உடலில் எந்த பகுதியில், உறுப்பில் நோய் ஏற்பட்டுள்ளது, அதன் தன்மை ஆகியவற்றை தெளிவாக மருத்துவ ஜோதிடம் படம் பிடித்து காட்டும்.
2) ஜோதிட ரீதியில் பரிகாரங்களை கூறி நோய்கள் நீங்க வழிவகை செய்வது.
3) முன்கூட்டியே நோய்வரும் காலம் அறிதல், நோய் தீர்க்கும் மருத்துவ முறைகளையும் கூறுதல்.
4) சிகிச்சையால் ஏற்படும் பக்க விளைவுகளை முன் கூட்டியே எச்சரிக்க முடியும்.
5) மருத்துவரின் பெயர் மற்றும், அவரின் மருத்துவ அறிவை விளக்க முடியும்.
6) இன்றைய மருத்துவ துறையில் கண்டுபிடிக்க முடியாத நோய்களையும் ஜோதிடத்தின் மூலம் அறிய முடியும்.

UNITS

1. ராசிகளும் கோள்களும் காட்டும் உடல் உறுப்புகள்
காலபுருஷ தத்துவம் - ராசிகள் - கோள்கள் - காட்டும் உடல் உறுப்புக்கள்.

2. ராசிகளும் கோள்களும் காட்டும் நோய்கள்
நோய்களும் அவற்றின் காரணங்களும் - நோய்களின் வகைகள் - ராசிகளும் கோள்களும் காட்டும் நோய்கள்.

3. நோய்வரும் காலம்
கோள்கள் பாவகங்கள் அடிப்படையில் - நோய்வரும் காலம்

4. நோய் குணமாகும் காலம்
நோயும் கன்ம வினையும் - நோய் தீரும் காலம், ஆறு எட்டு பன்னிரெண்டு பாவகங்களும் நோய்களும், பன்னிரு பாவகங்களில் ஆறு எட்டு பன்னிரெண்டு பாவகங்களில் தன்மைகள்-
ஆறு எட்டு பன்னிரெண்டு பாவகங்களில் நிற்கும் கோள்களும் நோய்களும்-

ஆறு எட்டு பன்னிரெண்டு பாவாதிபதிகள் நிற்கும் பாவகங்களில் ஏற்படும் நோய்கள்.

5. நோய் தீர்க்கும் வழி முறைகள்

அலோபதி - சித்த மருத்துவம் - ஹோமியோபதி- அக்குபஞ்சர் - வர்மம் உள்ளிட்ட
மருத்துவ முறைகள்.-இறைவழி மருத்துவம் - ஊர் மாற்றம் - இறைவழிபாடு

குறிப்புதவி நூல்கள்

1.	PRASNA MARGA; Vol 1 & 2	B.V. Raman
2.	MEDICAL ASTROLOGY	Sankar Adwal
3.	Medical Astrology	J.N. Bhasin/ Alan Leo
4.	ஆரோக்கியம் நாடி	நவமணி சண்முகவேலு
5.	ஜோதிடமும் நோய் அறிதலும்	எஸ்.பி. சுப்ரமணியன்
6.	கே. பி. மருத்துவ ஜோதிடம் - I	கே. சுப்ரமணியம்
7.	கே. பி. மருத்துவ ஜோதிடம் - II	கே. சுப்ரமணியம்

16ASP304	Casting Horoscope	Semester – III 4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) தனிமனிதனுக்கு ஜாதகம் கணிக்கும் முறைகள் மாணவர்கள் தெரிந்துக் கொள்ளும் நோக்கத்தோடு இப்பாட பகுதி அமைந்துள்ளது.
2) கணினிகள் இல்லாத நிலையிலும், மாணவர்கள் ஜாதகம் கணிக்க முடியம்.
3) ஜாதக கணிதத்திற்கு பஞ்சாங்கத்தின் பயன்பாடுகள் குறித்து விழிப்புணர்வு ஏற்படும்.
4) பஞ்சாங்க வகைகளில் உள்ள ஏற்ற தாழ்வுகளையும், அடிப்படைகளையும் மாணவர்கள் புரிந்துக் கொள்ளுதல்
5) சட்பலத்தின் மூலம் கோள்களின் பலத்தை அறிதல்.
6) அஷ்ட வர்க்கத்தின் மூலம் துல்லியமான பலன்களை அறிதல்.

பயன்கள் :

1) பலன் சொல்லுவதற்கு ஜாதக கணிதம் அவசியமாகும், ஜாதக கணிதத்திற்கு பஞ்சாங்கம் அவசியமாகும், பஞ்சாங்கத்திற்கு வானசாஸ்திரம் அவசியமாகும்.
2) ஜோதிடத்தில் ஜாதக கணிதத்திற்கு மென்பொருள் உருவாக்குவதற்கு இக்கணித முறைகள் பயன்படும்.
3) இக்கால விக்ஞானம் அழிந்தாலும், ஜோதிட சாஸ்திரம் அழியாமல் இருக்க ஜோதிட கணித முறைகளை மாணவர்கள் படிப்பதினால் காப்பாற்ற முடியும்.
4) கோள்களின் பலத்தை சட்பலத்தின் மூலம் அறிவதால் பலன்களை துல்லியமாக சொல்ல முடியும்.
5) அஷ்ட வர்க்க முறையின் மூலம் ஜாதகத்தின் பலன்களை நிர்ணயிப்பதில் புதுமை வெளிப்படும்.
6) வர்க்க சக்கர கணிதமுறைகள் ஜாதக பலன்களை சொல்வதற்கு மேலும் வலுசேர்க்கும்.

UNITS

1. **பஞ்சாங்க வகைகள்**
   வாக்கிய – திருக்கணிதம் - எபிமெரிஸ்

2. **லக்னம் கணித்தல் மற்றும் திசா புத்தி கணித்தல்**
   1. வாக்கிய முறை
   2. திருக்கணித முறை

3. **கோள்களின் ஸ்புடம் கணித்தல்**
   லக்ன ஸ்புடம் - ஒன்பது கோள்களின் ஸ்புடம்

4. **தினகதி**
   தினகதி அளவீடுகள்

5. **அஷ்டவர்க்கம்**
   அஷ்டவர்க்கம் அறிமுகம் - பரல்கள் -
   அஷ்டவர்க்க கணிதம்
   அஷ்டவர்க்க கணிதமுறை

குறிப்புதவி நூல்கள்:

1.	Brikat Parasara Hora Sastra	G.C. Sharma
2.	Ashta Varga System of Prediction	B.V.Raman / C.S. Patel
3.	ஜாதக கணிதம்	C.G.ராஜன்
4.	அஷ்டவர்க்கக் கணிதமும் பலன்களும்	சிவதாசன் ரவி
5.	Essential of Hindu Predictive Astrology	R.Santhanam

16ASP304 Dasabukthi Predictions Semester – III
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) தசாபுத்தி பலன்கள் கணிக்கும் முறைகள் மாணவர்கள் தெரிந்துக் கொள்ளும் நோக்கத்தோடு இப்பாட பகுதி அமைந்துள்ளது.
2) கணினிகள் இல்லாத நிலையிலும், மாணவர்கள் தசாபுத்தி பலன்கள் கணிக்க முடியம்.
3) தசாபுத்தி பலன்கள் கணிக்கும் முறைகள் பயன்பாடுகள் குறித்து விழிப்புணர்வு ஏற்படும்.
4) ஜாதகத்தில் கணிக்கப்பட்ட பலன்கள் எக்காலகட்டத்தில் நடக்கும் என்பதை அறிவது.
5) கோசார கிரக நிலைகளை கொண்டு ஜாதக பலன்கள் நடக்கும் காலத்தை அறிதல்.
6) தசாபுத்தி, கோசாரத்தை இணைத்து பலன்கள் நடக்கும் கால நிர்ணயத்தை அறிதல்.

பயன்கள் :

1. பலன் சொல்லுவதற்கு தசாபுத்தி பலன்கள், ஜாதக கணிதம் அவசியமாகும், ஜாதக கணிதத்திற்கு பஞ்சாங்கம் அவசியமாகும், பஞ்சாங்கத்திற்கு வானசாஸ்திரம் அவசியமாகும்.
2. ஜோதிடத்தில் தசாபுத்தி பலன்கள், ஜாதக கணிதத்திற்கு மென்பொருள் உருவாக்குவதற்கு இக்கணித முறைகள் பயன்படும்.
3. இக்கால விக்ஞானம் அழிந்தாலும், ஜோதிட சாஸ்திரம் அழியாமல் இருக்க தசாபுத்தி பலன்கள் கணிக்கும் முறைகளை மாணவர்கள் படிப்பதினால் காப்பாற்ற முடியும்.
4. ஜாதகத்தில் கணிக்கப்பட்ட எந்த நிகழ்ச்சிகளையும் கால நிர்ணயம் செய்யப் பயன்படும்.
5. எதிர்காலத்தில் நடைபெறும் நிகழ்ச்சிகளை தசாபுத்தியை கொண்டு தேதி வரை துல்லியமாக சொல்லப் பயன்படும்.
6. கோசாரமும், தசாபுத்தியும் இணைந்து ஜாதக பலன்கள் நடக்கும் காலத்தை முடிவு செய்யும்.

தசாபுத்தி பலன்கள்

UNITS:

1. **தசாபுத்தி கணிதம்**
தசா புத்திகள் வகைகள் - விம்சோத்திரி தசா ஆண்டுகள் - நவகோள்களுக்கும் தசாபுத்தி ஆண்டுகளை வகுத்து கொடுத்த முறை

2. **தசாபுத்தி கணக்கிடும் முறை**
தசாபுத்தி கணக்கிடும் முறையை வரையறுத்தல் - அந்தரம் கணக்கிடும் முறை.

3. **தசாபுத்தி பலன்கள்**
தசை – புத்தி – நட்சத்திர சாரம் இவைகளைக் கொண்டு பலன் கூறுதல்

தசாபுத்தி அந்தரங்களை கொண்டு ஜாதகபலன்கள் நடக்கும் காலத்தை நிர்ணயம் செய்தல்.

4. கோச்சார பலன்கள்

அன்றைய கோள்களின் நிலை – பலன்களை வரையறுத்தல் - கோசார கோள்களை கொண்டு கால நிர்ணயம் செய்தல்.

5. தசாபுத்திபலன்களையும் கோச்சார பலன்களையும் இணைத்தல்

கேள்விக்குரிய பலன்களை தசாபுத்தி அடைப்படையிலும் கோச்சார அடிப்படையிலும் இணைத்து பலன் கூறுதல் - கோள்கள் வழியாக பலன்கள் சனி குரு ராகு கேது கோள்கள் வழியாக பொதுப்பலன்களையும் கோச்சார பலன்களையும் கூறுதல்

குறிப்புதவி நூல்கள்

1. BRIKAT PARASARA HORA SASTRA — Grish Chand Sharma
2. ASHTA VARGA SYSTEM OF PREDICTION — B.V.Raman
3. ஜாதக கணிதம் — C.G.ராஜன்
4. துல்லியமாக கோட்சாரப் பலனறிதல் — எஸ். கோபால கிருக்ஷ்ணன்
5. குடும்ப ஜோதிடம் — ஸ்ரீராமய்யங்கார ஸ்ரீஸ்ரீனிவாஸாசாரியர்
6. Hindu Predictive Astrology — B.V. Raman

16ASP305 (A) Thajigam Semester – III
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்:

1) பலன் கூறுவதற்கு பலமுறைகள் இருந்தாலும், மாணவர்கள் பழங்கால முறையான தாஜிக முறையில் பலன் கூறுவதற்கு உதவியாக இருக்கும்.
2) தாஜிக முறையில் யோகங்களுக்கு பலன்கள் கூறுவது ஒரு வித்யாசமான முறை என்றே புரிந்துக் கொள்ளலாம்.
3) ஒவ்வொரு வருடத்திற்கும் ஒரு ஜாதகம் கணித்து பலன் சொல்லும் முறையை மாணவர்கள் அறியும் நோக்கில் இப்பாட பகுதி அமைந்துள்ளது.
4) ஜாதகர்களின் வருங்கால ஜோதிட பலன்களை கூறுவது.
5) கோள்களின் நிலைகளை மிக துல்லியமாக கணித்தல்
6) பலன்கள் நடைபெறும் காலங்களை முன்கூட்டியே எடுத்துரைத்தல்.

பயன்கள்:

1) பழமையான முறைகளில் ஒன்றான இத்தாஜிக முறை. ஒரு வித்யாசமான கோணத்தில் பலன்களை கூற வைக்கும்.
2) ஒரு வருடத்தில் ஏற்படும் நன்மை, தீமைகளை வரையறுத்து கூறுவதில் வல்லமைவுடையது தாஜிக முறையாகும்.
3) வாழ்நாள் முழுவதும் ஜாதகரின் வாழ்க்கையில் ஏற்படும் இன்பதுன்பங்களை சொல்ல முடியும்.
4) கோள்களின் பலம், பலஹீனம் ஆகியவற்றை தெளிவாக அறிய முடியும்.
5) ஒவ்வொரு வருடத்திலும் ஏற்படும் பலன்களை கோட்சார கிரகங்களை கொண்டு முடிவு செய்ய முடியும்.
6) பாவகங்களில் நிற்கும் கோள்களால் ஏற்படும் பலன்களை துல்லியமாக கணிக்க முடியும்.

UNITS

1. வருட சாதகம் கணித்தல்

வருட பிறந்த நாள் - வருட அதிபதி- இலக்கினம் - கோள்களின் நிலை, திதி – முந்த்தா – முந்த்தா இராசி அதிபதி – மந்த்தா இராசியல் நிற்கும் கோள்கள் - வருட அதிபதியைக் காணுதல்

2. சகமங்கள்

தாஜிக முறைப்படி சகம ஸ்புடங்கள் கணித்தல் - பலன் அறியும் விதம்

3. யோகங்கள்

தாஜிக முறையில் கூறப்படும் யோகங்களும் அதன் பலன்களும்

4. வருட தசை கணித்தல்

தாஜிகா முறைப்படி – வருட தசை கணித்தல், தசையில் புத்தியைக் கணித்தல் - பொது தசா பலன்கள்

5. சாதக பலன் நிர்ணயித்தல்

வருட சாதகத்தில் - பாவங்களின் நிற்கும் கோள்களால் ஏற்படும் பலன்கள் - அந்த வருடத்தில் ஏற்படக்கூடிய தீயபலன்கள் - தீய பலன்கள் நீக்கும் விதம்.

குறிப்பு நூல்கள்

1. பி.எஸ். அய்யர், தஜக நீலகண்டியம், கேரள சோதிட பதிப்பகம், மதுரை
2. பி.வி. ராமன் வாஷபல், யு.பி.எஸ்.பி.டி பப்ளிகேசன்ஸ், புது தில்லி
3. சுமித் ஷா வர்ஷபல், சாகர் பப்ளிகேன்ஸ், புது தில்லி
4. நீலகண்டர், உரை டி.பி. சாக்சேனா, தஜிக் நீலகாந்தி, ரஞ்சன் பப்ளிகேசன்ஸ், புது தில்லி
5. கே.எஸ். சரக் பிரடெக்டிவ் டெக்னிக் இன் வர்ஷ பலா, சிஸ்டம் விஷன், புது தில்லி
6. பலவகையான சோதிட இணை தளங்கள்

16ASP305 (B)	Ashtavargam	Semester – III 4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள்:

1) அஷ்டவர்க்க முறையில் பலன்கள் சொல்ல தேவையான அடிப்படை செய்திகளை இப்பாட பகுதி மூலம் தெரிந்துக் கொள்ளலாம்.
2) கோள்கள் அஷ்ட வர்க்கத்தில் கொடுக்கும் பரல்களுக்கு ஏற்ற வகையில் பலன்களில் ஏற்படும் தாரதம்யத்தை மாணவர்கள புரிந்துக் கொள்ளலாம்.
3) கோச்சார கிரகங்கள் அஷ்டவர்க்கங்களில் ஏற்படுத்தும் பலன்களை நிர்ணயம் செய்யலாம்.
4) சூரிய, சந்திர அ்டக வர்க்கங்களில் கோசார சூரியனை கொண்டு சுப முகூர்த்தங்கள் முடிவு செய்யலாம்.
5) செவ்வாய் பின் பின்னா்டக வர்க்கத்தில் கோசார செவ்வாய் வரும் காலத்தை கொண்டு சகோதர, சகோதரிகளை பற்றி அறியலாம்.
6) அஷ்டக வர்க்க கணிதம் மூலம் ஆயுள் கணிதம் துல்லியமாக கணிக்கலாம்.

பயன்கள் :

1) அஷ்ட வர்க்கங்களை கொண்டு முகூர்த்த நிர்ணயம் செய்யலாம், தொழில் நிர்ணயம் செய்யலாம்.
2) ஜாதகர்களுக்கு ஏற்படும் நோய், திருமண வாழ்க்கை, புத்ர பாக்யம் போன்ற அனைத்து விதமான பலன்களையும் மிக துல்லியமாக வரையறுத்து கூற முடியும்.
3) பலன் கூறுவதில் ரிஷிகளின் அறிவு கூர்மையை புரிந்துக் கொள்ள முடியும்.
4) அஷ்டக வர்க்க கணிதம் மூலம் திருமணப் பொருத்தம் நிர்ணயம் செய்ய முடியும்.
5) மகிழ்ச்சிகரமான திருமண வாழ்க்கைக்கு சுக்கிர பின்னாஷ்ட வர்க்கத்தின் மூலம் அறியலாம்.
6) புனித யாத்திரை, புதிய முயற்சிகள், தொழில் தொடங்குதல் ஆகியவற்றை சூரிய சஞ்சாரத்தின் மூலம் முடிவு செய்யலாம்.

UNITS

அஷ்டவர்க்கம்

1. **அஷ்டவர்க்கம் கணித்தல்**
அஷ்டவர்க்கம் அறிமுகம் - முக்கியத்துவம் - கோள்கள் பரல் தரம் ஸ்தானங்கள் - சமுதாய – பிரஸ்தார அஷ்டவர்க்கம்

2. **அஷ்டவர்க்க சோதனைகள் மற்றும் சுத்த பிண்டம் கணித்தல் - திரிகோண சோதனை –**
ஏகாதிபத்திய சோதனை – கிரக குணாகரம், இராசி குணாகரம் - சுத்த பிண்டம்

3. **அஷ்டவர்க்க பொது பலன்கள்**

பன்னிரண்டு பாவங்களில் உள்ள பரல்களின் பலன் - கோள்கள் தரும் பரல்களின் பலன் - பாவகம் மற்றும் கோள்களின் பொதுப் பலன்கள்

4. அஷ்டவர்க்க சிறப்புப் பலன்கள்

சுத்த பிணடம் கணித அடிப்படையிலும் - கோள்கள் ஒரு பாவத்தில் கொடுத்துள்ள பரல்களின் அடிப்படையிலும் - பலன் நிர்ணயித்தல் - ஆயுள் கணித்தல் - பாவக பலன் நடைபெறும் காலம் கணித்தல்

5. அஷ்டவர்க்க கோசார பலன்கள்

கோள்களின் தற்கால நிலை – பரல்களுக்கு ஏற்றவாறு தரும் பலன்கள் - கச்சயா கணக்கிடுதல் - கோள்கள் கச்சயாவை கடக்கும் கால அளவு - பலன்கள்

குறிப்பு நூல்கள்

1. பராசரர் - உரை, கிரிஸ் சந்த் சர்மா, பிருகத் பராசரா ஹோரா சாஸ்திரம், சாகர் பப்ளிகேசன்ஸ்,
   புது தில்லி
2. சி.எஸ் படேல் மற்றும் சி.ஏ. சுப்பிரமணிய சாஸ்திரிகள். அஷ்டவர்க்கம், சாகர் பப்ளிகேசன்ஸ்,
   புது தில்லி
3. பி.எஸ். சாஸ்திரி, சீக்ரேட்ஸ் ஆ.்.ப் அஷ்டவர்கா, ரஞ்சன் பப்ளிகேசன்ஸ், புது தில்லி
4. பீ.வி ராமன், அஷ்டவர்கா சிஸ்டம் ஆ.்.ப் பிரடிக்கசன், பு.பி எஸ்.பி.டி. பப்ளிகேசன்ஸ். புது தில்லி
5. பல வகையான சோதிட இணை தளங்கள்

16ASP305 (C) 16 Varga Chakras and Prediction Semester – III
4H – 4C

Instruction Hours / Week: L : 4 T : 0 P : 0 Marks Internal : 40, External : 60 Total : 100
End Semester Exam : 3 hrs

நோக்கங்கள் :

1) ஒவ்வொரு கேள்விக்கும் ஒவ்வொரு வர்க்க சக்கரங்களை ஏற்படுத்தி அதன் மூலம் பலன்கள் துல்லியமாக சொல்ல முடியும்.
2) கோள்களின் உண்மையான வலிமை வர்க்க சக்கரங்களில் மட்டுமே வெளிப்படும்.
3) இராசி சக்கரத்தை கொண்டு மேலோட்டமான பொது பலன்களை மட்டுமே சொல்ல முடியும் ஆனால் வர்க்கங்கள் கொண்டு துல்லியமான, ஆழமான, விளக்கமான பலன்களை சொல்ல முடியும்.
4) நவாம்சத்தை கொண்டு ஜாதகரின் திருமண வாழ்க்கையின் சாராம்சத்தை புரிந்துக் கொள்ள முடியும்.
5) சதுர்விம்சாம்சத்தை கொண்டு ஜாதகரின் கல்வியின் தரத்தை நிர்ணயம் செய்ய முடியும்.
6) சப்தாம்சத்தை கொண்டு, புத்ர பாக்யத்தை அறிய முடியும்.

பயன்கள்:

1) வர்க்க சக்கர முறையில் பலன் சொல்வது என்பது ஒரு உயர்தர முறையில் பலன்கள் சொல்வதாகும்.
2) ஜாதகனின் வாழ்க்கையில் மறைந்து கிடக்கின்ற பலபல உண்மைகளை வெளி உலகத்திற்கு காட்டும் ஒரு பல பலன் சொல்லும் முறை என்றால் அது மிகையல்ல.
3) நமது வாழ்வில் நடக்கும் அனைத்து நிகழ்ச்சிகளுக்கும் காரண காரியங்களோடு, கோள்கள் சம்பந்தம் உள்ளது என்பதை புரிந்துக் கொள்ள முடியும்.
4) சதுர்த்தாம்சத்தை கொண்டு அசையா சொத்துகளின் நிலையை அறிய முடியும்.
5) தசாம்சத்தை கொண்டு ஜாதகரின் வேலையின் நிலையை முடிவு செய்யலாம்.
6) ஏகாதாம்சத்தை கொண்டு ஒருவரின் சொந்த தொழில் நலனை அறியலாம்.

UNITS

16 வர்க்கச் சக்கரங்களும் பலன்களும்

1. ஸ்தான பலம் மற்றும் திக்பலம்
ஸ்தான பலம் - உச்ச – சப்த வர்கிய – ஓஜ உக்ம – கேந்திர திரிகோண பலம் - திக்பலம் - திசைகள் - கோள்களின் பலம் - பலவீனம் - பலன் D2, D3 கட்டமைப்புகள், பலன்கள்

2. காலபலம் மற்றும் சேஷ்டாபலம்
கோள்களின் தற்காலிக பலம் - பகல் - இரவு - திரிபாகம் - வருடம் - மாதம் - நாள் - நேர அதிபதி –
கோள்களின் கோசார பலம் - உள்வட்டம் - வெளிவட்டம் - விரைவாக – மெதுவாகச் செல்லும் -
கோள்களின் பலம் - பலவீனம் - பலன் D4, D16, D24 கட்டமைப்புகள், பலன்கள்

3. **நைசர்க்கிய பலம் மற்றும் திருக் பலம்**

கோள்களின் இயற்கை பலம் - கோள்களின் பார்வை பலம் - பலவீனம் - பலன் D5,D6,D7 கட்டமைப்புகள், பலன்கள்

4. **பாவக பலம்**

பாவக பலம் - பால காரகம் - பகல் - இரவு - பிறப்பு பலம் - இஷ்ட பலம் - கஷ்ட பலம் நிகர பலம் D8, D9, D10, D11, D12, D20, D30 கட்டமைப்புகள், பலன்கள்

5. **சாதக பலன் நிர்ணயித்தல்**

பல அடிப்படையில் கோள்கள் - பாவகம் - தசா புக்தி கோசார – பலன் நிர்ணயித்தல்

குறிப்புதவி நூல்கள்

1. பராசரர், உரையாசிரியர் - கிரிஸ் சந்த் சர்மா, பிருகத் பராசரா ஹோரா சாஸ்திரம், சாகர் பப்ளிகேசன்ஸ், புது தில்லி
2. மந்திரேஸ்வரர், உரையாசிரியர், சு.எ. குமார சுவாமி ஆச்சாரியார், பல தீபிகை, ஆனந்த நிலையம் சென்னை
3. கல்யாணவர்மர், உரையாசிரியர் சு.ஏ. குமாரசுவாமி ஆச்சாரியார். சாராவளி. ஆனந்த நிலையம் சென்னை
4. கிருஷ்ண குமார், சட்பல ரகசியம், ஆல்ஃபா பப்ளிகேசன்ஸ், புது தில்லி
5. எஸ்.எம். சதாசிவம், சட்பலம், இந்து பப்ளிகேசன்ஸ், சென்னை
6. பல வகையான சோதிட இணைய தளங்கள்
7. Sanjay Rath, varga chakra, Saagar publication.
8. P.V.R. Narasimha Rao, Vedic Astrology an intergrated Approach. Sagar publication.
9. Crux of vedic Astrology- timing of events by Sanjay Rath, Sagar publication.
10. V.P.Goel, Comprehensive prediction by Division charts, Sagar publication.

16ASP312 Practical – III Semester – III

4H – 4C

Instruction Hours / Week: L : 0 T : 0 P : 4 Marks Internal : 40, External : 60 Total : 100

End Semester Exam : 3 hrs

நோக்கங்கள்

1) பராசரா் முறையில் பன்னிரு இலக்ன சாதகங்களுக்கு ஆதிபத்திய முறையில் பலன் கூறுதல் மாணவா்களின் சோதிட அறிவை பரைசாற்றுவதாக அமையும்
2) மேலும் பன்னிரு இலக்ன சாதகங்களுக்கு நட்சத்திர சார ஆதிபத்திய முறையில் பலன்கள் கூறுதல் மாணவா்களின் நுட்பமான சோதிட அறிவு இந்த செய்முறைத் தோ்வின் மூலம் வெளிப்படும்
3) பலன்களாக சொல்லப்படும் நிகழ்வுகள் எக்காலகட்டத்தில் ஏற்படும் என்பதை விம்சோத்திரி தசா புத்தியின் மூலம் கூறுவது இந்த செய்முறைத் தோ்வின் நோக்கமாகும்.
4) அஷ்டவா்க்க பலன்கள் மூலம் கோட்சார பலன்களை சொல்வதும்,
5) மேலை நாட்டுமுறையில் பலன்கள் கூறுவதும் மாணவா்களை பல முறைகளில் பலன் கூறவைப்பதற்கான முயற்சியாகும்.
6) கோள்களின் நிலைகள் இல்லாமலேயே ஜாதகப் பலன்களை லக்னம், ராசியை கொண்டு அறிதல்.

பயன்கள்

1) இந்த செய்முறை பயிற்சியின் மூலம் மாணவா்கள் உயா்தரமான சோதிட அறிவை பெறுவாா்கள்
2) தங்களிடம் வருகின்ற சாதகா்களின் வாழ்வில் வழிகாட்டியாகவும் நன்மை செய்பவா்களாகவும் இருப்பாா்கள்
3) மற்றவா்களுக்கு சோதிட சாஸ்திரதின் மூலம் வழிபாட்டுவதால் தெய்வீக நிலையை அடைய வழி ஏற்படும்.
4) மேலை நாட்டு முறையில் பலன்களை கண்டறிதல் மாணவா்களுக்கு புதிய உத்வேகத்தை தரும்.
5) விம்சோத்திரி தசா மூலம் ஜாதக பலன்கள் நடக்க போகும் காலக்கட்டத்தை அறிய உதவும்.
6) அஷ்டக வா்க்கத்தின் மூலம் மிகவும் துல்லியமான பலன்களை சொல்ல முடியும்.

செய்முறைத்தோ்வு (Practical) :III

UNITS

1. பன்னிரு லக்ன சாதகங்களுக்கு ஆதிபத்திய முறையில் பலன் கூறுதல்.
2. பன்னிரு லக்ன சாதகங்களுக்கு நட்சத்திர சார ஆதிபத்திய முறையில்பலன் கூறுதல்.
3. விம்சோத்திரி தசா புத்தி கணித்துப் பலன் கூறுதல்.
4. அஷ்டவா்க்க ஜனன பரல்கள் மூலம் கோச்சார பலன்களைக் கூறுதல்.
5. மேலை நாட்டு முறையில் பலன் கூறுதல்.

16ASP401	Project – VIVA VOCE	Semester – IV 15C
Instruction Hours / Week: L : 0 T : 0 P : 0		Marks Internal : 80, External : 120 Total : 200

DEPARTMENT OF BIOCHEMISTRY
FACULTY OF ARTS, SCIENCE AND HUMANITIES
KARPAGAM ACADEMY OF HIGHER EDUCATION
(*Deemed to be University, Established Under Section 3 of UGC Act 1956*)
Eachanari PO, Coimbatore – 641 021, India.

B.Sc., BIOCHEMISTRY

PREAMBLE

- Biochemistry is the study of chemistry and relating to, biological organisms.
- Biochemistry is sometimes viewed as a hybrid branch of organic chemistry, which specializes in the chemical processes and chemical transformations that take place inside of living organisms.
- All life forms alive today are generally believed to have descend from a single proto-biotic ancestor, which could explain why all known living things naturally have similar biochemistries.
- Biochemistry essentially remains the study of the structure and functions of cellular components (such as enzymes and cellular organelles) and the processes carry out both on and by organic macromolecules - especially proteins, but also carbohydrates, lipids, nucleic acids and other biomolecules.
- Biochemistry is the chemistry of life.

OBJECTIVE

- To inspire and educate students, today and for the future, in the concepts and skills of biochemistry; to prepare them to think about, to work with, and to enjoy the concepts of biochemistry and apply them at appropriate situation in practical life.

KARPAGAM UNIVERSITY
KARPAGAM ACADEMY OF HIGHER EDUCATION
Coimbatore – 641 021
DEPARTMENT OF BIOCHEMISTRY
(Scheme of Examination for 2016- 2017 onwards)
B.Sc., BIOCHEMISTRY CURRICULUM

Course code	Name of the course	Objectives and out comes		Instruction hours / week			Credit(s)	Maximum Marks		
		PEOs	POs	L	T	P		CIA	ESE	Total
								40	60	100
SEMESTER – I										
16LSU 101	Language -I	I	a	4	-	-	4	40	60	100
16ENU101	English	I	a	4	-	-	4	40	60	100
16BCU101	Molecules of Life	I	b, k	3	1	-	4	40	60	100
16BCU102	Cell Biology	I	d, k	4	-	-	4	40	60	100
16BCU103	Membrane Biology and Bioenergetics	I	f	3	1	-	4	40	60	100
16BCU111	Molecules of Life- Practical	III	d	-	-	3	2	40	60	100
16BCU112	Cell biology - Practical	III	d	-	-	3	2	40	60	100
16BCU113	Membrane Biology and Bioenergetics – Practical	III	c, f	-	-	4	2	40	60	100
	Semester Total			**19**	**1**	**10**	**26**	**320**	**480**	**800**
SEMESTER – II										
16LSU 201	Language – II	I	a	4	-	-	4	40	60	100
16BCU201	Proteins	III	e, k	4	-	-	4	40	60	100
16BCU202	Enzymes	III	e	4	1	-	4	40	60	100
16BCU203	Human Physiology	I	e	4	-	-	4	40	60	100
16BCU211	Proteins – Practical	III	e	-	-	3	2	40	60	100
16BCU212	Enzymes- Practical	III	e	-	-	3	2	40	60	100
16BCU213	Human Physiology - Practical	III	e	-	-	4	2	40	60	100
16AEC 201	Environmental Studies	IV	h	3	-	-	4	40	60	100
	Semester Total			**19**	**1**	**10**	**26**	**320**	**480**	**800**
SEMESTER – III										
16BCU301	Metabolism of Carbohydrates and Lipids	I	f	4			4	40	60	100
16BCU302	Metabolism of Amino acids and Nucleic acids	I	f	4			4	40	60	100
16BCU303	Hormone: Biochemistry and Functions	V	d, e, k	3	1	-	4	40	60	100
16BCU311	Metabolism of Carbohydrates and Lipids – Practical	III	c, f	-	-	4	2	40	60	100
16BCU312	Metabolism of Amino acids and Nucleic acids- Practical	III	c, f	-	-	4	2	40	60	100
16BCU313	Hormone: Biochemistry and Functions – Practical	III	j	-	-	4	2	40	60	100
16BCU304A	Tools and Techniques in Biochemistry	II	c, f	3	-	-	3	40	60	100
16BCU304B	Concepts in Genetics	I	c, f							
16BCU314	A-Tools and Techniques in Biochemistry – Practical	III	c, f	-	-	3	1	40	60	100
16BCU314	B-Concepts in Genetics - Practical	III	c, f							
	Semester Total			**14**	**1**	**15**	**22**	**320**	**480**	**800**
SEMESTER – IV										
16BCU401	Gene Organization, Replication and Repair	I, II	g	4	-		4	40	60	100

16BCU402	Gene Expression and Regulation	I, II	g	4	-		4	40	60	100
16BCU403	Immunology	V	i, j	3	1	-	4	40	60	100
16BCU411	Gene Organisation, Replication and Repair-Practical	III	c, g	-	-	4	2	40	60	100
16BCU412	Gene Expression and Regulation- Practical	III	c, g	-	-	4	2	40	60	100
16BCU413	Immunology Practical	III	i, j	-	-	4	2	40	60	100
16BCU404A	Bioinformatics	III	c, g	3	-	-	3	40	60	100
16BCU404B	Protein Purification Techniques		c, g							
16BCU414A	Bioinformatics - Practical	III	c, g	-	-	3	1	40	60	100
16BCU414B	Protein Purification Techniques - Practical		c, g							
	Semester Total			**14**	**1**	**15**	**22**	**320**	**480**	**800**
SEMESTER – V										
16BCU501A	Clinical Biochemistry	II, III	d, e	3	-	-	3	40	60	100
16BCU501B	Biochemical Correlation of Diseases	II, III	d, e							
16BCU511A	Clinical Biochemistry	III	j	-	-	4	1	40	60	100
16BCU511B	Biochemical Correlation of Diseases	III	j							
16BCU502A	Basic Microbiology	I	d, e,	4	-	-	4	40	60	100
16BCU502B	Nutritional Biochemistry	I	i, l							
16BCU503A	Plant Biochemistry	V	D	4	-	-	4	40	60	100
16BCU503B	Advanced cell biology	I	d, k							
16BCU504A	Molecular Basis of Non-Infectious diseases	V	d, e	4	-	-	4	40	60	100
16BCU504B	Molecular Basis of Infectious diseases	V	d, e							
16BCU512A	Basic Microbiology- Practical	III	j	-	-	4	2	40	60	100
16BCU512B	Nutritional Biochemistry- Practical	III	j							
16BCU513A	Plant Biochemistry-- Practical	III	j	-	-	4	2	40	60	100
16BCU513B	Advanced Cell Biology- Practical	III	j							
16BCU514A	Molecular Basis of Non-Infectious Diseases-Practical	III	j	-	-	4	2	40	60	100
16BCU514B	Molecular Basis of Infectious Diseases-Practical	III	j							
	Semester Total			**15**	**-**	**15**	**22**	**320**	**480**	**800**
SEMESTER – VI										
17BCU601A	Genetic Engineering and Biotechnology	I	g, n, l	3	-	-	3	40	60	100
17BCU601B	Recombinant DNA Technology	I	g, n, l							
16BCU611A	Genetic Engineering and Biotechnology-Practical	III	e	-	-	3	1	40	60	100
16BCU611B	Recombinant DNA Technology-Practical	III	e							
16BCU602A	Biostatistics	III	e, l	4			4	40	60	100
16BCU602B	Fundamentals of nanotechnology	III	e, l							
16BCU603A	A- Drug Biochemistry	II	i, j, l	4			4	40	60	100
16BCU603B	B-Food Preservation Technology	II	i, j, l							
16BCU612A	A-Biostatistics- Practical	III	e			4	2	40	60	100
16BCU612B	B-Fundamentals of nanotechnology- Practical	III	e							
16BCU613A	A- Drug Biochemistry- Practical	III	e			4	2	40	60	100
16BCU613B	B-Food Preservation Technology- Practical	III	e							
17BCU691	Project work	IV	j	2	-	6	6	40	60	100
ECA / NCC / NSS / Sports / General interest etc							**Good**			
Semester Total				**13**	**-**	**17**	**22**	**280**	**420**	**700**
Program Total				**94**	**4**	**82**	**140**	**1880**	**2820**	**4700**

Blue – Employability
Green – Entrepreneurship
Red – Skill Development

Code: 16BCU101

16 -Academic Year

BC -Biochemistry

U - Bachelor's Degree

First Digit - Semester number (1, 2, 3 and)

Second digit - Theory (0); Practical (1); Project (9)

Last digit - Paper number in the concerned semester (1, 2…)

SKILL ENHANCEMENT COURSE

Semester	Subject Code	Skill Enhancement Course
III	16BCU304A	Tools and Techniques in Biochemistry
	16BCU304B	Concepts in Genetics
	16BCU314A	Tools and Techniques in Biochemistry - Practical
	16BCU314B	Concepts in Genetics - Practical
IV	16BCU404A	Bioinformatics
	16BCU404B	Protein Purification Techniques
	16BCU414A	Bioinformatics- Practical
	16BCU414B	Protein Purification Techniques- Practical
V	16BCU501A	Clinical Biochemistry
	16BCU501B	Biochemical Correlations and Diseases
	16BCU511A	Clinical Biochemistry- Practical
	16BCU511B	Biochemical Correlations and Diseases- Practical
VI	16BCU601A	Genetic Engineering and Biotechnology
	16BCU601B	Recombinant DNA Technology
	16BCU611A	Genetic Engineering and Biotechnology- Practical
	16BCU611B	Recombinant DNA Technology- Practical

DISCIPLINE SPECIFIC ELECTIVE

Semester	Subject Code	Discipline Specific Elective
V	16BCU502A	Basic Microbiology
	16BCU502B	Nutritional Biochemistry
	16BCU512A	Basic Microbiology- Practical
	16BCU512B	Nutritional Biochemistry- Practical
V	16BCU503A	Plant Biochemistry
	16BCU503B	Advanced Cell Biology
	16BCU513A	Plant Biochemistry- Practical
	16BCU513B	Advanced Cell Biology- Practical
V	16BCU504A	Molecular basis of non-infectious human diseases
	16BCU504B	Molecular basis of infectious diseases
	16BCU514A	Molecular basis of non-infectious human diseases- Practical
	16BCU514B	Molecular basis of infectious diseases- Practical
VI	16BCU602A	Biostatistics
	16BCU602B	Fundamentals of nanotechnology
	16BCU612A	Biostatistics- Practical
	16BCU612B	Fundamentals of nanotechnology- Practical
VI	16BCU603A	Drug Biochemistry
	16BCU603B	Food Preservation Technology
	16BCU613A	Drug Biochemistry- Practical
	16BCU613B	Food Preservation Technology- Practical
VI	16BCU691	**Project**

CORE COURSE

CC-1: Molecules of Life
CC-2: Cell Biology
CC-3: Membrane Biology and Bioenergetics
CC-4: Proteins
CC-5: Enzymes
CC-6: Human Physiology
CC-7: Metabolism of Carbohydrates and Lipids
CC-8: Metabolism of Amino Acids and Nucleotides
CC-9: Hormone: Biochemistry and Function
CC-10: Gene Organization, Replication and Repair
CC-11: Gene Expression and Regulation
CC-12: Immunology

SKILL ENHANCEMENT COURSE

SEC-1: Tools and Techniques in Biochemistry
SEC-2: Protein Purification Techniques
SEC-3: Clinical Biochemistry

SEC-4: Bioinformatics
SEC-5: Recombinant DNA Technology
SEC-6: Concepts in Genetics
SEC-7: Genetic Engineering and Biotechnology
SEC-8: Biochemical Correlations and Diseases

DISCIPLINE SPECIFIC ELECTIVE

DSE-1: Nutritional Biochemistry
DSE-2: Basic Microbiology
DSE-3: Molecular basis of non-infectious human diseases
DSE-4: Molecular basis of infectious diseases
DSE-5: Research Project
DSE-6: Advanced cell biology
DSE-7: Plant Biochemistry
DSE-8: Research Methodology
DSE-9 : Biostatistics
DSE-10: Fundamentals of nanotechnology
DSE-11: Food Preservation Technology
DSE-12: Drug Biochemistry

ABILITY ENHANCEMENT COMPULSORY COURSE

AECC-1: English communication

AECC-2: Environmental Studies

PROGRAMME OUTCOME (POs).

The Biochemistry graduate will be able to acquire

a. **Critical Thinking and Language Training:** The ability to analyze information objectively and make a reasonable judgment and conclusion by evaluating data, facts, observable phenomenon, and research findings from a set of information and distinguish among priorities to solve a problem To train them to communicate science by improving their English vocabulary. Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

b. **Ethics:** Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

c. **Social Interaction:** Elicit views of others, mediate disagreements and help reach conclusions in group settings. Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

d. **Understanding cellular function:** To equip them with basic and advanced knowledge in cell biology in order to get entry/placed in cell based research and development institution/laboratories.

e. **Protein based skills:** To make them understand protein, enzymes and human physiology to lay solid foundation and to get through competitive examinations. To equip them to get placed in recombinant protein production industries/laboratory.

f. **Understanding of endocrine system and metabolism:** To train them on the regulatory role of hormone on the metabolism of carbohydrates, lipids, amino acids and nucleic acid.

g. **Molecular and Genetic understanding:** To train them on the genetic regulation of immune system and to use computational tools.

h. **Environment and Sustainability:** Understand the issues of environmental contexts and sustainable development.

i. **Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

j. **Skill development:** To gain hands on experience on various biochemical experiments and to equip them to interpret the data.

PROGRAMME SPECIFIC OUTCOME (PSOs)

k. Be able to demonstrate foundation knowledge in the areas of Biochemistry like Cell biology, Biomolecules, Protein Biochemistry, Molecular Biology, Pharmaceutical Chemistry and Hormonal Biochemistry.

l. Be able to integrate knowledge learned in discipline specific courses like Microbiology, Plant Biochemistry, Nutritional Biochemistry, Biostatistics, Drug Biochemistry and Biotechnology.

m. To use standard laboratory protocols in biochemistry, modern instrumentations, proper laboratory safety protocols and classical techniques to carry out experiments and also use computers in data acquisition and processing and use available software as a tool in data analysis.

n. To understand the applications of biological sciences in Genetics, Biochemical Correlations of Diseases, Microbiology, Genetic Engineering and Biotechnology.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

I. To give students a basic knowledge in biochemistry and to teach on ethics.

II. To develop analytical and critical-thinking skills that allows independent exploration of biological phenomena through the scientific methods.

III. To acquaint knowledge on modern methods of biochemical experimentation to implement for future studies.

IV. To motivate students for social responsibilities and to educate them on ethical values in addition to inculcating environmental awareness.

V. To enable them to execute a research objective through experimentation.

Mapping of PEOs and POs

POs	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
PEO I	X	X		X		X	X				X			
PEO II			X			X	X				X	X	X	X
PEO III			X	X	X		X				X	X	X	X
PEO IV								X		X				X
PEO V				X	X				X	X	X	X	X	X

Semester I

16LSU101 **TAMIL-1** **4H-4C**

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

பாடத்திட்டப்பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

1. இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇடம்பெறுகின்ற, ‘தமிழ்இலக்கியவரலாறு’ குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக்குரியஆய்வு மனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
3. தமிழின்வளர்ச்சித்துறையாகிய, ‘அறிவியல்தமிழ்’ ; ‘இணையதமிழ்’ குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைமேம்பாடு.
4. வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
5. சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
6. மொழிபெயப்புத்துறைசார்ந்தவேலைவாய்புத்திறன்பெற்றிருத்தல்

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	**தாள்**	**கற்பிக்கும் நேரம்/வாரம்**	**தேர்வு மணிகள்**	**மதிப்பெண் அக/எழுத்து**	**மொத்தம்**	**மதிப்பீடு**
ஒன்று	I	4	3	40 / 60	100	4

பகுதி - I தமிழ்ப்பாடத்திட்டம் (2016-2017)

பகுதி – I, தமிழ்பருவம் I

16LAU101 : **தமிழ்முதல்தாள்** 4-H,4-C

(இளநிலைஅறிவியல்பட்டவகுப்புகளுக்குரியது)

பொதுநோக்கம்

- கற்றல்வழிகருத்துவெளிப்பாட்டுத்திறனைஅதிகரித்தலும் , சிந்தித்தலைமேம்படுத்துதல்.
- இலக்கியங்கள்உணர்த்தும்வாழ்வின்நுட்பமானபகுதிகளைஉணர்த்துதல்.மனிதமனத்தினைப்பக் குவப்படுத்துதலில்இலக்கியம்தரும்பங்கினைஉணர்த்துதல்.
- வளர்ந்துவரும்சமூகத்தில்அறஉணர்வு , பண்பாடுபோன்றவைகுறித்து அறிவூட்டல்.
- அரசுத்தேர்வுகளுக்குமாணவர்களைஆயத்தமாக்குதல்.

அலகு – I :இக்காலஇலக்கியம்: (10 மணிநேரம்)

கல்வி: மகாகவிபாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணிதேசிகவிநாயகம்பிள்ளை– ஒற்றுமையேஉயிர்நிலை.
மனிதநேயம் :கவிஞர்சிற்பிபாலசுப்பிரமணியன் –மலையாளக்காற்று.
சூழலியல் :கவிஞர்.வைதீஸ்வரன் - விரல்மீட்டியமழை.
பெண்ணியம் :கவிஞர்.சுகந்திசுப்பிரமணியம் – புதையுண்டவாழ்க்கை.

அலகு – II :அறஇலக்கியம்: (10 மணிநேரம்)

கொன்றைவேந்தன்: 1-50 பாடல்கள்

திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்

பழமொழிநானூறு: 5 பாடல்கள்

அலகு - III :சிற்றிலக்கியம்: (10 மணிநேரம்)

மூவருலா: 1-26 கண்ணிகள்

திருச்செந்தூர்முருகன்பிள்ளைத்தமிழ்: 2 பாடல்கள்

கலிங்கத்துப்பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV :கட்டுரை: (10 மணிநேரம்)

1. **உயர்தனிச்செம்மொழி-பரிதிமாற்கலைஞர்**
2. **கட்டிடக்கலை-** அ. இராசமாணிக்கனார்
3. **வாழ்க்கை** - இளவழகனார்
4. ஆளுமைத்திறன்அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V :மொழிப்பயிற்சி: (8 மணிநேரம்)

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை,கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு

Semester I

16ENU101 ENGLISH -I 4H- 4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcomes (CO's):

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed
6. Betterment of language competence

Unit 1

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

Unit 2

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

Unit 3

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

Unit 4

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams

Grammar: Preposition, Voice- Active and Passive

Unit 5

Short Story: The Bird – Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. *Spring* 2013**.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala, V. , (2006). *English for Communication*. Emerald Publishers: Chennai

Semester I

16BCU101 **MOLECULES OF LIFE** **4H-4C**

Instruction hours/week: L: 3 T: 1 P: 0 Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- To understand the properties and importance of water in biological system
- To know the biological significance of aminoacids and proteins in living systems
- To know the biological significance of lipids and fats in living systems
- To know the biological significance of carbohydrate metabolites in living systems
- To understand the functional role of nucleic acid in living systems
- To introduce the importance of vitamins in human body

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Recognize water as a universal solvent and elixir of life by knowing its importance
2. Identify the properties and classification of carbohydrates
3. Recall the role of various lipids in biomembrane including signal transduction
4. Categorize the amino acids and know their properties
5. Differentiate the structure, properties and functions of DNA and RNA
6. List the functions and deficiency disease of fat and water soluble vitamins

Unit 1

The foundations of biochemistry and water: Cellular and chemical foundations of life. Unique properties, weak interactions in aqueous systems, ionization of water, buffers, water as a reactant and fitness of the aqueous environment.

Unit 2

Carbohydrates and glycobiology: Monosaccharides - structure of aldoses and ketoses, ring structure of sugars, conformations of sugars, mutarotation, anomers, epimers and enantiomers, structure of biologically important sugar derivatives, oxidation of sugars. Formation of disaccharides, reducing and non-reducing disaccharides. Polysaccharides – homo- and heteropolysaccharides, structural and storage polysaccharides. Structure and role of proteoglycans, glycoproteins and glycolipids (gangliosides and lipopolysaccharides). Carbohydrates as informational molecules, working with carbohydrates

Unit 3

Lipids : Building blocks of lipids - fatty acids, glycerol, ceramide. Storage lipids - triacyl glycerol and waxes. Structural lipids in membranes – glycerophospholipids, galactolipids and sulpholipids, sphingolipids and sterols, structure, distribution and role of membrane lipids. Plant steroids. Lipids as signals, cofactors and pigments

Unit 4

Amino acids and Nucleic acids : Structure and classification, physical, chemical and optical properties of amino acids. Nucleotides - structure and properties. Nucleic acid structure – Watson-Crick model of DNA. Structure of major species of RNA - mRNA, tRNA and rRNA. Nucleic acid chemistry - UV absorption, effect of acid and alkali on DNA. Other functions of nucleotides - source of energy, component of coenzymes, second messengers.

Unit 5

Vitamins: Structure and active forms of water soluble and fat soluble vitamins, deficiency diseases and symptoms, hypervitaminosis

TEXT BOOKS

Ambika, S, (2004). Fundamentals of Biochemistry for Medical Students, CIT Chennai.

Deb, C., (2011). Fundamentals of Biochemistry, 9th edition New Central Book Agency, Calcutta.

Jain, J.L., Jain, S and Jain, N., (2005). Fundamentals of Biochemistry, S. Chand and Company Ltd, New Delhi.

REFERENCE BOOKS

Nelson, D., and Cox, M. W.H. (2012) Lehninger Principles of Biochemistry (4th Ed.) New York, Freeman and Company.

Stryer, L., (2009). Biochemistry, W.H. Freeman and Company, New York.

Murray, R.K., Bender, D.A., Botham, K.M., and Kennelly, P.J., (2012). Harper's illustrated Biochemistry, 29th Edition. McGraw-Hill Medical. London.

Semester I

16BCU102 **CELL BIOLOGY** **4H-4C**

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- To understand the structural organization of prokaryotic cells
- To understand the structural organization of eukaryotic cells
- To understand the technical basis of membrane biology
- On the structure and functions of various sub-cellular organelle
- To understand the cytoskeletal network and extracellular matrix
- To understand the cell cycle, cell division and cell death process

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Differentiate the prokaryotic and eukaryotic cell
2. Understand the principle behind studying the cell morphology using various microscope
3. Identify the structure and functions of each organelle in cell
4. Recognise the mechanism behind the protein sorting and transport to their destinations like lysosome, mitochondria and chloroplast
5. Maintenance of cytoskeleton structure and function of micro, macro and intermediary filaments
6. Enumerate the phases of cell cycle, events in cell division and mechanism of cell death

Unit 1

Introduction to cell biology: Prokaryotic (*archaea and eubacteria*) and eukaryotic cell (animal and plant cells), cells as experimental models.

Plasma membrane: Composition, Fluid mosaic model

Tools of cell biology: Light microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, electron microscopy, FACS. Centrifugation for sub-cellular fractionation.

Unit 2

Structure of different cell organelles

Structure of nuclear envelope, nuclear pore complex. Selective transport of proteins to and from the nucleus. Regulation of nuclear protein import and export.

ER structure. Targeting proteins to ER, smooth ER and lipid synthesis. Export of proteins and lipids from ER and into ER.

Structure and functions of mitochondria, chloroplasts and peroxisomes. Zellweger syndrome.

Unit 3

Protein trafficking

Organization of Golgi. Lipid and polysaccharide metabolism in Golgi. Protein sorting and export from Golgi. Mechanism of vesicular transport, cargo selection, coat proteins

and vesicle budding, vesicle fusion.
Lysosome. – Acid hydrolases, phagocytosis and autophagy**.**
import and mitochondrial assembly, protein export from mitochondrial matrix. Import and sorting of chloroplast proteins.

Unit 4

Cytoskeletal proteins : Structure and organization of actin filaments. Treadmilling and role of ATP in microfilament polymerization, organization of actin filaments. Non-muscle myosin. Intermediate filament proteins, assembly and intracellular organization. Assembly, organization and movement of cilia and flagella.

Unit 5

Cell wall and extracellular matrix :Prokaryotic and eukaryotic cell wall, cell matrix proteins. Cell-matrix interactions and cell-cell interactions. Adherence junctions, tight junctions, gap junctions, desmosomes, hemidesmosomes, focal adhesions and plasmodesmata.

Cell cycle, cell death and cell renewal : Eukaryotic cell cycle, restriction point, and checkpoints. Cell division. Apoptosis and necrosis - brief outline. Salient features of a transformed cell.

TEXT BOOKS

Paul, A., (2007). Text Book of Cell and Molecular Biology,1st edition. Books and Allied (P) Ltd, Kolkata.

Verma, P.S., and.Agarwal, V.K., (2005). Cell Biology Molecular Biology and Genetics, VII Edition, S.Chand and company Ltd, New Delhi.

Shukla, R.M., (2013). A textbook of Cell Biology, Dominant Publishers and Distributors.

Powar, C.B., (2001). Cell Biology, 3rd edition, Himalaya Publishing House, New Delhi

REFERENCES

Lodish, H., Berk, A., Kaiser, C.A., and Krieger, M., (2012). Molecular Cell Biology, 7th edition. W.H. Freeman & Company, London.

Garret, R. H. and Grisham, C.M., Biochemistry (2010) 4th ed., Cengage Learning (Boston), ISBN-13: 978-0-495-11464-2.

Cooper, G.M., and Hausman, R.E., (2013). Cell-A Molecular Approach, 6th Edition.. Sinauer Associates. USA

Karp, G., (2013). Cell and Molecular Biology, 7th edition. John Wiley and Sons, Inc, Hoboken, United States.

Alberts, B., Johnson,A., Lewis, J., and Enlarge, M., Molecular Biology of the Cell (2008) 5th ed., Garland Science (Princeton), ISBN:

Semester I

16BCU103 MEMBRANE BIOLOGY AND BIOENEGETICS 4H-4C

Instruction hours/week: L:3 T:1 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- The basis of membrane proteins (intrinsic and extrinsic)
- The basis of membrane lipids (phospholipids and glycolipids)
- The basis of membrane carbohydrates
- The basis of membrane model system for drug delivery
- On the transport of biomolecules across membranes
- To understand the role of membrane components on energy production

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Understand the basis of membrane proteins (intrinsic and extrinsic)
2. Understand the basis of membrane lipids (phospholipids and glycolipids)
3. Understand the basis of membrane carbohydrates
4. Understand the basis of membrane model system for drug delivery
5. Understand the transport of biomolecules across membranes
6. Understand the role of membrane components on energy production.

Unit 1

Biomembranes, membrane structures and membrane dynamics: Composition of biomembranes- prokaryotic, eukaryotic, neuronal and sub-cellular membranes. Study of membrane proteins. Fluid mosaic model with experimental proof. Monolayer, planer bilayer and liposomes as model membrane systems. Polymorphic structures of amphiphilic molecules in aqueous solutions- micelles and bilayers. CMC, critical packing parameter. Membrane asymmetry. Macro and micro domains in membranes. Membrane skeleton, lipid rafts, caveolae and tight junctions. RBC membrane architecture. Lateral, transverse and rotational motion of lipids and proteins. Techniques used to study membrane dynamics - FRAP, TNBS labeling etc. Transition studies of lipid bilayer, transition temperature. Membrane fluidity, factors affecting membrane fluidity.

Unit 2

Membrane transports: Thermodynamics of transport. Simple diffusion and facilitated diffusion. Passive transport- glucose transporter, anion transporter and porins**.** Primary active transporters- P type ATPases, V type ATPases, F type ATPases. Secondary active transporters- lactose permease, Na^+-glucose symporter. ABC family of transporters- MDR, CFTR. Group translocation. Ion channels- voltage-gated ion channels (Na^+/K^+ voltage-gated channel), ligand-gated ion channels (acetyl choline receptor), aquaporins, bacteriorhodopsin. Ionophores - valinomycin, gramicidin.

Unit 3

Vesicular transport, membrane fusion and bioenergetics: Types of vesicle transport and their function- clathrin, COP I and COP II coated vesicles. Molecular mechanism of vesicular transport. Membrane fusion. Receptor mediated endocytosis of transferrin. Laws of thermodynamics, state functions, equilibrium constant, coupled reactions, energy charge, ATP cycle, phosphorylation potential, phosphoryl group transfers. Chemical basis of high standard energy of hydrolysis of ATP, other phosphorylated compounds and thioesters. Redox reactions, standard redox potentials and Nernst equation. Universal electron carriers.

Unit 4

Oxidative phosphorylation: Mitochondria. Electron transport chain- its organization and function. Inhibitors of ETC and uncouplers. Peter Mitchell's chemiosmotic hypothesis. Proton motive force. Fo F1ATP synthase, structure and mechanism of ATP synthesis. Metabolite transporters in mitochondria. Regulation of oxidative phosphorylation. ROS production and antioxidant mechanisms. Thermogenesis. Alternative respiratory pathways in plants.

Unit 5

Photophosphorylation : General features of photophosphorylation, historical background, Hills reaction, photosynthetic pigments, light harvesting systems of plants and microbes and resonance energy transfer. Bacterial photophosphorylation in purple bacteria, Green sulfur bacteria and *Halobacterium salinarum*. Photophosphorylation in plants - structure of chloroplast, molecular architecture of Photosystem I and Photosystem II, Z-scheme of photosynthetic electron flow, oxygen evolving complex and action of herbicides. Cyclic photophosphorylation and its significance. Photo inhibition. Evolution of oxygenic photosynthesis.

REFERENCES

Nelson, D.L. and Cox, M.M., W.H.Freeman., Lehninger: Principles of Biochemistry (2013) 6th ed., and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.

Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., Molecular Cell Biology (2013) 7th ed., W.H. Freeman & Company (New York), ISBN:13: 978-1-4641-0981-2.

Garret, R. H. and Grisham, C.M., Biochemistry (2010) 4th ed., Cengage Learning (Boston), ISBN-13: 978-0-495-11464-2.

Voet, D.J., Voet, J.G. and Pratt, C.W., (2008) Principles of Biochemistry 3rd ed., John Wiley & Sons, Inc. (New York), ISBN:13: 978

Semester I

16BCU111 **MOLECULES OF LIFE PRACTICAL -1** **3H-2C**

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives

To impart hands-on training:

- To know the safety measures to be followed in laboratory
- To prepare molar, normal and ppm solutions
- On buffer preparation
- To separate the biomolecules using chromatography techniques
- To identify the biomolecules qualitatively
- To quantify the biomolecules using colorimetry

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Gain knowledge on lab safety
2. Prepare reagents and solutions
3. Understand the basis of buffer preparation
4. Understand the principle and working procedure behind chromatographic separations
5. Understand the principle and working procedure behind staining techniques
6. Understand the principle and working procedure behind colorimetrictechniques

Experiments

1. Safety measures in laboratories.
2. Preparation of normal and molar solutions.
3. Preparation of buffers.
4. Determination of pKa of acetic acid and glycine.
5. Qualitative tests for carbohydrates, lipids, amino acids, proteins and nucleic acids.
6. Separation of amino acids/ sugars/ bases by thin layer chromatography.
7. Estimation of vitamin C.
8. Estimation of vitamin E.

REFERENCE BOOKS

Nelson, D.L. and Cox, M.M., W.H.Freeman., Lehninger: Principles of Biochemistry (2013) 6th ed., and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.

Devlin, T.M., (2011) Textbook of Biochemistry with Clinical Correlations 7th ed., John Wiley & Sons, Inc. (New York), ISBN:978-0-470-28173-4.

Jayaraman, J. (2007). Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi.

Sadasivam, S., and Manickam, A., (2009). Biochemical Methods, New Age International Publishers, New Delhi.

Semester I

16BCU112 **CELL BIOLOGY PRACTICAL -2** **3H-2C**

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

To impart hands-on training:

- On different parts of light microscopy
- On how to visualize the cells
- On phase contrast microscopy
- On how to identify different stages of mitosis and meiosis
- On staining techniques to identify the cell types
- On how to count the cells using hemocytometer

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Identify the spotters of light microscopy
2. Be able to visualize the cells
3. Use the phase contrast microscopy at appropriate magnifications
4. Identify the cells using staining techniques
5. Interpret various stages of cell division
6. Count the cells manually using hemocytometer

Experiments

1. Preparation of onion root squash and observation of cell
2. Visualization of animal and plant cell by methylene blue.
3. Identification of different stages of mitosis in onion root tip.
4. Identification of different stages of meiosis in grasshopper testis.
5. Cell size determination using ocular stage micrometer
6. Micrographs of different cell components (dry lab).
7. Sub-cellular fractionation.
8. Visualization of nuclear fraction by acetocarmine stain.
9. Staining and visualization of mitochondria by Janus green stain.

REFERENCE BOOKS

Cooper, G.M. and Hausman, R.E., (2009). The Cell: A Molecular Approach 5th ed., ASM Press & Sunderland (Washington DC), Sinauer Associates, MA, ISBN:978-0-87893-300-6.

Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell. J., (2012) Molecular Cell Biology 7th ed., W.H. Freeman & Company (New York), ISBN:13:978-1-4641-0981-2 / ISBN:10: 1-4641-0981-8.

Alberts, B., Johnson,A., Lewis, J., and Enlarge, M., (2008) Molecular Biology of the Cell 5th ed., Garland Science (Princeton), ISBN:

Semester I

16BCU113 MEMBRANE BIOLOGY AND BIOENEGETICS PRACTICAL-3 4H-2C

Instruction hours/week: L:0 T:0 P:4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

To impart hands-on training:

- To analyze the composition of lipids in animal cell (RBC)
- To analyze the composition of lipids in plant cell
- On CMC determination and its significance
- To separate the photosynthetic pigments using TLC
- On techniques related to isolation of membrane bound enzymes
- On techniques related to quantification of membrane bound enzymes

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Analyze the composition of lipids in animal cell (RBC)
2. Analyze the composition of lipids in plant cell
3. Determine CMC for the given sample
4. Separate the photosynthetic pigments using TLC
5. Isolate membrane bound enzymes
6. Perform quantification of membrane bound enzymes

Experiments

1. Effect of lipid composition on the permeability of a lipid monolayer.
2. Determination of CMC of detergents.
3. RBC ghost cell preparation and to study the effect of detergents on membranes.
4. Separation of photosynthetic pigments by TLC.
5. Isolation of mitochondria from liver and assay of marker enzyme SDH.
6. Study photosynthetic O2 evolution in hydrilla plant.
7. Isolation of chloroplast from spinach leaves, Estimation of chlorophyll.

REFERENCES

Nelson, D.L. and Cox, M.M., (2013) Lehninger: Principles of Biochemistry 6th ed., W.H.Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.

Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., (2013). Molecular Cell Biology 7th ed., W.H. Freeman & Company (New York), ISBN:13: 978-1-4641-0981-2.

Garret, R. H. and Grisham, (2010). Biochemistry 4th ed., C.M., Cengage Learning (Boston), ISBN-13: 978-0-495-11464-2.

Voet, D.J., Voet, J.G. and Pratt, C.W., (2008). Principles of Biochemistry 3rd ed., John Wiley & Sons, Inc. (New York), ISBN:13: 978

Semester II

16LSU201 **TAMIL-2** **4H-4C**

Instruction hours/week: L:4 T:0 P:0 Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

பாடத்திட்டப்பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

7. இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில் , விருப்பப்பாடமாகஇடம்பெறுகின்ற, ‘தமிழ்இலக்கியவரலாறு’ குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
8. கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக்குரியஆய்வுமனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
9. தமிழின்வளர்ச்சித்துறையாகிய, ‘அறிவியல்தமிழ்’ ; ‘இணையதமிழ்’ குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைமேம்பாடு.
10. வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
11. சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
12. மொழிபெயப்புத்துறைசார்ந்தவேலைவாய்புத்திறன்பெற்றிருத்தல்

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	**தாள்**	**கற்பிக்கும் நேரம்/வாரம்**	**தேர்வு மணிகள்**	**மதிப்பெண் அக/எழுத்து**	**மொத்தம்**	**மதிப்பீடு**
இரண்டு	II	4	3	40 / 60	100	4

பகுதி – I, தமிழ் பருவம் II

16LAU201 : தமிழ்இரண்டாம்தாள் 4-H,4-C

(இளநிலைஅறிவியல்பட்டவகுப்புகளுக்குரியது)

அலகு – I :பக்திஇலக்கியம் (10 மணிநேரம்)

சைவ, வைணவஇலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. **சைவம் -**பெரியபுராணம் - திருமூலநாயனார்புராணம்.
2. **வைணவம் -** பெரியாழ்வார்திருமொழி: 10 பாடல்கள்.

அலகு – II :சங்கஇலக்கியம் : (15 மணிநேரம்)

சங்கஇலக்கியங்கள்அறிமுகம்

அ).எட்டுத்தொகை

நற்றிணை : பிரசம்கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக்கலை – குறிஞ்சி- 69

ஐங்குறுநூறு :நெய்தல்-தொண்டிப்பத்து: திரைஇமிழ்இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்ததுமன்ற - 27

பரிபாடல்: பரிபாடல்திரட்டு-மதுரைநகர்ச்சிறப்பு –

உலகம்ஒருநிறையாத்தான்-6, மாயோன்கொப்பூழ்-7, செய்யாட்குஇழைத்த-9, கார்த்திகைகாதில்-10, ஈவாரைக்கொண்டாடி-11.

கலித்தொகை:சுடர்தொடீகேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு:அன்னாய்வாழிவேண்டன்னை - குறிஞ்சி - 48

புறநானூறு :யாதும்ஊரேயாவருங்கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின்சிறப்பு

முருகன்இருப்பிடங்கள் – 'சிறுதினைமலரொடு' என்பதிலிருந்துதொடங்கி, 'அறிந்தவாறே' என்பதுவரையிலானதொடர்கள்: 218-249.

முருகன்அருள்புரிதல் – 'தெய்வம்சான்ற' என்பதிலிருந்துதொடங்கி, 'நல்குமதி' என்பதுவரையிலானதொடர்கள்: 286-295.

அலகு - III :காப்பியம் (6 மணிநேரம்)

சிலப்பதிகாரம்:

மங்கலவாழ்த்துப்பாடல்: (21-29) – கண்ணகியின்சிறப்பு:

'நாகநீள்நகரொடு' என்பதிலிருந்துதொடங்கி,

'கண்ணகிஎன்பாண்மன்னோ' என்பதுவரையிலானதொடர்கள்.

நடுகற்காதை: (207-234)- சேரன்செங்குட்டுவன்கண்ணகிக்குக்கோயில்எடுத்தல்:

'அருந்திறலரசர்' என்பதிலிருந்துதொடங்கி, 'மன்னவரேறென்' என்பதுவரையிலானதொடர்கள்.

Semester II

16BCU201 **PROTEINS** **4H-4C**

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- To build their understanding on proteins
- On different molecular techniques used for separation of proteins
- On different molecular techniques used for characterization of proteins
- To study the three dimensional structure of proteins using computational tools
- To enrich the biological significance of proteins
- To identify appropriate technique to use during their project work

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Build on their understanding of proteins
2. Use different molecular techniques used for separation of proteins
3. Use different molecular techniques used for characterization of proteins
4. Understand the three dimensional structure of proteins using computational tools
5. Identify the biological significance of proteins
6. Use appropriate technique during their project work

Unit 1

Introduction, Extraction and Separation of Proteins: Introduction - Amino acids and their properties - hydrophobic, polar and charged amino acids. Biologically important peptides - hormones, antibiotics and growth factors. Multimeric proteins, conjugated proteins and metallo proteins. Diversity of function. Extraction of proteins for downstream processing - Solubilization of proteins from their cellular and extracellular locations. Use of simple grinding methods, homogenization, ultrasonication, French press and centrifugation. Separation techniques - Ammonium sulphate fractionation, solvent fractionation, dialysis and lyophilization.

Unit 2

Purification and Characterization of proteins: Chromatographic Techniques - Ion-exchange chromatography, molecular sieve chromatography, hydrophobic interaction/reverse phase chromatography, affinity chromatography, HPLC (Normal and Reverse phase) and FPLC. Characterization of proteins - Determination of purity, molecular weight, extinction coefficient and sedimentation coefficient, IEF, SDS-PAGE and 2-D electrophoresis.

Unit 3

Structural Organization and Analysis of proteins : Organization of protein structure into primary, secondary, tertiary and quaternary structures. N-terminal and C-terminal amino acid analysis. Sequencing techniques - Edman degradation. Generation of overlap peptides using different enzymes and chemical reagents. Disulfide bonds and their location. Mass spectrometric analysis, tandem MS. Solid phase peptide synthesis

Unit 4

Three dimensional structures of protein and Protein Structure Database : Nature of stabilizing bonds - covalent and non covalent. Importance of primary structure in folding. The peptide bond - bond lengths and configuration. Dihedral angles psi and phi. Helices, sheets and turns. Ramachandran map. Techniques used in studying 3-D structures - X-ray diffraction and NMR. Motifs and domains. Tertiary and quaternary structures. Structures of myoglobin and haemoglobin. Denaturation and renaturation of Ribonuclease A. Introduction to thermodynamics of folding and molten globule. Assisted folding by molecular chaperones, chaperonins and PDI. Defects in protein folding. Diseases –Alzheimer's and Prion based. Protein sequence and structure databases (PDB). Use of sequence and domain information. Viewing protein structures using *in silico* tools.

Unit 5

Specialized Proteins and its Applications : Myoglobin and haemoglobin - Oxygen binding curves, influence of 2,3-BPG, CO2 and Cl^- Hill plot. Cooperativity between subunits and models to explain the phenomena –concerted and sequential models. Haemoglobin disorders. Antibodies - Antibody structure and binding to antigens. Actin-myosin motors - ATP activated actin - myosin contractions. Membrane Proteins - Integral and membrane associated proteins. Hydropathy plots to predict transmembrane domains. Significance of membrane proteins - bacteriorhodopsin.

REFERENCES

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6^{th} ed., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.

Sheehan, D., (2009). Physical Biochemistry 2^{nd} ed., Wiley-Blackwell (West Sussex), ISBN: 9780470856024 / ISBN: 9780470856031.

Cooper, T.G., (2011). The Tools of Biochemistry Wiley India Pvt. Ltd. (New Delhi), ISBN: 978-81-265-3016-8.

Semester II

16BCU202 **ENZYMES** **4H-4C**

Instruction hours/ week: L:4 T:1 P:0 **Marks:** Internal: **40** External: **60 Total**: **100**
End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- To understand the basic concepts of enzymes
- To study the kinetics of enzyme catalysed reactions
- To learn the mechanism of action of enzymes and enzyme inhibition concepts
- To understand various modes of enzyme regulation
- To learn the application of enzymes in health
- To learn the application of enzymes in diseases

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Understand the basic concepts on enzymes
2. Relate the initial velocity and substrate concentration of enzymes and be able to understand the kinetics of inhibition reactions
3. Understand the basis of enzyme inhibitor drugs
4. Be able to understand the regulation pattern of various enzymes
5. Relate the regulation pattern of enzymes for its application in health and diseases
6. Understand the application of enzymes as marker in various disease conditions

Unit 1

Introduction to enzymes and enzyme catalysis

Introduction - Nature of enzymes - protein and non-protein (ribozyme). Cofactor and prosthetic group, apoenzyme, holoenzyme. IUBMB classification of enzymes. Features of enzyme catalysis- Factors affecting the rate of chemical reactions, collision theory, activation energy and transition state theory, catalysis, reaction rates and thermodynamics of reaction. Catalytic power and specificity of enzymes (concept of active site), Fischer's lock and key hypothesis, Koshland's induced fit hypothesis.

Unit 2

Enzyme kinetics

Relationship between initial velocity and substrate concentration, steady state kinetics, equilibrium constant - monosubstrate reactions. Michaelis-Menten equation, Lineweaver-Burk plot, Eadie-Hofstee and Hanes plot. Km and Vmax, Kcat and turnover number. Effect of pH, temperature and metal ions on the activity of enzyme. Bisubstrate reactions - Types of bi bi reactions (sequential – ordered and random, ping pong reactions). Differentiating bi substrate mechanisms (diagnostic plots, isotope exchange).

Unit 3

Mechanism of action of enzymes and Enzyme inhibition

Mechanism of action of enzymes - General features - proximity and orientation, strain and distortion, acid base and covalent catalysis (chymotrypsin, lysozyme). Metal activated enzymes and metalloenzymes, transition state analogues. Enzyme Inhibition - Reversible inhibition (competitive, uncompetitive, non-competitive, mixed and substrate). Mechanism based inhibitors - antibiotics as inhibitors.

Unit 4

Regulation of enzyme activity

Control of activities of single enzymes (end product inhibition) and metabolic pathways, feedback inhibition (aspartate transcarbomoylase), reversible covalent modification phosphorylation (glycogen phosphorylase). Proteolytic cleavage-zymogen. Multienzyme complex as regulatory enzymes. Occurrence and isolation, phylogenetic distribution and properties (pyruvate dehydrogenase, fatty acyl synthase) Isoenzymes - properties and physiological significance (lactate dehydrogenase).

Unit 5

Coenzymes in enzyme catalysed reactions and Applications of enzymes. Structure and Functions of TPP, FAD, NAD, pyridoxal phosphate, biotin, coenzyme A, tetrahydrofolate, lipoic acid. Applications of enzymes - Application of enzymes in diagnostics (SGPT, SGOT, creatine kinase, alkaline and acid phosphatases), enzyme immunoassay (HRPO), enzyme therapy (Streptokinase). Immobilized enzymes – Preparation techniques and its applications.

REFERENCES

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.

Donald, V. and Judith G.V., (2011). Biochemistry 4th ed., John Wiley & Sons Asia Pvt. Ltd. (New Jersey), ISBN:978-1180-25024.

Nicholas C.P., and Lewis S., (1999). Fundamentals of Enzymology 3rd ed., Oxford University Press Inc. (New York), ISBN:0 19 850229 X.

Semester II

16BCU203 **HUMAN PHYSIOLOGY** **4H-4C**

Instruction hours/week: L:3 T:1 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- On the concept of homeostasis
- On the physiological functioning of cardiovascular system
- On the physiological functioning of renal system
- On the physiological functioning of gastro-intestinal and hepatic system
- On the physiological functioning of muscular skeletal system
- On the physiological functioning of reproductive system

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Understand the concept of homeostasis
2. Understand the physiological functioning of cardiovascular system
3. Understand the physiological functioning of renal system
4. Understand the physiological functioning of gastro-intestinal and hepatic system
5. Understand the physiological functioning of muscular skeletal system
6. Understand the physiological functioning of reproductive system

Unit 1

Homeostasis and the organization of body fluid compartments :
Intracellular, extracellular and interstitial fluid. Homeostasis, control system and their components. Plasma as an extracellular fluid, RBC, molecular mechanism of blood coagulation, role of vitamin K in coagulation, anticoagulant and fibrinolytic systems. Anemias, polycythemia, haemophilia and thrombosis.

Respiration : Organization of the pulmonary system. Mechanism of respiration, pulmonary ventilation and related volumes, pulmonary circulation. Principles of gas exchange and transport. Regulation of respiration. Pulmonary oedema and regulation of pleural fluid. Hypoxia, hypercapnea, pulmonary distress, emphesema, ARDS.

Unit 2

Cardiovascular physiology: Pressure, flow and resistance. Anatomy of heart. Physiology of the cardiac muscle, automacity of the cardiac muscle contraction, excitation contraction coupling, relationship between cardiac cycle, heart sound, ventricular volumes and the ECG, control of cardiac function and output. The arterial system, venous system, the microcirculation and mechanics of capillary fluid exchange. Control of blood flow to the tissues. Portal circulations. Arterial pressure and its regulation. Hypertension, congestive heart disease, atherosclerosis and myocardial infarction.

Unit 3

Renal physiology: Anatomy of the kidney and the nephron. Regulation of renal blood flow. Cell biology of the Bowmans' capsule. Physiology of glomerular filtration and GFR. Tubular processing of the glomerular filtrate. Micturition reflex and voluntary control of micturition. Regulation of ECF electrolyte and water content, blood volume and long term blood pressure. Blood buffer systems, renal and pulmonary control of blood pH, renal clearance. Assessment of kidney function. Acidosis and alkalosis. Glomerular nephritis, renal failure, dialysis and diuretics.

Unit 4

Gastrointestinal and hepatic physiology: Histology of the gastrointestinal tract. Propulsion and motility of food and digested material. Enteric reflexes, secretory functions of the gastrointestinal tract, digestion and absorption of macro and micronutrients. Peptic ulcer, Sprue, celiac disease, IBD, regurgitation, diarrhoea and constipation. Anatomy of the hepatic lobule and blood flow into the liver. Formation and secretion of bile. enterohepatic cycle, reticuloendothelial system, metabolic importance of liver. Liver function tests. Jaundice, liver cirrhosis and fatty liver.

Musculosketetal system :Bone structure and formation. Physiology of muscle contraction in striated and non-striated muscle.

Unit 5

Reproductive physiology : Sex determination and differentiation. Development of female and male genital tracts. Spermatogenesis, capacitation and transport of sperm, blood testis barrier. Ovarian function and its control. Uterine changes, fertilization and implantation. Placenta as a feto- maternal unit, gestation and parturition.

Neurochemistry and neurophysiology: Central Nervous system. Peripheral Nervous system. Blood brain barrier and CSF. Membrane potentials. Synaptic transmission. Neurotransmitters. Sensory receptors and neural pathways. Somatic sensation, EEG, sleep, coma, learning and memory**.**

TEXTBOOKS

Chatterjee, C.C., (2012). Human Physiology, 11th edition, Mical Alli Agency, Calcutta.

Saradha, S., (2004). Textbook of Human Physiology, S. Chand and Company, New Delhi.

REFERENCES

Guyton, C., and Hall, J.E., (2010). Textbook of Medical Physiology, 12th Editon. Prism Indian edition, W.B. Saunders Company, New Delhi.

Murray, R.K., Bender, D.A., Botham, K.M., and Kennelly, P.J., (2012).Harper's illustrated Biochemistry, 29th edition.. McGraw-Hill Medical. London.

Semester II

16BCU211 **PROTEINS PRACTICAL - 4** **3H-2C**

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives:
To impart hands-on training:

- Qualitative analysis of proteins
- Quantitative analysis of proteins
- Determination of isoelectric point of proteins
- Separation of proteins using chemical methods
- Electrophoretic separation of proteins using SDS-PAGE
- Immune based separation of proteins

Course Outcomes (CO's):
After successful completion of the course, the student will:

1. Perform qualitative analysis of proteins
2. Quantify the amount of protein in the given sample
3. Determine isolectric point of given protein
4. Separate the protein using ammonium sulphate method
5. Perform SDS-PAGE for separation of proteins
6. Perform affinity chromatography

Experiments

1. Estimation of proteins using UV absorbance and Biuret method.
2. Microassay of proteins using Lowry/Bradford method.
3. Isoelectric pH of casein.
4. Ammonium sulphate fractionation of serum proteins.
5. Separation of albumin from serum using anion-exchange chromatography.
6. SDS-PAGE analysis of proteins.

REFERENCES

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.

Sheehan, D., (2009). Physical Biochemistry 2nd ed., Wiley-Blackwell (West Sussex), ISBN: 9780470856024 / ISBN: 9780470856031.

Cooper, T.G., (2011). The Tools of Biochemistry Wiley India Pvt. Ltd. (New Delhi), ISBN: 978-81-265-3016-8.

Semester II

16BCU212 **ENZYMES PRACTICAL - 5** **3H-2C**

Instruction hours/ week: L:0 T:1 P:3 **Marks:** Internal: **40** External: **60** **Total**: **100**

End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- To understand the basic concepts of enzymes
- To study the kinetics of enzyme catalysed reactions
- To learn the mechanism of action of enzymes and enzyme inhibition concepts
- To understand various modes of enzyme regulation
- To learn the application of enzymes in health
- To learn the application of enzymes in diseases

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Understand the basic concepts on enzymes
2. Relate the initial velocity and substrate concentration of enzymes and be able to understand the kinetics of inhibition reactions
3. Understand the basis of enzyme inhibitor drugs
4. Be able to understand the regulation pattern of various enzymes
5. Relate the regulation pattern of enzymes for its application in health and diseases
6. Understand the application of enzymes as marker in various disease conditions

Experiments

1. Partial purification of acid phosphatase from germinating mung bean.
2. Assay of enzyme activity and specific activity, e.g. acid phosphatase.
3. Effect of pH on enzyme activity
4. Determination of Km and Vmax using Lineweaver-Burk graph.
5. Enzyme inhibition - calculation of Ki for competitive inhibition.
6. Continuous assay of lactate dehydrogenase.
7. Assay of glucose-6-phosphate dehydrogenase.

REFERENCE

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.

Donald, V., and Judith G.V., (2011). Biochemistry 4th ed., John Wiley & Sons Asia Pvt. Ltd. (New Jersey), ISBN:978-1180-25024.

Nicholas C.P. and Lewis S., (1999). Fundamentals of Enzymology 3rd ed., Oxford University Press Inc. (New York), ISBN:0 19 850229 X.

Semester II

16BCU213 **HUMAN PHYSIOLOGY PRACTICAL-6** **4H-2C**

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives

To impart hands-on training on:

- Counting of different cell types using microscopy
- Estimation of haemoglobin in the given blood sample
- Determination of the group of the given blood sample
- Separation of isoenzymes by electrophoresis
- Measurement of blood pressure using sphygmomanometer
- Fixing and staining of microtome sections of tissues for histopathology observations

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Count of different cell types (RBC, WBC) using microscopy
2. Perform the estimation of haemoglobin in the given blood sample
3. Perform and identify the grouping (ABO and Rh) of the given blood sample
4. Separate isoenzymes by electrophoresis
5. Perform blood pressure measurement using sphygmomanometer
6. Perform fixing and staining of microtome sections of tissues for histopathology observations

Experiments

1. Hematology.
   a. RBC and WBC counting
   b. Differential leucocyte count.
   c. Clotting time.
   d. Bleeding time
2. Estimation of haemoglobin.
3. Determination of blood groups
4. Separation of plasma proteins.
5. Determination of total iron binding capacity.
6. Pulmonary function tests, spirometry and measurement of blood pressure.
7. Separation of isoenzymes by electrophoresis.
8. Histology of connective tissue, liver and/ brain permanent slides.
9. Case studies (Renal clearance, GFR, ECG).

REFERENCES

Rajan, S., (2012) Manual for Medical laboratory technology, First edition. Anjana Book House, Chennai.

Rao, B.S. and Deshpande, V., (2005). Experimental Biochemistry: A Student Companion IK International Pvt. Ltd. (New Delhi), ISBN:81-88237-41-8.

Semester II

16AEC201 **ENVIRONMENTAL STUDIES** **4H/4C**

Instruction hours/week: L: 3 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- To understand the concepts and components of ecosystem
- To understand the significance of eco components and measures to maintain ecosystem
- To teach the ethical and legal perspectives on ecosystem management
- To understand the undesired effects of environmental pollution
- To device a strategy to avoid environmental pollution
- To understand the concept of conservation

Course Outcomes (COs)

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Understand the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

UNIT-1

Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

Unit 2

Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources : Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. effects of fireworks.

Unit 3

Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit 4

Environmental Pollution - Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution , Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit 5

Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

REFERENCES

T1: Tripathy, S.N., and Panda, S., (2004). Fundamentals of Environmental Studies; 2nd Edition, Vrianda Publications Private Ltd., New Delhi.

T2: Kumar, A., (2004). A Textbook of Environmental Science; APH Publishing Corporation, New Delhi.

T3: Verma, P.S., Agarwal, V.K., (2001). Environmental Biology (Principles of Ecology); S.Chand and Company Ltd., New Delhi.

T4: Kaushik, A., Kaushik, C.P., (2004). Perspectives in Environmental Studies, New Age International Pvt. Ltd. Publications, New Delhi.

R1: Singh, M.P., Singh, B.S., and Dey, S.S., (2004). Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.

R2: Botkin, D.B., and Keller, E.A., (1995). Environmental Science, John Wiley and Sons, Inc., New York.

R3: Uberoi, N.K., (2005). Environmental Studies, Excel Books Publications, New Delhi, India.

Semester III

16BCU301 METABOLISM OF CARBOHYDRATES AND LIPIDS 4H-4C

Instruction hours/week: L: 4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objective

Equip the students:

- An overview on various metabolic pathways in human
- An overview on various metabolic pathways in plants
- To understand the pathways related with energy production through catabolism of carbohydrates and lipids
- To understand the pathways related with energy production through anabolism of carbohydrates and lipids
- To recognize the metabolic pathways that involve with the synthesis of macromolecule
- To know the biomolecules homeostasis mechanism

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Students are able to understand the breakdown of macromolecules like carbohydrate and lipids
2. Recognise the energy production pathways like glycolysis, glycogeneolysis and TCA cycle
3. Interpret the central role of TCA cycle in energy metabolism
4. Relate the calvin cycle with the synthesis of starch and sucrose and integration of carbohydrate metabolism in plant
5. Understand the energy requirement and energy balance through glucose homeostasis
6. Relate the interdependence of metabolic pathways

Unit 1

Basic design of metabolism: Autotrophs, heterotrophs, metabolic pathways, catabolism, anabolism, ATP as energy currency, reducing power of the cell.

Glycolysis: Glycolysis - a universal pathway, reactions of glycolysis, fermentation, fates of pyruvate, feeder pathways for glycolysis, galactosemia.

Gluconeogenesis and pentose phosphate pathway: Synthesis of glucose from non-carbohydrate sources, reciprocal regulation of glycolysis and gluconeogenesis, pentose phosphate pathway and its importance.

Unit 2

Glycogen metabolism: Glycogenesis and glycogenolysis, regulation of glycogen metabolism, glycogen storage diseases.

Citric acid cycle: Production of acetyl CoA, reactions of citric acid cycle, anaplerotic reactions, amphibolic role, regulation of citric acid cycle, glyoxalate pathway, coordinated regulation of glyoxalate and citric acid pathways.

Unit 3

Synthesis of carbohydrates : Calvin cycle, regulation of calvin cycle, regulated synthesis of starch and sucrose, photorespiration, C4 and CAM pathways, synthesis of cell wall polysaccharides, integration of carbohydrate metabolism in plant cell.

Unit 4

Fatty acid oxidation: Digestion, mobilisation and transport of cholesterol and triacyl glycerols, fatty acid transport to mitochondria, β oxidation of saturated, unsaturated, odd and even numbered and branched chain fatty acids, regulation of fatty acid oxidation, peroxisomal oxidation, ω oxidation, ketone bodies metabolism, ketoacidosis.

Fatty acid synthesis: Fatty acid synthase complex. Synthesis of saturated, unsaturated, odd and even chain fatty acids and regulation.

Unit 5

Biosynthesis of eicosanoids, cholesterol, steroids and isoprenoids: Synthesis of prostagladins, leukotrienes and thromboxanes. Synthesis of cholesterol, regulation of cholesterol synthesis. Synthesis of steroids and isoprenoids.

Biosynthesis of membrane lipids:

Synthesis of membrane phospholipids in prokaryotes and eukaryotes, respiratory distress syndrome, biosynthesis of triacylglycerol, biosynthesis of plasmalogens, sphingolipids and glycolipids, lipid storage diseases.

Starve-feed cycle

Well-fed state, early fasting state, fasting state, early re-fed state, energy requirements, reserves and caloric homeostasis, five phases of glucose homeostasis.

REFERENCES:

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.

Devlin, T.M., (2011). Textbook of Biochemistry with Clinical Correlations 7th ed., John Wiley & Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4.

Berg, J.M., Tymoczko, J.L. and Stryer L., (2012). Biochemistry 7th ed., W.H. Freeman and Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4.

Semester III

16BCU302 METABOLISM OF AMINOACID AND NUCLEIC ACIDS 4H-4C

Instruction hours/week: L: 4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- To understand the structure and functions of amino acids
- To understand the structure and functions of nucleic acids
- To understand the basis of diseases associated with amino acid catabolism
- To understand the basis of diseases associated with nucleic acid catabolism
- To understand the interconnection between amino acids and nucleic acids and central dogma concept
- To understand the biosynthesis of amino acids and nucleic acids

Course Outcomes (CO's)

After successful completion of the course, the student will:

1. Identify basic structures, names, and properties of nucleic acids
2. Demonstrate overview of amino acid metabolism and catabolism of amino acids
3. Understand the chemical logic of metabolic pathways
4. Recognize and understand basic mechanisms of pathway regulation
5. Understand the central dogma concept
6. Understand the basis of amino acid and nucleic acid disorders

Unit 1

Overview of amino acid metabolism : Nitrogen cycle, incorporation of ammonia into biomolecules. Metabolic fates of amino groups. Digestion and absorption of dietary proteins. Protein calorie malnutrition - Kwashiorkar and Marasmus. Nitrogen balance, transamination, role of pyridoxal phosphate, glucose-alanine cycle, Kreb's bicycle, urea cycle and inherited defects of urea cycle.

Catabolism of amino acids : Catabolic pathways of individual amino acids. Glucogenic and ketogenic amino acids. Metabolism of one carbon units.

Unit 2

Catabolism of amino acids

Disorders of amino acids metabolism, phenylketonuria, alkaptonuria, maple syrup urine disease, methylmalonic acidemia (MMA), homocystinuria and Hartnup's disease.

Biosynthesis of amino acids

Overview of amino acid synthesis. Biosynthesis of non-essential amino acids and its regulation.

Unit 3

Precursor functions of amino acids

Biosynthesis of creatine and creatinine, polyamines (putresine, spermine, spermidine), catecholamines (dopamine, epinephrine, norepinephrine) and neurotransmitters (serotonin, GABA). Porphyrin biosynthesis, catabolism and disorders of porphyrin metabolism.

Unit 4

Biosynthesis of purine and pyrimidine nucleotides

De novo synthesis of purine and pyrimidine nucleotides, regulation and salvage pathways.

Deoxyribonucleotides and synthesis of nucleotide triphosphate

Biosynthesis of deoxyribonucleotides and its regulation, conversion to triphosphates, biosynthesis of coenzyme nucleotides.

Unit 5

Degradation of purine and pyrimidine nucleotides

Digestion of nucleic acids, degradation of purine and pyrimidine nucleotides. Inhibitors of nucleotide metabolism. Disorders of purine and pyrimidine metabolism – Lesch-Nyhan syndrome, Gout, SCID, adenosine deaminase deficiency.

Integration of metabolism

Integration of metabolic pathways (carbohydrate, lipid and amino acid metabolic pathways), tissue specific metabolism (brain, muscle, and liver).

REFERENCES:

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962.

Devlin, T.M., (2011). Textbook of Biochemistry with Clinical Correlations 7th ed., John Wiley & Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4.

Berg, J.M., Tymoczko, J.L. and Stryer L., (2012). Biochemistry 7th ed., W.H. Freeman and Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4.

Semester III

16BCU303 HORMONES: BIOCHEMISTRY AND FUNCTION 4H-4C

Instruction hours/week: L:3 T:1 P:0 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students on:

- The fundamentals of hormones and receptors
- Different mechanisms of hormonal actions
- Understanding of physiological and biochemical actions of hypothalamic, thyroid and pituitary hormones
- The role and applications of gastrointestinal hormones
- Understanding the clinical significance of adrenal and gonadal hormones
- Understanding of various endocrine disorders

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Gain knowledge on functions, classification and transport of hormones
2. Understand the role of secondary messengers, effector systems and protein kinases, tyrosine kinases in hormonal action
3. Have knowledge on the biochemical action and regulation of various endocrine hormones
4. Understand the role and applications of gastrointestinal hormones
5. Have knowledge on the role and functions of adrenal and gonadal hormones
6. To be able to identify an endocrine disorder if symptoms are available

Unit 1

Introduction to hormones and receptors

Functions of hormones and their regulation. Chemical signaling - endocrine, paracrine, autocrine, intracrine and neuroendocrine mechanisms. Chemical classification of hormones, transport of hormones in the circulation and their half-lives. Hormone therapy. General introduction to Endocrine methodology. Hormone receptors - extracellular and intracellular. Receptor - hormone binding, Scatchard analysis. G protein coupled receptors, G proteins

Unit 2

Mechanisms of hormonal actions

Second messengers - cAMP, cGMP, IP3, DAG, Ca^{2+}, NO. Effector systems - adenylate cyclase, guanylate cyclase, PDE, PLC. Protein kinases (PKA, PKB, PKC, PKG). Growth factor signaling, PDGF, EGF, IGF-II, and erythropoietin. Receptor tyrosine kinases - EGF, insulin, erythropoietin receptor; ras - MAP kinase cascade, JAK - STAT pathway. Steroid hormone/ thyroid hormone receptor mediated gene regulation. Receptor regulation and cross talk.

Unit 3

Hypothalamic, pituitary and thyroid hormones

Hypothalamic - pituitary axis. Study the physiological and biochemical actions of hypothalamic hormones, pituitary hormones - GH, prolactin, TSH, LH, FSH, POMC peptide family, oxytocin and vasopressin, feedback regulation cycle. Endocrine disorders - gigantism, acromegaly, dwarfs, pigmies and diabetes insipidus. Thyroid gland.

Biosynthesis of thyroid hormone and its regulation; its physiological and biochemical action. Pathophysiology - Goiter, Graves disease, cretinism, myxedema, Hashimato's disease.

Unit 4

PTH, calcitonin and gastrointestinal hormones

PTH, Vitamin D and calcitonin. Mechanism of Ca^{2+} regulation and pathways involving bone, skin, liver, gut and kidneys. Pathophysiology - rickets, osteomalacia, osteoporosis. Regulation of release of insulin, glucagon, gastrin, secretin, CCK, GIP, adipolectin, leptin and ghrelin. Summary of hormone metabolite control of GI function. Physiological and biochemical action. Pathophysiology - diabetes type I and type II.

Unit 5

Adrenal and gonadal hormones

Aldosterone, renin angiotensin system, cortisol, epinephrine and norepinephrine. Fight or flight response, stress response. Pathophysiology – Addison's disease, Conn's syndrome, Cushing syndrome.Male and female sex hormones. Interplay of hormones during reproductive cycle, pregnancy, parturition and lactation. Hormone based contraception.

REFERENCES

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman & Company (NewYork), ISBN:13: 978-1-4641-0962-1 / ISBN:10-14641-0962-1.

Widmaier, E.P., Raff, H., and Strang, K.T., (2008). Vander's Human Physiology 11th ed.,. McGraw Hill International Publications, ISBN: 978-0-07-128366-3.

Hadley, M.C., and Levine, J.E., (2007). Endocrinology 6th ed., Pearson Education (New Delhi), Inc. ISBN: 978-81-317-2610-5.

Cooper, G.M., and Hausman, R.E., (2009). The Cell: A Molecular Approach 5th Ed. ASM Press & Sunderland, (Washington DC), Sinauer Associates. (MA). ISBN:978-0-87893-300-6.

16BCU311 METABOLISM OF CARBOHYDRATES AND LIPIDS Semester III
PRACTICAL- 7 4H-2C

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

To impart hands-on training:

- On different qualitative methods to estimate glucose
- On different quantitative methods to estimate glucose
- On fermentation techniques
- On isolation methods for lipids
- To understand the quantitative analysis of enzymes involved in carbohydrate metabolism
- To understand the quantitative analysis of enzymes involved in lipid metabolism

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Use different qualitative methods to estimate glucose
2. Use different quantitative methods to estimate glucose
3. Perform fermentation techniques
4. Understand the quantitative analysis of enzymes involved in carbohydrate metabolism
5. Isolate lipid from the given sample
6. Estimate enzymes involved in lipid metabolism

Experiments

1. Estimation of blood glucose.
2. Sugar fermentation of microorganisms.
3. Assay of salivary amylase.
4. Isolation of lecithin, identification by TLC, and its estimation.
5. Isolation of cholesterol from egg yolk and its estimation.

REFERENCES:

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.

Devlin, T.M., (2011). Textbook of Biochemistry with Clinical Correlations 7th ed., John Wiley & Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4.

Berg, J.M., Tymoczko, J.L. and Stryer L., (2012). Biochemistry 7th ed., W.H. Freeman and Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4.

16BCU312 METABOLISM OF AMINOACID AND NUCLEIC ACIDS Semester III
PRACTICAL-8 4H-2C

Instruction hours/week: L:0 T:0 P:4 Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

To impart hands-on training:

- To assay clinically relevant transaminases
- To assess the levels of urea, uric acid and creatinine in urine sample using qualitative methods
- To assess the levels of urea, uric acid and creatinine in urine sample using quantitative methods
- To interpret the results on amino acids and nucleic acids in clinical cases
- To introduce case studies related to amino acid disorders
- To introduce case studies related to nucleic acid disorders

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Assay clinically relevant transaminases
2. Assess the levels of urea, uric acid and creatinine in urine sample using qualitative methods
3. Assess the levels of urea, uric acid and creatinine in urine sample using quantitative methods
4. Interpret the results on amino acids and nucleic acids in clinical cases
5. Understand case studies related to amino acid disorders
6. Understand case studies related to nucleic acid disorders

Experiments

1. Assay of serum transaminases – SGOT and SGPT.
2. Estimation of serum urea.
3. Estimation of serum uric acid.
4. Estimation of serum creatinine.

REFERENCES

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.

Devlin, T.M., (2011). Textbook of Biochemistry with Clinical Correlations 7th ed., John Wiley & Sons, Inc. (New York), ISBN: 978-0-470-28173-4 / BRV ISBN: 978-0-470-60152-5.

16BCU313 HORMONES: BIOCHEMISTRY AND FUNCTION PRACTICAL-9 Semester III 4H-2C

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on

- Qualitative and quantitative measurement of glucose
- Calcium assessment methods (inorganic)
- Assay of insulin using enzyme linked immunosorbent assay
- Basis of pregnancy detection kit
- Assessments of electrolytes to understand hormonal functioning
- Case studies related to hormonal imbalance

Course outcomes (CO's)

After successful completion, the students will understand

1. The different Qualitative and quantitative methods of glucose estimation
2. Titrimetric and colorimetric methods for Calcium assessment
3. Enzyme linked immunosorbent assay
4. The principle behind the making of hCG kit and working procedure
5. Assessments of electrolytes to understand hormonal functioning
6. The fundamental defects due to hormonal imbalance

Experiments

1. Glucose tolerance test.
2. Estimation of serum Ca^{2+}.
3. Estimation of serum T4.
4. HCG based pregnancy test.
5. Estimation of serum electrolytes.
6. Case studies.

REFERENCES

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman & Company (NewYork), ISBN:13: 978-1-4641-0962-1 / ISBN:10-14641-0962-1.

Widmaier, E.P., Raff, H. and Strang, K.T., (2008). Vander's Human Physiology 11th ed., McGraw Hill International Publications, ISBN: 978-0-07-128366-3.

Hadley, M.C. and Levine, J.E., (2007). Endocrinology 6th ed., Pearson Education (New Delhi), Inc. ISBN: 978-81-317-2610-5.

Cooper, G.M., and Hausman, R.E., (2009). The Cell: A Molecular Approach 5th Ed. ASM Press & Sunderland, (Washington DC), Sinauer Associates. (MA). ISBN:978-0-87893-300-6.

16BCU304-A **TOOLS AND TECHNIQUES IN BIOCHEMISTRY** **Semester III**
3H-3C

Instruction hours/week: L: 3 T:0 P:0 Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objective

Equip the students:

- On maintenance of safety documents.
- On the preparation of SOPs
- On the detection of radioisotopes
- Interpretation of virtual lab experiment
- Different methods of centrifugation (differential/density gradient)
- Determination of pKa for biological buffers using Henderson-Hasselbach equation

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Maintain safety documents.
2. Prepare SOPs
3. Detect radioisotopes
4. Interpret virtual lab experiments
5. Use different methods of centrifugation (differential/density gradient)
6. DeterminepKa for biological buffers using Henderson-Hasselbach equationin a given situation

Unit 1

Biochemical reagents and solutions

Good laboratory practices. Preparation and storage of solutions. Concepts of solution concentration and storing solutions.

- Preparation of a molar solutions
- Preparation of normal solutions
- Preparation of percentage and ppm solutions.

Unit 2

Serial dilution

Quantitative transfer of liquids.

- Preparation of dilute acids from concentrated acids
- Preparation of various dilute solutions

Unit 3

Buffers

Concept of a buffer, Henderson-Hasselbach equation, working of a pH meter.

- Preparation of a buffer of given pH and molarity.

Unit 4

Spectrophotometric techniques

Principle , instrumentation and applications of UV-visible and fluorescence spectroscopy.

- Determination of the absorption maxima and molar extinction coefficient (of a relevant organic molecule).
- Measurement of fluorescence spectrum.
- Determination of concentration of a protein solution by Lowry/BCA method.
- Determination of nucleic acid concentration and purity

Unit 5

Introduction and importance of virtual labs in Biochemistry

REFERENCES

Sheehan, D., (2010). Physical Biochemistry: Principles and Applications 2nd ed., Wiley Blackwell (West Sussex), ISBN:978-0-470-85602-4 / ISBN:978-0-470-85603-1.

Freifelder, D., (1982). Physical Biochemistry: Applications to Biochemistry and Molecular Biology 2nd ed., W.H. Freeman and Company (New York), ISBN:0-7167-1315-2 / ISBN:0-7167-1444-2.

Plummer D. T., (1998). An Introduction to Practical Biochemistry 3rd ed., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4 / ISBN:10: 0-07-099487-0.

Semester III

16BCU304-B **CONCEPTS IN GENETICS** **3H-3C**

Instruction hours/week: L: 3 T:0 P:0 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students:

- On understanding of the principles and concepts of genetics
- On the concepts of genetic disorders
- On the concepts of different types of mutations (inversions, deletions, duplications and translocations)
- On understanding the structure-function relationship of a specific gene
- On different model systems to study hereditary concepts
- On pedigree analysis

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Understand the principles and concepts of genetics
2. Understand the basis of genetic disorders
3. Comprehend different types of mutations (inversions, deletions, duplications and translocations)
4. Understand the structure-function relationship of a specific gene
5. Use appropriate model systems to study hereditary concepts
6. Perform pedigree analysis

Unit 1

Model organisms, Mendelism and chromosomal basis of heredity

Model organisms: *Escherichia coli*, *Saccharomyces cerevisiae*, *Drosophila melanogaster*, *Caenorhabditis elegans*, *Danio rerio* and *Arabidopsis thaliana*, Basic principles of heredity. Laws of probability & binomial expansion, formulating and testing genetic hypothesis, chromosomal basis of Mendelism -Sutton and Boveri hypothesis with experimental evidences.

Unit 2

Extensions of Mendelism, genetics of a gene, bacteria and viruses

Allelic variation and gene function- dominance relationships, multiple alleles, lethal alleles and null alleles. Pleiotropy gene interaction- epistatic and non-epistatic, interaction between gene(s) and environment. Penetrance and expressivity, norm of reaction and phenocopy. Complementation test, limitations of *cis-trans* test, intragenic complementation, rII locus of phage T4 and concept of cistron. Mechanism of genetic exchange - conjugation, transformation and transduction. Gene mapping in bacteria.

Unit 3

Genetics of eukaryotes and Human pedigree analysis

Linkage and crossing over, genetic mapping in eukaryotes, centromere mapping with ordered tetrads, cytogenetic mapping with deletions and duplications in *Drosophila*, detection of linked loci by pedigree analysis in humans and somatic cell hybridization for positioning genes on chromosomes. Pedigree conventions, characteristics of dominant and recessive inheritance. Applications of pedigree analysis.

Unit 4

Developmental genetics, epigenetics and chromosomal aberrations

Model organism for genetic analysis, *Drosophila* development, maternal effect genes, morphogens and zygotic gene activity in development, sex chromosomes and sex determination, dosage compensation of X-linked genes. Extra nuclear inheritance, tests for organelle heredity and maternal effect, epigenetic mechanisms of transcriptional regulation & genomic imprinting. Variations in chromosome number- monosomy and trisomy of sex and autosomes. Variations in chromosome structure- inversions, deletions, duplications and translocations.

Unit 5

Complex traits inheritance, population & evolutionary genetics

Inheritance of complex trait, analysis of quantitative traits, narrow and broad sense heritability, quantitative trait loci (QTL) and their identification. Hardy- Weinberg law, predicting allele and genotype frequencies and exceptions to Hardy-Weinberg principle. Molecular evolution - analysis of nucleotide and amino acid sequences, molecular phylogenies, homologous sequences, phenotypic evolution and speciation.

REFERENCES

Snustad, D.P., and Simmons, M.J., (2012). Genetics 6th ed., John Wiley & Sons. (Singapore), ISBN: 978-1-118-09242-2.

Pierce, B.A., (2012). Genetics - A Conceptual Approach 4th ed., W.H. Freeman & Co. (New York), ISBN:13:978-1-4292-7606-1 / ISBN:10:1-4292-7606-1.

Griffiths, A.J.F., Wessler, S. R., Carroll, S. B., and Doebley, J., (2010). An Introduction to Genetic Analysis 10th ed., W.H. Freeman & Company (New York), ISBN:10: 1-4292-2943-8.

16BCU314-A TOOLS AND TECHNIQUES IN BIOCHEMISTRY PRACTICAL-A Semester III 3H-1C

Instruction hours/week: L:0 T:0 P:3 Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

To impart hands-on training:

- On the strength of concentrated acids
- On serial dilution of concentrated solutions
- How to determine the molar extension coefficient?
- How to obtain UV spectrum for a given compound?
- How to quantify nucleic acids using spectrophotometer?
- How to estimate the purity of nucleic acids

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Know the strength of laboratory acids and bases
2. Prepare serial dilution of concentrated solutions
3. Determine the molar extension coefficient
4. Obtain UV spectrum for a given compound
5. Quantify nucleic acids using spectrophotometer
6. Assess the purity of nucleic acids

Experiments

1. Preparation of a molar solutions
2. Preparation of normal solutions
3. Preparation of percentage and ppm solutions.
4. Preparation of dilute acids from concentrated acids
5. Preparation of various dilute solutions
6. Preparation of a buffer of given pH and molarity.
7. Determination of the absorption maxima and molar extinction coefficient (of a relevant organic molecule).
8. Measurement of UV spectrum of compounds .
9. Determination of concentration of a protein solution by Lowry/BCA method.
10. Determination of nucleic acid concentration and purity

REFERENCES

Sheehan, D., (2010). Physical Biochemistry: Principles and Applications 2nd ed., Wiley Blackwell (West Sussex), ISBN:978-0-470-85602-4 / ISBN:978-0-470-85603-1.

Freifelder, D., (1982). Physical Biochemistry: Applications to Biochemistry and Molecular Biology 2nd ed., W.H. Freeman and Company (New York), ISBN:0-7167-1315-2 / ISBN:0-7167-1444-2.

Plummer D. T., (1998). An Introduction to Practical Biochemistry 3rd ed., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4 / ISBN:10: 0-07-099487-0.

16BCU314-B **CONCEPTS IN GENETICS PRACTICAL-B** **Semester III**
3H-1C

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

To impart hands-on training:

- Sex determination
- On the method of induction of polyploidy
- On utility of buccal epithelial cells for genetic assessments
- On verification of Monohybrid crosses.
- On calculation of allele and genotype frequencies
- On plasmid conjugation in bacteria (transformation)

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Execute sex determination
2. Understand induction methods of polyploidy
3. Use buccal epithelial cellsfor genetic assessments
4. Understand monohybrid crosses.
5. Calculate allele and genotype frequencies
6. Understand bacterial transformation

Experiments

1. Squash preparation of salivary glands of Dipteran larva to observe polytene chromosomes.
2. Induction of polyploidy in onion roots.
3. Smear technique to demonstrate sex chromatin in buccal epithelial cells.
4. Monohybrid crosses in *Drosophila* for studying autosomal and sex-linked inheritance.
5. PTC testing in a population and calculation of allele and genotype frequencies.
6. Study of abnormal human karyotype and pedigrees (dry lab).
7. Conjugation in bacteria.

REFERENCES

Snustad, D.P., and Simmons, M.J., (2012). Genetics 6th ed., John Wiley & Sons. (Singapore), ISBN: 978-1-118-09242-2.

Pierce, B.A., (2012). Genetics - A Conceptual Approach 4th ed., W.H. Freeman & Co. (New York), ISBN:13:978-1-4292-7606-1 / ISBN:10:1-4292-7606-1.

Griffiths, A.J.F, Wessler, S. R, Carroll, S. B. and Doebley, J., (2010). An Introduction to Genetic Analysis 10th ed., W.H. Freeman & Company (New York), ISBN:10: 1-4292-2943-8.

16BCU401 GENE ORGANISATION, REPLICATION AND REPAIR Semester IV
4H-4C

Instruction hours/week: L:4 T:0 P:0 Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

Equip the students:

- On the genome organization
- To study the mechanism of replication DNA in prokaryotes
- To study the mechanism of replication DNA in eukaryotes
- To study the mechanism of transcription in bothprokaryotes and eukaryotes
- To understand the mechanism of recombination and transposition of DNA
- To understand DNA damage, mutation and DNA repair process

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Understand the genome organization
2. Understand the mechanism of replication DNA in prokaryotes
3. Understand the mechanism of replication DNA in eukaryotes
4. Understand the mechanism of transcription in both prokaryotes and eukaryotes
5. Understand the basis of recombination and transposition of DNA
6. Understand DNA damage, mutation and DNA repair process

Unit 1

Structure, Genes and genomic organization of DNA

DNA structure, features of the double helix, various forms of DNA, denaturation and reassociation of DNA. **Genes and genomic organization** - Genome sequence and chromosome diversity, definition of a gene, organization of genes in viruses, bacteria, animals and plants. Nucleosome structure and packaging of DNA into higher order structures.

Unit 2

Replication of DNA in Prokaryotes

The chemistry of DNA synthesis, DNA polymerase, the replication fork, origin of replication, enzymes and proteins in DNA replication, various modes of replication, stages of replication of *E. coli* chromosome, relationship between replication and cell division,

Unit3

Replication of DNA in Eukaryotes

Replication in eukaryotes. Comparison of replication in prokaryotes and eukaryotes. Inhibitors of DNA replication and applications in medicine. Supercoiling of DNA and its importance, topoisomerases, critical role of topoisomerases in cell, topoisomerase inhibitors and their application in medicine.

Unit 4

Recombination and transposition of DNA

Homologous recombination, proteins and enzymes in recombination, site-specific recombination, serine and tyrosine recombinases, biological roles of site-specific recombination, transposition, three classes of transposable elements, importance of transposable elements in horizontal transfer of genes and evolution.

Unit 5

Molecular basis of mutations and DNA repair

Importance of mutations in evolution of species. Types of mutations - transition, transversions, frame shift mutations, mutations induced by chemicals, radiation, transposable elements, Ames test. Various modes of DNA repair - Replication errors and mismatch repair system, repair of DNA damage, direct repair, base excision repair, nucleotide excision repair, recombination repair, translesion DNA synthesis.

REFERENCES

Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R., (2008). Molecular Biology of the Gene 6th ed., Cold Spring Harbor Laboratory Press, Cold spring Harbor (New York), ISBN:0-321-50781 / ISBN:978-0-321-50781-5.

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W. H. Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962-1.

Snustad, D.P., and Simmons, M.J., (2010). Principles of Genetics 5th ed., John Wiley & Sons Asia, ISBN:978-0-470-39842-5.

Semester IV

16BCU402 GENE EXPRESSION AND REGULATION 4H-4C

Instruction hours/week: L:4 T:0 P:0Marks: Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students:

- To utilize stages of transcription for drug development
- To understand the stages of RNA biosynthesis
- To understand the antibiotics mechanism of action and applications in medicine
- To understand the specialized system for protein degradation
- To gain knowledge on RNA interference in the treatment of HIV and Cancer
- To gain knowledge on DNA repair mechanisms

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Course outcomes (CO's)

After successful completion of the course, the student will:

1. Understand the mechanism of action of drugs
2. Understand the stages of RNA biosynthesis
3. Understand the mechanism of action of broad spectrum and specific antibiotics
4. Utilize the specialized system for protein degradation
5. Gain knowledge on RNA interference in the treatment of HIV and Cancer
6. Gain knowledge on DNA repair mechanisms.

Unit 1

Biosynthesis of RNA in prokaryotes

RNA polymerases, transcription cycle in bacteria, sigma factor, bacterial promoters, identification of DNA binding sites by DNA footprinting, the three stages of RNA synthesis, initiation, elongation and termination, rho-dependent and rho-independent termination. Inhibitors of transcription and applications as anti-microbial drugs.

Unit 2

Biosynthesis of RNA in eukaryotes

Comparison between prokaryotic and eukaryotic transcription. Transcription by RNA polymerase II, RNA polymerase II core promoters, general transcription factors, various types of RNA processing, transcription by RNA polymerase I and III. Inhibitors of eukaryotic transcription and their applications. Comparison of fidelity of transcription and replication.**RNA splicing-** Chemistry of RNA splicing, the spliceosome machinery, splicing pathways, group I and group II introns, alternative splicing, exon shuffling, RNA editing.

Unit 3

Biosynthesis of proteins

The genetic code-Degeneracy of the genetic code, wobble in the anticodon, features of the genetic code, nearly universal code. **Biosynthesis of proteins-** Messenger RNA, transfer RNA, attachment of amino acids to tRNA, the ribosome - initiation, elongation and termination of translation, regulation of translation. Comparison of prokaryotic and eukaryotic protein synthesis. Use of antibiotics in understanding protein synthesis and applications in medicine.**Protein targeting and degradation -** Post translational modifications, glycosylation, signal sequences for nuclear transport, bacterial signal sequences, import of proteins by receptor mediated endocytosis, specialized systems for protein degradation.

Unit 4

Regulation of gene expression in prokaryotes

Principles of gene regulation, negative and positive regulation, concept of operons, regulatory proteins, activators, repressors, DNA binding domains, regulation of lac operon and trp operon, induction of SOS response, synthesis of ribosomal proteins, regulation by genetic recombination, transcriptional regulation in λ bacteriophage.

Unit 5

Regulation of gene expression in eukaryotes

Heterochromatin, euchromatin, chromatin remodeling, regulation of galactose metabolism in yeast, regulation by phosphorylation of nuclear transcription factors, regulatory RNAs, riboswitches, RNA interference, synthesis and function of miRNA molecules, phosphorylation of nuclear transcription factors.

REFERENCES

Nelson, D.L. and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962-1.

Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R., (2008). Molecular Biology of the Gene 6th ed., Cold Spring Harbor Laboratory Press, Cold Spring Harbor (New York), ISBN:0-321-50781 / ISBN: 978-0-321-50781-5.

Semester IV

16BCU403 IMMUNOLOGY 4H-4C

Instruction hours/week: L:3 T:1 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Organs involved in immunity
- Acquired and innate arms of immune system
- The significance of humoral and cell mediated immunity during infection
- Various immunodeficiency diseases and hypersensitive reactions
- Structure and function of various immune cells and their role to combat infection
- Principles of vaccination

Course outcomes (CO's)

After successful completion, the students will understand

1. Organs involved in immunity
2. Acquired and innate arms of immune system
3. The significance of humoral and cell mediated immunity during infection
4. Various immunodeficiency diseases and hypersensitive reactions
5. Structure and function of various immune cells and their role to combat infection
6. Principles of vaccination

Unit 1

Cells and organs of the immune system and immunity

Hematopoiesis, cells of the immune system, primary and secondary lymphoid organs and tissues (MALT). Anatomical barriers, cell types of innate immunity, soluble molecules and membrane associated receptors (PRR), connections between innate and adaptive immunity, cell adhesion molecules, chemokines, leukocyte extravasation, localized and systemic response.

Unit 2

Antigens, Antibodies and receptor diversity

Antigens and haptens, factors that dictate immunogenicity, B and T cell epitopes. Structure and distribution of classes and subclasses of immunoglobulins (Ig), Ig fold, effector functions of antibody, antigenic determinants on Ig and Ig super family**.** Dreyer-Bennett hypothesis, multigene organization of Ig locus, mechanism of V region DNA rearrangement, ways of antibody diversification.

Unit 3

Biology of the B and T lymphocyte and complement system

Antigen independent phase of B cell maturation and selection, humoral response – T-dependent and T-independent response, anatomical distribution of B cell populations. Structure and role of T cell receptor, and co-receptor, T cell development, generation of receptor diversity, selection and differentiation. Complement activation by classical, alternate and MB lectin pathway, biological consequences of complement activation, regulation and complement deficiencies.

Unit 4

Cell mediated cytotoxic responses and hypersensitivity

General properties of effector T cells, cytotoxic T cells (Tc), natural killer cells; NKT cells and antibody dependent cellular cytotoxicity (ADCC). Organ specific and systemic autoimmune diseases, possible mechanisms of induction of autoimmunity, Gell and Coombs classification, IgE mediated (Type I) hypersensitivity antibody mediated cytotoxic (Type II) hypersensitivity, immune complex mediated (type III) hypersensitivity and cell mediated (Type IV) hypersensitivity.

Unit 5

Antigen presentation, MHC complex and transplantation

General organization and inheritance of MHC, structure, distribution and role of MHC class I and class II proteins, linkage disequilibrium, pathways of antigen processing and presentation. Immunological basis of graft rejection, clinical manifestations, immunosuppressive therapy and privileged sites. Vaccines - active and passive immunization, types of vaccines.

REFERENCES:

Kuby., (2007) Immunology ; 6th ed., Kindt, T.L., Goldsby, R.A. and Osborne, B.A., W.H Freeman and Company (New York), ISBN:13: 978-0-7167-8590-3 / ISBN: 10:0-7617-8590-0.

Coico, R., and Sunshine, G., (2009) Immunology: A Short Course 6th ed., John Wiley& sons, Inc (New Jersey), ISBN: 978-0-470-08158-7.

Murphy, K., Mowat, A., and Weaver, C.T., (2012). Janeway's Immunobiology 8th ed., Garland Science (London & New York), ISBN: 978-0-8153-4243-4.

Semester IV

16BCU411 GENE ORGANISATION, REPLICATION AND REPAIR 4H-2C

PRACTICAL -10

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on:

- The isolation of prokaryotic chromosomal DNA
- The isolation of eukaryotic chromosomal DNA
- Determination of melting temperature for the given nucleotide sequence
- Concepts of hyper and hypo chromicity
- Determination of viscosity
- Verification of Chargaffs rule (purine=pyrimidine)

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Isolate prokaryotic chromosomal DNA
2. Isolate eukaryotic chromosomal DNA
3. Determine the melting temperature for the given nucleotide sequence
4. Know the concepts of hyper and hypo chromicity
5. Determine the viscosity of DNA
6. Verify Chargaffs rule (purine=pyrimidine)

Experiments

1. Verification of Chargaff's rule by paper chromatography.
2. Ultraviolet absorption spectrum of DNA and RNA.
3. Determination of DNA and RNA concentration by A260nm.
4. Determination of the melting temperature and GC content of DNA.
5. A study on the viscosity of DNA solutions.
6. Isolation of chromosomal DNA from *E. coli* cells.

REFERENCES:

Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R., (2008). Molecular Biology of the Gene 6th ed., Cold Spring Harbor Laboratory Press, Cold spring Harbor (New York), ISBN:0-321-50781 / ISBN:978-0-321-50781-5.

Nelson, D.L., and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W. H. Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962-1.

Snustad, D.P., and Simmons, M.J., (2010). Principles of Genetics 5th ed., John Wiley & Sons Asia, ISBN:978-0-470-39842-5.

Semester IV

16BCU412 **GENE EXPRESSION AND REGULATION** **4H-2C**
PRACTICAL - 11

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40**External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

To impart hands-on training:

- To analyze total nucleic acids from planttissue
- To analyze total nucleic acids from animal tissue
- To isolate mRNA using affinity chromatography
- On the synthesis of cDNA
- On the gene expression using RT-PCR
- To study Lac Operon

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Estimate total nucleic acids from plant tissue
2. Estimate total nucleic acids from animal tissue
3. Isolate mRNA using affinity chromatography
4. Synthesize cDNA
5. Perform RT-PCR
6. Test Lac Operon in E. coli cells

Experiments

1. Extraction of total nucleic acids from plant tissue.
2. Isolation of mRNA from yeast by affinity chromatography.
3. cDNA synthesis
4. Assessment of gene expression using RT-PCR.
5. Induction of Lac Operon.

REFERENCES

Nelson, D.L., and Cox, M.M., (2013). Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962-1.

Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R., (2008). Molecular Biology of the Gene 6th ed., Cold Spring Harbor Laboratory Press, Cold Spring Harbor (New York), ISBN:0-321-50781 / ISBN: 978-0-321-50781-5.

16BCU413 **IMMUNOLOGY PRACTICAL - 12** **Semester IV** **4H-2C**

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

To impart hands-on training on:

- Isolation of lymphocytes
- Purification of immunoglobulins using protein A
- Immunodiffusion techniques (Single and Double)
- Agglutination techniques
- Blood grouping
- ELISA

Course outcomes (CO's)

1. Will perform isolation of lymphocytes
2. Purify of immunoglobulins using protein A
3. Perfom Immunodiffusion techniques (Single and Double)
4. Agglutination techniques
5. Blood grouping
6. ELISA

Experiments

1. Isolation of lymphocytes from blood and macrophages from peritoneal cavity or spleen.
2. Purification of immunoglobulins.
3. Assays based on precipitation reactions - Ouchterlony double diffusion (ODD) and Mancini radial immunodiffusion.
4. Assays based on agglutination reactions - Blood typing (active) & passive agglutination.
5. Enzyme linked immune-sorbent assay (ELISA).

REFERENCES

Kuby, J., (2007) Immunology;6th ed., Kindt, T.L., Goldsby, R.A. and Osborne, B.A., W.H Freeman and Company (New York), ISBN:13: 978-0-7167-8590-3 / ISBN: 10:0-7617-8590-0.

Coico, R., and Sunshine, G., (2009). Immunology: A Short Course 6th ed., John Wiley& sons, Inc (New Jersey), ISBN: 978-0-470-08158-7.

Murphy, K., Mowat, A., and Weaver, C.T., (2012). Janeway's Immunobiology 8th ed., Garland Science (London & New York), ISBN: 978-0-8153-4243-4.

Semester IV

16BCU404-A **BIOINFORMATICS** **3H-3C**

Instruction hours/week: L:3 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Equip the students:

- To understand basis and importance of bioinformatics and computer aided drug design
- To get exposed to different types of biological databases
- To look at a biological problem from a computational point of view
- To find out the methods for analyzing the expression, structure and function of proteins, and understanding the relationships between species
- To get knowledge on different methods for construction of a phylogenetic tree
- About the basics and importance of Proteomics and Genomics

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Understand the basics of computer aided drug design
2. Perform experiment pair wise and multiple sequence alignment and will analyze the secondary and tertiary structures of protein sequences
3. Understand the data structure (databases) used in bioinformatics and interpret the information
4. Perform search on protein and metabolic pathway databases
5. Perform BLAST to identify the sequence of amino acids
6. Construct a phylogenetic tree using bioinformatics

Unit 1

Introduction to bioinformatics

Computer fundamentals - programming languages in bioinformatics, role of supercomputers in biology. Historical background. Scope of bioinformatics - genomics, proteomics, computer aided drug design (structure based and ligand based approaches) and Systems Biology. Applications of bioinformatics.

Unit 2

Biological databases and data retrieval

Introduction to biological databases - primary, secondary and composite databases, NCBI, nucleic acid databases (GenBank, EMBL, DDBJ, NDB), protein databases (PIR, Swiss-Prot, TrEMBL, PDB), metabolic pathway database (KEGG, EcoCyc, and MetaCyc), small molecule databases (PubChem, Drug Bank, ZINC, CSD). Structure viewers (RasMol, J mol), file formats.

Unit 3

Sequence alignment

Similarity, identity and homology. Alignment – local and global alignment, pairwise and multiple sequence alignments, alignment algorithms, amino acid substitution matrices (PAM and BLOSUM), BLAST and CLUSTALW.

Unit 4

Phylogenetic analysis

Construction of phylogenetic tree, dendrograms, methods of construction of phylogenetic trees - maximum parsimony, maximum likelihood and distance methods.

Unit 5

Protein structure prediction analysis and gene prediction

Levels of protein structure. Protein tertiary structure prediction methods –homology modeling, fold recognition and *ab-initio* methods. Significance of Ramachandran map. Introduction to genomics, comparative and functional genomics, gene structure in prokaryotes and eukaryotes, gene prediction methods and tools.

REFERENCES

Mount, D.W., (2001). Bioinformatics: Sequence and Genome Analysis 1st ed., Cold Spring Harbor Laborator Press (New York), ISBN: 0-87969-608-7.

Pevsner, J., (2003). Bioinformatics and Functional Genomics (2003), 1st ed., John Wiley & Sons, Inc. (New Jersey), ISBN: 0-47121004-8.

Baxevanis, A.D., and Ouellette, B.F., (2005). Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, 3rd ed., John Wiley & Sons, Inc. (New Jersey), ISBN: 0-47147878-4.

Ghosh, Z., and Mallick, B., (2008). Bioinformatics – Principles and Applications (2008), 1st ed. Oxford University Press (India), ISBN: 9780195692303.

Semester IV

16BCU404-B PROTEIN PURIFICATION TECHNIQUES 3H-3C

Instruction hours/week: L:3 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students on:

- The basic principles involved in protein purification
- The basic chemical methods used for protein separation
- The principle, working and applications of different chromatographic techniques for protein characterization
- The principle, working and applications of different electrophoretic techniques for protein purification.
- The principle and applications of dialysis
- Advanced protein purification techniques

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Understand the basic principles pertaining to protein purification
2. Perform gel exclusion, affinity and ion exchange chromatography for protein purification
3. Perform SDS PAGE and identify the molecular weight of the protein
4. Understand the principle, instrumentation and applications of HPLC
5. Perform dialysis technique
6. Identify and apply appropriate techniques for purification of the given protein sample

Unit 1

Salting in and salting out- Principle, Debye-Huckel theory, Hofmeister series,Ionic strength, Ammonium sulfate precipitation, applications

Unit 2

Gel exclusion Chromatography- Principle, instrumentation and applications of gel exclusion chromatography, data analysis Advantages and disadvantages.

Unit 3

Polyacrylamide gel electrophoresis- Principle, instrumentation and applications of PAGE. Gel polymerization- APS, TEMED. Separation and determination of molecular weight of proteins SDS, running gel, stacking gel, electrophoresis buffer,

Unit 4

HPLC -Principle, instrumentation and applications of HPLC. Preparation of column, adsorbent materials, void volume, efficiency factor. Van Deemter equation Applications- Manufacturing, legal, research, medical

Unit 5

Dialysis- Principle and types- Hemodialysis, pediatric, intestinal and peritoneal dialysis. Dialyzable substances. Medical applications.

REFERENCES

Sheehan, D., (2010). Physical Biochemistry: Principles and Applications 2nd ed., Wiley Blackwell (West Sussex), ISBN: 978-0-470-85602-4 / ISBN: 978-0-470-85603-1.

Freifelder, D., (1982). Physical Biochemistry: Applications to Biochemistry and Molecular Biology 2nd ed., W.H. Freeman and Company (New York), ISBN:0-7167-1315-2 / ISBN:0-7167-1444-2.

Plummer D. T., (1998). An Introduction to Practical Biochemistry 3rd ed., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4 / ISBN:10: 0-07-099487-0

16BCU414-A **BIOINFORMATICS PRACTICAL-A** **Semester IV 3H-1C**

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on:

- Sequence retrieval from NCBI database
- Searching Protein and DNA structure from PDB
- Different molecular file formats for saving a protein/DNA sequence
- Different sequence alignment databases.
- Applying the statistical approaches and models for phylogenetic analysis and tree reconstruction.
- Different protein structure prediction databases

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Be able to retrieve a sequence from NCBI database
2. Be able to search a protein from PDB
3. Understand the different molecular file formats for saving a protein/DNA sequence
4. Apply different sequence alignment databases such as BLAST and CLUSTALW.
5. Apply the statistical approaches and models for phylogenetic analysis and tree reconstruction.
6. Analyze and predict the protein structure using structure prediction databases

Experiments

1. Biological databases and data retrieval

Sequence retrieval (protein and gene) from NCBI.
Structure download (protein and DNA) from PDB.
Molecular file formats - FASTA, GenBank, Genpept, GCG, CLUSTAL, Swiss-Prot, FIR. Molecular viewer by visualization software.

2. Sequence alignment

BLAST suite of tools for pairwise alignment.
Multiple sequence alignment using CLUSTALW.

3. Phylogenetic analysis

Generating phylogenetic tree using PHYLIP.

4. Protein structure prediction and analysis

Primary sequence analyses (Protparam).
Secondary structure prediction (GOR, nnPredict, SOPMA).
Tertiary structure prediction (SWISSMODEL).
Protein structure evaluation - Ramachandran map (PROCHECK).

5. Gene structure prediction and analysis

Gene prediction using GENSCAN and GLIMMER.

REFERENCE

Mount, D.W., (2001). Bioinformatics: Sequence and Genome Analysis 1st ed., Cold Spring Harbor Laborator Press (New York), ISBN: 0-87969-608-7.

Pevsner, J., (2003). Bioinformatics and Functional Genomics 1st ed., John Wiley & Sons, Inc. (New Jersey), ISBN: 0-47121004-8.

Baxevanis, A.D., and Ouellette, B.F., (2005). Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins 3rd ed., John Wiley & Sons, Inc. (New Jersey), ISBN: 0-47147878-4.

Ghosh, Z., and Mallick, B., (2008). Bioinformatics – Principles and Applications 1st ed. Oxford University Press (India), ISBN: 9780195692303.

16BCU414-B PROTEIN PURIFICATION TECHNIQUES PRACTICAL -B Semester IV 3H-1C

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on:

- Instrumentation of different protein purification methods
- The basic chemical methods used for protein separation
- The principle, working and applications of different chromatographic techniques for protein characterization
- The principle, working and applications of different electrophoretic techniques for protein purification.
- The principle and applications of dialysis
- Advanced protein purification techniques

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Gain knowledge on the basic principles pertaining to protein purification
2. Perform gel exclusion, affinity and ion exchange chromatography for protein purification
3. Perform SDS PAGE and identify the molecular weight of the protein
4. Understand the principle, instrumentation and applications of HPLC
5. Perform dialysis techniques for protein separation
6. Identify and apply appropriate techniques for purification of the given protein sample

Experiments

1. Preparation of the sample.
2. Ion-exchange chromatography.
3. Gel filtration chromatography.
4. Paper chromatography /TLC.
5. Electrophoresis.

REFERENCES

Sheehan, D., (2010). Physical Biochemistry: Principles and Applications 2nd ed., Wiley Blackwell (West Sussex), ISBN: 978-0-470-85602-4 / ISBN: 978-0-470-85603-1.

Freifelder, D., (1982). Physical Biochemistry: Applications to Biochemistry and Molecular Biology 2nd ed., W.H. Freeman and Company (New York), ISBN:0-7167-1315-2 / ISBN:0-7167-1444-2.

Plummer D. T., (1998). An Introduction to Practical Biochemistry 3rd ed., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4 / ISBN:10: 0-07-099487-0

16BCU501-A **CLINICAL BIOCHEMISTRY** **Semester V**
3H-3C

Instruction hours/week: L:3 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

Equip the students on:

- Organization of clinical laboratory
- Specimen collection
- Precision, accuracy
- Quality control
- Automated systems
- Assessment of organ functions

Course outcomes (CO's)

After successful completion of the course, the student will

1. Know about organization of clinical laboratory
2. Specimen collection
3. Precision, accuracy calculations
4. Quality control
5. Automated systems
6. Know to use the diagnosis to assess organ functioning

Unit 1

Introduction

Organization of clinical laboratory, Introduction to instrumentation and automation in clinical biochemistry laboratories safety regulations and first aid. General comments on specimen collection, types of specimen for biochemical analysis. Precision, accuracy, quality control, precautions and limitations.

Unit 2

Evaluation of biochemical changes in diseases

Basic hepatic, renal and cardiovascular physiology. Biochemical symptoms associated with disease and their evaluation. Diagnostic biochemical profile.

Unit 3

Assessment of glucose metabolism in blood

Clinical significance of variations in blood glucose. Diabetes mellitus.

Lipid profile

Composition and functions of lipoproteins. Clinical significance of elevated lipoprotein.

Unit 4

Liver function tests

Renal function tests and urine analysis

Use of urine strip / dipstick method for urine analysis.

Unit 5 Tests for cardiovascular diseases

Involvement of enzymes in diagnostics of heart disease including aspartate transaminase, isoenzymes of creatine kinase and lactate dehydrogenase and troponin.

REFERENCES

Mukherjee, K.L., (2010). Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol. I (2010), Tata Mc Graw–Hill Publishing Company Limited (New Delhi). ISBN:9780070076594 / ISBN:9780070076631

Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests VoI. II (2010), Mukherjee, K.L., Tata Mc Graw – Hill Publishing Company Ltd. (New Delhi), ISBN: 9780070076648.

Baynes, J.W. and Dominiczak, M.H., (2005). Medical Biochemistry 2nd ed., Elsevier Mosby Ltd. (Philadelphia), ISBN:0-7234-3341-0.

Rao, B.S. and Deshpande, V., (2005). Experimental Biochemistry: A Student Companion IK International Pvt. Ltd. (New Delhi), ISBN:81-88237-41-8.

Semester V

16BCU501-B BIOCHEMICAL CORRELATION OF DISEASE 3H-3C

Instruction hours/week: L:3 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Inborn errors of metabolism
- Nutritional disorders
- Life style disorders
- Autoimmune diseases
- Contagious diseases
- Vaccine strategies

Course outcomes (CO's)

After successful completion, the students will understand:

1. Inborn errors of metabolism
2. Nutritional disorders
3. Life style disorders
4. Autoimmune diseases
5. Contagious diseases
6. Vaccine strategies

Unit 1

Inborn errors of metabolism

Alkaptonuria, Phenylketonuria, Glycogen and Lipid storage diseases, SCID, Clotting disorders.

Unit 2

Nutritional deficiency based diseases

Kwashiorkar, Marasmus, Beri-beri, Scurvy, Pellagra, Anaemia, Night blindedness, Rickets, Osteomalacia, Osteoporosis, Wilson's disease.

Unit 3

Life style diseases

Obesity, Cardiovascular diseases, Atherosclerosis, Diabetes mellitus-II. Inflammatory Bowel Disease (IBD).

Hormonal Imbalances

Outline of hormone action and imbalances leading to disease - precocious puberty, hyper and hypopituitarism. Hyper and hypothyroidism.

Unit4

Autoimmune diseases

Concepts in immune recognition - self and non self discrimination, organ specific autoimmune diseases – Hashimoto's thyroiditis, Grave's disease, myasthenia gravis;. Systemic diseases - SLE, rheumatoid arthritis; Diabetes Mellitus-I.

Diseases caused due to misfolded proteins

Alzheimer's, Huntington's disease, Kuru, Creutzfeldt-Jakob disease, Sickle cell anaemia, Thalessemia.

Unit 5
Infectious diseases
Viral infection (polio, measles, mumps, influenza, HIV); Bacterial infections (tetanus, diphtheria, tuberculosis, typhoid, cholera); Protozoan (*Plasmodium* and *Trypanosoma*) and parasitic infections. Vaccines against diseases. General strategies in the design and development of vaccines.

REFERENCES

Devlin, T.M., (2011). Textbook of Biochemistry with Clinical Correlations. John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4.

Coico, R., and Sunshine, G., (2009). Immunology: A Short Course. 6^{th} ed., John Wiley& sons, Inc (New Jersey), ISBN: 978-0-470-08158-7.

Berg, J.M., Tymoczko, J.L. and Stryer, L., (2012). Biochemistry. 7^{th} ed., W.H Freeman and Company (New York), ISBN: 13:978-1-4292-7635-1.

Snustad, D.P. and Simmons, M.J., (2012). Genetics. 6^{th} ed., John Wiley & Sons. (Singapore), ISBN: 978-1-118-09242-2.

16BCU511-A **CLINCAL BIOCHEMISTRY PRACTICAL-A** **Semester IV**
3H-1C

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on

- Collection and processing of serum
- Collection and processing of urine sample
- Assessment of liver function
- Assessment of renal function
- Assessment of cardiac function
- Principles behind Dipstick method for fast diagnosis

Course outcomes (CO's)

After successful completion, the students will understand

1. How to Collectand process serum/plasma samples
2. How to Collect and process urine samples
3. Assessment of liver function
4. Assessment of renal function
5. Assessment of cardiac function
6. Principles behind Dipstick method for fast diagnosis

Experiments

1. Collection of blood and storage
2. Separation and storage of serum
3. Estimation of blood glucose by glucose oxidase peroxidase method.
4. Estimation of triglycerides.
5. Estimation of bilirubin (direct and indirect).
6. Quantitative determination of serum creatinine and urea.
7. Estimation of creatine kinase.

REFERENCES

Mukherjee, K.L., (2010). Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol. I Tata Mc Graw–Hill Publishing Company Limited (New Delhi). ISBN:9780070076594 / ISBN:9780070076631

Mukherjee, K.L., (2010). Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests VoI. II, Tata Mc Graw – Hill Publishing Company Ltd. (New Delhi), ISBN: 9780070076648.

Baynes, J.W., and Dominiczak, M.H., (2005). Medical Biochemistry, 2nd ed., Elsevier Mosby Ltd. (Philadelphia), ISBN:0-7234-3341-0.

Rao, B.S., and Deshpande, V., (2005). Experimental Biochemistry: A Student Companion IK International Pvt. Ltd. (New Delhi), ISBN:81-88237-41-8.

Semester V

16BCU511-B BIOCHEMICAL CORRELATION OF DISEASE PRACTICAL- B 3H-1C

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on

- The execution of glucose challenge and tolerance test
- Measurement of cholesterol
- Basis of cell counting using hemocytometer
- Principles behind automated cell counters
- Assessment of bone mineral density
- Measurement of thyroid hormones using ELISA

Course outcomes (CO's)

After successful completion, the students will understand

1. the execution of glucose challenge and tolerance test
2. Measurement of cholesterol
3. Basis of cell counting using hemocytometer
4. Principles behind automated cell counters
5. Assessment of bone mineral density
6. Measurement of thyroid hormones using ELISA

Experiments

1. Glucose tolerance test.
2. Lipid profile: triglycerides and total cholesterol.
3. Obesity parameters.
4. RBC counting and haemoglobin estimation.
5. Blood pressure measurements.
6. Bone density measurements (visit to a nearby clinic).
7. T4/TSH assays.

REFERENCES

Devlin, T.M., (2011). Textbook of Biochemistry with Clinical Correlations, John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4.

Coico, R., and Sunshine, G., (2009). Immunology: A Short Course, 6th ed., John Wiley& sons, Inc (New Jersey), ISBN: 978-0-470-08158-7.

Berg, J.M., Tymoczko, J.L., and Stryer, L., (2012). Biochemistry, 7th ed., W.H Freeman and Company (New York), ISBN: 13:978-1-4292-7635-1.

Snustad, D.P., and Simmons, M.J., (2012). Genetics, 6th ed., John Wiley & Sons. (Singapore), ISBN: 978-1-118-09242-2.

Semester V

16BCU502-A BASIC MICROBIOLOGY 4H-4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Origin of microbiology field and theories
- Diverse nature of microbial organisms
- Life cycle of viruses
- Life cycle of bacteria
- Life cycle of algae, fungi and protozoa

Course outcomes (CO's)

After successful completion, the students will understand:

1. Origin of microbiology field and theories
2. Diverse nature of microbial organisms
3. Life cycle of viruses
4. Life cycle of bacteria
5. Life cycle of algae, fungi and protozoa
6. Emerging microbial threats

Unit 1

History of Development of Microbiology

Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming. Role of microorganisms in fermentation, Germ theory of disease, Development of various microbiological techniques and golden era of microbiology, Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner

Unit 2

Diversity of Microbial world

Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. Difference between prokaryotic and eukaryotic microorganisms. General characteristics of different groups: acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) with emphasis on distribution and occurrence, morphology, mode of reproduction and economic importance.

Unit 3

Viruses, viroids and prions

An introduction to viruses with special reference to the structure and replication of the following: Poxvirus, Poliovirus, HIV, T4 and λ phage, lytic and lysogenic cycles.

Unit 4

Bacteria

An account of typical eubacteria, chlamydiae & rickettsiae (obligate intracellular parasites), mycoplasma, and archaebacteria (extremophiles). Applications of bacteria in industry, environment and food.

Unit 5

Algae, Fungi and Protozoa

History of phycology; General characteristics of algae including occurrence, thallus organization, algae cell ultra structure, pigments, flagella, eyespot food reserves and vegetative, asexual and sexual reproduction. Applications of Algae in agriculture, industry, environment and food. Historical developments in the field of Mycology, significant contributions of eminent mycologists. General characteristics of fungi including habitat, distribution, nutritional requirements, fungal cell ultra- structure, thallus organization and aggregation, fungal wall structure and synthesis, asexual reproduction, sexual reproduction, heterokaryosis, heterothallism and parasexual mechanism. Economic Importance of Fungi in Agriculture, environment, Industry, medicine, food, biodeterioration, mycotoxins. General characteristics with special reference to Amoeba.

TEXTBOOK

Powar, C.B., and Dahinwala, H.F., (2007). General Microbiology, Himalaya Publishing house, Mumbai.

REFERENCES

Prescott, L.J., and Klein, D., (2007). Microbiology, 7th edition McGraw Hill Publishers, London.

Pelzar, A., (2004). Microbiology, McGraw Hill Publishers, London
Atlas, R.M., (1997). Principles of Microbiology. 2nd edition. W M.T.Brown Publishers

Semester V

16BCU502-B NUTRITIONAL BIOCHEMISTRY 4H-4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with

- Concepts of nutrition
- Calorific value of carbohydrates, fats and proteins
- Recommended dietary allowances
- Nutrition as a strategy to prevent diseases
- Nutrition deficiency disorders
- Food drug interactions

Course outcomes (CO's)

After successful completion, the students will understand

1. Concepts of nutrition
2. Calorific value of carbohydrates, fats and proteins
3. Recommended dietary allowances
4. Nutrition as a strategy to prevent diseases
5. Nutrition deficiency disorders
6. Food drug interactions

Unit 1

Introduction to Nutrition and Energy Metabolism

Defining Nutrition, role of nutrients. Unit of energy, Biological oxidation of foodstuff. measurement of energy content of food, Physiological energy value of foods, SDA. Measurement of energy expenditure. Direct and Indirect Calorimetry, factors affecting thermogenesis, energy utilization by cells, energy output – Basal and Resting metabolism, physical activity, factors affecting energy input - hunger, appetite, energy balance Energy expenditure in man. Estimating energy requirements, BMR factors Recommended Nutrient Intakes (RNI) and Recommended Dietary Allowances for different age groups.

Unit 2

Dietary carbohydrates, lipid and health

Review functions of carbohydrates. Digestion, absorption ,utilization and storage, hormonal regulation of blood glucose. Dietary requirements and source of carbohydrates, Dietary fiber, role of fibre in lipid metabolism, colon function, blood glucose level and GI tract functions.

Review of classification, sources, functions, digestion, absorption, utilization and storage. Essential Fatty Acids; Functions of EFA, RDA, – excess and deficiency of EFA. Lipotropic factors, role of saturated fat, cholesterol, lipoprotein and triglycerides. Importance of the following: a) Omega – fatty acids. Omega 3/ omega 6 ratio b) Phospholipids c) Cholesterol in the body d) Mono, Polyunsaturated and Saturated Fatty Acids. Dietary implications of fats and oils, Combination ratios of n6 and n3, MUFA, PUFA and SFA.

Unit 3

Dietary Proteins and health

Review of functions of proteins in the body, Digestion and absorption. Essential and Non-essential amino acids. Amino Acid Availability Antagonism, Toxicity and Imbalance, Amino acid Supplementation. Effects of deficiency. Food source and Recommended Dietary Allowances for different age group. Amino acid pool. NPU, Biological Value , Nitrogen balance. PEM and Kwashiorkor.

Unit 4

Fat and water soluble Vitamins, Minerals

Vitamin A, C, E,K and D Dietary sources, RDA, Adsorption, Distribution, Metabolism and excretion(ADME), Deficiency. Role of Vitamin A as an antioxidant, in Visual cycle, dermatology and immunity. Role of Vitamin K in Gamma carboxylation. Role of Vitamin E as an antioxidant. Extra-skeletal role of Vitamin D and its effect on bone physiology. Hypervitaminosis. Vitamin C role as cofactor in amino acid modifications. Niacin-Metabolic interrelation between tryptophan, Niacin and NAD/ NADP. Vitamin B6-Dietary source, RDA, conversion to Pyridoxal Phosphate. Role in metabolism, Biochemical basis for deficiency symptoms. Vitamin B12 and folate; Dietary source, RDA, absorption, metabolic role Biochemical basis for deficiency symptoms. Calcium, Phosphorus and Iron - Distribution in the body digestion, Absorption, Utilization , Transport, Excretion, Balance, Deficiency, Toxicity, Sources, RDA. Calcium: Phosphorus ratio, Role of iron in prevention of anemia. Iodine and iodine cycle. Iodine, Fluoride, Mg, Cu, Zn, Se, Manganese, Chromium, Molybdenum Distribution in the human body, Physiology, Function, deficiency, Toxicity and Sources

Unit 5

Assessment of Nutritional status, Food and drug interactions and Nutriceuticals

Anthropometric measurements; Z scores, BMI, skinfold, circumference ratios. Biochemical assessment; Basal metabolic panel, Comprehensive metabolic panel, CBC, Urine Analysis, Assessment of Anemia, ROS assessment, GTT and glycosylated Hb, Differential diagnosis of B12 and folate.Nutrient interactions affecting ADME of drugs, Alcohol and nutrient deficiency, Anti-depressants, psychoactive drugs and nutrient interactions, Appetite changes with drug intakes and malnutrition. Food as medicine.

REFERENCES

Devlin, T.M., (2011). Textbook of Biochemistry with Clinical Correlations, John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4.

Williams, M.H., Anderson, D.E, and Rawson, E.S., (2013). Nutrition for health, fitness and sport. McGraw Hill international edition. ISBN-978-0-07-131816-7.

Mahan, L.K. Strings, S.E., and Raymond, J., (2012). Krause's Food and Nutrition Care process. Elsevier's Publications. ISBN- 978-1-4377-2233-8.

Coombs, G.F., (2008). The vitamins, Fundamental aspects in Nutrition and Health. Elsevier's Publications. ISBN-13- 978-0-12- 183493-7.

Gibson R., (2005). Principles of Nutritional Assessment. Oxford University Press.

Semester V

15BCU503-A **PLANT BIOCHEMISTRY** **4H-4C**

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with

- Plant cell structure
- Synthesis of proteins by plants
- Metabolism in plants
- Microenvironment for plant growth
- Nitrogen fixation
- Biosynthesis of secondary metabolites by plants

Course outcomes (CO's)

After successful completion, the students will understand

1. The difference between Animal and Plant cell structure
2. Significance of plant proteins
3. Metabolism in plants
4. Various microenvironment required for plant growth
5. The process of nitrogen fixation
6. Biosynthesis of secondary metabolites by plants

Unit 1

Plant cell structure and Photosynthesis

Structure of Plasma membrane, Vacuole and tonoplast membrane, cell wall, plastids and peroxisomes. Photosynthesis - Structure of PSI and PSII complexes, Light reaction, Cyclic and non cyclic photophosphorylation.

Unit 2

Carbon assimilation and Plant Respiration

Carbon assimilation - Calvin cycle and regulation; C4 cycle and Crassulacean acid metabolism (CAM). Respiration - Overview of glycolysis, Alternative reactions of glycolysis, Regulation of plant glycolysis, Translocation of metabolites across mitochondrial membrane, TCA cycle, Alternative NAD(P)H oxidative pathways; Cyanide resistant respiration and Photorespiration.

Unit 3

Nitrogen metabolism

Biological Nitrogen fixation by free living and in symbiotic association, structure and function of enzyme Nitrogenase. Nitrate assimilation: Nitrate and Nitrite reductase. Primary and secondary ammonia assimilation in plants; ammonia assimilation by Glutamine synthetase- glutamine oxoglutarate amino transferase (GS-GOGAT) pathway. Seed storage proteins in legumes and cereals.

Unit 4

Regulation of plant growth and Plant tissue culture

Introduction to plant hormones and their effect on plant growth and development, Regulation of plant morphogenetic processes by light. Plant tissue culture - Cell and tissue culture techniques, types of cultures: organ and explants culture, callus culture, cell suspension culture and protoplast culture. Plant regeneration pathways: organogenesis and somatic embryogenesis. Applications of cell and tissue culture and somoclonal variation.

Unit 5

Plant Secondary metabolites

Representatives alkaloid group and their amino acid precursors, function of alkaloids, Examples of major phenolic groups; simple phenylpropanoids, Coumarins, Benzoic acid derivatives, flavonoids, tannins and lignin, biological role of plant phenolics, Classification of terpenoids and representative examples from each class, biological functions of terpenoids.

REFERENCES

Bowsher, C., Steer, M., Tobin, A., (2008). Plant Biochemistry. Garland science ISBN 978-0-8153-4121-5.

Biochemistry and molecular Biology of plant-Buchanan. (2005) 1st edition. Publisher: I K International. ISBN-10: 8188237116, ISBN-13: 978-8188237111.

Dey, P.M., and Harborne, J.B., (1997). Plant Biochemistry. Academic Press ISBN-10:0122146743, ISBN-13:978-0122146749

Semester V

16BCU503-B ADVANCED CELL BIOLOGY 4H-4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students:

- To understand the organization of plasma membrane
- To understand the cell- cell interactions
- To understand the cell cycle and cell division
- On the structure and functions of various sub-cellular organelle
- To understand the cancer biology
- To grow and characterize the cancer cell

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Composition of plasma membrane and transport in nucleus
2. Understand the methods of cell-cell interactions
3. Know the stages in cell cycle and cell division
4. Recognise the mechanism behind the protein sorting and transport to their destinations
5. Ensure the stages of cancer
6. Cell culture studies and instrumentation analysis.

Unit 1

Plasma Membrane and Nuclear Transport

Properties and Composition of Cell Membrane; Structure of Nuclear Envelope; Nuclear Pore Complex; Transport Across Nuclear Envelope; Regulation of Nuclear Protein Import and Export. **Transport across plasma membrane**

Unit 2

Cell-Cell Interaction

Cell-Cell Interactions and Cell-Matrix Interactions; Components of Extracellular Matrix: Collagen and Non-Collagen Components; Tight Junctions; Gap Junctions; Desmosomes; Hemidesmosomes: Focal adhesions and plasma desmata; Cell wall; Role of cell interaction in development

Unit 3

Cell Cycle and Programmed Cell Death

Overview of The Cell Cycle; Eukaryotic Cell Cycle; Events Of Mitotic Phase; Cytokinesis; Events Of Meiosis And Fertilization; Regulation Of Cell Division And Cell Growth; Apoptosis And Necrosis, Stem Cells And Maintenance of Adult Tissues, Hematopoiesis,
Embryonic Stem Cells and Therapeutic Cloning.

Unit 4

Cancer Biology

Development and causes Of Cancer; Genetic Basis of Cancer; Oncogenes, Tumor Viruses; Molecular Approach to Cancer Treatment.

Unit 5

Advanced Methods in Cell Biology

Ultracentrifugation, Fluorescence Microscopy- FACS, Confocal Microscopy, Electron Microscopy, Plant and Animal Cell Culture, Immunohistochemistry.

REFERENCES

Cooper, G.M., and Hausman, R.E., (2009) The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.

Karp, G., (2010) Cell and Molecular Biology: Concepts and Experiments. 6 edition. John Wiley & Sons. Inc.

Alberts, B., Johnson,A., Lewis, J., and Enlarge, M., (2008) Molecular Biology of the Cell. 5th ed., Garland Science (Princeton).

Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D., and Darnell. J., (2012). Molecular Cell Biology. 7th ed., W.H. Freeman & Company (New York).

Becker, W.M., Kleinsmith, L.J., Hardin, J., and Bertoni, G.P., (2009). The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing , San Francisco.

Semester V

16BCU504-A MOLECULAR BASIS OF NON- INFECTIOUS HUMAN DISEASE 4H-4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with

- Concept of infection
- Classification of infectious pathogens
- Steps involved in the infection of a pathogenic bacteria
- Steps involved in the infection of a pathogenic viruses
- Steps involved in the infection of a pathogenic parasites
- Methods to prevent/treat infections

Course outcomes (CO's)

After successful completion, the students will understand

1. Concept of infection
2. Variety of infectious pathogens
3. The process of infection by pathogenic bacteria
4. The process of infection by pathogenic viruses
5. The process of infection by pathogenic parasites
6. How to prevent/treat infections

Unit 1

Nutritional disorders

Overview of major and minor nutrient components in the diet. Balanced diet and the concept of RDA. Nutrient deficiencies; Kwashiorkor and Marasmus, Scurvy, beri beri, pellagra and B12 deficiency, Xerophthalmia and Night blindness, Vitamin D deficiency, Vitamin K deficiency. Discuss with relation to biochemical basis for symptoms. Obesity and eating disorders like Anorexia nervosa and Bullemia.

Unit 2

Metabolic and Lifestyle disorders

Diabetes mellitus A metabolic syndrome and the relationship with hypertension, obesity, hypothyroidism and stress. Cardio vascular disorders and Atherosclerosis- defining the broad spectrum of ailments that fall in this category, understanding the factors that contribute to the syndrome, stages of disorder and the management of the condition. Irritable bowel syndrome- biochemistry behind the disorder and the influence of diet, stress and environment on the condition.

Unit 3

Cancer: Initiation and stages of progression

Cancer: characteristics of a transformed cell, causes and stages of Cancer, molecular basis for neoplastic growth and metastasis, Proto-oncogenes and tumor suppressor genes; Cancer causing mutations; Tumor viruses; Biochemical analysis of cancer; Molecular approaches to cancer treatment.

Unit 4

Diseases due associated with misfolded proteins and multifactorial complex disorders

Introduction to protein folding and proteosome removal of misfolded proteins; etiology and molecular basis for Alzheimer's, Prion diseases, Huntington's Chorea, sickle cell anemia, Thalassemia. Understanding the definition of multifactorial diseases. Polygenic diseases and the relationship of environmental factors and genetic makeup in the onset of diseases.

Disorders of mood : Schizophrenia, dementia and anxiety disorders. Polycystic ovarian syndrome, Parkinson's disease, ALS

Unit 5

Monogenic diseases

In born errors in metabolism: PKU, Alkaptonuria, Maple syrup urine disease; Receptor and transport defects: Cystic fibrosis, Long QT syndrome, familial hypercholesterolemia, Achondroplasia. Hemoglobinopathies and clotting disorders.

REFERENCES

Willey, J.M., Sherwood, L.M., Woolverton, C.J. (2008). Prescott, Harley, Klein's Microbiology, 7th Ed., Mc Graw Hill International Edition (New York) ISBN: 978-007-126727.

Mandell, Douglas and Bennett. S., (2008). Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill Livingstone Elsevier.

Kenneth, J.R., Ray, C.G., (2010). Sherris Medical Microbiology: An Introduction to Infectious Diseases by Publisher: McGraw-Hill.

Patrick, R., Murray, K.S., Michael A.R., and Pfaller, (2011). Medical Microbiology, Elsevier Health Sciences

Semester V

16BCU504-B MOLECULAR BASIS OF INFECTIOUS DISEASES 4H-4C

Instruction hours/week: L:4 T:0 P:0 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with

- Concept of infection
- Classification of infectious pathogens
- Steps involved in the infection of a pathogenic bacteria
- Steps involved in the infection of a pathogenic viruses
- Steps involved in the infection of a pathogenic parasites
- Methods to prevent/treat infections

Course outcomes (CO's)

After successful completion, the students will understand

1. Concept of infection
2. Variety of infectious pathogens
3. The process of infection by pathogenic bacteria
4. The process of infection by pathogenic viruses
5. The process of infection by pathogenic parasites
6. How to prevent/treat infections

Unit 1

Classification of infectious agents

Bacteria, Viruses, protozoa and fungi. Past and present emerging and re-emerging infectious diseases and pathogens. Source, reservoir and transmission of pathogens, Antigenic shift and antigenic drift. Host parasite relationship, types of infections associated with parasitic organisms. Overview of viral and bacterial pathogenesis. Infection and evasion.

Unit 2

Overview of diseases caused by bacteria

Detailed study of tuberculosis: History, causative agent, molecular basis of host specificity, infection and pathogenicity, Diagnostics, Therapeutics, inhibitors and vaccines. Drug resistance and implications on public health. Other bacterial diseases including Typhoid, Diphtheria, Pertussis, Tetanus, Typhoid and Pneumonia.

Unit 3

Overview of diseases caused by Viruses

Detailed study of AIDS, history, causative agent, pathogenesis, Diagnostics, Drugs and inhibitors. Other viral diseases including hepatitis, influenza, rabies, chikungunya and polio.

Unit 4

Overview of diseases caused by Parasites

Detailed study of Malaria, history, causative agents, Vectors, life cycle, Host parasite interactions, Diagnostics, Drugs and Inhibitors, Resistance, Vaccine development.

Other diseases including leishmaniasis, amoebiasis.

Unit 5

Overview of diseases caused by other organisms

Fungal diseases, General characteristics. Medical importance of major groups, pathogenesis, treatment.

REFERENCES

Willey, J.M., Sherwood, L.M., Woolverton, C.J. Prescott, Harley, (2008) Klein's Microbiology 7th Ed., Mc Graw Hill International Edition (New York)
ISBN: 978-007-126727.

Mandell, Douglas and Bennett, S., (2010). Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill Livingstone Elsevier.

Kenneth, J., Ryan, C., Ray, G., (2010). Sherris Medical Microbiology: An Introduction to Infectious Diseases by Publisher: McGraw-Hill

Patrick R. Murray, Ken S. Rosenthal, Michael A., (2010).Medical Microbiology
Elsevier Health Sciences

Semester V

16BCU512-A BASIC MICROBIOLOGY PRACTICAL-A 4H-2C

Course objectives

To impart hands-on training on

- Sterilization methods
- Autoclave, filtration techniques
- Preparation of microbial culture media
- Assessment of bacterial strains
- Pure cultures using streaking methods
- Colony counting

Course outcomes (CO's)

After successful completion, the students will understand

1. Sterilization methods
2. Autoclave, filtration techniques
3. Preparation of microbial culture media
4. Assessment of bacterial strains
5. Pure cultures using streaking methods
6. Colony counting

Experiments

1. Microbiology Laboratory Practices and Biosafety.
2. To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter).
3. Preparation and sterilization of culture media for bacterial cultivation.
4. Study of different shapes of bacteria, fungi, algae, protozoa using permanent slides/pictographs.
5. Staining of bacteria using Gram stain.
6. Isolation of pure cultures of bacteria by streaking method.
7. Estimation of CFU count.

REFERENCES

Atlas, R.M., (1997). Principles of Microbiology. 2nd edition. W M.T.Brown Publishers.

Pelczar, M.J, Chan, E.C.S., and Krieg, N.R., (1993). Microbiology. 5th edition. McGraw Hill Book Company .

Kannan, N., (2003). Laboratory Manual in Microbiology, Panima Publishing Corporation, Bangalore.

Semester V

16BCU512-B **NUTRITIONAL BIOCHEMISTRY PRACTICAL-B** **4H-2C**

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on

- Estimation of vitamin
- Homocysteine measurements
- Assessment of protein energy malnutrition
- Obesity assessments
- Oxidative stress measurements
- BMD assessments

Course outcomes (CO's)

After successful completion, the students will understand

1. Estimation of vitamin
2. Homocysteine measurements
3. Assessment of protein energy malnutrition
4. Obesity assessments
5. Oxidative stress measurements
6. BMD assessments

Experiments

1. Bioassay for vitamin (Any one).
2. Homocystiene estimation by colorimetric method.
3. Serum/ urine MMA estimation.
4. Anthropometric identifications for Kwashiorkor, Marasmus and Obesity.
5. Determination of oxidative stress: TBARS, antioxidant enzymes in hemolysate.
6. Vitamin A/E estimation in food item.
7. Bone densitometry /bone ultrasound test demonstration (visit to a nearby clinic)

REFERENCES

Devlin, T.M., (2011). Textbook of Biochemistry with Clinical Correlations. John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4.

Williams, M.H., Anderson, D.E., Rawson, E.S., (2013). Nutrition for health, fitness and sport. McGraw Hill international edition. ISBN-978-0-07-131816-7.

Mahan, L.K, Strings, S.E., Raymond, J., (2012). Krause's Food and Nutrition Care process. Elsevier's Publications. ISBN- 978-1-4377-2233-8.

Coombs, G.F., (2008). The vitamins, Fundamental aspects in Nutrition and Health. Elsevier's Publications. ISBN-13- 978-0-12- 183493-7.

Gibson R., (2005). Principles of Nutritional Assessment. Oxford University Press.

Semester V

16BCU513-A PLANT BIOCHEMISTRY PRACTICAL-A 4H-2C

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives:

To impart hands-on training on

1. Preparation of plant tissue lysates
2. Estimation of enzymes during germination
3. Extraction of enzymes from plant source
4. Separation of plant metabolites using TLC
5. PTC media preparation, culturing techniques
6. Vitamin assessments.

Course outcomes (CO's)s:

After successful completion, the students will understand

1. Preparation of plant tissue lysates
2. Estimation of enzymes during germination
3. Extraction of enzymes from plant source
4. Separation of plant metabolites using TLC
5. PTC media preparation, culturing techniques
6. Vitamin assessments

Experiments

1. Induction of hydrolytic enzymes proteinases /amylases/lipase during germination
2. Extraction and assay of Urease from Jack bean
3. Estimation of carotene/ascorbic acid/phenols/tannins in fruits and vegetables
4. Separation of plant pigments by TLC
5. Culture of plants (explants).

REFERENCES

Bowsher, C., Steer, M., and Tobin, A., (2008). Plant Biochemistry, Garland science ISBN 978-0-8153-4121-5.

Biochemistry and molecular Biology of plant-Buchanan. (2005) 1 edition. Publisher: I K International. ISBN-10: 8188237116, ISBN-13: 978-8188237111.

Dey P.M and Harborne J.B. (1997). Plant Biochemistry (Editors) Publisher: Academic Press ISBN-10:0122146743, ISBN-13:978-0122146749

Semester V

16BCU513-B ADVANCED CELL BIOLOGY PRACTICAL-B 4H-2C

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

To impart hands-on training:

- Sterilization analysis and good culture pracice
- On how to visualize the cells
- On phase contrast microscopy
- On how to identify different stages of mitosis and meiosis
- On staining techniques to identify the cell types
- On how to count the cells using hemocytometer

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Follow the good practice in lab
2. Be able to visualize the cells
3. Use the phase contrast microscopy at appropriate magnifications
4. Identify the cells using staining techniques
5. Interpret various stages of cell division
6. Count the cells manually using hemocytometer

Experiments

1. Aseptic technique and good culture practice
2. Measurement of the size of the cells in light microscope
3. Isolation of organelles by sub-cellular fractionation.
4. Study of cell viability /death assay by use of trypan blue and MTT assay.
5. Study of apoptosis through analysis of DNA fragmentation patterns in mitochondria.
6. Identification and study of cancerous cells using permanent slides and photomicrographs.
7. Histopathology procedure (Demo)

REFERENCES

Cooper, G.M., and Hausman, R.E., (2009). The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.

Karp, G., (2010). Cell and Molecular Biology: Concepts and Experiments. 6 edition. John Wiley & Sons. Inc.

Alberts, B., Johnson,A., Lewis, J., and Enlarge, M., (2008). Molecular Biology of the Cell. 5th ed., Garland Science (Princeton).

Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell. J., (2012). Molecular Cell Biology. 7th ed., W.H. Freeman & Company (New York).

Becker, W.M., Kleinsmith, L.J., Hardin. J., and Bertoni, G.P., (2009). The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

16BCU514-A MOLECULAR BASIS OF NON INFECTIOUS HUMAN DISEASE PRACTICAL-A **Semester V 4H-2C**

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40**External: **60** Total:100
End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on

- Preparation of slides for infectious pathogens
- the principle behind WIDAL test
- the basis of Gram staining
- the detection of pathogens using PCR
- Dot Blot principles
- differential diagnosis

Course outcomes (CO's)

After successful completion, the students will understand

1. Preparation of slides for infectious pathognes
2. the principle behing WIDAL test
3. the basis of Gram staining
4. the detection of pathogens using PCR
5. Dot Blot principles
6. differential diagnosis

Experiments

1. Anthropometric measurements for normal and high risk individual and identifications for Kwashiorkor, Marasmus and Obesity
2. Estimation of homocysteine levels in serum
3. Estimation of glycosylated hemoglobin
4. Permanent slides for different types of cancer
5. Diagnostic profile for assessment of CVS and Diabetes mellitus using case studies.
6. Bone densitometry test demonstration (visit to a nearby clinic)

REFERENCES

Prescott, Harley, (2008). Klein's Microbiology 7th Ed., Willey, J.M., Sherwood, L.M., Woolverton, C.J. Mc Graw Hill International Edition (New York) ISBN: 978-007-126727.

Mandell, Douglas and Bennett.S, (2009). Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill Livingstone Elsevier.

Kenneth, J., Ryan, C., and Ray, G., (2008). Sherris Medical Microbiology: An Introduction to Infectious Diseases, Publisher: McGraw-Hill

Patrick R., Ken, S., and Pfaller, M.A., (2008). Medical Microbiology by Elsevier Health Sciences

Semester V

16BCU514-B MOLECULAR BASIS OF INFECTIOUS DISEASES PRACTICAL-B 4H-2C

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on

- Preparation of slides for infectious pathogens
- The principle behind WIDAL test
- The basis of Gram staining
- The detection of pathogens using PCR
- Dot Blot principles
- Differential diagnosis

Course outcomes (CO's)

After successful completion, the students will understand

1. Preparation of slides for infectious pathognes
2. The principle WIDAL test
3. The basis of Gram staining
4. The detection of pathogens using PCR
5. Dot Blot principles
6. Differential diagnosis

Experiments

1. Permanent slides of pathogens. *Mycobacterium tuberculosis, Leishmania, Plasmodium falciparum*
2. WIDAL test
3. Gram staining
4. Acid fast staining
4. PCR based diagnosis (Demo)
5. Dot Blot ELISA

REFERENCES

Willey, J.M., Sherwood, L.M., and Woolverton, C.J., (2008). Prescott, Harley, Klein's Microbiology, 7th Ed., Mc Graw Hill International Edition (New York) ISBN: 978-007-126727.

Mandell, Douglas and Bennett.S, Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill Livingstone Elsevier.

Ryan, K.J., and Ray, C.G., (2008). Sherris Medical Microbiology: An Introduction to Infectious Diseases by Publisher: McGraw-Hill

Murray, P.R., Rosenthal, K.S., and Pfaller, M.A., (2008). Medical Microbiology by Elsevier Health Sciences

Semester VI

16BCU601-A GENETIC ENGINEERING AND BIOTECHNOLOGY 3H-3C

Instruction hours/week: L:3 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objective

Equip the students on:

- Principles behind recombinant DNA technology
- Tools required for recombinant DNA technology
- Cloning and expression vectors
- Production of industrial relevant proteins
- Production of drugs for clinical applications
- Application of rDNA technology in crop improvement

Course outcomes (CO's)

After successful completion, the students will understand

1. The principles behind recombinant DNA technology
2. Various tools required for recombinant DNA technology
3. Cloning and expression vectors
4. Production of industrial relevant proteins
5. Production of drugs for clinical applications like insulin
6. Application of rDNA technology in crop improvement

Unit 1

Introduction to recombinant DNA technology : Overview of recombinant DNA technology. Restriction and modification systems, restriction endonucleases and other enzymes used in manipulating DNA molecules, separation of DNA by gel electrophoresis. Extraction and purification of plasmid and bacteriophage DNA.

Joining of DNA fragments : Ligation of DNA molecules. DNA ligase, sticky ends, blunt ends, linkers and adapters. Synthetic oligonucleotides, synthesis and use.

Unit 2

Cloning vectors for prokaryotes and eukaryotes : Plasmids and bacteriophages as vectors for gene cloning. Cloning vectors based on *E. coli* plasmids, pBR322, pUC8, pGEM3Z. Cloning vectors based on M13 and λ bacteriophage. Vectors for yeast, higher plants and animals.

DNA sequencing : DNA sequencing by Sanger's method, modifications based on Sanger's method. Automated DNA sequencing. Pyrosequencing.

Unit 3

Introduction of DNA into cells and selection for recombinants : Uptake of DNA by cells, preparation of competent cells. Selection for transformed cells. Identification for recombinants - insertional inactivation, blue-white selection. Introduction of phage DNA into bacterial cells. Identification of recombinant phages. Introduction of DNA into animal cells, electroporation.

Methods for clone identification

The problem of selection, direct selection, marker rescue. Gene libraries, identification of a clone from gene library, colony and plaque hybridization probing, methods based on detection of the translation product of the cloned gene.

Unit4

Polymerase chain reaction: Fundamentals of polymerase chain reaction, designing primers for PCR. Studying PCR products. Cloning PCR products. Real time PCR.

Expression of cloned genes : Vectors for expression of foreign genes in *E. coli*, cassettes and gene fusions. Challenges in producing recombinant protein in *E. coli*. Production of recombinant protein by eukaryotic cells. Fusion tags and their role in purification of recombinant proteins.

Unit 5

Applications of genetic engineering in Biotechnology: Site–directed mutagenesis and protein engineering. Applications in medicine, production of recombinant pharmaceuticals such as insulin, human growth hormone, factor VIII.

Recombinant vaccines. Gene therapy. Applications in agriculture - plant genetic engineering, herbicide resistant crops, problems with genetically modified plants, safety concerns.

REFERENCES

Brown, T.A., (2010). Gene Cloning and DNA Analysis 6^{th} ed., Wiley-Blackwell publishing (Oxford, UK), ISBN: 978-1-4051-8173-0.

Primrose, S.B., and Twyman, R. M., (2006). Principles of Gene Manipulation and Genomics 7^{th} ed., Blackwell publishing (Oxford, UK) ISBN:13: 978-1-4051-3544-3.

Glick, B.R., Pasternak, J.J. and Patten, C.L., (2010). Molecular Biotechnology: Principles and Applications of Recombinant DNA 4^{th} ed., ASM Press (Washington DC), ISBN: 978-1-55581-498-4 (HC).

16BCU601-B RECOMBINANT DNA TECHNOLOGY 4H-4C

Instruction hours/week: L:3 T:0 P:0 Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Handling of *Escherichia coli*
- Isolation of plasmid DNA from *Escherichia coli*
- Restriction digestion using enzymes
- Amplification using PCR
- Transformation of plasmid into *Escherichia coli*
- Western blotting demonstration

Course outcomes (CO's)

After successful completion, the students will

1. Know the precautions of handling *Escherichia coli*
2. Isolate the plasmid DNA from *Escherichia coli*
3. Restriction digestion using enzymes such as ECoRI, Hind III
4. Amplify the rDNA using PCR
5. Understand the techniques related to transformation of plasmid into *Escherichia coli*
6. Understand the steps involved in Western blot analysis

Unit 1

Work flow for *in silico* cloning

Unit 2

Preparation of media, antibiotic solution, culturing of *E. coli*, isolation of single Colonies

- Preparation of LB broth and agar.
- Inoculation of medium.
- Preparation of glycerol stocks of bacterial strains.
- Obtaining isolated colonies by streak plate method.
- Preparation of stock solutions.

Unit 3

Overview of plasmid vectors and methods of isolation Isolation of plasmid by alkaline lysis method.

- Isolation of plasmid DNA using column chromatography (kit).

Unit 4

Characterization of plasmid by gel electrophoresis

- Digestion of plasmid DNA with restriction enzymes and analysis of the fragments.

Unit 5

Cloning of a gene in a vector and functional analysis No. of Hours : 12

Polymerases chain reaction (parametric optimization, primer designing), ligation, introduction of DNA construct into host cells, selection of recombinants.

- Amplification of DNA segment/gene of interest by PCR.
- Purification of PCR product, digestion of insert and vector by restriction enzymes for directional cloning, purification of insert and digested vector by gel extraction.
- Ligation of vector and insert.
- Preparation of competent cells of *E. coli* DH5α and transformation with the ligation mixture.
- Functional selection of recombinants (blue/white selection and eGFP fluorescence).

REFERENCES

Green, M.R., and Sambrook, J., (2012). Molecular Cloning: A laboratory Manual Vol. 1-3, 4th ed., Cold Spring Harbour Laboratory Press (New York). ISBN: 978-1-936113-41-5 / ISBN: 978-1-936113-42-2.

Semester VI

16BCU611-A GENETIC ENGINEERING AND BIOTECHNOLOGY 3H-1C
PRACTICAL-A

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Handling of *Escherichia coli*
- Isolation of plasmid DNA from *Escherichia coli*
- Restriction digestion using enzymes
- Amplification using PCR
- Transformation of plasmid into *Escherichia coli*
- Western blotting demonstration

Course outcomes (CO's)

After successful completion, the students will

1. Know the precautions of handling *Escherichia coli*
2. Isolate the plasmid DNA from *Escherichia coli*
3. Restriction digestion using enzymes such as ECoRI, Hind III
4. Amplify the rDNA using PCR
5. Understand the techniques related to transformation of plasmid into *Escherichia coli*
6. Understand the steps involved in Western blot analysis

Experiments

1. Isolation and estimation of DNA, RNA and protein from animal source
2. Isolation of plasmid DNA from *E. coli* cells.
3. Agarose gel electrophoresis of DNA
4. Digestion of plasmid DNA with restriction enzymes.
5. Amplification of a DNA fragment by PCR.
6. Transformation of *E. coli* cells with plasmid DNA.
7. Western Blotting(Demo)

REFERENCE

Brown, T.A., (2010). Gene Cloning and DNA Analysis 6th ed., Wiley-Blackwell publishing (Oxford, UK), ISBN: 978-1-4051-8173-0.

Primrose, S.B., and Twyman, R.M., (2006). Principles of Gene Manipulation and Genomics 7th ed., Blackwell publishing (Oxford, UK) ISBN:13: 978-1-4051-3544-3.

Glick, B.R., Pasternak, J.J. and Patten, C.L., (2010). Molecular Biotechnology: Principles and Applications of Recombinant DNA 4th ed., ASM Press (Washington DC), ISBN: 978-1-55581-498-4 (HC).

Semester VI

16BCU611-B RECOMBINANT DNA TECHNOLOGY PRACTICAL-B 3H-1C

Instruction hours/week: L:0 T:0 P:3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Handling of streak plate method
- Isolation of plasmid DNA from *Escherichia coli*
- Restriction digestion using enzymes
- Amplification using PCR
- Transformation of plasmid into *Escherichia coli*
- Western blotting demonstration

Course outcomes (CO's)

After successful completion, the students will

1.Know the handling of streak plate method
2.Isolate the plasmid DNA from *Escherichia coli*
3.Restriction digestion using enzymes such as ECoRI, Hind III
4.Amplify the rDNA using PCR
5.Understand the techniques related to transformation of plasmid into *Escherichia coli*
6.Understand the steps involved in Western blot analysis

Experiments

1. Obtaining isolated colonies by streak plate method.
2. Isolation of plasmid by alkaline lysis method.
3. Isolation of plasmid DNA using column chromatography (kit).
4. Digestion of plasmid DNA with restriction enzymes and analysis of the fragments(Demo).
5. Amplification of DNA segment/gene of interest by PCR.
6. Preparation of competent cells of *E. coli* DH5α and transformation with the ligation mixture.
7. Functional selection of recombinants (blue/white selection and eGFP fluorescence).

REFERENCES

Green, M.R., and Sambrook, J., (2012). Molecular Cloning: A laboratory Manual Vol. 1-3, 4th ed., Cold Spring Harbour Laboratory Press (New York). ISBN: 978-1-936113-41-5 / ISBN: 978-1-936113-42-2.

Semester VI

16BCU602-A BIOSTATISTICS 4H-4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Definition and representation styles of data
- Analysis of data using correlation to understand the interdependence
- Analysis of data using regression to understand the interdependence
- To learn various measures of central values and standard deviation.
- To understand the relationship between two variables.
- To test the significance of a particular data by various parameters.

Course outcomes (CO's)

After successful completion, the students will:

1. Use appropriate representation styles to present the data
2. Perform correlation analysis
3. Perform regression analysis
4. Calculate mean, median, mode and standard deviation.
5. Calculate the relationship between two variables.
6. Test the significance of a particular data by various parameters.

Unit 1

Definitions-Scope of Biostatistics- Variables in biology, collection, classification and tabulation of data- Graphical and diagrammatic representation.

Unit 2

Measures of central tendency – Arithmetic mean, median and mode. Measures of dispersion-Range, standard deviation, Coefficient of variation.

Unit 3

Correlation – Meaning and definition - Scatter diagram –Karl Pearson's correlation coefficient. Rank correlation.

Unit 4

Regression: Regression in two variables – Regression coefficient problems – uses of regression.

Unit 5

Test of significance: Tests based on Means only-Both Large sample and Small sample tests - Chi square test - goodness of fit.

TEXT BOOK

Pillai R.S.N., and Bagavathi V., 2002.,Statistics , S. Chand & Company Ltd, New Delhi.

REFERENCES

Jerrold H.Z., (2003). Biostatistical Analysis, Fourth Edition, Pearson Education (Pvt., Ltd.,) New Delhi.

Arora, P.N., (1997). A foundation course statistics, S.Chand & Company Ltd, New Delhi.

Navnitham, P.A., (2004). Business Mathematics and Statistics, Jai Publications, Trichy,

Gupta S.P., (2001). Statistical methods, Sultan Chand & Sons, New Delhi.

Semester VI

16BCU602-B FUNDAMENTALS OF NANO TECHNOLOGY 4H-4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with

- Structure and modeling of Nanoparticles
- Interactions between atoms and molecules
- Building block of nanostructures
- Synthesis and formation of nanotubes
- Nanomachine and devices
- Characteristic feature of nanomachine

Course outcomes (CO's)

After successful completion, the students will understand

1. Structure and properties of nanoparticles
2. Types of forces formed between atoms and molecules
3. Biological building blocks and nanostructures
4. Synthesis and application of nanomaterial
5. Types of nanomachines and nanodevices
6. Applications of nanodevices

Unit 1

Nanostructre and Properties: Structure- size Dependence of properties, Localized particles- Donors, Acceptors and Deep Traps, Mobility, Excitons Properties of nanoparticles-Metal nanoclusters –theoretical modeling of nanoparticles, geometric structure, electronic structure, Semiconducting nanoparticles-optical properties, photofragmentation, coulombic explosion.

Unit 2

Forces Between Atoms and Molecules: Thermodynamic aspects of intermolecular forces – Strong intermolecular forces – Covalent and coulomb interactions – Interactions involving polar molecules – Interactions involving thepolarization of molecules – Van der Waals forces – Repulsive forces, total intermolecular pairpotentials, and liquid structure – Special Interactions – Hydrogen bonding, Hydrophobic, and Hydrophilic interactions.

Unit 3

Biological Materials: Biological building blocks-sizes of building blocks and nanostructures, polypeptide Nanowire and protein nanoparticles. Nucleic acids-DNA Double nanowire, biological nanostructures-examples of proteins, miscelles and vesicles, multilayer films.

Unit 4

Synthesis of Nanomaterials: Top down – ball milerling; Bottom up – co-precipitaion – sol-gel – electrodeposition – using natural nanoparticles – chemical vapor deposition. The

Carbon Nanotube – New Forms of Cabon – Types of Nanotubes – Formation of Nanotubes – Uses for nanotubes – Biological Applications

Unit 5

Applications of nanotechnology: Nanomachines and nanodevices- Microelectromechanical systems (MEMSs), Nanoelectrochemical systems (NEMSs)- fabrication, nanodevices and nanomachines, molecular and supramolecular switches- photochemical switching, current-voltage characteristics

TEXT BOOKS

Poole, C.P., and Owens J.F., (2003). Introduction to Nanotechnology" Wiley- Interscience.

REFERENCES

Israelachvili, J.N., (2008). Intermolecular and surface forces. Academic Press.

Ratner, M.A., and Ratner, D., (2002). Nanotechnology: A Gentle Introduction to the Next Big Idea" **,**First Edition,Prentice Hall PTR.

Wilson, M., Kannangara, K., Smith, G., Simmons, M., and Raguse, B., (2005). Nanotechnology: basic science and emerging technologies, Overseas Press.

Semester VI

16BCU603-A **DRUG BIOCHEMISTRY** **4H-4C**

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Definition and classification of drugs
- Basics of Pharmacokinetics of a drug
- Basics of Pharmacodynamics in living system
- Mechanism of action of drugs
- Toxicity assessment
- Drug abuse

Course outcomes (CO's)

After successful completion, the students will understand

1. Definition and classification of drugs
2. Basics of Pharmacokinetics of a drug
3. Basics of Pharmacodynamics in living system
4. Mechanism of action of drugs
5. Toxicity assessment
6. Drug abuse

Unit 1

Introduction to drug Biochemistry: Classification, routes of administration – factors influencing dosage and drug action, Absorption and distribution of drugs, binding of drugs to plasma proteins, Drug Dose relationship (LD_{50}, ED_{50}, therapeutic index), Drug – Receptor interaction, Drug binding forces, Receptor theories, Drug – Receptor interaction. Bioavailability; Pharmaco kinetics.

Unit 2

Drug metabolism: Drug Biotransformation pathways - phase I – oxidation, reduction and hydroxylation. Phase II- Conjugation, Elimination of drugs from body system. Storage of drugs in adipose tissue.

Unit 3

Drug abuse; drug dependence; drug resistance- Biological mechanism, ways to overcome.

Chemotherapy: Antibacterials – Mode of action of sulfonamides, penicillin, streptomycin, tetracycline, chloramphenicol, antiviral drugs, antifungal drugs; Antimetabolites of folate, purines & pyrimidines, Anti tubercular drugs.

Unit 4

Mechanism of action drugs used in the treatment of diabetes mellitus (Acarbose, Biguanides), AIDS (Azidophymidine, Didanosine), cancer(Mechlorethamine, Busulfan), heart (Amrinone, Digoxin) and kidney disorder (Benzophiadiazines, furosemide); antiepileptic drug(Lamictal, Tapclob), drugs for cough (Dextromethorphane Hydrobromide, Noscapine) and bronchial asthma (Salbutamol, Aminophylline), diuretics

(Manitol, Xanthine), anti ulcer drugs (Cimetidine, Ranitidine) and drugs for fever (Paracetamol, Ibuprofen).

Unit 5

Toxicology- Introduction, definition and disciplines of toxicology, classification of toxicity and toxicants, Mechanisms of toxic effect, treatment of intoxication, methods in toxicology testing, heavy metal toxicity and chelation therpy. Environmental pollution, mycotoxins, mushroom poisons

TEXTBOOKS

Satoskar, R.S., Bhandarkar, S.P., and Ainapuri, S.S., (2003). Pharmacology and Pharmacotherapeutic, 18th edition,Popular Prakashan, Mumbai.

REFERENCE BOOKS

Hamilton, D., Philips, R.J., and Scott, D., (2004). Occupational, Industrial and Environmental Toxicology, Moshy Inc Publishers.

Berg, G., Hendrickson, R.G., and Morocco, A., (2005). Medical Toxicology Review. McGraw Hill Mical Publishing Company**.**

Foye, W., (2012). Principles of Medicinal Chemistry, 7th edition, B.I. Wanerly Pvt. Ltd, New Delhi.

Grahame-Smith, D.G., and Aronson, J.K., (2002). Oxford textbook of ClinicalPharmacology and Drug Therapy: 3rd edition. Oxford University Press.

Tripathy, K.D., (2009). Essentials of Medical Pharmacology, Jaypee brothers medical publishers, New Delhi.

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Semester VI

16BCU603-B FOOD PRESERVATION TECHNOLOGY 4H-4C

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with

- Microorganisms in food
- Methods of food preservation
- Types and applications of Preservation Technology
- Principle and processing of packaging
- Importance and functions of quality control
- Methods of quality and processed the food products.

Course outcomes (CO's)

After successful completion, the students will understand

1. Microorganism in natural food and control mechanism
2. Principles and food preservative methods
3. Types and applications of Preservation Technology
4. Introduction and development of Packaging
5. Objectives of food quality
6. Assessment of food quality and integrated food law

Unit 1

Microbiology of Food: History of microbiology of food. Types of micro-organism normally associated with food -mold, yeast, and bacteria, Microbial growth pattern, physical and chemical factors influencing destruction of micro-organisms. Micro-organisms in natural food products and their control mechanisms. Food chemistry-definition and importance

Unit 2

Principles of Food Processing: Principles of Preservation methods. Dehydration: Novel evaporation /dehydration techniques, spray drying. Vacuum drying- osmotic dehydration - efficient drying systems, High salt and high sugar preservations, infrared heating Freezing of foods, freeze concentration and drying, methods of freeze concentration. High Temperature operations, sterilization and Pasteurization.

Unit 3

Types of Preservation Technology: Microwave Processing: Microwave, properties, heating mechanism. Applications of microwave in food processing, effect of microwave on food nutrient. Food Irradiation Technology: General aspects of irradiation, ionizing radiation, irradiation process, units, mechanism, advantages and disadvantages of irradiation process. Ultrasound in food processing and preservation: Introduction and its application in food processing.

Unit 4

Food Packaging: Introduction to packaging. Packaging operation, package-functions and design. Principle in the development of protective packaging. Deteriorative changes in foodstuff and packaging methods for prevention, shelf life of packaged foodstuff, methods to extend Shelf-life. Evaluation of packaging, and package performance, packaging equipment, package standards and regulation, bar coding material. Biodegradable packaging.

Unit 5

Food Quality and Food Laws: Objectives, Importance and functions of quality control. Methods of quality, assessment of food materials-fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products. Sanitation and hygiene - Integrated Food Laws

TEXT BOOKS:

Barbosa-Canovas, G.V., and Gould, G.W., (2000). Innovation in Food Processing. Technomic Publication, Lancaster, UK:

Frazier, W.C., and Dennis, C., Westhoff, C., (2008). Food Microbiology. Fourth Edition, Tata McGraw-Hill Education Publication, India.

REFERENCES:

Ray, B., (2003). Fundamental Food Microbiology, 3rd edition. CRC Press LLC, N.W. Corporate Blvd., Boca Raton, Florida 33431.

Precott, Harley, (2004). Microbiology, Sixth edition, McGraw-Hill Science, NewYork
Michael J. Waites, Neil L. Morgan, John S. Rockey, Gary Higton. 2001. "Industrial Microbiology: An Introduction", Blackwell Science, oxford,UK

Vijaya, R.K., (2007). Food microbiology. First Edition MJP Publishers, 2007.

16BCU612-A **BIOSTATISTICS PRACTICAL-A** **Semester VI 4H-2C**

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

To impart hands-on training in the usage of software's to perform:

- Measures of central tendency
- Coefficient of variation
- Correlation analysis
- RANK Correlation test
- Regression analysis
- T-test

Course outcomes (CO's)

After successful completion, the student will:

1. Measure mean, median and mode
2. Perform Coefficient of variation
3. Execute Correlation analysis
4. Perform Regression analysis
5. Perform RANK correlation test
6. Analysis the difference between means using T-test

Experiments

1. Mean for individual, discrete series using SPSS Package.
2. Mean for continuous series using SPSS Package.
3. Median for individual and discrete series using SPSS Package..
4. Median for continuous series using SPSS Package..
5. Mode for individual and discrete series using SPSS Package..
6. Standard deviation for individual and discrete series using SPSS Package.
7. Coefficient of variation for individual and discrete series using SPSS Package.
8. Karl Pearson's Correlation using SPSS Package.
9. Rank Correlation Coefficient for Untied Rank using SPSS Package.
10. Rank Correlation Coefficient for Tied Rank using SPSS Package.

REFERENCES

Jerrold, H.Z., (2003). Biostatistical Analysis, Fourth Edition, Pearson Education (Pvt., Ltd, New Delhi.

Arora, P.N., (1997). A foundation course statistics, S.Chand & Company Ltd, New Delhi.

Navnitham, P.A., (2004). Business Mathematics And Statistics, Jai Publications, Trichy,

Gupta, S.P., (2001). Statistical methods, Sultan Chand & Sons, New Delhi.

Semester VI

16BCU612-B FUNDAMENTALS OF NANO TECHNOLOGY PRACTICAL-B 4H-2C

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Synthesis of silver nanoparticles
- Synthesis of nanoparticles using leaf extract
- Synthesis of nanoparticles using fungal part
- Synthesis of Nanoparticles using *Actinomyces*
- Characterization of nanoparticles by UV spectroscopy
- Synthesis and Characterization of nanoparticles using FTIR

Course outcomes (CO's)

After successful completion, the students will

1. Know the synthesis of nanoparticles
2. Synthesis of nanoparticles from plant extract
3. Synthesis of nanoparticles from fungi
4. Synthesis of nanoparticles from Actinomycete
5. Characterization of nanoparticles by UV spectroscopy
6. Analysis of chemical composition by FTIR

Experiments

1. Nanoparticles synthesis using chemical methods
2. Synthesis of nanoparticles using plant extracts
3. Nanoparticles synthesis using fungal species
4. Nanoparticles synthesis using *Actinomyces*
5. UV-Visible spectra analysis of nanoparticles (Demo)
6. FT-IR spectra analysis of nanoparticles (Demo)

References

Edward, L.W., (2006). Nanophysics & Nanotechnology: An Introduction to Modern Concepts in Nanoscience, WILEY-VCH.

Fahrner, W.R., (2005). Nanotechnology and Nanoelectronics Materials, Devices, Measurement Techniques, Springer.

Semester VI

16BCU613-A **DRUG BIOCHEMISTRY PRACTICAL-A** **4H-2C**

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

To impart hands-on training in:

- Handling of small experimental animals
- Enteral and parenteral route of drug administration
- Assessment of behavioual changes
- Assessment of drug toxicity
- Calculation of LD_{50}
- Monitoring for adverse effects of drugs

Course outcomes (CO's)

After successful completion, the student will:

1. Handle small experimental animals such as rats, mice and rabbits
2. Learn Enteral and parenteral route of drug administration
3. Learn to assess behavioual changes
4. Learn to assess drug toxicity
5. Learn the basis of LD_{50}
6. Monitor adverse effects of drugs

Experiments

1. Behavioural Changes upon drug Adminstration
2. Liver toxicity Studies
    SGOT
    SGPT
    GGT
3. Renal toxicity studies
    Urea
    Uric acid
    Creatinine
4. LD_{50} Determination

REFERENCE BOOKS

Hamilton, D., Philips, R.J., and Scott, D., (2004). Occupational, Industrial and Environmental Toxicology, Moshy Inc Publishers.

Berg, G.M.I., Hendrickson R.G., and Morocco, A., (2005). Medical Toxicology Review. McGraw Hill Mical Publishing Company**.**

Foye, W., (2012). Principles of Medicinal Chemistry, 7th edition, B.I. Wanerly Pvt. Ltd, New Delhi.

Grahame-Smith, D.G., and Aronson, J.K., (2002). Oxford textbook of ClinicalPharmacology and Drug Therapy: 3rd edition. Oxford University Press.

Tripathy, K.D., (2009). Essentials of Medical Pharmacology, Jaypee brothers medical publishers, New Delhi.

Semester VI

16BCU613-B FOOD PRESERVATION TECHNOLOGY PRACTICAL-B 4H-2C

Instruction hours/week: L:0 T:0 P:4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

To impart hands-on training on

- Preparation of syrups with fruits
- Assessment of product quality and shelf-life
- Measurement of carrier gas movement
- Determine the presence of coliform in food
- Determine the heterotrophic plate count of bacteria.
- Identification of microflora in food.

Course outcomes (CO's)

After successful completion, the students will understand

1. Preparation of syrups with fruits
2. Measurement of water vapour in carrier gas
3. Determine the types of chemicals migrate from packaging into food.
4. Heterotrophic plate count of bacteria in packed food
5. Determine the counts of staphylococcus aureus in bread.
6. Identification of the microflora behavior and physicochemical changes undertaken in a food

Experiments

1. Preparation of syrups, Grape squash and orange squash.
2. Water vapor transmission rate of different packaging materials
3. Determination of migration characteristics of packaging materials
4. Determination of migration characteristics of packaging materials using different simulants
5. Determination of bacterial counts of polymer – packed foods during storage
6. Determination of tensile strength of given packaging material
7. Determination of bursting strength of given packaging material
8. Determination of coliforms and fungal counts of polymer – packed foods during storage
9. Microwave and radiation preservation of meat, poultry and fish
10. Identification and chemical resistance of plastic films.
11. Estimation of shelf-life of packaged food stuff.
12. Detection of adulteration in foods.

REFERENCES

Coles, R., Dowell, D.M., and Kirwan, J., (2003). Food Packaging Technology. Black Well Publishing Ltd., 2003.

Plummer, D.T., (1971). An Introduction to Practical Biochemistry. Mc-Graw Hill Pub.Co., New York.

Raghuramulu, N., Nair, K.M., and Kalyanasundaram, S., (1983). A Manual of Laboratory Techniques. National Institute of Nutrition, ICMR, Hyderabad.

Rahman, M.S., (2006). Handbook of Food Preservation. Marcel Dekker Publisher, Inc.NY.

Stanburry, P.P., and Whitaker, A., (1984). Principles of Fermentation Technology.Pergamon Press, Oxford UK.

Semester VI

16BCU691 **RESEARCH PROJECT** **8H-6C**

Instruction hours/week: L:2 T:0 P:6 **Marks:** Internal: **40** External: **60** Total: **100**

DEPARTMENT OF BIOCHEMISTRY
FACULTY OF ARTS, SCIENCE AND HUMANITIES
KARPAGAM UNIVERSITY
Karpagam Academy of Higher Education
(Deemed University, Established Under Section 3 of UGC Act 1956)
Eachanari PO, Coimbatore – 641 021, India.

M.Sc., - BIOCHEMISTRY

PREAMBLE

- Biochemistry is the study of chemistry and relating to biological organisms.
- Biochemistry is sometimes viewed as a hybrid branch of organic chemistry which specializes in the chemical processes and chemical transformations that take place inside of living organisms.
- Biochemistry incorporates everything in size between a molecule and a cell and all the interactions between them.
- Biochemistry essentially remains the study of the structure and function of cellular components (such as enzymes and cellular organelles) and the processes carried out both on and by organic macromolecules - especially proteins, but also carbohydrates, lipids, nucleic acids and other biomolecules.
- All life forms alive today are generally believed to have descended from a single proto-biotic ancestor, which could explain why all known living things naturally have similar biochemistries.
- Biochemistry is most simply put the chemistry of life.

OBJECTIVE

- To inspire and educate students, today and for the future, in the concepts and skills of Biochemistry; to prepare them to think about, to work with, and to enjoy the concepts of Biochemistry and apply them at appropriate situation in practical life.

KARPAGAM ACADEMY OF HIGHER EDUCATION
Coimbatore – 641 021
DEPARTMENT OF BIOCHEMISTRY
M.Sc., CURRICULUM (2016 – 2017 Batch)
(Scheme of Examination for 2016 – 2017 onwards)

Course code	Name of the course	Objectives and out comes		Instruction hours / week			Credit(s)	Maximum Marks		
		PEOs	POs	L	T	P		CIA	ESE	Total
								40	60	100
SEMESTER - I										
16BCP101	Chemistry of Biopolymers	I	a	4	-	-	4	40	60	100
16BCP102	Enzymes and Microbial Technology	II	d	4	-	-	4	40	60	100
16BCP103	Bioinstrumentation and Good Laboratory Practices	II	d, e	4	-	-	4	40	60	100
16BCP104	Cellular Biochemistry	III	a	4	-	-	4	40	60	100
16BCP105A	Plant Biochemistry	III	a	4	-	-	4	40	60	100
16BCP105B	Plant tissue culture	I	c, f							
16BCP105C	Biopharmacy	I	d							
16BCP111	Practical – I Quantitative Estimation and Separation Techniques	II	a	-	-	4	2	40	60	100
16BCP112	Practical – II Plant Biochemistry and Microbiology	I, III	a, e	-	-	4	2	40	60	100
	Journal paper analysis and Presentation	I-III	a, e	2	-	-	-	-	-	-
Semester Total				**22**	**-**	**8**	**24**	**280**	**420**	**700**
SEMESTER – II										
16BCP201	Regulation of Metabolic Pathways	II	a	4	-	-	4	40	60	100
16BCP202	Molecular Biology	II	a, b	4	-	-	4	40	60	100
16BCP203	Endocrinology	II	a, d	4	-	-	4	40	60	100
16BCP204	Bioinformatics	III	d	4	-	-	4	40	60	100
16BCP205A	Recombinant DNA Technology	I	d	4	-	-	4	40	60	100
16BCP205B	Animal Tissue Culture	III	d, e							
16BCP205C	Genomics and Proteomics	III	d							
16BCP211	Practical – III Molecular Biology and Animal Biotechnology	II	d, g	-	-	4	2	40	60	100
16BCP212	Practical – IV Biological Databases and Analysis	III	d, g	-	-	4	2	40	60	100
	Journal paper analysis and Presentation	I-III	a, e	2	-	-	-	-	-	-
Semester Total				**22**	**-**	**8**	**24**	**280**	**420**	**700**

SEMESTER – III										
16BCP301	Immunology	I	a	4	-	-	4	40	60	100
16BCP302	Clinical Biochemistry	I, III	a, d	4	-	-	4	40	60	100
16BCP303	Chemistry of Natural Products			4	-	-	4	40	60	100
16BCP304	Drug Biochemistry and Neurochemistry	III	a, d	4	-	-	4	40	60	100
16BCP305A	Biostatistics and Research Methodology	III	e, g							
16BCP305B	Clinical Research and IPR	III	d, e, i	4	-	-	4	40	60	100
16BCP305C	Dietetic Management of Disease	I	d, i							
16BCP311	Practical – V Clinical Enzymes And Immunology	I, II	d, e, h	-	-	4	2	40	60	100
16BCP312	Practical – VI Clinical Biochemistry and Animal Studies	I	d, e, h	-	-	4	2	40	60	100
	Journal paper analysis and Presentation	I-III	d, e	2	-	-	-	-	-	-
Semester Total				**22**	**-**	**8**	**24**	**280**	**420**	**700**
SEMESTER – IV										
16BCP491	Project and *Viva Voce*	I-III	a-j	05	-	**25**	**15**	**80**	**120**	**200**
Semester total							**15**	**80**	**120**	**200**
Program Total							**87**	**920**	**1380**	**2300**

Core Elective – 1* (Theory)		**Core Elective – 2 (Theory)***		**Core Elective – 3(Theory)***	
16BCP105-A	Plant Biochemistry	16BCP205-A	Recombinant DNA Technology	16BCP305-A	Biostatistics and Research Methodolology
16BCP105-B	Plant tissue culture	16BCP205-B	Animal Tissue Culture	16BCP305-B	Clinical Research and IPR
16BCP105-C	Biopharmacy	16BCP205-C	Genomics and Proteomics	16BCP305-C	Dietetic Management of Disease

Blue – Employability
Green – Entrepreneurship
Red – Skill Development

Code: 16BCP101

16	- Academic Year
BC	- Biochemistry
P	- Masters Degree
First Digit	- Semester number (1, 2, 3 and)
Second digit	- Theory (0); Practical (1); Project (9)

Last digit **-** Paper number in the concerned semester (1, 2…)
***** The candidate has to select any one elective course from three options in each semester

PROGRAMME OUTCOMES (POs)

PG biochemistry graduate will be able to achieve

a. **Critical Thinking and Effective Communication:** The teaching is intended to kindle the critical thinking of the student to address problems (Problem based learning) and equip them to list out their understanding (Activity based learning). The syllabus also includes journal paper presentation and analysis on specific topics of all subjects which will be evaluated by faculty handling the subject.

b. **Future Career:** To prepare students for future careers in the various fields of biochemistry such as academic and research institution.

c. **Societal Contribution and Social Interaction:** The Biochemistry Program will benefit the society on the whole by adding to the highly skilled scientific workforce, particularly for the biomedical research sectors, in the academic, industry as well as for research laboratories across the country and the globe. Inside the classrooms group discussion is encouraged on topics during the last five minutes of class to improve the understanding and to share the knowledge and view point. Outside the classroom, various outreach programis conducted on various health initiatives.

d. **Identification and Differential Diagnosis:** To acquire **b**iochemistposition in leading hospitals and scientist position in industries.

e. **Ethics:** Students learn about the significance of having right moral features to develop good interpersonal skills.

f. **Environment and Sustainability:** Understand the role of citizen to maintain sustainable environment and encourage Eco-friendly initiatives.

g. **Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context of health and disease.

PROGRAMME SPECIFIC OUTCOME (PSOs)

h.To prepare students for future careers in various fields of biochemistry by enhancing analytical and critical-thinking skills in which a core understanding of the chemistry of biological processes are important for the understanding of human health and disease.

i. To equip highly skilled scientific workforce, particularly for the biomedical research sectors, in the academic, industry as well as for research laboratories across the country and the globe.

j.The skills acquired in the program will help the students in acquiring scientific, academic and industrial positions such as Analyst, Research Scientist at Pharma (R&D) Industries, Academician, Project Associates (JRF, SRF), Doctoral Research positions abroad at India and abroad. Clinical biochemist at renowned hospitals, medical coding, Scientific writers.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

I. The course aims to impart advanced and in depth understanding on all the human physiological and pathological state. To understand the molecular process and their perturbation during disease.

II. The program covers various aspects of Biomolecule estimation and regulation to ascertain health and disease state. metabolic pathways alterations along with their regulation at the replication, transcriptional, translational, and post-translational levels including by studying DNA, RNA and protein molecules, immunology, endocrinology, advancements in rDNA technologies to circumvent genetic disorders.

III. Further to enrich research understanding various genomic, proteomic and bioinformatics tools are added. Animal cell culture, IPR, Biostatistics, research methodology, clinical research and Plant tissue culture are offered as elective papers to get specialized in a specific area. The final semester is devoted exclusively to enrich the students to address specific research objective.

Mapping of PEOs and POs

Pos	a	b	c	d	e	f	g	h	i	j
PEO I	X		X			X				
PEO II	X		X	X	X	X		X	X	X
PEO III	X	X	X	X	X		X		X	X

16BCP101 CHEMISTRY OF BIOPOLYMERS 4H-4C

Instruction hours/week: L: 4 T: 0 P: 0Marks: Internal: **40** External: **60**Total: **100**
End Semester Exam: 3 Hours

Course objectives
Equip the students:

- To understand the biological significance of polysaccharides in living systems
- To understand thestructure of amino acids and proteins and their biological significance in living systems
- To know the structure, properties and biological significance of lipids in biological systems
- To understand lipid peroxidation and the importance of antioxidants in degenerative diseases
- To understand the structure and functional role of nucleic acid in living systems
- To understand the nucleic acid interaction with proteins and their molecular aspects.

Course outcomes (CO's)
After successful completion of the course, the student will:

1. Understand the structure and organization of storage and structural polysaccharides in living system
2. Recognize the structure and importance of proteins and amino acids in biological system.
3. Recall the role of lipids in bio membrane including signal transduction
4. Equip with the knowledge on antioxidants and their importance
5. Differentiate the structure, types, properties and functions of DNA and RNA
6. Recognize the nucleic acid interaction with proteins and gain knowledge in molecular techniques.

UNIT I

Polysaccharides: Occurrence, structure and biological functions of cellulose, chitin, starch and glycogen. Fructans, arabinans and galactans (brief account). Dietary fibre. Occurrence, structure, and biological functions of bacterial cell wall polysaccharides and blood group antigens. Structure and significance of glycoconjucates - Glycosaminoglycans – structure and biological role of hyaluronic acid, chondroitin sulfate and heparin, sialic acid; glycoproteins and glycolipids.

UNIT II

Proteins: Orders of protein structure. Primary structure – determination of amino acid sequence of proteins. The peptide bond – The Ramachandran plot. Secondary structures – α-helix, β-sheet and β-turns. Fibrous proteins- Collagen triple helix-Structure and assembly. Globular proteins-forces involved, folding process and folding patterns. Tertiary structure –Myoglobin organisation. Quarternary structure of proteins- Structure of haemoglobin. Models for haemoglobin allostery. Quintinary structure-basics only.

Protein function as enzymes, defensive and transport.

UNIT III

Lipids: Introduction- simple lipid, compound lipids-phospholipids, glycolipids and storage lipids. Properties of lipids-Micelles, bilayers and liposomes. Significance of lipid anchored protein-prenylated, fatty acylated and GPI anchored proteins. Lipoproteins – classification and composition. Lipids as signals,cofactors and pigments(Brief account).Lipid peroxidation and antioxidants.

UNIT IV

Nucleic acids: DNA double helical structure – Watson and Crick model. A, B and Z forms of DNA. Tertiary and quadraplex structures of DNA. DNA supercoiling and linking number. Properties of DNA – DNA bending, buoyant density, viscosity, denaturation and renaturation – The cot curve – Chemical synthesis of DNA. Major classes of RNA – mRNA, rRNA, tRNA, sn RNA, siRNA, hn RNA – structure and biological functions. Secondary and tertiary structure of tRNA and rRNA.

UNIT V

Nucleic acid interaction with proteins: DNA binding motifs in proteins – the basic helix loop helix (bHLH) motif, zinc finger, the leucine zipper, helix-loop helix and homeo domain. RNA binding motifs in proteins. Molecular aspects of protein-nucleic acid binding – direct interactions. Techniques characterizing nucleic acid-protein complex – gel retardation assay, DNase I footprinting.

REFERENCES

1. Nelson, D., and Cox, M. W.H. (2012) Lehninger Principles of Biochemistry (4th Ed.) New York, Freeman and Company

2. Murray, R.K., Bender, D.A., Botham, K.M., and Kennelly, P.J., (2012). Harper's illustrated Biochemistry, 29th Edition. McGraw-Hill Medical. London.

3. Zubay, G., (2009). Biochemistry, Wm.C Brown Publishers, Saunders and Company, Philadelphia.

4. Voet, D., Voet, J. G., & Pratt, C. W. (2008). Fundamentals of biochemistry: Life at the molecular level. Hoboken, NJ: Wiley.

5. Nucleic acid structure and recognition. Neidle, Oxford University Press, 2002

6. Nucleic acids in Chemistry and Biology. Blackburn and Gait, IRL Press, 1996

7. Rawn, .J.D.,(2004). Biochemistry, First Indian reprint, Panima Publishing Corporation, New Delhi.

Semester I

16BCP102 ENZYMES AND MICROBIAL TECHNOLOGY 4H-4C

Instruction hours/week:L: 4 T: 0 P:0 Marks: Internal: **40** External: **60**Total: **100**

End Semester Exam: 3 Hours

Course objectives
Equip the students:

- To understand the structure of enzymes and their classifications.
- To analyse the active site of enzymes by various experimental approaches.
- To learn the kinetics of enzyme catalysed reactions.
- To learn the importance of enzyme immobilization and its wide applications in medicine and industries.
- To study various fermentor designs, culture systems and the application of fermentation process in industry.
- To learn the fermented products preparation, downstream processing and its industrial applications.

Course outcomes (CO's)
After successful completion of the course, the student will:

1. Understand the mechanism of action of enzymes and their classifications.
2. Recall the kinetics of enzyme catalyzed reactions
3. Understand the enzyme immobilization concept and apply the knowledge to produce more products out of it.
4. Gain knowledge in designing fermentor based on Industrial needs
5. Have clear understanding of microbe's implication to derive a product and the role of enzymes in downstream process.
6. Clear in concept of various culture techniques and apply the suitable one for a particular application.

UNIT I

Proteins: Enzymes - Nomenclature and classification of Enzymes with examples; coenzymes and cofactors. Active site rule: catalytic triad; Mechanism of enzyme action - Lock and key model, Induced fit model. Factors affecting enzyme activity. Isolation, purification and characterization of enzymes.

UNIT II

Enzyme Kinetics : Derivation of MM equation, LB plot, Eadie Hofstee plot and Hanes plot. Enzyme inhibition-Types and differentiation of competitive, uncompetitive, Non-competitive inhibition, Allosteric inhibition, feed-back inhibition and regulation. Allosteric enzymes- cooperativity, Hills equation, Physiological significance of sigmoidal behaviour. R and T states and K and V series. Mechanism of action of enzymes - chymotrypsin and lysozyme. Enzyme based diagnostic techniques.

UNIT III

Immobilization of enzymes: Methods of immobilization - adsorption, covalent binding, entrapment, membrane confinement. Effect of immobilization on enzyme. Use of enzymes in detergents, Leather Industry, Wool Industry, Food, Dairy, Juice and Beverage Industry, Sugar Industry. Uses in medicine. Enzyme engineering. Artificial enzymes and synzymes, Abzymes, ribozymes, enzymes in organic solvents.

UNIT IV

Microbial Growth: Balanced and Unbalanced microbial growth; Measurement of growth; Principles of microbial growth and culture systems-batch culture, fed batch culture, semi-continuous culture and continuous culture. Isolation and screening of industrially important microbes. Important strains for better yield. Design of a fermenter. Types of bioreactor-Continuous stirred tank, Bubble column, Airlift, Fluidized bed, Packed bed and Photobioreactor.

Solid substrate fermentation and Media fermentation. Examples of bioprocess for the production of biomass. Microbial metabolic products-primary and secondary metabolites.

UNIT V

Production of fermented products and downstream processing: Production of alcohol and alcoholic beverages. Microbial production of Organic acids: Source, recovery and uses of Citric acid, Lactic acid, Acetic acid and L-ascorbic acid. Production of antibiotics: Penicillin and Tetracyclin. Bioinsecticides: Production of Bacterial and fungal polysaccharides, commercial production of Xanthan gum and pullulan. Production of edible mushroom and SCP.

Biofertilizers (*Phosphobcterium* and *Rhizobium sp*.,- Basics only).

TEXT BOOKS

1. Jain, J.L, (2013). Fundamentals of biochemistry, S. Chand & Co Ltd, New Delhi.

2. Sathya Narayana U, (2005). Biotechnology, Books and Allied Publishers, Kolkata.

3. Trevor and Palmer, 2004. Enzymes, East West Press Pvt Ltd, New Delhi.

4. Wolf Crueger and Annesie Cruger, 2004. Biotechnology: A Textbook of Industrial
5. Microbiology, 2nd Edition, Panima Publishers, Bangalore.

6. Adams, M.R., and Moss, M. O. (2004). Food Microbiology, New age publishers,
7. New Delhi.

8. Singh, R., and Ghosh, S.K., (2004). Industrial Microbiology, Global Vision publishers, New Delhi.

9. Dixon, M., and Webb, E.C. (1979). Enzymes, 3rd Edition, Longman and

company Better World books Ltd. UK

REFERENCES

1. Chapline, M.F., and Bucke, C. (1990). Protein Biotechnology. Cambridge University Press, London.

2. Walsh, G (2002), Proteins Biochemistry and Biotechnology, John Wiley & Sons Ltd, New York.

3. Glazer, A.N., Nikaido, H. (2007). Fundamentals of Applied Microbiology. W H. Freeman Company, New York.

4. Price, N.C., and Stevens, L (2004). Fundamentals of Enzymology, 3rd Edition, Oxford Univ. Press, New York.

5. Stanbury, P.F., Whitaker, A and Hall, S.J. (2005). Principles of Fermentation Technology, Elsevier Publishers.

6. Thomas, E., and Creighton, W., (2002). Proteins: Structure and Molecular properties, W.H Freeman and Company, New York.

7. Patel, (2003). Industrial Microbiology, Macmillan India limited, New Delhi.

Semester I

16BCP103 BIOINSTRUMENTATION AND GOOD LABORATORY PRACTICE

4H-4C

Instruction hours/week:L: 4 T: 0 P:0 **Marks: I**nternal**: 40** External**: 60Total: 100**

End Semester Exam: 3 Hours

Course objective

Equip the students:

- To learn centrifugation techniques and their applications in biological system.
- To understand the principle of colorimetry and advanced spectrophotometric techniques
- To learn the basics, advanced techniques and applications of chromatography
- To learn the importance of calibration of analytical instruments.
- To learn the principle and applications of electrophoresis and radioisotopic techniques in biological sample analysis
- In good laboratory practices procedures.

Course outcomes (CO's)

After successful completion of the course, the student will:

1. Apply the centrifugation techniques in biological system
2. Use colorimetry and spectrophotometry for sample analysis
3. Use chromatographic techniques for sample analysis
4. Calibrate analytical instruments
5. Detect radioisotopes and analyze samples using electrophoretic techniques
6. Follow the good laboratory practices procedures.

UNIT I

Centrifugation: Principle, types of centrifuges, Principles and applications of analytical and preparative centrifuges, density gradient and ultra centrifugation. Relative molecular mass determination and sedimentation coefficient. Sub cellular fractionation of cellular components. Applications.

Colorimetry: Beer's law and Lambert's law. Principle of photoelectric colorimeter, Spectroscopy – Properties of electromagnetic radiations, Instrumentation and applications of UV Visible and mass spectroscopy, FTIR, NIR, Raman Spectroscopy, reverse spectroscopy. Spectrofluorimetery, atomic spectroscopy, NMR spectroscopy.

UNIT II

Chromatography: Principles, Types – paper chromatography, thin layer chromatography and HPTLC, Column chromatography - Ion exchange chromatography, affinity chromatography, gel filtration chromatography, Low pressure liquid chromatography (LPLC) and High Performance Liquid Chromatography (HPLC)- Normal and Reverse Phase Gas -liquid chromatography Mass spectroscopy (GC – MS), LC-MS, MALDI-TOF, ICPMS, Application of Chromatography.

UNIT III

Electrophoresis: Principle, instrumentation and applications of agarose gel electrophoresis, sodium dodecyl sulphate – polyacrylamide gel electrophoresis (SDS-PAGE), native PAGE, isoelectric focusing, immunoelectrophoresis, 2D gel electrophoresis. Pulse field gel electrophoresis, capillary electrophoresis, gel documentation – Applications.

UNIT IV

Radioisotopic techniques : Introduction, nature of radio activity, types and rate of radio active decay, units of radio activity, detection and measurement of radioactivity-Geiger-Muller counter, solid and liquid scintillation counter. Autoradiography, X-ray diffraction and circular dichorism. Non radioactive, fluorescent methods.
Flowcytometry: Principles and applications**.**
Western Blot: Principles and applications**.**

UNIT V

Good Laboratory Practices: Quality concepts, personal protective equipment. General safety-biological safety, chemical safety and fire safety. data generation and storage, quality control documents, retention samples, records, audits of quality control facilities. List of Regulations to be followed**.** Laboratory safety procedure- glass ware, equipment safety, hands protection, precaution to be undertaken to prevent accident and contamination.
GLP – an overview and basic information, Scope. Principles of GLP: Test Facility Organization and Personnel, Test Systems, Test and Reference Items, Standard Operating Procedures, Performance of the Study, Reporting of Study Result, Storage and Retention of Records and Materials. Responsibilities in GLP. Implementing of GLP in non GLP analytical laboratory.

TEXT BOOKS

1. Weinberg, S., (1995). Good Laboratory Practice Regulations, 3rd edition, CRC Press, U.S.A.

2. Harburn, K., (1990). Quality Control of Packing Materials in Pharmaceutical Industry, CRC Press, U.S.A.

3. Chatwal, G.R., and Anand, S.K., (2003). Instrumental Methods of Chemical Analysis. 5th
4. Edition, Himalaya Publishing House, Mumbai.

5. Sharma, B.K., (2004). Instrumental Methods of Chemical Analysis, 24th Edition, Goel Publishing House, Meerut.

REFERENCES

1. Richard, A.G., Richard, G., (2009). New Drug Approval Process Drugs and the Pharmaceutical Sciences), 5th edition CRC Press, U.S.A.

2. Wenclawiak, B.W., Koch, M., Hadjicostas, E. (2004). Quality Assurance in Analytical Chemistry: Training and Teaching. 1st edition, springer. U.S.A.

3. Wilson, K., and Walker, J., (2010). Principles and Techniques of Biochemistry and
4. Molecular Biology, 7th Low Price Edition, Cambridge University Press, India.

Semester I

16BCP104 **CELLULAR BIOCHEMISTRY** **4H-4C**

Instruction hours per week: L: 4 T: 0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students

- To recall the knowledge in organization and dynamics of mitochondria.
- To understand the molecules within the cell and interaction between cells that allows construction of multicellular organisms.
- To understand cytoskeleton network and extracellular matrix.
- To learn cell signaling mechanisms and pathways
- To understand cell cycle, cell division and cell death process.
- To recognize cancer and mutational changes at gene level.

Course outcomes (CO's)

Upon successful completion of this course, participants will be able to:

1. Recognize the organization and dynamics of mitochondria.
2. Recognize cell cell interaction and their mechanism.
3. Maintain cytoskeleton structure and functions of micro, macro and intermediary filaments.
4. Recognize the cell signaling mechanisms and pathways.
5. Enumerate the phases of cell cycle, events in cell division and mechanism of cell death
6. Relate properties of cancerous cells to mutational changes in gene function.

UNIT I

Membrane: Membrane bilayer- models, Membrane lipids- fluidity, asymmetry, phase transition, Liposomes.

Membrane proteins – Types, Orientation, Mobility – Experiments, flippases, proteins of RBC membrane, RBC ghosts, Bacteriorhodopsin, Porins – aquaporin.

solubilisation of proteins, lipid anchored proteins, Carbohydrates – cell surface carbohydrates – Lectins and selectins.

UNIT II

Membrane transport: Passive diffusion, facilitated diffusion in erythrocytes, Carriers and ion channels, Ion concentration gradients.

Uniporter Catalyzed transport, active transport systems. Transport process driven by ATP- Ion pumps: Calcium ATP ase; Na^+ K^+ ATPase; Mechanism, Gastric H^+ K^+ ATPase, ABC superfamily – ATPases that transport peptides and drugs (MDR proteins).

Co-transport by Symporters and antiporters, Group translocation.

Osmosis and receptor mediated endocytosis.

UNIT III

Mitochondria – Reduction potential, electron transport chain – Complexes, Q-cycle, Cyt C oxidase complex, Translocation of protons and the establishment of a proton motive force, machinery for ATP formation and chemi-osmotic mechanism, ATP synthase – Experiments, inhibitors and uncouplers of oxidative phosphorylation.
Microfilaments – Actin – Stuctures, Assembly, Myosin. Microtubules – Organisation and dynamics, kinesin and dynein. Cilia and flagella – Structure and functions, intermediary filaments.

UNIT IV
Cell – Matrix interaction: Cell – Cell interaction: Extra cellular matrix; Collagen, hyaluronan and proteoglycans, laminin, integrins and fibronectins.
Cell – Cell adhesion: Specialised junctions – Desmosomes, Gap junctions, Tight junctions. Adhesion molecules – Cadherins, Connexins.

Cell – Cell signaling – Signalling molecules and their receptors; functions of cell surface receptors, pathways of intracellular signal transduction, second messengers, G-protein coupled receptors, receptor tyrosine kinases, Ras, MAP kinases.

UNIT V
Cell cycle and cancer: Cell cycle and its control, Cell cycle control in mammalian cells, checkpoints in cell cycle regulation.
Cancer: Properties of tumour cells and genetic basis and onset of cancer.
Tumour viruses – DNA & RNA Viruses as transforming agents – mechanism.
Tumour suppressor genes and functions of their products. Carcinogenic effect of chemicals and radiation. Apoptosis (Programmed cell death) – pathways, regulators and effectors on apoptosis.

TEXT BOOKS

1. Paul, A., (2009). Text Book of Cell and Molecular Biology,1st edition. Books and Allied (P) Ltd, Kolkata.

2. Cooper, G.M., and Hausman, R.E., (2013).Cell-A Molecular Approach, 6th Edition.. Sinauer Associates. USA.

3. Gerald, K., 2013. Cell and Molecular Biology, 7th edition. John Wiley and Sons, Inc, Hoboken, United States.

4. Nelson, D.L., and Cox, M.M., (2012). Lehninger's Principles of Biochemistry, 6th edition. W.H.Freeman and company, New York.

REFERENCES

1. Lodish, H., Berk, A., Kaiser, C.A., and Krieger, M., (2012). Molecular Cell Biology, 7th edition. W.H. Freeman & Company, London.

2. Garrette & Grisham, (2004). Principles of biochemistry, 4th edition. Saunders

college publisher, Philadelphia,United States.

3. Alberts, B.,, Johnson, A., Lewis, J., and Raff, M.,. (2007). Molecular Biology of the Cell, 5th edition. Garland Publishing Co.New York.

Semester I

16BCP105A **CORE ELECTIVE -I** **4H-4C**

PLANT BIOCHEMISTRY

Instruction hours/week:L: 4 T: 0 P: 0Marks: Internal: **40** External: **60**Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students

- To recollect the knowledge in plant cell organelles and their functions
- To understand the functions and regulations of major biosynthetic pathways of plants,
- To learn and understand the role of plant growth substances in various stages of plant growth
- Obtaining knowledge on tissue culture techniques
- To learn metabolic engineering to increase the production of plant secondary metabolites
- To become familiar with the transformation process and its applications

Course outcomes (CO's)

Upon successful completion of this course, participants will be able to:

1. Recall the understanding of plant cell organelles and their functions
2. Recognize the source of food for other organisms and their synthesis in plants
3. Recall the role of plant growth substances in various stages of plant growth
4. Equip with tissue culture techniques
5. Understand the role of secondary metabolites and their production and importance
6. Equip with gene transfer techniques

UNIT I

Plant cell: Structure of plant cell – cell wall, vacuoles, plastids, mitochondria, peroxisomes and Golgi complex. Overview of photosynthesis: photosynthetic apparatus, reaction center, photosystems I and II, mechanism of photosynthesis-cyclic and non cyclic photophosphorylation; evidences in support of light and dark reactions.

UNIT II

Assimilatory mechanisms in plants: Photorespiration and water consumption, CO_2 assimilation by C3 and C4 plants, CAM plants. Nitrogen assimilation; reduction of nitrate, nitrogen fixation in symbiotic and non-symbiotic plants, nitrogen cycle. Sulphate metabolism in leaf; sulfite reduction and sulphur cycle, glutathione synthesis. Carbon and phosphorus cycles.

UNIT III

Lipid metabolism in plants: Biosynthesis of fatty acids in plastids, synthesis of waxes, triacyl glycerols and glycolipids. Synthesis of chlorophyll. Carotenoid formation. Synthesis of nitrogenous compounds: caffiene synthesis, ureide synthesis in nodulated legumes.

Secondary oxidative mechanisms: β- oxidation, ω- oxidation, glyoxylate pathway.

UNIT IV

Plant growth substances: chemistry, biosynthesis, mode of action and physiological role of auxins, gibberellins, cytokinins, abscisic acid and ethylene. Factors influencing endogenous growth- Biotic and Abiotic factors. Phytochromes: molecule, biological display, functions as light sensor. Senescence: biochemical changes, regulation.

UNIT V

Plant secondary metabolites: Synthesis of secondary metabolites- shikimate pathway. Alkaloids, flavonoids, terpenoids, phenols and glycosteroids-Occurrence, distribution & functions, Production of secondary metabolites in plants, stages of secondary metabolite production, PTC- Totipotency, meristematic and nodal cultures-Callus induction. Somatic embryogenesis. Metabolic engineering for increased production of secondary metabolites.

TEXT BOOKS

1. Verma,S.K., and Verma, M., (2010). A Text Book of Plant Physiology, Biochemistry and Biotechnology. 7th edition.S.Chand and Co, New Delhi.
2. Anderson, J.W., and Beardall, J., Molecular Activities of Plant cells-An introduction to Plant Biochemistry. Blackwell Scientific Publications.
3. Goodwin,T.W., and Mercer, E.I., Introduction to Plant Biochemistry, 1st edition, Robert Maxwell.M.C Publisher, New York.
4. Bonner, J., and Varner, J.F., Plant Biochemistry. 3rd edition. Academic Press, New York.

REFERENCES

1. Buchannan, B., (2002). Biochemistry and Molecular Biology of Plants, IK. International, New York.
2. Heldt, H.V., (2005). Plant Biochemistry and Molecular Biology, Oxford University Press, England.
3. Wink, M., (2010). Functions and Biotechnology of Plant Secondary Metabolites, Second edition, Blackwell Publishing Ltd, London.
4. Heldt, H.W., Piechulla, B., Heldt, F., (2011). Plant Biochemistry, Fourth Edition, Academic Press Publication, London, UK.

Semester I

16BCP105 B **CORE ELECTIVE –I** **4H-4C**

PLANT TISSUE CULTURE

Instruction hours/week:L: 4 T: 0 P:0 **Marks:** Internal**: 40** External**: 60Total: 100**

End Semester Exam: 3 Hours

Course Objectives:
Equip the students

- To understand the role of nutrients and hormones in plant growth and development
- To gain knowledge on media composition for plant tissue culture
- To maintain aseptic condition in laboratory
- To gain knowledge on setting up of plant tissue culture laboratory
- To understand plant transformation techniques
- To understand the applications of plant tissue culture

Course Outcomes (COs):
After completion of this course the student will be able to

1. Understand the role of nutrients and hormones in plant growth and development
2. Design media composition for plant tissue culture
3. Maintain aseptic condition in laboratory
4. set up a plant tissue culture laboratory
5. Carryout plant transformation techniques
6. Apply plant tissue culture for mass production of significant products.

UNIT I
Growth and Development:
Role of Plant Hormones in growth & development. Plant Nutrition - Effect of soil pH on mineral availability, uptake & assimilation of minerals and their physiological role.
Impact of macro, micro, vitamins in plant growth development. Allelopathic effect.

UNIT II
Introduction to plant tissue culture: Totipotency, Tissue culture Media (Composition and preparation). Nutritional components of tissue culture media. Plant Hormones- Types, structures, biosynthesis & metabolism. Basic concepts of aseptic cultures and its uses Different areas and applications of plant tissue culture.

UNIT III
Basic techniques in tissue culture: Design & lab setup of Tissue Culture laboratory. Types of culture, Initiation of callus and suspension cultures, Micro propagation (Organogenesis, Somatic Embryogenesis, Shoot tip culture, Rapid clonal propagation, Embryo Culture and Pollen culture).Production of haploids and their application, Storage of plant genetic

resources and Cryopreservation.

UNIT IV

Plant transformation technology: Ti &Ri Plasmid and thier transfer mechanisms, Use of Ti &Ri as vectors, Binary vectors, Use of 35s & other promoters genetic markers- methods of nuclear transformation, viral vectors & their applications, Use of reporter gene, Particle bombardment ,electroporation, Microinjection, Chloroplast transformation- transplastomics, Transformation of monocots, Transgene stability & gene silencing in Plant transformation.

UNIT V

Plant tissue culture and its applications: Transgenic plants - for– biotic (weeds, insects, viruses, fungi and bacteria) and abiotic (drought, salt, temperature, poor soil quality and oxidative) stress tolerance. Production of secondary metabolites. Molecular farming(improvement in protein, lipids, carbohydrates). Plant antibodies, vaccines, therapeutic proteins and active principles. Biofortication of important crops (rice and banana).

TEXT BOOKS

1. Davies, K., (2004). "Plant pigments and their manipulation" – Annual plant revies, vol 14 Blackwell Publication, UK
2. Slater, A., Scott, N.W., Fowler, M.R., (2008) "Plant Biotechnology: the genetic manipulation of plants" Oxford Press, UK
3. Altman, A., Hasegawa, P.M., (2012) "Plant Biotechnology and agriculture. Prospect for the 21st century" Academic press,USA.

REFERENCES

1. Brown, T. A., (2010). "Gene Cloning and DNA Analysis: an introduction", 6th edition, Wiley-Blackwell Publisher, UK.
2. Chawla, H.C., (2009) " Introduction to plant biotechnology 3r^{d} Edition", Oxford & IBH publication Pvt .Ltd, New Delhi.
3. Primrose, S.B., and Twyman, R.M., (2003). "Principles of Genome Analysis".Blackwell Publishing, Oxford.
4. Winnacker, E., (2003). "From Gene to Clones ; Introduction to gene technology", 4th edition, Panima Publisher, India

Semester I

16BCP105C **CORE ELECTIVE -I BIOPHARMACY** **4H-4C**

Instruction hours/week:L:4 T:0 P:0 **Marks:** Internal: **40** External: **60**Total: **100**
End Semester Exam: 3 Hours**Course**

Course objectives
Equip the student

- To explain the relationship among physicochemical and biological factors, dosage forms,
- To understand the routes of administration and therapeutic outcomes;
- To illustrate the principles of pharmaceutics and biopharmaceutics in dosage form design and development;
- To describe production procedures
- To learn quality control measurements and stability improvements for tablets and sterile products and different routes of drug administration in principles and applications
- To identify the needs and differences in drug use for various patient groups, and devise appropriate strategies from perspectives of dosage forms.

Course outcomes (CO's)
After completion of this course the student will

1. Explain biopharmaceutical, physiological, biochemical and cell biology-related aspects
2. Understand the transport and metabolism of drugs in the gastrointestinal tract and in the liver.
3. Explain mechanisms behind the transport of drug and metabolism and how drugs can interact with other drugs and food and methods to study these
4. Have developed its ability to plan, compile, analyse and report experiment that has importance for biopharmaceutical issues -
5. Recognize the regulatory requirements within the biopharmaceutical area
6. Describe the role of biopharmaceutics in drug development within the pharmaceutical industry

UNIT I
Phytochemistry: Authentication of medicinal palnts,Biosynthesis of primary and secondary metabolites - alkaloids, terpenoids. Phenolic compounds and coumarins.Classification and sources of alkaloids. Major classes in phenolic compounds – carotenoids, flavonoids, tannins and phenolic acids. Classification of terpenoids.

UNIT II
General extraction and isolation techniques for compounds from plants. Techniques involved in extraction of phytochemicals – Perculation, Soxhlet extraction,

Supercritical Fluid extraction, Pilot scale extraction, reflux and other methods. Factors affecting extraction.

UNIT III

Isolation and purification techniques – Thin layer and Column chromatography. Chemical fingerprinting – HPLC, HPTLC, FTIR, NMR and GC-MS.

UNIT IV

Biotechnology of medicinal plants: Production of secondary metabolites from plant culture. Indian Standard Specifications (ISI) laid down for sampling and testing of various drugs in finished form by the Bureau of Indian Standards. Toxicity testing in drugs and Safety.

UNIT V

Bioactive studies: Anticancer, antidiabetic, anti-inflammatory, hepatoprotectives, antimicrobials from medicinal plants. Antioxidants of plant origin – Reactive Oxygen Species (ROS), antioxidant polyphenols.

REFERENCES

1. Harborne, J.B., (1998). Phytochemical methods to modern techniques of plant analysis. Chapman & Hall, London.

2. Trease, G.E., Evans, M.C., (1979). Textbook of Pharmacognosy, 12th edition. Balliere-Tindal, London.

3. Khan, I.A., and Khanum, A., (Eds.). (2004). Role of Biotechnology in medicinal and Aromatic plants, Vols. I-X. Ukaaz Publications, Hyderabad.

Semester I

16BCP111 **PRACTICAL- I** **4H-2C**

QUANTITATIVE ESTIMATION AND SEPARATION TECHNIQUES

Instruction hours / week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60**Total: **100**
End Semester Exam: 3 Hours

Course objectives

- To provide hands on experience on preparation of buffers and determination of pH of solutions
- To estimate the macromolecules quantitatively thro colorimetric procedures
- To perform fluorometric experiments and titrimetry
- To separate the macromolecules using TLC and column chromatography.
- To perform the secondary metabolite quantification using HPLC.
- Gain hands on training in protein extraction and purification techniques.

Course outcomes (CO's)
After completion of this course the student will

1. Prepare buffers and reagents based on the needs of experiments
2. Estimate macromolecules quantitatively thro colorimetric procedures
3. Estimate vitamins and calcium using fluorimetry and titrimetry
4. Quantify secondary metabolites using HPLC
5. Separate the macro molecules using TLC and column chromatography
6. Extract and purify protein from various source

Colorimetry
1. Isolation and estimation of starch from potato (Anthrone method)
2. Isolation and estimation of glycogen from liver (Anthrone method)
3. Estimation of Total carotenoids (Spectroscopic method)
4. Estimation of fructose in fruits (Resorcinol method)
5. Estimation of ascorbic acid (DNPH method)
6. Estimation of Vitamin E (Dipyrridyl method)

Fluorimetry
7. Estimation of thiamine from cereals or fruits
8. Estimation of riboflavin

Titrimetry
9. Estimation of lactose in milk
10. Estimation of calcium in milk

Separation techniques
11. Separation of amino acids by paper chromatography- circular, ascending & Descending.
12. Separation of plant pigments by TLC.

13. Separation of plant pigments by column chromatography.
14. Estimation of quercetin using HPLC (Demo).

Cell biology:

15. Preparation of standard buffer and determination of pH of buffers.
16. Subcellular fractionation by differential centrifugation and purity assessment with marker enzymes (Group Experiment).
17. Salting out of proteins using ammonium sulphate precipitation

REFERENCES

1. Jayaraman, J., (2007). Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi.

2. Sadasivam, S.,and Manickam, A., (2009). Biochemical Methods, New Age, International Publishers, New Delhi.

3. Singh, S.P., (2009). Practical Manual of Biochemistry, CBS Publishers, New Delhi.

Semester I

16BCP112 **PRACTICAL – II** **4H-2C**

PLANT BIOCHEMISTRY AND MICROBIOLOGY

Instruction hours/week: L:0 T:0 P: 4 **Marks:** Internal: **40** External**: 60Total: 100**

End Semester Exam: 3 Hours

Course objectives

Equip the students

- To screen phytochemicals and estimate the amount of secondary metabolites
- To handle microbiological techniques
- To identify microbes in soil and water samples
- To isolate, characterize and purify microbial enzymes
- To perform antibacterial activity of active compounds
- To gain hands on experience in plant tissue culture

Course outcomes (CO's)

After completion of this course the student will perform

1. Phytochemical screening and secondary metabolite estimation
2. Microbiological techniques
3. Microbial identification in soil and water samples
4. Isolation, characterization and purification of microbial enzymes.
5. Antibacterial activity of active compounds
6. Callus induction and regeneration of plantlets

Plant Biochemistry

1. Phytochemical screening of any one selected medicinal plant
2. Estimation of Tannins
3. Estimation of Flavonoids
4. Estimation of Chlorophyll
5. Estimation of Phenols

MICROBIOLOGY

6. Isolation of pure culture – serial dilution, pour plate, spread plate, streak plate methods.
7. Colony morphology – colony counting.
8. Staining techniques- simple, differential, spore, and fungal staining.
9. Antibiotic resistance / sensitivity test (Disc method)
10. Estimation of bacteria- growth curve of bacteria and generation time.
11. Identification of microorganisms – biochemical tests (IMVIC test)(Group Experiment)
12. Microbiology of potable water
13. Isolation, characterization and purification of ANY one of the following microbial enzymes
    a) Amylase
    b) Protease
14. Assay of Antibacterial of ANY ONE selected medicinal plant by Disc or Well diffusion and broth dilution method.

15. Assay of antifungal activity of ANY ONE selected medicinal plant by Disc or Well diffusion. TLC- Bioautography.

PLANT TISSUE CULTURE (Group experiment)

16. Preparation of tissue culture media
17. Surface sterilization
18. Induction of meristem culture
19. Callus induction.
20. Regeneration of shoot and root from callus culture.

REFERENCES

1. Wagner, H., and Bladt, S., (1996). Plant drug analysis. Springer Science & Business media 2nd edition

2. Jayaraman, J., (2011). Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi.

3. Kannan, N., (2003). Laboratory Manual in Microbiology, Panima Publishing Corporation, Bangalore.

4. Sadasivam, S.,and Manickam, A., (2009). Biochemical Methods, New Age, International Publishers, New Delhi.

5. Singh, S.P., (2009). Practical Manual of Biochemistry, CBS Publishers, New Delhi.

6. Talib, V.H., (2007). A Handbook of Medical Laboratory Technology, CBS publishers,2nd edition. New Delhi.

7. Varley, H., (2003). Practical Clinical Biochemistry, CBS Publishers, New Delhi.

Semester II

16BCP201 REGULATION OF METABOLIC PATHWAYS 4H-4C

Instruction hours/week:L: 4 T:0 P:0Marks: Internal: **40** External: **60**Total: **100**

End Semester Exam: 3 Hours

Course objectives

- To shed knowledge on generation and transformation of energy in metabolic pathways.
- To know the metabolic pathway of carbohydrate and their regulation with associated disorders.
- To learn fatty acid synthesis and degradation and their regulation
- To study the regulation of amino acid metabolismand its regulations with Metabolic disorders.
- To understand the inter relationship of carbohydrate, lipid , protein and nucleic acid metabolism and understand the importance of TCA cycle.
- To aware about the homeostatis of glucosemetabolites by intrinsic and extrinsic control mechanism.

Course outcomes (CO's)

After completion of this course the student will perform

1. Gain knowledge on glucose anabolic and catabolic pathways that ultimately control the glucose homeostatis.
2. know the metabolic pathway of amino acid and their regulation with associated disorders.
3. learn fatty acid synthesis and degradation and their regulation
4. Able to explain the role of lipids, their metabolism and their stringent control by hormones and other factors.
5. Understand the anabolic and catabolic processes associated with amino acids and nucleic acids and their regulation.
6. Able to understand the energy homeostatis during starvation and energy excess

UNIT I

Introduction to control of enzyme activity: Allosteric interaction; Reversible covalent modification; proteolytic action; control of amount of enzyme; control of rates of enzyme degradation; feed back inhibition; feed forward stimulation. Role of compartmentation. Elucidation of Metabolic pathways- Single-and Multi-step pathways. Experimental approaches to study the metabolism- using metabolic inhibitors and isotopes.

UNIT II

Carbohydrate Metabolism: An overview of Glycolysis and Gluconeogenesis. Regulation of Glycolysis and Gluconeogenesis-Reciprocal control of Glycolysis and Gluconeogenesis, TCA cycle- steps, regulation at branch points; Glycogen Metabolism: Overview of glycogenesis and glycogenolysis. Reciprocal control of glycogenesis and glycogenolysis. Hormonal regulation of fuel metabolism; Metabolic disorders-Diabetes mellitus and insipidus.

UNIT III

Lipid metabolism: An overview of fatty acid synthesis and degradation, Regulation of fatty acid synthesis- control of acetyl CoA carboxylase and fatty acid synthetase complex; Reciprocal control of fatty acid synthesis and degradation. Biosynthesis of triacyl glycerol, phosphatidyl choline, phosphotidyl ethanolamine and sphingomyelin and their regulation. Synthesis and degradation of cholesterol and its regulation. Obesity and regulation of body mass. Metabolic disorders- Atherosclerosis, Hyper and hypo lipoproteinemia.

UNIT IV

Amino acid metabolism: Regulation of synthesis of aspartate and aromatic family of aminoacids. Key role of glutamate dehydrogenase and glutamine synthetase in nitrogen metabolism and their allosteric regulations. Amino acid degradation- deamination, decarboxylation and transamination. Regulation of urea cycle. Biosynthesis of heme (porphyrin) and its regulations. Molecules derived from aminoacids. Metabolic disorders- Alkaptonuria, phenyl ketonuria.

UNIT V

Nucleic acid metabolism: De novo synthesis of purine and its regulation – Role of PRPP amino transferase. De novo synthesis of pyrimidine and its regulation – Role of aspartate carbomyl transferase. Regulation of deoxy ribonucleotides by activators and inhibitors. Tissue specific metabolism- Metabolic profile of major organs- Brain, Muscle, Liver and Adipose tissue. Intergration of metabolism. Metabolic disorders- Gout, SCID.

TEXT BOOKS

1. Lehninger, L., Nelson, D.L., and Cox, M.M., (2012). Principles of Biochemistry, 6th edition WH Freeman and Company, New York.

2. Murray, R.K., Bender, D.A., Botham, K.M., and Kennelly, P.J., (2012). Harper's illustrated Biochemistry, 29th Edition. McGraw-Hill Medical. London.

REFERENCES

1. Donald Voet and Judith Voet ,2004. Biochemistry, John Wiley and Sons,. 2ndEedition.
   New York

2. Lehninger L, D.L. Nelson and M.M. Cox, 2012, Principles of Biochemistry, 6th edition WH Freeman and Company, New York.

3. Leubert Stryer, 2009. Biochemistry, W.H. Freeman and Company. New York.

4. Pamila C. Champ and Richard A. Harvey ,2008. Biochemistry, Lipponcott Company,

Philadelphia.

5. Murray, R.K., Bender, D.A., Botham, K.M., and Kennelly, P.J., (2012).Harper's illustrated Biochemistry, 29th edition.. McGraw-Hill Medical. London.

6. Smith. 2003. Principles of Biochemistry, McGraw– Hill International Book Company,
London.

7. Zubay, G., (2009). Biochemistry, Wm.C Brown Publishers, Saunders and Company, Philadelphia.

16BCP202	MOLECULAR BIOLOGY	4H-4C

Instruction hours/week:L: 4 T:0 P:0Marks: Internal: **40** External: **60**Total: **100**
End Semester Exam: 3 Hours

Course objectives
Equip the students

- To acquire the knowledge on Organization of DNA in a genome and transposons
- To know the mechanism behind replication and repair.
- To enable the knowledge on transcription and translation.
- To understand the mechanism of Regulation of gene expression in prokaryotes
- To study the structure and remodeling of chromatin
- To learn the mechanism of Eukaryotic gene regulation

Course outcomes (CO's)
After completion of this course the student will

1. Acquire the knowledge on molecular structure of genes.
2. Understand the structure of nucleic acids and the DNA replication process
3. Learn about the process of transcription
4. Understand the mechanism of translation
5. Learn about gene regulation in prokaryotes
6. Learn about gene regulation in eukaryotes

UNIT I
Molecular structure of genes: Molecular definition of gene, chromosomal organization of genes and non-coding DNA, protein coding genes, tandomly repeated genes, single sequence DNA. Structural organization of eukaryotic chromosomes- histone proteins, chromatin, functional elements. Mobile DNA elements- bacterial IS elements, transposons, viral transposons and non- viral transposons. Mutation- types.

UNIT II
DNA replication and repair: General features of chromosomal replication. Enzymology of DNA replication, DNA replication machinery. Replication in prokaryotes and eukaryotes- Initiation, elongation and termination. DNA damage-types. Repair mechanism of DNA damage-all types.

UNIT III
Transcription: prokaryotic gene transcription**-** Initiation, elongation and termination. Eukaryotic gene transcription- transcription unit, RNA polymerases- types, Transcription and processing of mRNA, tRNA and rRNA. Regulatory sequences in protein coding genes-TATA box, initiators, CpG island, promoter-proximal element, activators and repressors of transcription, Multiple transcription control elements. Regulation of transcription factor activity by lipid-soluble hormones.

UNIT IV
Translation: Deciphering genetic code, features. Wobble hypothesis. Initiation, elongation and termination of prokaryotic and eukaryotic translation. Fidelity of translation. Post translational modifications-all types; Protein targeting-Targeting protein to nucleus, ER, Golgi complex. Protein degradation- ubiquitin mediated degradation.

UNIT V

Prokaryotic gene regulation: Operon model, Lac, trp and ara operons. Regulatory proteins-DNA binding domain, protein- protein interaction domain. Recombination- holiday model, Rec BCD enzymes, Rec A protein, Messelson Radding model, site- specific recombination. Antisense RNA technology.

Eukaryotic gene regulation: Transcriptionally active chromatin, chromatin remodeling, DNA binding transactivators and coactivators. Regulation of gene expression by intracellular and intercellular signal, RNAi.

TEXT BOOKS

1. Watson, J. D., Hopkins, N. H., Roberts, J. W., Steitz, J. A., and Weiner, A. M., (2005)
2. Molecular biology of the gene, The Benjamin/Cummings publishing companies, Inc, California.
3. Lewin, B., (2008) Genes IX, Oxford University Press, 9th Edition, Oxford, London,
4. Weaver, R. F., (2008) Molecular biology, WCB McGraw-Hill companies, 6th Edition.Inc, New York.

REFERENCES

1. Lodish, H., Berk, A., Kaiser, C.A., and Krieger, M.,. (2012). Molecular Cell Biology, 7th edition. W.H. Freeman & Company,
2. Lehninger, L., Nelson, D.L., and Cox, M.M., (2012). Principles of Biochemistry, WH
3. Freeman and Company, 6th Edition, New York.
4. Kornberg, A., Baker, A., (2005). DNA replication, W.H. Freeman and Co, USA.
5. Cooper, G.M., and Hausman, R.E., (2013). Cell-A Molecular Approach, 6th Edition.. Sinauer Associates. USA

Semester II

16BCP203 **ENDOCRINOLOGY** **4H-4C**

Instruction hours/week:L: 4 T:0 P:0 **Marks:** Internal: **40**External: **60**Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Hypothalamo - Hypophyseal axis
- Classification of hormones
- Mechansim of action of peptide and steroid hormones
- Endocrine pathologies
- Endocrinology of pregnancy
- Investigative techniques in endocrinology

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Course outcomes (CO's)

After successful completion, the students will understand:

1. Hypothalamo - Hypophyseal axis
2. Different classification of hormones
3. Functioning of peptide and steroid hormones
4. The molecular and cellular basis of endocrine pathologies
5. Role of hormones in different stages of gestation
6. The techniques involved in the assessment of endocrine functions

Unit I: General Introduction and Hypothalamo-hypophyseal axis

Chemical signaling – endocrine, paracrine, autocrine, intracrine and neuroendocrine mechanisms. Chemical classification of hormones, transport of hormones in the circulation and their half-lives. Hormone receptors – extracellular and intracellular. Receptor – hormone binding, Scatchard analysis. Releasing/release inhibiting hormones (TRH, GnRH, CRH, GHTH, somatostatin, dopamine) their structure, secretion and regulation

.

Unit II: Protein/Peptide hormones, Steriod and Thyroid hormones

GH, Prolactin, ACTH, insulin, glucagon, PTH and calcitonin) and glycoprotein hormones (TSH, FSH, LH) – Structure, Syntheisis – release and regulation. Sex steroids and adrenal corticoids – structure, synthesis, release, transport, regulation and metabolism. Structure, synthesis, secretion, regulation, transport and metabolism of thyroid hormones.

Unit III: Hormones and gonads

Physiological action of hormone in the regulation of spermatogenesis, sperm maturation, Oogenesis and menstrual/estrus cycles. Gonadal and adrenal steroidogenesis. Cell-cell communication – Two cellconcept. Hormonal control of implantation, gestation and lactation; hormonal contraception. Oxytocin and parturition.

Unit IV: Hormone action

Protein and steroid hormone receptors and their ignaling cascades; non-genomic modes of action; Ras-Raf-MAPK ignaling- PI3K ignaling and genomic actions of hormones- thyroid hormone nuclear receptor super family- Angiotensin- Rennin angiotensin system- , atrial natriuretic hormones, recycling and degradation of receptors. Vasopressin and water retention.

Unit V: Investigative techniques in endocrinology

Hormone assays, RIA, IRMA, Radio receptor assay, extraction, purification, and quantification of hormone receptors (cell surface, cytosolic and nuclear receptors, semen analysis. Radiolabeling techniques – Radioiodination of peptides, autoradiography. Properties of different types of radioisotopes commonly used in biology, radioactivity, detection and measurement of radioactivity, safely guidelines and disposal procedures.

REFERENCES

1. Burtis, C.A., and Edward R. Tietz, E.R., (1999) Textbook of Clinical Chemistry 3rd Edition, WB Saunders Harcourt Brace & Company Asia PTE Ltd., USA.

2. Lehninger, L., Nelson, D.L., and Cox, M.M., (2012). Principles of Biochemistry, WH
3. Freeman and Company, 6th Edition, New York.

4. Hadley, M.C., and Levine, J.E., (2007) Endocrinology 6th ed.,. Pearson Education (New Delhi), Inc. ISBN: 978-81-317-2610-5.

5. Cooper, G.M., and Hausman, R.E., (2009) The Cell: A Molecular Approach 5th Ed.. ASM Press & Sunderland, (Washington DC), Sinauer Associates. (MA). ISBN:978-0-87893-300-6.

6. Widmaier, E.P., Raff, H. and Strang, K.T. Vander's Human Physiology (2008) 11th ed., McGraw Hill International Publications, ISBN: 978-0-07-128366-3.

Semester II

16BCP204 BIOINFORMATICS 4H-4C

Instruction hours / week:L: 4 T:0 P:0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam: 3 Hours

Course objective

Equip the students

- To make students understand the essential features of the interdisciplinary field of science for better understanding the biological data.
- To retrieve the sequence analysis of Nucleic acid and protein
- To create opportunity to interact with algorithms, tools and data in current scenario.
- To make the students look at a biological problem from a computational point of view.
- To find out the methods for analyzing the expression, structure and function of proteins,
- To understand the relationships between species.

Course outcomes (CO's)

After completion of this course the student will perform

1. Acquire the knowledge on biological data, submission and retrieval from databases.
2. Able to make experiment pair wise and multiple sequence alignment
3. Analyze the secondary and tertiary structures of protein sequences.
4. Understand the data structure (databases) used in bioinformatics and interpret the information (especially: find genes; determine their functions),
5. Understand and be aware of current research and problems relating to this area.
6. Knowledge on applications of bioinformatics

UNIT I

Definition, concepts of Bioinformatics: Objectives, History of Bioinformatics, Milestones, Genome sequencing projects, Human Genome Project- Science, applications and ELSI.
Introduction to Biological databases: Types of databases, sequence databases-nucleic acid sequence databases, GenBank, protein sequence database, Swiss-Prot, PIR, motif database-PROSITE, structural databases, bibliographic databases and organism specific databases-GMOD- Searching and retrieval of data-Entrez and SRS.

UNIT II

Introduction to sequence Alignment: Pairwise and multiple sequence alignment, substitution matrices, Similarity searching programs, BLAST, FASTA, Multiple sequence alignment – CLUSTAL, Phylogenetic analysis-PHYLIP theory of phylogeny, tree building methods.

UNIT III

Protein prediction strategies and programs: Protein Secondary Structure Prediction, three dimensional structure prediction-Comparative modeling, threading, protein folding and visualization of molecules – Visualization tools-RasMol, Deep View.

UNIT IV

Gene Identification and Prediction: Gene Mark, Gene Scan, Pattern Recognition, Global gene expression studies-DNA Micro array.

UNIT V

Applications of Bioinformatics-Molecular medicine, biotechnology, agricultral, Computer Aided Drug Designing- Lead molecules, properties, ADME profiles, QSAR. receptors, docking.

REFERENCES

1. Lesk, A.M., (2014). Introduction to Bioinformatics, 4th edition. Oxford University Press, Oxford.

2. Attwood, K., and Parry-Smith, J., (2003). Introduction to Bioinformatics, Pearson Education, Singapore.

3. Baxevanis, A.D., and Quellette, B.F.F., (2001). Practical Guide to the Analysis of Genes and Proteins, John Wiley & Sons, New York.

4. Mount, D.W., 2013. Bioinformatics: Sequence and Genome Analysis. 2nd edition, Cold Spring Harbour Laboratory Press, New York.

5. Ignacimuthu, S., (2013). Basic Bioinformatics, 2nd edition Alpha Science Intl Ltd Chennai.

6. Rastogi, S.C., Mendiratta, N and Rastogi, P., (2004). Bioinformatics – Concepts, Skills, Applications. CBS Publishers & Distributiors, New Delhi.

7. Rastogi S.C and Mendiratta, N., (2006). Bionformatics Methods and applications
8. Genomics, Proteomics and Drug Discovery 2nd Edition, Parag Rastogi Publication, India.

9. Sundararajan, S., and Balaji, R., (2003). Introduction to Bioinformatics, Himalaya Publishing House, Mumbai.

Semester II

16BCP205A **CORE ELECTIVE –II** **4H-4C**

RECOMBINANT DNA TECHNOLOGY

Instruction hours/week:L:4 T:0 P:0 **Marks:** Internal: **40** External: **60**Total: **100**

End Semester Exam: 3 Hours

Course objective

Equip the students

To make the student to understand the concept of gene manipulation and gene transfer technologies.

- To understand the concept of recombinant DNA technology or genetic engineering
- To interpret the characterization of recombinant protein
- To infer the knowledge on cDNA
- To expose students to the application of recombinant DNA technology in biotechnological research.
- To train students in strategizing research methodologies employing genetic engineering techniques.
- To understand the applications of recombinant DNA technology

Course outcomes (CO's)

After completion of this course the student will

1. Understand the application of genetic engineering techniques in basic and applied experimental biology
2. Learn the concept of recombinant DNA technology or genetic engineering
3. Understand the expression of gene cloning vectors
4. Explore the knowledge on genomic library
5. Proficiency in designing and conducting experiments involving genetic manipulation.
6. Describe DNA fingerprinting, and restriction fragment length polymorphism (RFLP) analysis and their applications.

UNIT I

Introduction to gene manipulation: Basic techniques- Isolation and purification of nucleic Acids, Agarose gel Electrophoresis. Hybridization of nucleic acids-probes and types. Hybridization techniques-Southern, Northern, Western blotting. DNA and RNA markers.

UNIT II

Gene cloning vectors: Plasmids, bacteriophages, phagemids, cosmids, Artificial chromosomes- BAC, YAC, HAC. Restriction mapping of DNA fragments, Map construction, Cloning in *E. coli*- Vector engineering and codon optimization. Gene expression in *E.coli.* Expression vector- PET vector. Genomic library.

UNIT III

Isolation and characterization of gene transcripts: Introduction, Converting mRNA transcripts into cDNA, Screening representative cDNA libraries, Functional sequencing of cDNA expression libraries. Expressed cDNAs compared with computer databases. Characterization of recombinant proteins- Processing, purification and refolding and stabilization-Insulin, hGH, tpA.

UNIT IV

Mutagenesis: Site-directed mutagenesis, *In vitro* mutagenesis-Linkers, synthetic oligonucleotides and transposons, Role of Tagging in gene analysis, Identification and isolation of genes through T-DNA or transposons.

Gene therapy- Different strategies for gene therapy, therapeutics based on targeted exhibition of gene expression and mutation correction *in vivo*, Gene therapy for inherited diseases, ADA, FH, Cystic fibrosis.

UNIT V

Transgenics: Gene transfer techniques- Microinjection, biolistic methods, vector based transfer.

Transgenic plants: Agrobacterium & Ti plasmids. Methods of engineering herbicide resistance plants, Stress resistance plants and modification of plant nutritional content (amino acids, β- carotene) Plants as bioreactors: edible vaccines.

Transgenic animals: Method of Engineering transgenic mice, transgenic cattle- applications

Biosafety- regularities and concerns. Societal impact of genetically modified food.

REFERENCES

1. Glick, B.R., Pasternak, J.J., and Patten, C.L., (2009). Molecular Biotechnology, 4th edition, Panima Publishing Corporation, Delhi.

2. Watson, J.D., Gilamn, M., Witkowski, J., and Zotler, M., (2006). Recombinant DNA, 3rd Edition. W.H. Freeman Company, New York.

3. Kingsman, S .M., and Kingsman, A.J., (2001). Genetic Engineering: An Introduction to Gene Analysis and Exploitation in Eukaryotes, 6th Edition. Blackwell Scientific Publication, Oxford.

4. Kreuzer, H., and Massay, A., (2008). Molecular Biology and Biotechnology, 3rd Edition Aim Press, Washington,DC.

5. Primrose, S. B., (2003). Molecular Biotech, 2nd edition, Panima Publications, New Delhi.

6. Sambrook, J., Fritch, E.F., and Maniate, T., (2001). Molecular Cloning, A Laboratory Manual, Cold Spring Harbor Laboratory Press, New York.
7. Strachan, T., and Read, A.P., (2003). Human Molecular Genetics, 3rd edition. John Wiley and Sons,Toronto. Canada.

Semester II

16BCP205B **CORE ELECTIVE –I I** **4H-4C**

ANIMAL TISSUE CULTURE

Instruction hours/week:L:4 T:0P:0 **Marks:** Internal: **40** External**: 60Total: 100**

End Semester Exam: 3 Hours

Course objectives

Equip the students

- To impart the knowledge on basic tissue culture techniques and limitations in products
- To study about tissue culture laboratory and safety – biohazards
- To extrapolate the different types of culture media
- To understand the various types of cultures
- To learn synchronization of cell cultures and cell division
- To know the importance of stem cell research and its applications.

Course outcomes (CO's)

After completion of this course the student will be able to

1. Demonstrate foundational knowledge of Cell culture techniques and competence in laboratory techniques.
2. Set up a tissue culture lab to carry out research based on cell lines.
3. Extrapolate the different types of culture media
4. Understand the various types of cultures
5. Learn synchronization of cell cultures and cell division
6. Know the importance of stem cell research and its applications.

UNIT I

Introduction, importance, history of cell culture development, different tissue culture techniques including primary and secondary culture, continuous cell lines, suspension culture, organ culture, advantages and limitations medical/pharmaceutical products of animal cell culture-genetic engineering of animal cells and their applications. Risks in a tissue culture laboratory and safety - biohazards.

UNIT II

Different types of cell culture media, growth supplements, serum free media, balanced salt solution, other cell culture reagents, culture of different tissues and its application. Facilities for animal cell culture-infrastructure, equipment, culture vessels. Biology and characterization of cultured cells-cell adhesion, proliferation, differentiation, morphology of cells and identification.

UNIT III

Primary cell culture techniques - mechanical disaggregation, enzymatic disaggregation, separation of viable and non-viable cells. Mass culture of cells - manipulation of cell line selection - types of cell lines -maintenance of cell lines - immobilization of cells and its application - synchronization of cell cultures and cell division - production of secondary metabolites - biotransformation - Induction of cell line mutants and mutations - cryopreservation – germplasm conservation and establishment of gene banks.

UNIT IV

Animal cell culture scale up: Scale up in suspension - stirrer culture, continuous flow culture, air-lift fermentor culture; Scale up in monolayer - Roller bottle culture, multi surface culture, multi array disks, spirals and tubes - monitoring of cell growth. Organ culture - whole embryo culture - specialized culture techniques - measurement of cell death.

UNIT V

Tissue engineering: Design and engineering of tissues - tissue modeling. Embryonic stem cell engineering - ES cell culture to produce differential cells - Human embryonic stem cell research. Transgenic animals-transgenic animals in xenotransplantation

TEXT BOOKS

1. Darling, D.C., and Morgan, S.J., (1994). Animal Cells Culture and Media, BIOS Scientific Publishers Limited.

2. Ranga, M.M., (2000). Animal Biotechnology,. Agrobios, India.

3. Satyanarayana, U., (2006). Biotechnology, Books and Allied (P) Ltd. India.

REFERENCES

1. Harris, A., (1996). Epithelial Cell Culture, Cambridge University Press, London.

2. Mathur, J.P., and David Barnes, D., (1998). Methods in Cell Biology, Volume 57, Animal Cell Culture Methods Academic Press.

Semester II

16BCP205C **CORE ELECTIVE –II** **4H-4C**

GENOMICS AND PROTEOMICS

Instruction hours/week:L: 4 T:0 P:0 Marks: Internal: **40** External: **60**Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students

- To provide a comprehensive theoretical knowledge on genomics and proteomics
- To learn the fundamentals, current techniques and applications.
- To update and strengthen basic concepts in proteomics and genomics
- To address the modern biological issues.
- To use the different methodologies, techniques and tools commonly used in genome sequencing, assembly and annotation.
- To understand the Characterization of protein complexes

Course outcomes (CO's)

After completion of this course the student will be able to

1. Identify and describe the different components in prokaryotic and eukaryotic genomes and proteomes.
2. Identify molecular mechanisms responsible for diseases.
3. Use the different methodologies, techniques and tools commonly used in genome sequencing, assembly and annotation.
4. Use the different methodologies, techniques and tools commonly used in proteomics.
5. Address the modern biological issues.
6. Characterize the protein complexes

UNIT I

Genome Sequencing: Introduction to Genes, Genome organization –prokaryotes and eukaryotes, Genetic markers- RFLP, Mini and Micro satellite, STS, EST, SSCP, RAPD, RFLP, SNP and SSR. Human Genome and Genomic analysis: Size, features, composition and characteristics of human genome – Sequence repeats, transposable elements, gene structure and pseudogenes.

UNIT II

Sequencing Genomes- methodology, chain termination method, chemical degradation method, shotgun sequencing and assembly of contiguous DNA sequence. cDNA and genomic library construction. Genomic Mapping: Different types of Genome maps and their uses, Genetic and Physical mapping techniques. Map resources. Practical uses of genome maps, NGS

UNIT III

Gene Expressions and Microarrays: Gene structure and pseudo genes. Concepts of microarrays, spotter analysis, Normalization –total intensity, using regression techniques, ratio statistics. Clustering Gene expression profiles-hierarchical, single-linkage, complete linkage, and average linkage. Tools for microarray analysis- MADAM, spot finder, SAGE Applications of Microarrays- Bioinformatics challenges in micro array design and analysis.

UNIT IV

Analytical Proteomics:RP-HPLC, Mass Spectrometry – ESI MS and MALDI techniques and applications. Characterization of protein complexes – protein-protein interactions, yeast two-hybrid system and protein micro arrays. Proteomics in drug discovery.

UNIT V

Experimental Proteomics: Proteome analysis- 2D gel electrophoresis: general strategy, immobilized pH gradients, sample preparation, isoelectric focusing, second dimension PAGE, staining, transfer of proteins from 2D gels, image acquisition and analysis of 2D gels. 2DE databases.

TEXT BOOKS

1. Brown, TA., (2002). Genomes. John Wiley & Sons. Singapore.

2. Pennington, S., and Dunn, M.J.,(2001). Proteomics: From Sequence to Function. Bios Scientific Pub.Ltd. Oxford.

3. Primrose, S.B., and Twyman, R.M., (2003). Principles of Genome Analysis. Blackwell Publishing, Oxford.

4. Simpson, R.P., (2004). Proteins and Proteomics. A Laboratory Manual. Cold Spring Harbor Laboratory Press, New York.

REFERENCES

1. Cantor, C.R., and Smith, CL., (1999). Genomics: The Science and Technology behind the Human Genome Project, John Wiley & Sons Pvt. Ltd. Singapore.

2. Stekal, D., (2003). Microarray Bioinformatics, Cambridge University Press, Cambridge.
3. Greg Gibson and Spencer V. Muse., A Primer of Genome Science. Sinauer Associates Inc. Publishers, Sunderlands, New York.

4. Liebler, (2001). Introduction to Proteomics, Tools for the New Biology. Humana Press, New Jersey. USA

5. Westermeier, R., and Naven, T., (2002). Proteomics in Practice. Wiley – VCH, Weinheim,Germany.

Semester II

16BCP211 PRACTICAL – III 4H-2C

MOLECULAR BIOLOGY AND ANIMAL BIOTECHNOLOGY

Instruction hours/week: L:0 T:0 P:4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students

- To understand the Molecular structure, functions of cells, molecules such as DNA, RNA, proteins.
- To understand the principles of animal cell culture and its application.
- To learnthe knowledge on quantity of DNA by Diphenylamine method
- To infer the Estimation of RNA by Orcinol method
- To know the Preparation of competent E coli- transformation
- To explore the knowledge on Ligation of DNA

Course outcomes (CO's)

After completion of this course the student will perform

1. To demonstrate knowledge and understanding of the molecular machinery of living cells, cell and tissue culture to manipulate.
2. Toexplore the genomes of animals for ways to improve the livestock for food production and biomedical purpose as well as and to analyse, interpret, and participate in reporting to their peers on the results of their laboratory experiments.
3. Identification of DNA by Agarose gel electrophoresis
4. Estimation of RNA by Orcinol method
5. Preparation of competent E coli- transformation
6. Ligation of DNA

MOLECULAR BIOLOGY

1. Isolation of DNA and RNA from liver
2. Estimation of DNA and RNA - UV method
3. Estimation of DNA by Diphenylamine method
4. Estimation of RNA by Orcinol method
5. Estimation of Protein by Lowry's method
6. Culturing and Isolation of Plasmid DNA
7. Agarose gel electrophoresis of DNA
8. Restriction digestion analysis of DNA (Demonstration)
9. Preparation of competent *E coli*- transformation (demonstration)
10. Determination of Molecular weight of polypeptides by SDS PAGE (group)
11. Polymerase Chain Reaction for amplification of DNA (demonstration)
12. Ligation of DNA
13. Southern Blot Analysis (Demonstration)
14. Western Blotting (Demonstration)

ANIMAL TISSUE CULTURE (Demonstration)

15. Preparation and Sterilization of media

16. Cell lines and maintenance -Trypsinisation, Passaging, Staging
17. Cell counting and cell staining
18. Cell viability determination – Tryphan blue exclusion.

REFERENCES

1. Freshney, R. I., (2010). Culture of Animal Cells - A Manual of Basic Techniques, 6th edition, John Wiley and Sons,Inc, Publication,NewYork.

2. Jayaraman, J., (2007). Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi.

3. Kannan, N., (2003). Laboratory Manual in Microbiology, Panima Publishing Corporation, Bangalore.

4. Sadasivam, S., and Manickam, A., (2009). Biochemical Methods, New Age International Publishers, New Delhi.

5. Singh, S.P., (2009). Practical Manual of Biochemistry, CBS Publishers, New Delhi.

6. Talib, V.H., (2003). A Handbook of Medical Laboratory Technology, CBS Publishers, New Delhi.

Semester II

16BCP212 **PRACTICAL – IV** **4H-2C**

BIOLOGICAL DATABASES AND ANALYSIS

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

To make the students

- To provide hands on experience on various biological databases
- To learn the retrieval of data from the biological databases
- To make them learn about pair wise and multiple sequence analysis.
- To learn and apply the statistical approaches
- To study the models for phylogenetic analysis and tree reconstruction.
- To teach them protein prediction methods and its validation.

Course outcomes (CO's)

The students shall be able to

1. The course will enable students to use various biological databases
2. The importance functions in the biological system.
3. The use computational approaches for pair wise, multiple and phylogenetic analysis.
4. Aware to predict the physio-chemical properties, protein structure and validation using computer-based labs.
5. Solve the biological problems using various computational tools and techniques.
6. Visualization of Protein structure by RASMOL.

Experiments

1.Biological Databanks Sequence databases, Structure Databases, Specialized databases

2. Data base file formats.

3. Data retrieval tools and methods (PUBMED, ENTREZ, SRS)

4. Sequence Similarity searching (NCBI- BLAST, FASTA)

5. Protein sequence analysis (ExPASY proteomics tools)

6. Multiple sequence alignment (Clustal-W)

7. Gene structure and function prediction (Using ORF Finder, Genscan, GeneMark)

8. Molecular Phylogeny (PHYLIP)

9.Sequence Analysis using EMBOSS

10. Protein structure visualization – RASMOL (Menu function and Command line entries), Deep View.

REFERENCES:

1. Lesk, A.M., (2014). Introduction to Bioinformatics, Oxford University Press, Oxford.

2. Attwood, K., and Parry-Smith, J., (2003). Introduction to Bioinformatics, Pearson Education, Singapore.

3. Baxevanis., A.D., and Quellette, B.F.F., (2001). Practical Guide to the Analysis of Genes and Proteins, 3rd edition, John Wiley & Sons, New York.

4. Mount, D.W., (2013). Bioinformatics: Sequence and Genome Analysis. Cold Spring Harbour Laboratory Press, New York.

16BCP301 **IMMUNOLOGY** **Semester III** **4H-4C**

Instruction hours/week:L:4 T:0 P:0 **Marks:** Internal**: 40** External**: 60**Total**: 100**
End Semester Exam: 3 Hours Course

objectives

Equip the students with

1. Specialized immune cells and their function
2. Mechanisms of humoral immunity
3. Mechanisms of cell mediated immunity
4. Hyperactivation of immune cell and associated pathogenesis
5. Basis behind immunodeficiency diseases
6. Utility of immune based principles in diagnostic field

Course outcomes (CO's)

After successful completion, the students will understand:

1. The structure and functions of specialized immune cells
2. Basis of humoral immunity
3. Basis of cell mediated immunity
4. Hypersensitivity reactions (I-V)
5. Hereditary and acquired immunodeficiency diseases
6. Utility of immune based principles in diagnostic field

UNIT I

Cells of the immune system: Haematopoiesis. Overview of Immune stem cells-Lymphoid cells, mononuclear, granulocytes, mast cells and dentritic cells. Lymphoid classes B, T and NK – B & T Cell maturation, activation and differentiation; Lymphocyte surface markers, CD nomenclature. Cell-mediated and humoral response.

UNIT II

Antigen: Epitope, B cell and T cell epitope, haptens, viral and bacterial antigens; factors influencing adjuvant technology. Immunoglobulins-domains, B cell receptors, antigenic determinants on immunoglobulins, Immunoglobulin super family. Immunoglobulin genes: multigene family; Immunoglobulin rearrangement- antibody diversity.

UNIT III

Hyper sensitivity: Type I, II, III, IV, V and VI. Complement-definition, classical and alternate pathway, MHC: organization, MHC molecules and genes, MHC and immune responsiveness, Transplantation and rejection.

UNIT IV

Immunity to infection: Definition and types of immunity, Primary and secondary immunodeficiency diseases. Auto-immune diseases, Tumor immunology Vaccines: Active and passive immunization, Types of vaccines with example. Monoclonal Antibodies- Production and Applications.

UNIT V

Immuno Techniques: Antigen-Antibody interactions- precipitation reaction, agglutination tests- haemagglutination; Complement fixation test. Direct and indirect immunofluorescence, RIA, ELISA, CMIA, ECLIA, Immunoblotting, effector cell assay, Heamolytic plaque assay and Elispot assay.

TEXT BOOK

1. Kuby, J., (2006). Immunology. W.H. Freeman and Company, New York. 6th Edition.

REFERENCES

2. Abbas, L., and Pober, (2000). Cellular and Molecular Immunology, W.B. Saunders and company, Philadelphia, United States.

3. Janeway, C.A., and Traverse, P., (Jr) (2004). Immunobiology, 6th edition, Blackwell Scientific Publishers, Oxford university, London.

4. Zubay, G., (2009). Immunology, W.B. Saunders and company, Philadelphia, United States.

5. Tizard, I.R., (2009). Immunology- An Introduction,.Saunders College Publishers, Sydney, 8th Edition.

6. Riott, I., and Brotoff, J.,(2006). Immunology, Mosby Publishers,Sydney. 7th Edition.

7. Roitt, I., (2006). Essential Immunology. Blackwell Science, Oxford, UK 11th edition.

Semester III

16BCP302 **CLINICAL BIOCHEMISTRY** **4H-4C**

Instruction hours/week:L:4 T:0 P:0 **Marks:** Internal: **40** External: **60**Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students with:

- Biological fluid collection and analysis
- Blood cell counting
- Assessment of inflammatory markers
- Estimation of clinically relevant enzymes
- Diagnosis of cancer
- Assessment of endocrine pathophysiology

Course outcomes (CO's)

After successful completion, the students will:

1. Collect and analyze biological fluid
2. Count the total RBC and different WBC using hemocytometer
3. Learn the assessment of CRP, RA and ESR
4. Perform estimation of clinically relevant enzymes
5. Understand the cancer marker assessment
6. Understand the endocrine pathophysiology

UNIT I

Clinical Samples: Blood collection, processing and transfusion process. Normal blood profile. Cerebrospinal fluid: Composition, clinical investigation of CSF in meningitis. Amniotic fluid: Origin, composition and analysis of amniotic fluid. Collection of urine Urine preservatives. Test for urine compounds. Clinical significance of urinary components.

UNIT II

Serology and Hematology: C- reactive protein test, immunological test for pregnancy. Rheumatoid arthritis (RA) test, ESR. Coagulation test, prothrombin test. Haemoglobin Normal and abnormal Hb, separation of haemoglobin, Thalassemia, Hemoglobinopathies. Disorder of erythrocyte metabolic pathways, erythrocyte enzyme disorders. Porphyrins and disorder: porphyrias.

UNIT III

Clinical Parameters: Myocardial infarctions, hepatobiliary disease. - Enzyme tests in determination of myocardial infarction. Diagnostic enzymes: Principles of diagnostic enzymology. Clinical significance of aspartate aminotransferase, alanine aminotransferase, creatine kinase, aldolase and lactate dehydrogenase. Enzymes of pancreatic origin and biliary tract. Clinical significance of electrolytes.

UNIT IV

Oncology- oncogenes and cell cycle, Etiology-Free radical induced cancer. Free radical scavengers. Antioxidants in disease prevention. Benign and malignant types- Different stages of cancer progression- Cancer Markers. Therapy-Chemotherapy, radiotherapy, hormonal therapy and phytotherapy. Diagnosis of various cancers.

UNIT V

Pathophysiology of – hypothalamus and pituitary (dwarfism, Klienfelter syndrome, adenoma, galactorrhea, amenorrhea). Pathophysiology of thyroid cretinism, myxodema, hashimoto's (autoimmune thyroid disorder), hypo- and hyperparathyroidism, bone (osteopenia and osteoporosis), adrenal (Cushing syndrome and Addison's disease) Pancreas (IDDM and NIDDM) and gonads (cystic ovaries, endometriosis, hypogonadism, cryptorchidis and testicular carcinoma).

TEXT BOOKS

1. Murray, R.K., Bender, D.A., Botham, K.M., and Kennelly, P.J., (2012). Harper's illustrated Biochemistry, 29th Edition. McGraw-Hill Medical. London.

2. Chatterjea, M.N., (2011). Text book of medical biochemistry, 8th edition, JB publisher.

REFERENCES

1. Burtis, C.A., Ashwood, E.R., and Teitz, W.H., (1999). Textbook of Clinical Biochemistry, W.B. Saunders Company, London.

2. Smith, E., Handler, P., and White, A., (2004). Principles of Biochemistry, Mcgraw Hill International Book Company, London.

3. Varley, H., (2003). Practical Clinical Biochemistry, volume 1 and 2, CBS Publishers, New Delhi.

4. Wards, MJC and Bouchier, I., (1995), Davidson's Principles and Practice of Micine, English Language Book Society.

5. Murray, R.K., Granner, D.K., Mayes, P.A., Rodwell, V.W.,(2012). Harper's illustrated Biochemistry, Appleton and Lange Publishers, London, 29th edition

Semester III

16BCP303 **CHEMISTRY OF NATURAL PRODUCTS** **4H-4C**

Instruction hours/week: L:4 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course objectives

Equip the students

- To learn and understand the methods of plant analysis
- To gain knowledge on natural products from plant sources
- To extract the natural products from plant sources
- To gain knowledge on natural products from plant sources
- To learn extraction of secondary metabolites from marine organisms
- To extract drugs from natural sources

Course outcomes (CO's)

After successful completion, the students will

1. Learn and understand the methods of plant analysis
2. Gain knowledge on natural products from plant sources
3. Extract the natural products from plant sources
4. Gain knowledge on natural products from plant sources
5. Learn extraction of secondary metabolites from marine organisms
6. Extract drugs from natural sources

UNIT I

Introduction to phytochemistry: Primary and secondary metabolites, preliminary phytochemical analysis, quality standardization of herbal drugs, physico-chemical parameters.

Unit-II

Methods of plant analysis-Extraction- sequential and percolation techniques. Separation techniques-Column chromatography, TLC, GLC and HPLC. Methods of identification-UV, IR, NMR and MS; Analysis of results- Qualitative and quantitative methods.

UNIT III

Natural products from plant sources: Chemistry, distribution and techniques for triterpenoids, essential oils, steroids, carotenoids and alkaloids, phenolics, flavonol and flavones, tannin and quinines (General discussion only).

UNIT IV

Natural products from microbes: Sample collection; Screening tests- antiviral, antibacterial, anticancer, antihypercholesterolemic. Commercial production of microbial enzymes - Invertase and beta galactosidase.

UNIT V

Marine organism and animals: Secondary metabolite from marine algae, bacteria, fungi and vertebrates. Separation and isolation techniques- Desalting, ion exchange and reverse phase column chromatography; Bio assay directed fractionation. Isolation of simple peptides. Drugs from animal sources – hormones, carbohydrate and proteins.

TEXT BOOKS

1. HarborneJ.P 2008.Phytochemical methods- A Guide to modern techniques of plant analysis. Fourth Indian reprint-3rd Edition, Springer (India) Pvt Ltd, New Delhi.

2. Michael J. Waites, Neil L. Morgan, John S. Rockey, Gary Higton 2001. Industrial Microbiology: An Introduction", Blackwell Science, Replica press Pvt Ltd, New Delhi.

REFERENCES

1. Sujatha, V.B., Nagasampagi, B.A., Meenakshi, S., (2014) Natural Products-Chemistry and applications. Second reprint. NK Mehra for Narosa Publishing House Pvt Ltd, New Delhi.

2. .Mansi, E.M.T.E., Bryce, C.F.A., Demain, A.L., Allman, A.R., (2006).Fermentation microbiology and biotechnology", 2nd Edition, Taylor & Francis, Florida.

3. Demain, A.L., Davies, J.E., Atlas, R.M., (1999).Manual of industrial microbiology and biotechnology, 2nd Edition, ASM Press, Washington.

M.Sc., Biochemistry **2016-2017**

Semester III

16BCP304 DRUG BIOCHEMISTRY AND NEUROCHEMISTRY 4H-4C

Instruction hours / week:L:4 T:0 P:0 **Marks:** Internal**: 40** External**: 60**Total**: 100**

End Semester Exam: 3 Hours Course

Objectives

Equip the students with

- Pharmacokinectics
- Pharmacodynamics
- Drug tolerance and dependence
- Genetically engineered drugs
- Mechansim of action of drugs
- Undesired effects of drugs

Course outcomes (CO's)

After successful completion, the students will understand

1. What the body does to a drug
2. What a drug does to a body
3. Drug dependence
4. The principles and procedure for genetically engineered drugs
5. How the drugs elicit the desired effect
6. Undesired effects of drugs

UNIT I

Drugs – Introduction, sources and routes of administration, Structural features and pharmacological activity, prodrug concept, Adsorption – factors modifying drug absorption. Distribution, metabolism - phase I, II reactions, action of cytochrome P450 and excretion of drugs.

Drug receptors – Localization, types and subtypes, models and theories. G-protein coupled receptor and ion-channel linked receptors. Examples of drug-receptor interactions. Agonists and antagonists. Bioavailability of drug

UNIT II

Drug tolerance and drug dependence. Principles of basic pharmacokinetics. Adversse response to drugs, drug intolerance, pharmacogenetics, drug allergy, tachyphylaxis, drug abuse, vaccination against infection, factors modifying drug action and effect. Assay of drug potency: chemical, bioassay and immunoassay.

UNIT III

Genetically engineered protein and peptide agents as drugs, Novel drug delivery systems, anti-AIDS drug development, oncogenes as targets for drugs, multidrug resistance phenotypes, production of secondary metabolites by plant tissue culture. Genome based medicine.

UNIT IV

Mechanism of action of drugs used in therapy of Respiratory system – cough, bronchial asthma, pulmonary tuberculosis. Antimicrobial drugs – sulphonamides, trimethoprim, penicillins, aminoglycosides and bacterial resistance, Cancer chemotherapy. Thyroid and antithyroid drugs, insulin and oral antidiabetic drugs, antifertility and ovulation inducing drugs. Pharmacotherapy of gout and rheumatoid arthritis, Immuno therapy – Immunosuppressants and immunostimulants, Enzymes in therapy.

UNIT V

Brain – Neurotransmitters, encephalins and endorphins; general function of autonomic and somatic nervous system; cholinergic transmission and receptors; adrenergic transmission and receptors; muscarinic receptors. Non steroidal and anti inflammatory drugs; adrenergic blocking drugs; cholinergic blocking drugs; muscatrinic blocking drugs; parkinson's disease; Alzhiemier's disease. Neurodegenerative disorders – Amylotropic, lateral sclerosis, senile dementia, schizophrenia, Huntington's disease.

TEXTBOOKS

1. Satoskar, R.S., Bhandarkar, S.D., and Ainapare, S.S., (2003). Pharmacology and Pharmacotherapeutics, Popular Prakasham, Mumbai.

2. Patrick, G., (2002). Medicinal Chemistry Instant notes, Viva books private limited, New Delhi.

3. Chauduri, S.K., (2001). Quintessence of Medical Pharmacology, New central book agency limited, Calcutta.

REFERENCES

1. Glick, B.R., Pasternak, J.J., and Patten, C.L., (2009). Molecular Biotechnology, 4th edition, Panima Publishing Corporation, Delhi.

2. Grahame-Smith, D.G., and Aronson, J. K., (2002). Oxford textbook of Clinical Pharmacology and Drug Therapy: 3rd edition. Oxford University Press.

3. Foye, W.O., Lemke, T.L., Williams, D.A., (2012). Principles of Medicinal Chemistry, 7th edition, B.I. Wanerly Pvt. Ltd, New Delhi.

4. Wolf, E.,(1995). Burgers Medicinal Chemistry and Drug Discovery. Principles and Practice, John Wiley and Sons, Manfred.

Semester III

16BCP305A **CORE ELECTIVE – III** **4H-4C**

BIOSTATISTICS AND RESEARCH METHODOLOGY

Instruction hours/week: L:4 T:0 P :0 **Marks:** Internal**: 40**External**: 60**Total**: 100**

End Semester Exam: 3 Hours Course

Course objectives

Equip the students with:

- Definition and representation styles of data
- Analysis of data using correlation to understand the interdependence
- Analysis of data using regression to understand the interdependence
- To learn various measures of central values and standard deviation.
- To understand the relationship between two variables.
- To test the significance of a particular data by various parameters.

Course outcomes (CO's)

After successful completion, the students will:

1. Use appropriate representation styles to present the data
2. Perform correlation analysis
3. Perform regression analysis
4. Calculate mean, median, mode and standard deviation.
5. Calculate the relationship between two variables.
6. Test the significance of a particular data by various parameters.

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UNIT I

Definitions-Scope of Biostatistics- Variables in biology, collection, classification and tabulation of data- Graphical and diagrammatic representation.

Measures of central tendency – Arithmetic mean, median and mode. Measures of dispersion- Range, standard deviation, Coefficient of variation.

UNIT II

Correlation: Meaning and definition - Scatter diagram –Karl Pearson's correlation coefficient. Rank correlation.

Regression: Regression in two variables – Regression coefficient problems – uses of regression.

UNIT III

Test of significance: Tests based on Means only-Both Large sample and Small sample tests – Student's t test, F-test, Chi square test - goodness of fit. Analysis of variance – one way and two way classification. CRD, RBD Designs.

UNIT IV

Research: Scope and significance – Types of Research – Research Process – Characteristics of good research – Problems in Research – Identifying research problems. Research

Designs – Features of good designs.

UNIT V

Sampling Design : Meaning – Concepts – Steps in sampling – Criteria for good sample design. Scaling measurements – Techniques – Types of scale.

REFERENCES

1. Gupta, S.P., (2007). Statistical Methods, Sultan Chand & Co, New Delhi.
2. Kothari, C.R., (2009). Research Methodology – Methods and Techniques, 3rd edition, New Age International Pvt. Ltd, New Delhi.
3. Sundar Rao, P.S.S., and Richard, J., (2006). Introduction to Biostatistics and ResearchMethods, PHI Publication, New Delhi.
4. Sandhu, T., (1990). Research Techniques in Biological Sciences, Anmol Publishers, New Delhi.

Semester III

16BCP305B CORE ELECTIVE –III 4H-4C

CLINICAL RESEARCH AND IPR

Instruction hours/week:L:4 T:0 P:0 Marks: Internal: **40** External: **60**Total: **100**

End Semester Exam: 3 Hours**Course**

Course objectives

Equip the students with:

1. The process of drug discovery
2. Pre-clinical studies
3. Components of clinical research (Phases)
4. Questionaire preparation
5. Fundamentals of IPR
6. Patents laws

Course outcomes (CO's)

After successful completion, the student will understand:

1. Steps involved in drug discovery
2. Using small experimental animals
3. Phase 2 and Phase 3 trials
4. Questionaire preparation
5. Intellectual property rights
6. Patents laws

UNIT I

Drug discovery and Development: Introduction to Pharmaceutical Industry, New drug discovery-Target Identification- Target Prioritization/ validation, Lead identification, Lead optimization ; Preclinical studies - Preclinical technology, Chemistry manufacturing and controls / Pharmaceutics Pharmacology/Toxicology

UNIT II

Basics of Clinical Research: Definition of clinical research and development, History of randomized trial Literature - Finding and Evaluation databases of Scientific Literature; Critiquing of Research Projects, Time management and resource implications

UNIT III

Epidemiology: Experimental Procedures - Controlled Experiments, Sampling Techniques, Questioner Design, Validity and reliability of observations, Primary variables, Acquisition and using secondary data, Randomization and Blinding: Theory and practice

UNIT IV

IPR: Introduction to Copyright - Conceptual Basis, International Protection of Copyright and Related rights- An Overview (International Convention/Treaties on Copyright). Indian Copyright Law -The Copyright Act, 1957 with its amendments, Ownership, transfer and duration of Copyright, Renewal and Termination of Copyright.

UNIT V

Patent: Introduction to Patent Law - Paris Convention, Patent Cooperation Treaty, WTO-TRIPS, Harmonisation of CBD and TRIPs. Indian Patent Law- The Patents Act, 1970, Amendments to the Patents Act, Patentable Subject Matter, Patentability Criteria, Procedure for Filing Patent Applications, Patent Granting Procedure.

TEXT BOOK

1. Weinberg, S., and Sandy, W., (2009). Guidebook for Drug Regulatory Submissions, 1st edition, Wiley-Blackwell, U.S.A.

REFERENCES

1. Richard, A.G., Richard, G., (2009). New Drug Approval Process Drugs and the Pharmaceutical Sciences), 5th edition CRC Press, U.S.A.
2. Duolao, W., Bakhai. A., (2005). Clinical Trials: A Practical Guide to Design, Analysis and Reporting, Remedica, London.
3. Weinberg, S., (1995). Good Laboratory Practice Regulations, 3rd edition, CRC Press, U.S.A.
4. Harburn, K., (1990). Quality Control of Packing Materials in Pharmaceutical Industry, CRC Press, U.S.A.
5. Prichard, E., (1995). Quality in the Analytical Chemistry Laboratory, 1st edition, Wiley, U.S.A.

Semester III

16BCP305C **CORE ELECTIVE –III** **4H-4C**

DIETETIC MANAGEMENT OF DISEASE

Instruction hours/week: L:4 T:0 P:0 Marks: Internal: **40** External: **60**Total: **100**
End Semester Exam: 3 Hours **Course**

Course objectives

Equip the students with

- Nutrition as a drug
- Dietary management of diabetes
- Dietary management of obesity
- Dietary management of cardiovascular diseases
- Nutrition deficiency affecting hematopoiesis and diet for individual with cancer
- Dietary management of musculoskeletal diseases

Course outcomes (CO's)

After successful completion, the students will understand:

1. Nutrition as a drug
2. Dietary management of diabetes
3. Dietary management of obesity
4. Dietary management of cardiovascular diseases
5. Nutrition deficiency affecting hematopoiesis and diet for individual with cancer
6. Dietary management of musculoskeletal diseases

UNIT-1

Nutrition- Foods for normal nutrition. Diets in gastrointestinal diseases-Acute gastrointestinal conditions, chronic and non-acute disorders of the upper gastrointestinal tract, lower gastrointestinal conditions, pancreatitis, liver diseases, gall stones, appendicitis, cholelithiasis. Diet for hepatitis

Nutrition for critically ill- Burns, Enteral nutrition, Enteral feeding vs parenteral feeding, Indications of enteral nutrition, Types of enteral feed formula, Complications of enteral feeding. Parenteral nutrition- Techniques of infusion, Complications of parenteral feeding.

UNIT II

Diet for diabetes mellitus- Nutrition recommendations for patient with diabetes, Meal planning, Exchange list of different food groups, Diabetic diets based on exchange list, Diabetic diets menu wise.

Diets in Renal disease-Acute renal failure, Proteinuria, Indoor diet charts for renal patients.

UNIT III

Diet for Cardiovascular Diseases- Risk Factors, Hypertension, Atherosclerosis, Stroke and other peripheral diseases, Cardiomyopathy and cardiac failure, Rheumatic heart disease, dietary management, general guidelines for coronary heart disease, Dietary recommendations of WHO.Diet for Acute cardiac diseases

Obesity- Body fat distribution, Health risks of obesity, Weight reduction, Factors contributing to obesity.

UNIT IV

Cancer and diet therapy- Influence of diet on carcinogenesis, Dietary risk factors and cancers at various sites in the human body, diet therapy, eating well during cancer treatment, managing eating problems during treatment

Diet for inborn errors of metabolism- phenylketonuria, Galactosaemia, Celiac disease.

UNIT V

Nutrition related bone disease- osteoporosis.

Dietary factors in dental disease- Starch & dental cavities, protective factor in food

Blood –Nutrition deficiency affecting hematopoiesis.

REFERENCES

1. Sharma, R (2004). Diet Management,3rd Edition,Reed Elsevier India Private Limited, Chennai.

2. Garrow, J.S., and James, W.P.T., (2000). Human Nutrition & Dietetics,Longman Group, UK.

3. Srilakshmi, (2006). Dietetics, 5th Edition.New Age International.Pvt Ltd, New Delhi.

Semester III

16BCP311 PRACTICAL – V 4H-2C

CLINICAL ENZYMES AND IMMUNOLOGY

Instruction hours/week: L:0 T:0 P: 4 Marks: Internal**: 40** External**: 60Total: 100**

End Semester Exam: 3 HoursCourse

Course objectives

To impart hands-on training in:

- Assays of clinically relevant enzymes
- Diagnostic utility of enzyme assays
- Radial immunodiffusion
- Double immunodiffusion
- Immunoelectrophoresis
- Glucose tolerance test

Course outcomes (CO's)

After successful completion, the students will understand:

1. Various methods of assaying clinically relevant enzymes
2. The diagnostic significance of enzyme assays
3. Working knowledge principle of Radial immunodiffusion
4. Working knowledge principle of Double immunodiffusion
5. Working knowledge principle of Immunoelectrophoresis
6. Working knowledge principle of Glucose tolerance test

ENZYMOLOGY

1. Determination of the activity of the following serum enzymes:
    a. LDH
    b. Acid phosphatase
    c. Alkaline phosphatase
    d. Aspartate amino transferase
    e. Alanine amino transferase
    f. 5' nucleotidase
    g. Sodium potassium ATPase
    h. Ceruloplasmin

IMMUNOLOGY (DEMONSTRATION)

2. Raising of antibodies- single soluble and particulate antigen
3. Immunodiffusion- single radial and double diffusion.
4. Immunoelectrophoresis.
5. Rocket immunoelectrophoresis
6. ELISA

Case study-Report

7. Serum enzyme in liver disease
8. Serum enzyme in cardiac disease

9. Serum enzyme in cancer disease
10. Glucose Tolerance Test

REFERENCES

1. Jayaraman, J., (2007). Laboratory Manual in Biochemistry, New Age International Publishers New Delhi.

2. Sadasivam, S., and Manickam, A., (2009). Biochemical Methods, New Age International Publishers, New Delhi.

3. Singh, S.P., (2009). Practical Manual of Biochemistry, CBS Publishers, New Delhi.

4. Talib, V. H., (2003). A Handbook of Medical Laboratory Technology, CBS Publishers, New Delhi.

Semester III

16BCP312 **PRACTICAL – VI** **4H-2C**

CLINICAL BIOCHEMISTRY AND ANIMAL STUDIES

Instruction hours/week: L:0 T:0 P:4 **Marks:** Internal**: 40** External**: 60**Total**: 100**

End Semester Exam: 3 Hours

Course objectives

To impart hands-on training in:

- The estimation of biomolecules such as glucose and cholesterol
- Assessment of renal function through the analysis of urea and uric acid in serum
- Assessment of liver function through the estimation of bilirubin
- The determination and significance of A/G ratio
- Handling experimental animals
- Various routes of injections

Course outcomes (CO's)

Upon successful completion of this course, students will be able to:

1. Explain the physiopathological bases and the biochemical markers of the most prevalent diseases in our population
2. Perform the estimation of biomolecules such as glucose and cholesterol
3. Assess renal function through the analysis of urea and uric acid in serum
4. Assess liver function through the estimation of bilirubin
5. Determine A/G ratio and interpret its relevance
6. Handle the small experimental animals
7. Understand the differences and significance of routes of injections

Clinical analysis

1. Estimation of glucose in serum
2. Estimation of cholesterol in serum
3. Estimation of urea in the urine and serum
4. Estimation of chloride in the urine and serum
5. Estimation of calcium in the urine and serum
6. Estimation of magnesium in the urine and serum
7. Analysis of urinary calculi
8. Estimation of Bilirubin in serum(Kit method)
9. Estimation of triglyceride in serum (Kit method)
10. Estimation of HDL in serum (Kit method)

ANIMAL STUDIES (Group experiment)

11. Handling of animals
12. Methods of injection
13. Induction of liver toxicity
14. Assay of lipid peroxidation in rat liver.

REFERENCES

1. Jayaraman, J., (2007). Laboratory Manual in Biochemistry, New Age International Publishers New Delhi.

2. Sadasivam, S., and Manickam, A., (2009). Biochemical Methods, New Age International Publishers, New Delhi.

3. Singh, S.P., (2009). Practical Manual of Biochemistry, CBS Publishers, New Delhi.

4. Talib, V. H., (2003). A Handbook of Medical Laboratory Technology, CBS Publishers, New Delhi.

Semester IV

16BCP491 **PROJECT AND *VIVA VOCE*** **15C**

Hours / week: L:5 T:0 P:25 **Marks: Internal: 80** **External:120Total: 200**

KARPAGAM ACADEMY OF HIGHER EDUCATION
Department of Biotechnology
(Scheme of examination for 2016-2017 onwards) B.Sc., Biotechnology Curriculum

Course code	Name of the course	Objectives and Outcomes		Hrs / week	Marks			Exam (hrs)	Credit
		PEO´s	PO´s & PSO´s		CIA	ESE	Total		
	SEMESTER – I								
16LSU101	Language -1	-	-	04	40	60	100	3	4
16ENU101	English	-	-	04	40	60	100	3	4
16BTU101	Biochemistry and Metabolism	I	a, b	04	40	60	100	3	4
16BTU102	Cell Biology	I	a, b	04	40	60	100	3	4
16BTU103	Chemistry -1	I	a	04	40	60	100	3	4
16BTU111	Biochemistry & Metabolism Practical	I	a, b	04	40	60	100	3	2
16BTU112	Cell Biology Practical	I	a, b	03	40	60	100	3	2
16BTU113	Chemistry -1 Practical	I	a	03	40	60	100	3	2
	Semester total			**30**	**320**	**480**	**800**	**–**	**26**
	SEMESTER – II								
16LSU201	Language -1	-	-	04	40	60	100	3	4
16BTU201	Genetics	II	e	04	40	60	100	3	4
16BTU202	Chemistry -2	I	a	04	40	60	100	3	4
16BTU203	General Microbiology	I	c	04	40	60	100	3	4
16BTU211	Genetics Practical	II	e	03	40	60	100	3	2
16BTU212	Chemistry- 2 Practical	I	a	03	40	60	100	3	2
16BTU213	General Microbiology Practical	I	c	04	40	60	100	3	2
16AEC201	Environmental Studies	I, IV	d, o	04	40	60	100	3	4
	Semester total			**30**	**320**	**480**	**800**	**–**	**26**
	SEMESTER – III								
16BTU301	Plant Physiology	II	e	04	40	60	100	3	4
16BTU302	Molecular Biology	II	e	04	40	60	100	3	4
16BTU303	Immunology	II	f	04	40	60	100	3	4
16BTU304A 16BTU304B	Molecular Diagnostics	III, IV	k, l, o	03	40	60	100	3	3
	Biotechnology and Human Welfare	I, III	d, l						
16BTU311	Plant Physiology Practical	II, IV	e, n	04	40	60	100	3	2
16BTU312	Molecular Biology -Practical	II, IV	e, n	04	40	60	100	3	2
16BTU313	Immunology Practical	II	f, n	04	40	60	100	3	2
16BTU314A	Molecular Diagnostics Practical	III, IV	k, l, o, n	03	40	60	100	3	1
16BTU314B	Biotechnology and Human Welfare Practical	III, IV	d, l, n						
	Semester total			**30**	**320**	**480**	**800**	**–**	**22**

SEMESTER – IV

16BTU401	Bioprocess Technology	II	g, h	04	40	60	100	3	4
16BTU402	Recombinant DNA Technology	II	e, g	04	40	60	100	3	4
16BTU403	Genomics and Proteomics	II, III	e, h, g, j, l	04	40	60	100	3	4
16BTU404A	Industrial Fermentation	II	g, h	03	40	60	100	3	3
16BTU404B	Enzymology	II	e, g, h						
16BTU412	Recombinant DNA Technology Practical	II, IV	e, g, n	04	40	60	100	3	2
16BTU413	Genomics and Proteomics Practical	II, III, IV	e, h, g, j, l, n	04	40	60	100	3	2
16BTU414A	Industrial Fermentation Practical	II, IV	g, h, n	03	40	60	100	3	1
16BTU414B	Enzymology Practical	II, IV	e, g, h, n						
	Semester total			**30**	**320**	**480**	**800**	**–**	**22**

SEMESTER – V

16BTU501A	Plant Diversity I	I	a	03	40	60	100	3	3
16BTU501B	Basics of Forensic Science	IV	l						
16BTU502A	Bioinformatics	III, IV	j, l	04	40	60	100	3	4
16BTU502B	Plant Diversity II	I	a						
16BTU503A	Plant Biotechnology	II, III	i, g	04	40	60	100	3	4
16BTU503B	Evolutionary Biology	I, III	b, i						
16BTU504A	Animal Biotechnology	III	i	04	40	60	100	3	4
16BTU504B	Animal diversity-I	I	a						
16BTU511A	Plant Diversity I Practical	I, IV	a, n	03	40	60	)0	3	1
16BTU511B	Basics of Forensic Science Practical	III, IV	l, n						
16BTU512A	Bioinformatics Practical	III, IV	j, l, n	04	40	60	100	3	2
16BTU512B	Plant Diversity –II Practical	I, IV	a, n						
16BTU513A	Plant Biotechnology Practical	II, III, IV	g, i, n	04	40	60	100	3	2
16BTU513B	Evolutionary Biology Practical	I, III, IV	b, i, n						
16BTU514A	Animal Biotechnology Practical	III, IV	i, n	04	40	60	100	3	2
16BTU514B	Animal Diversity-I Practical	I	a, n						
	Semester total			**30**	**320**	**480**	**800**	**–**	**22**

SEMESTER – VI

16BTU601A	I.P.R. Entrepreneurship, Bioethics & Biosafety	III, IV	k, l, o	03	40	60	100	3	3
16BTU601B	Bio- analytical Tool	I, III	d, l						
16BTU602A	Medical Microbiology	I, III	c, k	04	40	60	100	3	4
16BTU602B	Environmental Biotechnology	III, IV	d, k, l						
16BTU603A	Biostatistics	III, IV	l, o	04	40	60	100	3	4
16BTU603B	Environment Management	III, IV	d, k, l						

16BTU611A	I.P.R. Entrepreneurship, Bioethics & Biosafety Practical	III, IV	k, l, o, n	03	40	60	100	3	1
16BTU611B	Bio-analytical Tool Practical	III, IV	d, l, n						
16BTU612A	Medical Microbiology Practical	III, IV	c, k, n	04	40	60	100	3	2
16BTU612B	Environmental Biotechnology Practical	I, III, IV	d, k, l, n						
16BTU613A	Biostatistics Practical	III	l, o, n	04	40	60	100	3	2
16BTU613B	Environment Management Practical	I, III, IV	d, k, l, n						
16BTU691	DSE – 6 Project	III	l	08	40	60	100	3	6
ECA / NCC / NSS / Sports / General interest etc.,									Good
Semester total				**30**	**280**	**420**	**700**	**–**	**22**
Grand Total				**180**	**1880**	**2820**	**4700**	**–**	**140**

LS: Language course; EN: English course; SEC: Skill-enhancement course; DEC: Discipline -specific elective

Blue – Employability **Green – Entrepreneurship** **Red- Skill Development**

Skill Enhancement Elective Courses – Theory		
Semester	**Subject code**	**Subject**
III	16BTU304A	Molecular Diagnostics
	16BTU304B	Biotechnology and Human Welfare
IV	16BTU404A	Industrial Fermentation
	16BTU404B	Enzymology
V	16BTU501A	Plant Diversity I
	16BTU501B	Basics of Forensic Science
VI	16BTU601A	I.P.R. Entrepreneurship, Bioethics & Biosafety
	16BTU601B	Bio- analytical Tool

Skill Enhancement Elective Courses - Practicals		
Semester	**Subject code**	**Subject**
III	16BTU314A	Molecular Diagnostics Practical
	16BTU314B	Biotechnology and Human Welfare Practical
IV	16BTU414A	Industrial Fermentation Practical
	16BTU414B	Enzymology Practical
V	16BTU511A	Plant Diversity I Practical
	16BTU511B	Basics of Forensic Science Practical
VI	16BTU611A	I.P.R. Entrepreneurship, Bioethics & Biosafety Practical
	16BTU611B	Bio-analytical Tool Practical

Discipline Specific Elective Courses-Theory		
Semester	**Subject code**	**Subject**
V	16BTU502A	Bioinformatics
	16BTU502B	Plant Diversity II
	16BTU503A	Plant Biotechnology
	16BTU503B	Evolutionary Biology
	16BTU504A	Animal Biotechnology
	16BTU504B	Animal Diversity-I
VI	16BTU602A	Medical Microbiology
	16BTU602B	Environmental Biotechnology
	16BTU603A	Biostatistics
	16BTU603B	Environment Management

Discipline Specific Elective Courses –Practical		
Semester	**Subject Code**	**Subject**
V	16BTU512A	Bioinformatics Practical
	16BTU512B	Plant Diversity –II Practical
	16BTU513A	Plant Biotechnology Practical
	16BTU513B	Evolutionary Biology Practical
	16BTU514A	Animal Biotechnology Practical
	16BTU514B	Animal Diversity-I Practical
VI	16BTU612A	Medical Microbiology Practical
	16BTU612B	Environmental Biotechnology Practical
	16BTU613A	Biostatistics Practical
	16BTU613B	Environment Management Practical
	16BTU691	Project Work

PROGRAMME OUTCOMES (POs)

a) Graduates will acquire in-depth understanding of basic concept, knowledge about biochemistry and cell organelles, their functions for applied field, allied subject and life skills.

b) The students will be able to discuss the metabolic aspects of biomolecules.

c) The Graduates will gain the technical capability of handling, isolating and identifying various organisms from different sources.

d) Understanding and better knowledge of the causes, types and control methods for environmental pollution by the students.

e) The student will be able to discuss the mechanisms associated with gene expression system in prokaryotes and eukaryotes.

f) Understand the role of different types of cells, effectors and effectors mechanisms in immune-technology by the students.

g) Develop skills associated with screening of industrially important strains, various aspects of bioprocess technology and rDNA technology by the graduates.

h) The student will be able to understand the production of enzymes from different sources and enzyme characterization and kinetic actions in living organisms.

i) The student will be able to understand the production of transgenic plants and animals for human and environmental welfare.

j) Understand the basic concepts and modern knowledge of bioinformatics by graduates.

k) Apply the knowledge and skills gained from molecular aspects should be useful in developing new innovations in different life forms by the graduates.

l) The student will be able design, solve the application-oriented problem in biotechnological field through project-based learning.

PROGRAMME SPECIFIC OUTCOMEs (PSOs)

To enable the student to emerge as:

m) Proficiency to work on biotechnological concepts and interdisciplinary areas of science and technology towards product and process development for industrial and academic research applications.

n) An expert in Biotechnology and allied fields (medical, microbial, agricultural, environmental, plant and animal) for utilizing the practical skills to address biotechnological challenges.

o) Proficiency to demonstrate entrepreneurial and leadership skills with life-long learning.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

To impart the following PEOs to the students of Under-graduates in Biotechnology:

PEO I : To obtain detailed information about the fundamentals of Biotechnology, allied subjects and life skills.

PEO II : To provide information about the molecular methods which involved in cellular processes of living systems such as microbes to higher order organisms for applied aspects. To address the emerging need for skilled scientific manpower with research ethics involving organisms.

PEO III : To impart the basics and current molecular tools in the areas of Molecular Diagnostics, Fermentation Technology, Plant, Animal & Environmental Biotechnology are included to train the students for man power development and also sensitize them to scope for research. The practical subjects will provide information about the careers in the industry and applied research where biological system is employed.

PEO IV : To make the graduates of Biotechnology to learn and to adopt in a competitive world of technology update and contribute to all forms of life.

MAPPING OF PEOs AND POs

PEOs	Programme Outcome (s)														
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
PEO I	×	×	×	×											
PEO II					×	×	×	×							
PEO III									×	×	×	×			
PSO IV											×	×	×	×	×

கற்பகம் உயர்கல்வி கலைக்கழகம்
தமிழ்த்துறை
பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)
முதல் பருவம்
(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)
(For I-UG Science Degree Classes) 16LSU101

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வு நோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, ‘தமிழ் இலக்கிய வரலாறு’ குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, ‘அறிவியல் தமிழ்’ ; ‘இணைய தமிழ்’ குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

தாள்கள் வரிசையும் தேர்வுச் செயல்திட்டமும் பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
ஒன்று	I	4	3	40 / 60	100	4

அலகு – I : இக்கால இலக்கியம்: **(10 மணிநேரம்)**

கல்வி : மகாகவி பாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணி தேசிக விநாயகம் பிள்ளை – ஒற்றுமையே உயிர்நிலை.
மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் –மலையாளக் காற்று.
சூழலியல் : கவிஞர். வைதீஸ்வரன் - விரல் மீட்டிய மழை.
பெண்ணியம் : கவிஞர். சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை.

அலகு – II : அற இலக்கியம்: **(10 மணிநேரம்)**

கொன்றை வேந்தன்: 1-50 பாடல்கள்
திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்

பழமொழி நானூறு: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: **(10 மணிநேரம்)**

மூவருலா: 1-26 கண்ணிகள்

திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்

கலிங்கத்துப் பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV : கட்டுரை: **(10 மணிநேரம்)**

1. **உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்**
2. **கட்டிடக்கலை** - அ. இராசமாணிக்கனார்
3. **வாழ்க்கை** - இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஶ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: **(8 மணிநேரம்)**

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

SEMESTER I

16ENU101 **ENGLISH** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

- To help students enhance their Language skills.
- To introduce different kinds of literary works.
- To familiarize different genres of Literature.
- To instruct moral values through literature.
- To improvise their productive and receptive skills.
- To strengthen the basic knowledge about grammar.

Course Outcomes

1. Develop the four types of skills.
2. Reading and comprehending literary works.
3. Genres of literature to provide moral education.
4. Develop communication skills in business environment.
5. Interpersonal skills will be developed.
6. Betterment of language competence.

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefixes, Antonyms, Sentence Completion
Grammar: Articles, Adverbs, Pronouns
Composition: Proverb Expansion

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffixes, Analogies **Grammar:**
Nouns, Adjectives
Composition: Dialogue Writing

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verbs, Conjunctions and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Prepositions, Voice- Active and Passive
Composition: Letter Writing- Informal

UNIT V

Short Story: The Bird **–** Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitute
Grammar: Questions, Pronunciation
Composition: Letter Writing- Formal

Prescribed Text

Rao, G. Chandralekha et al. *Spring* (2013). Emerald Publishers: Chennai.

Suggested Readings

Shyamala, V. *English for Communication*. (2006). Emerald Publishers: Chennai

SEMESTER I

16BTU101 **BIOCHEMISTRY AND METABOLISM** 4H -4C

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The objectives of the course are to make the students to

- Understand the basic concepts of cellular structure and organization of various biomolecules.
- Understand the functions and importance of various biomolecules.
- Describe the various metabolic pathways involved in cells for its normal functioning.
- Obtain basic knowledge on disorders associated with metabolism of biomolecules.
- Understand enzymes and their classification
- Understand about Carbohydrates Metabolism

Course Outcomes

On successful completion of the course, students will be able to:

1. Understand Biochemistry as discipline and milestone discoveries in life sciences that led to establishment of Biochemistry as separate discipline.
2. Understand fundamental properties of elements, their role in formation of biomolecules and in chemical reactions within living organisms.
3. Draw or describe the structure of amino acids, proteins, enzymes, chemical messengers, carbohydrates, lipids, and nucleic acid.
4. Describe the metabolism of carbohydrates, lipids, proteins and amino acids, and write chemical reactions for the individual steps in each pathway.
5. Write the chemical reactions involved in biochemical pathways that produce ATP, such as citric acid cycle and electron transport.
6. Be familiar with the enzymes (biocatalysts), and their salient attributes including unique conformation and amazing catalytic properties.

UNIT- I

Introduction to Biochemistry: Amino acids &Proteins: Structure, properties and function of Aminoacids and Protein, Aminoacid and protein classification. Protein Purification. Denaturation and renaturation of proteins. Fibrous and globular proteins. Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions

UNIT-II

Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol. ß-oxidation of fatty acids.

UNIT-III

Nucleic acids: Structure and functions: Physical &chemical properties of Nucleic acids, Nucleosides &Nucleotides, purines & pyrimidines, Biologically important nucleotides, Double helical model of DNA structure, A, B & Z – DNA, denaturation and renaturation of DNA

UNIT-IV

Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, groups, metalloenzymes, monomeric &oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, Role of: NAD+, NADP+, FMN/FAD, coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate, lipoic-acid, BiotinvitaminB12, Tetrahydrofolate and metallicions. Photosynthesis– Photosystem I and II.

UNIT-V

Carbohydrates Metabolism: Glycolysis: Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance, Gluconeogenesis, Glycogenolysis and glycogen synthesis. TCA cycle.

References

1. Berg,J.M.,Tymoczko,J.L.,&Stryer,L.(2006).*Biochemistry*(6thed.).Newyork:W.H. Freeman & Company.
2. Buchanan, B., Gruissem, W., &Jones, R. (2015). *Biochemistry and Molecular Biologyof Plants* (2nd ed.). American Society of Plant Biologists.
3. Nelson, D.L., &Cox, M.M. (2013). *Lehninger: Principles of Biochemistry* (6th ed.).New York: W.H. Freeman and Company.
4. Hopkins, W.G., & Huner, P.A. (2008). *Introduction to Plant Physiology* (2nd ed.).John Wiley&Sons.
5. Murray, R.K., Bender, D.A., Botham, K.M., & Kennelly, P.J., (2012). *Harper's illustrated Biochemistry* (29th ed.). London : McGraw-Hill Medical

SEMESTER I

16BTU102 **CELL BIOLOGY** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total: 100**

Course Objectives

The objectives of the course are to make the students to

- Understand the structures and functions of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
- Understand how the cellular components are used to generate and utilize energy in cells
- Understand the cellular components underlying cell division.
- Obtain knowledge of various cellular events to understand various physiological processes.

Course Outcomes

On successful completion of Cell Biology course, students will be able to:

1. Describe the importance of cell biology in fundamental functions of living systems.
2. Describe the structures and basic components of prokaryotic and eukaryotic cells.
3. Illustrate how the cellular components are used for various cellular activities.
4. Demonstrate the pathways involved in various cellular events including cell cycle and cell division.
5. Describe cellular events associated with cell death and cancer formation.

UNIT- I

Cell: Introduction and classification of organisms by cell structure, cytosol, compartmentalization of eukaryotic cells, cell fractionation. Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport.

UNIT- II

Membrane Vacuolar System, Cytoskeleton and Cell Motility: Structure and function of microtubules, Microfilaments, Intermediate filaments. Endoplasmic reticulum: Structure, function including role in protein segregation. Golgi complex: Structure, biogenesis and functions including role in protein secretion.

UNIT-III

Lysosomes: Vacuoles and micro bodies: Structure and functions Ribosomes: Structures and function including role in protein synthesis. Mitochondria: Structure and function, Genomes, biogenesis. Chloroplasts: Structure and function, genomes, biogenesis Nucleus: Structure and function, chromosomes and their structure.

UNIT- IV

Extracellular Matrix: Composition, molecules that mediate cell adhesion, membrane receptors for extra cellular matrix, macromolecules, regulation of receptor expression and function.

UNIT-V

Cancer: Carcinogenesis, agents promoting carcinogenesis, characteristics and molecular basis of cancer. Signal transduction.

References

1. Karp, G. (2013). *Cell and Molecular Biology: Concepts and Experiments* (7th ed.). Hoboken, US: John Wiley & Sons. Inc.
2. De Robertis, E.D.P., & De Robertis, E.M.F. (2006). *Cell and Molecular Biology* (8th ed.). Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M., &Hausman, R.E. (2013). *The Cell: A Molecular Approach* (6th ed.). Washington, USA: ASM Press & Sunderland, D.C., Sinauer Associates.
4. Becker, W. M., Kleinsmith, L. J., Hardin. J., & Bertoni, G. P. (2009) *The World of the Cell* (7th ed.). San Francisco: Pearson Benjamin Cummings Publishing.

16BTU103 **CHEMISTRY-1** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The objectives of the course are to know

- The molecular orbital theory, preparation and properties of inorganic compounds.
- Theory of covalent bond, polar effects and stereochemistry of organic compounds.
- About important industrial chemicals like silicones, fuel gases and fertilizers and their impact on environment.
- Elements of photochemistry, chemical kinetics and chromatography.
- About the dyes, chemotherapy and vitamins.
- About the Column, Paper and Thin Layer Chromatography.

Course Outcomes

The student understands

1. The molecular orbital theory, preparation and properties of inorganic compounds.
2. Theory of covalent bond, polar effects and stereochemistry of organic compounds.
3. About important industrial chemicals like silicones, fuel gases and fertilizers and their impact on environment.
4. Elements of photochemistry, chemical kinetics and chromatography.
5. About the dyes, chemotherapy and vitamins.
6. Principles and applications of Column, Paper and Thin Layer Chromatography.

Unit-I

Chemical Bonding: Molecular orbital theory-linear combination of atomic orbitals-bonding and antibonding molecular orbitals-energy level diagram-bond order- M.O. configuration of H_2, N_2 and F_2 molecules. Diborane: Preparation, properties and structure. $NaBH_4$: Preparation and uses. Borazole: Preparation and properties. Interhalogen compounds: ICl, BrF_3, IF_5 - preparation, properties, uses and structure. Basic properties of iodine. Compounds of sulphur: Sodium hydrosulphite- preparation, properties, uses and structure. Per acids of sulphur: Preparation, properties, uses and structure.

Unit-II

Industrial Chemistry: Silicones: Synthesis, properties and uses. Fuels gases: Natural gas-water gas-semi water gas-carbureted water gas-producer gas- oil gas (Manufacturing details not required). Fertilizers: NPK fertilizer-ammonium sulphate-urea-superphosphate of lime- triple superphosphate-potassium nitrate-ammonium nitrate. Pollution: Water, air and soil pollution-sources and remedies-acid rain-ozone hole-greenhouse effect.

Unit- III

Covalent Bond and Stereoisomerism:

Covalent Bond: Orbital overlap, hybridization and geometry of CH_4, C_2H_4 and C_2H_2. Polar effects: Inductive effect-electromeric effect- mesomeric effect- steric effect- hyperconjugation.

Stereoisomerism: Elements of symmetry-polarised light and optical activity-isomerism in tartaric acid-racemisation- resolution- geometrical isomerism of maleic and fumaric acids-keto-enol tautomerism of acetoacetic esters.

Unit- IV

Dyes, Chemotherapy and Vitamins: Dyes: Terms used chromophore, auxochrome, bathachromic shift and hypsochromic shift- classification of dyes – based on chemical structure and application-one example each for azo, triphenylmethane, vat and mordant dyes- preparation. **Chemotherapy:** Preparation, uses and mechanism of action sulpha drugs- preparation and uses of prontosil, sulphadiazine and sulphafurazole-structure and uses of pencillins and chloromycetin. **Vitamins:** Diseases caused by the deficiency of vitamins A, B_1, B_2, C and D-sources of these vitamins.

Unit- V

Elements of Photochemistry, Chemical Kinetics and Chromatography: Elements of Photochemistry: Photochemical laws-Beer Lambert's law-Grotthuss-Draper law-Stark- Einstein law (statement only).

Chemical Kinetics: Rate-order-molecularity-pseudo first order reactions-zero order reactions-determination of order of reaction-measurement of order and rates of reactions- effect of temperature on reaction rate-energy of activation.

Chromatography: Principles and applications of Column, Paper and Thin Layer Chromatography.

References

1. Veeraiyan, V., & Vasudevan, A.N.S. (2005). *Text Book of Allied Chemistry* (2nd ed.). Chennai: Highmount Publishing House.
2. Puri, B.R., & Sharma L.R. (2002). *Principles of Inorganic Chemistry*. Jalandar: Shobanlal & Company Ltd.
3. Bahl, B.S., & Arun Bahl, (2005). *Advanced Organic Chemistry.* New Delhi: S.Chand& Company Ltd.
4. Puri, Sharma &Pathania, (2003). *Physical Chemistry.* Jalandhar: Vishal Publishing Company Ltd.
5. Gopalan, R. & Sundaram, S. (2003). *Allied Chemistry* (3rd ed.). New Delhi: Sultan Chand & Sons.

SEMESTER I

16BTU111 BIOCHEMISTRY & METABOLISM PRACTICAL 4H -2C

Total hours/week: L:0 T:0 P:4 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To acquire skill on various experimental methods and techniques on order to analyse the given biological samples.
- To know the standard procedures for handling the biochemical assays and instruments.
- To know the threshold levels of primary biochemicals.
- To analyse common organic reagents and compounds based on their properties.
- To analyse biological compounds from unknown mixture/origin.
- To Understand Good laboratory practices in a laboratory.

Course Outcomes

The learners will be able to,

1. Gain skills on quantitative estimation methods for various biomolecules from natural sources.
2. Acquire handling skills to handle the instrumentations.
3. Obtain skills on primary screening of samples.
4. Develop skills to prepare useful reagents in the laboratory.
5. Use of handling of glass wares, minor equipment for conducting experiments.
6. Learn safety and precautionary measures for working in a laboratory.

List of Practicals

1. Preparation of buffers.
2. Qualitative tests for Carbohydrates, lipids and proteins
3. Principles of Colorimetry**: (i)** Beer's law, estimation of protein. (**ii)** To study relation between absorbance and %transmission.
4. Separation of Amino acids by paper chromatography.
5. Estimation of blood glucose by glucose oxidase method.
6. Determination of - pH optima, temperature optima, Km value, V_{max}, Effect of inhibitor (Inorganic phosphate) on the enzyme activity.
7. To study the effect of pH, temperature on the activity of salivary amylase enzyme.
8. To study activity of any enzyme under optimum conditions.

References

1. Berg, J. M., Tymoczko, J. L., &Stryer, L. (2006). *Biochemistry* (6th ed.). Newyork: W.H. Freeman &Company.
2. Buchanan, B., Gruissem, W., &Jones, R. (2015). *Biochemistry and Molecular Biology of Plants* (2nd ed.). American Society of PlantBiologists.
3. Nelson, D.L., &Cox, M.M. (2013). *Lehninger:Principles of Biochemistry* (6th ed.). New York: W.H. Freeman andCompany.
4. Hopkins, W.G., &Huner, P.A. (2008). *Introduction to Plant Physiology* (2nd ed.).John Wiley&Sons.
5. Murray, R.K., Bender, D.A., Botham, K.M., &Kennelly, P.J., (2012). *Harper's illustrated Biochemistry* (29th ed.). London :McGraw-HillMedical.

SEMESTER I

16BTU112 CELL BIOLOGY PRACTICAL 3H -2C

Total hours/week: L:0 T:0 P:3 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To enable students to learn the basics of prokaryotic and eukaryotic cells
- To develop practical biological skills such as staining, sterilization, dialysis etc.
- To prepare students for subsequent biological courses that require an understanding of the physiology of organisms such as cell division, enzyme activity etc.
- To understand the basics of techniques to study cells.
- To prepare students to handle the equipment available and identify the suitable and appropriate experiments.
- To learn aseptic techniques in the lab.

Course Outcomes

The learners will be able to,

1. Understand the unique features of plant and animal cells.
2. Gain the practical skills on tissue mounting techniques to visualize the cell morphology.
3. Acquire knowledge about cell's response to various environmental conditions.
4. Able to differentiate the cells of various living organisms and get awareness of physiological processes of cell.
5. Able to observe and correctly identify different cell types, cellular structures.
6. Able to handle the equipment available and identify the suitable and appropriate experiments.

List of Practicals

1. Study the effect of temperature and organic solvents on semipermeable membrane.
2. Demonstration of dialysis.
3. Study of plasmolysis and de-plasmolysis.
4. Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other suitable source.
5. Study of structure of any Prokaryotic and Eukaryotic cell.
6. Microtomy: Fixation, block making, section cutting, double staining of animal tissues like liver, pancreas, kidney.
7. Cell division in onion root tip.
8. Preparation of Nuclear, Mitochondrial and cytoplasmic fractions.

References

1. Karp, G. (2013). *Cell and Molecular Biology: Concepts and Experiments* (7th ed.). Hoboken, US: John Wiley & Sons. Inc.
2. De Robertis, E.D.P., & De Robertis, E.M.F. (2006). *Cell and Molecular Biology* (8th ed.). Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M., &Hausman, R.E. (2013). *The Cell: A Molecular Approach* (6th ed.). Washington, USA: ASM Press & Sunderland, D.C., Sinauer Associates.
4. Becker, W. M., Kleinsmith, L. J., Hardin. J., & Bertoni,G.P.(2009).*The World of the Cell* (7th ed.). San Francisco: Pearson Benjamin Cummings Publishing.

SEMESTER I

16BTU113 **CHEMISTRY-1 PRACTICAL** **3H -2C**

Total hours/week: L:0 T:0 P:3 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The student should know

- The molecular orbital theory, preparation and properties of inorganic compounds.
- Theory of covalent bond, polar effects and stereochemistry of organic compounds.
- Theory about important Aromatic or aliphatic
- About the preliminary test
- Elements of chemical confirmatory test.
- Understand the concepts of safe laboratory practices.

Course Outcomes

The student understands

1. The molecular orbital theory, preparation and properties of inorganic compounds.
2. Theory of covalent bond, polar effects and stereochemistry of organic compounds.
3. About importance of the preliminary test
4. About the chemical confirmatory test
5. Elements of photochemistry, chemical kinetics.
6. About the safety measures to handle the chemicals in the lab.

List of Practicals

1. Preliminary tests
2. Detection of elements present
3. Aromatic or aliphatic
4. Saturated or unsaturated
5. Nature of the functional group
6. Confirmatory tests– aldehydes, ketones, amines, diamide, carbohydrates, phenols, acids, esters & nitro compounds.

Note: Each student should analyses minimum 6 compounds.

References

1. Ramasamy, R. (2008). *Allied Chemistry Practical Book*. Karur: Priya Publications.
2. Thomas, A.O. (2010). *Practical Chemistry for B.Sc. Main Students*. Cannanore: Kerala, Scientific Book Centre.
3. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A. R. (2004). *Basic Principles of Practical Chemistry* (2nd ed.). New Delhi: S. Chand Publications.

கற்பகம் உயர்கல்வி கலைக்கழகம்
தமிழ்த்துறை
பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)
இரண்டாம் பருவம்
(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)
(For I-UG Science Degree Classes) 16LSU201

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

தாள்கள் வரிசையும் தேர்வுச் செயல்திட்டமும் பகுதி-I தமிழ்

பருவம்	**தாள்**	**கற்பிக்கும் நேரம்/வாரம்**	**தேர்வு மணிகள்**	**மதிப்பெண் அக/எழுத்து**	**மொத்தம்**	**மதிப்பீடு**
இரண்டு	II	4	3	40 / 60	100	4

அலகு – I : பக்தி இலக்கியம் **(10 மணிநேரம்)**

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. சைவம் - பெரியபுராணம் - திருமூலநாயனார் புராணம்.

2. வைணவம் - பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

அலகு – II : சங்க இலக்கியம் : **(15 மணிநேரம்)**

சங்க இலக்கியங்கள் அறிமுகம்

அ). எட்டுத்தொகை

நற்றிணை : பிரசம் கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து: திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு –
உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : சுடர்தொடீ கேளாய்: குறிஞ்சிக்கலி- 36
அகநானூறு : அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி - 48
புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள் – 'சிறுதினை மலரொடு' என்பதிலிருந்துதொடங்கி,
'அறிந்தவாறே' என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – 'தெய்வம் சான்ற' என்பதிலிருந்து தொடங்கி, 'நல்குமதி' என்பது வரையிலான தொடர்கள்: 286-295.

அலகு - III : காப்பியம் (6 மணிநேரம்)

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29) – **கண்ணகியின் சிறப்பு:**
'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி,
'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234) **- சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்:** 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485) **- செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்:** 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

அலகு – IV : சிறுகதை (10 மணிநேரம்)

1. **குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்**
2. **காட்டில் ஒரு மான் - அம்பை**
3. **நாற்காலி – கி.ராஜநாராயணன்**
4. **நகரம் – சுஜாதா**

அலகு- V : மொழிப்பயிற்சி (7 மணிநேரம்)

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

SEMESTER II

16BTU201 **GENETICS** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To deliver the basic concepts of heredity in different living organisms
- To gain the information about the level of genome organization in various living organisms
- To obtain the knowledge about transmission of genetic information across generation at the individual and population level
- To understand how to identify and classify mutations in DNA.
- To relate the structure and function of the DNA molecule to its functional role in encoding genetic material.
- To describe the basic aspects of the flow of genetic information.

Course Outcomes

The learners will be able to,

1. Acquire knowledge about the central theories and methodologies traditional, molecular and population genetics.
2. Acquire information on sex- linked inheritance and associated diseases.
3. Understand the role of genetics in breeding and natural selection.
4. Apply the principles of inheritance as formulated by Mendel.
5. Apply the Hardy-Weinberg Law in analyzing population genetics for gene frequency, sex linkage, equilibrium, and heterozygote frequency.
6. Acquire knowledge about the relationship between genetic, physical, and cytogenetic maps.

UNIT- I

Introduction: Historical developments in the field of genetics. Organisms suitable for genetic experimentation and their genetic significance. Cell Cycle: Mitosis and Meiosis: Control points in cell-cycle progression in yeast. Role of meiosis in life cycles of organisms.

UNIT-II

Mendelian Genetics: Mendel's experimental design, monohybrid, di-hybrid and tri hybrid crosses, Law of segregation &Principle of independent assortment. Verification of segregates by test and back crosses, Chromosomal theory of inheritance, Allelic interactions: Concept of dominance, recessiveness, incomplete dominance, co-dominance, semi-dominance, pleiotropy, multiple alleles, pseudo-allele, essential and lethal genes, penetrance and expressivity.

UNIT-III

Chromosome and Genomic Organization: Eukaryotic nuclear genome nucleotide sequence composition–unique & repetitive DNA, satellite DNA. Centromere and telomere DNA sequences, repetitive transposed sequences- SINEs &LINEs. Genetic organization of prokaryotic and viral genome. Structure and characteristics of bacterial and eukaryotic chromosome, chromosome morphology, concept of euchromatin and heterochromatin. Concept of cistron, exons, introns, genetic code, gene function.

UNIT-IV

Chromosome and Gene Mutations: Definition and types of mutations, causes of mutations, Ames test for mutagenic agents, screening procedures for isolation of mutants and uses of mutants, variations in chromosomes structure - deletion, duplication, inversion and translocation (reciprocal and Robertsonian).

Sex determination, sex linkage, sex linked diseases: Mechanisms of sex determination, Fragile- X-syndrome and chromosome, sex influenced dominance, sex limited gene expression, sex linked inheritance.

UNIT-V

Genetic Linkage, Crossing Over and Chromosome Mapping: Linkage and Recombination of genes in a chromosome crossing over. Extra chromosomal inheritance: Rules of extra nuclear inheritance, maternal effects, maternal inheritance, cytoplasmic inheritance, organelle heredity, genomic imprinting. Evolution and population genetics: In breeding and out breeding, Hardy Weinberg law (prediction, derivation), allelic and genotype frequencies, changes in allelic frequencies, systems of mating, evolutionary genetics, natural selection.

References

1. Gardner, E.J., Simmons, M.J., & Snustad, D.P. (2006). *Principles of Genetics* (8th ed.). John Wiley &Sons.
2. Snustad, D.P., & Simmons, M.J. (2009). *Principles of Genetics* (5th ed.). USA: John Wiley and Sons Inc.
3. Russell, P. J. (2009). *Genetics- A Molecular Approach* (3rd ed.). Benjamin Cummings.
4. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C., &Carroll, S.B. (2007). *Introduction to Genetic Analysis* (9thed.). W. H. Freeman &Co.

SEMESTER II

16BTU202 CHEMISTRY-2 4H -4C

Total hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

- To make the student to be conversant with the extraction of metals, coordination chemistry, preparation, properties uses and structure of naphthalene and heterocyclic compounds.
- To make the student acquire sound knowledge of electrochemistry, biological functions of amino acids and proteins.
- To educate students on chemistry of carboxylic acids, nitro compounds and carbohydrates.
- To impart basic understanding on Thermodynamics
- To educate students on topics Electrochemistry
- To educate on thermodynamic laws, entropy, enthalpy change and the principles of electroplating.

Course Outcomes

1. The students will be able to understand the metallurgy of metals and the theories of coordination compounds and the industrial importance of EDTA, haemoglobin and chlorophyll.
2. The students will be able to understand the concept of aromaticity and preparation of aromatic compounds including heterocyclic compounds.
3. The students will be able to understand the preparation, classifications and properties of amino acids, proteins and carbohydrates.
4. The students will be able to understand the concepts of first and second laws of thermodynamics.
5. The students will be able to understand the fundamentals of electrochemistry.
6. To expose students on radical analysis in inorganic mixtures; Determination of surface tension and viscosity of liquids.

Unit-I

Metals and Coordination Chemistry:

Metals: General methods of extraction of metals-methods of ore dressing-types of furnaces- reduction methods-electrical methods-types of refining-Van Arkel Process-Zone refining.

Coordination Chemistry: Nomenclature-theories of Werner, Sidgewick and Pauling- chelation and its industrial importance-EDTA-haemoglobin-chlorophyll-applications in qualitative and quantitative analysis.

Unit-II

Aromatic Compounds and Heterocyclic Compounds:

Aromatic Compounds: Aromaticity-Huckel's (4n+2) rule- aromatic electrophilic substitution in benzene- mechanism of nitration, halogenation, alkylation, acylation and sulphonation. Naphthalene: Isolation, preparation, properties and structure. **Heterocyclic Compounds:** Preparation and properties of pyrrole, furan, thiophene and pyridine.

Unit-III

Amino acids, Proteins and Carbohydrates: Amino acids: Classification, preparation and properties. Peptides-preparation of peptides (Bergmann method only). **Proteins:** Classification, properties, biological functions and structure. **Carbohydrates:** Classification, preparation and properties of glucose and fructose- discussion of open chain and ring structures of glucose and fructose-glucose-fructose interconversion.

Unit-IV

Energetics: Type of systems-processes and their types - isothermal, adiabatic, reversible, irreversible and spontaneous processes-statement of first law of thermodynamics-need for the second law of thermodynamics-heat engine-Carnot cycle-efficiency-Carnot theorem- thermodynamics scale of temperature-Joule-Thomson effect- Enthalpy- Entropy and its significance-Free energy change.

Unit-V

Electrochemistry: Kohlrausch law-conductometric titrations-hydrolysis of salts-galvanic cells-E.M.F.-standard electrode potentials-reference electrodes- electrochemical series and its applications-buffer solution-buffer solution in the biological systems-pH and its determination-principles of electroplating.

References

1. Veeraiyan, V., & Vasudevan, A.N.S. (2005). *Text Book of Allied Chemistry* (2nd ed.). Chennai: Highmount Publishing House.
2. Puri, B.R., & Sharma L.R. (2002). *Principles of Inorganic Chemistry*. Jalandar: Shobanlal& Company Ltd.
3. Bahl, B.S., & Arun Bahl, (2005). *Advanced Organic Chemistry*. New Delhi: S. Chand& Company Ltd.
4. Puri, Sharma & Pathania, (2003). *Physical Chemistry*. Jalandhar: Vishal Publishing Company Ltd.
5. Gopalan, R. & Sundaram, S. (2003). *Allied Chemistry* (3rd ed.). New Delhi: Sultan Chand & Sons.

SEMESTER II

16BTU203	**GENERAL MICROBIOLOGY**	**4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40** **External: 60** **Total: 100**

Course Objectives

The main objectives of the course are

- To inculcate knowledge on fundamentals of microorganisms.
- To learn the structural organization, morphology and reproduction of microbes.
- To know the principles of Microscopy and advancements in Microscopy
- To deal with the study of genetic, metabolic strategies and ecology of microorganisms.
- To learn the basic knowledge of the main microbiological techniques to be applied in the laboratory.
- To develop understanding about microbial metabolism, growth, energy generation and disease caused.

Course Outcomes

On completion of the course, students are able to

1. Gain rigorous knowledge on historical perspective of Microbiology
2. Acquire basic knowledge on different structure of microbes.
3. Get Ideas on different type of microscope.
4. Acquire basic knowledge the different applications of microbiology in biotechnology.
5. Acquire basic knowledge of genetic, metabolic strategies and ecology of microorganisms.
6. Acquire basic knowledge about microbial metabolism, growth, energy generation and disease caused.

UNIT-I

Fundamentals, History, Scope and Evolution of Microbiology. Classification of microorganisms: Microbial taxonomy, criteria used including molecular approaches, Microbial phylogeny and current classification of bacteria. Microbial Diversity: Distribution and characterization Prokaryotic and Eukaryotic cells, Morphology and cell structure of major groups of microorganisms eg. Bacteria, Algae, Fungi, Protozoa and Unique features of viruses.

UNIT-II

Cultivation and Maintenance of microorganisms: Nutritional categories of micro-organisms, Media, Types of media, Methods of isolation, Stating and types, Purification and preservation.

UNIT-III

Microbial growth: Growth curve, Microbial growth kinetics, batch and continuous culture, Measurement of growth, growth factors, factors affecting growth of bacteria. Bacterial Reproduction: Transformation, Transduction and Conjugation. Endospores and sporulation in bacteria.

UNIT-IV

Water Microbiology: Bacterial pollutants of water, coliforms and non coliforms. Sewage composition and its disposal. Food Microbiology: Important microorganism in food Microbiology: Moulds, Yeasts, bacteria. Major food born infections and intoxications, Preservation of various types of foods. Fermented Foods.

UNIT-V

Causative agent, pathology, diagnosis, treatment and control of Microbial diseases. TB, Cholera, Malaria, Amoebiasis, AIDS Control of Microorganisms: By physical, chemical and chemotherapeutic Agents.

References

1. Aneja, K.R., &Mehrotra, R.S. (2015). *An Introduction to Mycology* (2nd ed.). New Age International.
2. Jay, J.M., Loessner, M.J., &Golden, D.A. (2005). *Modern Food Microbiology* (7th ed.). Delhi: India, CBS Publishers and Distributors.
3. Robert Edward Lee, (2008). *Phycology* (4thed.). Cambridge University Press.

4. Madigan, M.T., Martinko, J.M., &Parker, J. (2010). *Brock Biology of Microorganisms*. (13th ed.). Pearson/Benjamin Cummings.
5. Pelczar, M.J., Chan, E.C.S., &Krieg, N.R. (1993). *Microbiology* (5th ed.). McGraw Hill Book Company.
6. Stanier, R. Y., Ingraham, J. L., Wheelis, M. L., & Painter, P. R .(2005).*General Microbiology* (5th ed.). McMillan.
7. Tortora ,G.J., Funke, B.R., &Case ,C.L. (2008). *Microbiology: An Introduction* (9th ed.). Pearson Education.
8. Willey, J.M., Sherwood, L.M., &Woolverton, C.J. (2008). *Prescott, Harley and Klein's Microbiology* (7th ed.). McGraw Hill Higher Education.

SEMESTER II

16BTU211 GENETICS PRACTICAL 3H -2C

Total hours/week: L:0 T:0 P:3 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To learn about prokaryotic and eukaryotic genetic system using modern techniques.
- To inculcate knowledge on cell division stages.
- To develop skills on cell mounting techniques.
- To develop skills on karyotyping
- To inculcate knowledge on pedigree analysis.
- To learn about the mendelian laws and the experiment outcomes.

Course Outcomes

The learners will be able to

1. Gain rich knowledge on genetic model system used in research.
2. Acquire basic knowledge on different stages in cell division.
3. Get Ideas on pedigree analysis for detection of genetic disorders.
4. Acquire basic knowledge on karyotyping
5. Acquire basic knowledge of genetic variations among microorganisms.
6. Apply the principles of inheritance as formulated by Mendel.

List of Practicals

1. Permanent and temporary mount of mitosis.
2. Permanent and temporary mount of meiosis.
3. Mendelian deviations in dihybrid crosses
4. Demonstration of - Barr Body -*Rhoeo* translocation.
5. Karyotyping with the help of photographs
6. Pedigree charts of some common characters like blood group, color blindness and PTC tasting.
7. Study of polyploidy in onion root tip by colchicine treatment.

References

1. Gardner, E.J., Simmons, M.J., & Snustad, D.P. (2006). *Principles of Genetics* (8th ed.). John Wiley &Sons.
2. Snustad, D.P., &Simmons, M.J. (2009). *Principles of Genetics* (5th ed.). USA: John Wiley and Sons Inc.
3. Russell, P. J. (2009). *Genetics- A Molecular Approach* (3rd ed.). Benjamin Cummings.
4. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C., &Carroll, S.B. (2007). *Introduction to Genetic Analysis* (9thed.). W. H. Freeman &Co.
5. Klug, W.S., Cummings, M.R., &Spencer, C.A. (2009). *Concepts of Genetics* (9th ed.). Benjamin Cummings.

SEMESTER II

16BTU212 CHEMISTRY -2 PRACTICAL 3H -2C

Total hours/week: L:0 T:0 P:3 Marks: Internal: 40 External: 60 Total:100

Course Objectives

- To make the student to be conversant with the extraction of metals, coordination chemistry, preparation, properties uses and structure of naphthalene and heterocyclic compounds.

- To make the student acquire sound knowledge of electrochemistry, biological functions of amino acids and proteins.
- To educate students on chemistry of carboxylic acids, nitro compounds and carbohydrates.
- To impart basic understanding on Thermodynamics
- To educate students on topics Electrochemistry
- To educate on thermodynamic laws, entropy, enthalpy change and the principles of electroplating.

Course Outcomes

1. The students will be able to understand the metallurgy of metals and the theories of coordination compounds and the industrial importance of EDTA, haemoglobin and chlorophyll.
2. The students will be able to understand the concept of aromaticity and preparation of aromatic compounds including heterocyclic compounds.
3. The students will be able to understand the preparation, classifications and properties of amino acids, proteins and carbohydrates.
4. The students will be able to understand the concepts of first and second laws of thermodynamics.
5. The students will be able to understand the fundamentals of electrochemistry.
6. To expose students on radical analysis in inorganic mixtures; Determination of surface tension and viscosity of liquids.

VOLUMETRIC ANALYSIS

A. Acidimetry & Alkalimetry

1. Estimation of sodium carbonate using standard sodium hydroxide.
2. Estimation of sodium hydroxide using standard sodium carbonate.
3. Estimation of sulphuric acid using standard oxalic acid.
4. Estimation of potassium permanganate using standard sodium hydroxide.

B. Permanganometry

1. Estimation of ferrous sulphate using standard Mohr's salt.
2. Estimation of oxalic acid using standard ferrous sulphate.
3. Estimation of calcium-direct method.

References

1. Ramasamy, R. (2008). *Allied Chemistry Practical Book*. Karur: Priya Publications.
2. Thomas, A.O. (2010). *Practical Chemistry for B.Sc. Main Students.* Cannanore: Kerala, Scientific Book Centre.
3. Venkateswaran, V., Veeraswamy, R., &Kulandaivelu, A. R. (2004). *Basic Principles of Practical Chemistry* (2nd ed.). New Delhi: S. Chand Publications.

SEMESTER II

16BTU213 GENERAL MICROBIOLOGY PRACTICAL

3H -2C

Total hours/week: L:0 T:0 P:3 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are

- To understand the basic principles of microscopy ultra-structure of microbes along with staining and sterilization methods
- To understand various accessories for microbiology practicals.
- To acquaint the students with various aspects of basic microbiology.
- To understand the biochemical characterization of isolated microbes.
- To develop practical biological skills such as staining, sterilization etc.
- To develop skills on primary screening of microorganisms.

Course Outcomes

On completion of the course, students are able to

1. Develop basic skill in aseptic techniques
2. Have outline knowledge on isolation, sub culture and maintenance of microbes.
3. Gain experience in microbiological laboratory practices and skills in the design and execution of microbiology related research.
4. Develop skills to prepare useful medias for microbial growth in the laboratory.
5. Use of handling of glass wares, minor equipment for conducting experiments.
6. Learn safety and precautionary measures for working with microbes in a laboratory.

List of Practicals

1. Preparation of media & sterilization methods
2. Methods of Isolation of bacteria from different sources.
3. Staining methods: simple staining, Gram staining, spore staining, negative staining, hanging drop.
4. Biochemical characterization of isolated microbes.
5. Enumeration of microorganism - total & viable count.
6. Determination of bacterial cell size by micrometry.

References

1. Brooks, G.F, Carroll, K.C., Butel, J.S., & Morse, S.A. (2007). Jawetz, Melnick and Adelberg's *Medical Microbiology* (24th ed.). McGraw Hill Publication.
2. Goering, R., Dockrell, H., Zuckerman, M., & Wakelin, D. (2007). *Mims' Medical Microbiology* (4th ed.). Elsevier.
3. Willey, J.M., Sherwood, L.M., & Woolverton, C.J. (2008). *Prescott, Harley and Klein's Microbiology* (7th ed.). McGraw Hill Higher Education.

16AEC201 **ENVIRONMENTAL STUDIES** **4H –4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks: Internal: 40 External: 60 Total: 100**

Course Objectives

The main objectives of the course are,

- To create awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To learn about the environment, resources available, biodiversity and its conservation
- To understand the current scenarios- to find ways for protection and betterment of or habitat.
- To Understand the concepts and methodologies to analyze the interactions between social and environmental processes.

Course Outcomes

The learners will be able to,

1. Understand the concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Study the concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Learn the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Creating the awareness about environmental problems among people.

UNIT-I

Introduction: Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

Unit II

Renewable and Non-renewable Resources: Natural Resources- Renewable and Non- renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources: Use and over- utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fireworks.

Unit III

Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV

Environmental Pollution: Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit V

Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population. growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

References

1. Tripathy.S.N., & Sunakar Panda. (2004). *Fundamentals of Environmental Studies* (2nded.). New Delhi: Vrianda Publications Private Ltd.
2. Arvind Kumar, (2004). *A Textbook of Environmental Science.* New Delhi: APH Publishing Corporation.
3. Verma,P.S.,&Agarwal,V.K.(2001).*EnvironmentalBiology(PrinciplesofEcology).* New Delhi: S.Chand and Company Ltd.
4. Anubha Kaushik, &Kaushik C.P. (2004). *Perspectives in Environmental Studies.* New Delhi: New Age International Pvt. Ltd.Publications.
5. Singh, M.P., &Singh B.S., &Soma Dey S. (2004). *Conservation of Biodiversity and Natural Resources.* New Delhi: Daya Publishing House.
6. Daniel Botkin B., &Edward Keller A. (1995). *Environmental Science.* New York: John Wiley and Sons,Inc.
7. Uberoi, N.K.(2005). *Environmental Studies.* New Delhi: India, Excel Books Publications.

SEMESTER III

16BTU301 **PLANT PHYSIOLOGY** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To understand the physiological conditions of the plants and metabolism.
- To understand the basic concepts of Photosystems and their importance in plant growth.
- To gain the information about the economic importance of algae and fungi.
- To develop familiarity with plant development, biochemistry, and metabolism.
- To be familiar with cutting edge technology employed in contemporary plant biology.
- To integrate their knowledge of plant physiology to relevant cultural, social, and legal aspects of their lives.

Course Outcomes

The learners will be able to,

1. Gain adequate knowledge on plant physiology and importance.
2. Understand the molecular mechanisms of macro and micro nutrients in plant growth.
3. Get the basic and applied knowledge of plant growth, development and metabolism.
4. Impart an insight into the various plant water relations
5. Understand the mechanism of various metabolic processes in plants
6. Equip students with skills and techniques related to plant physiology so that they can design their own experiments

UNIT-I: Anatomy: The shoot and root apical meristem and its histological organization, simple &complex permanent tissues, primary structure of shoot &root, secondary growth, growth rings, leaf anatomy (dorsi-ventral and isobilateral leaf).

UNIT-II: Plant water relations and micro &macro nutrients: Plant water relations: Importance of water to plant life, diffusion, osmosis, plasmolysis, imbibition, guttation, transpiration, stomata &their mechanism of opening &closing. Micro &macro nutrients: criteria for identification of essentiality of nutrients, roles and deficiency systems of nutrients, mechanism of uptake of nutrients, mechanism of food transport.

UNIT-III: Carbon and nitrogen metabolism: Photosynthesis- Photosynthesis pigments, concept of two photo systems, photphosphorylation, calvin cycle, CAM plants, photorespiration, compensation point
Nitrogen metabolism- inorganic &molecular nitrogen fixation, nitrate reduction and ammonium assimilation in plants.

UNIT-IV: Growth and development: Growth and development: Definitions, phases of growth, growth curve, growth hormones (auxins, gibberlins, cytokinins, abscisic acid, ethylene). Physiological role and mode of action, seed dormancy and seed germination, concept of photoperiodism and vernalization.

UNIT-V: Plant adaptation: Stress adaptation mechanism: Definitions, Indicators of stress response - morphological, physiological, biochemical and molecular level. Stress adaptation and tolerance mechanism – biotic and abiotic stress, Effect of stress on crop productivity, Global warming - physiological effects on crop productivity.

References

1. Dickinson, W.C. (2000). *Integrative Plant Anatomy.* USA: Harcourt AcademicPress.
2. Esau, K. (1977) *Anatomy of Seed Plants.* WileyPublishers.
3. Hopkins,W.G., &Huner, P.A. (2008). *Introduction to Plant Physiology*. John Wiley &Sons.
4. Nelson, D.L., &Cox, M.M. (2004). *Lehninger Principles of Biochemistry* (4th ed.). New York: USA, W.H. Freeman &Company.
5. Salisbury, F.B, &Ross, C.W. (1991). *Plant Physiology.* Wadsworth Publishing Co.Ltd.
6. Taiz, L., &Zeiger, E. (2006). *Plant Physiology* (4th ed.). MA: USA, Sinauer Associates Inc.

SEMESTER III

16BTU302 MOLECULAR BIOLOGY 4H -4C

Total hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total: 100

Course Objectives

The main objectives of the course are

- To emphasize the basic knowledge about the structure and functions of nucleic acids (DNA/RNA) and proteins.
- To obtain the adequate knowledge on the structure and functions of biomolecules.
- To gain the information about the DNA damage and repair mechanisms.
- To understand the mechanisms behind gene regulations.
- To understand the mechanism behind translation and transcription
- To understand the mutations and its significance

Course Outcomes

The learners will be able to,

1. Achieve knowledge about the functions of nucleic acids and proteins.
2. Acquire an in-depth knowledge of chemical and molecular processes that occur in and between the cells.
3. Gain an insight into the most significant molecular and cell-based methods used today to expand our understanding of biology.
4. Acquire knowledge about the mechanisms behind gene regulations.
5. Gain knowledge about mechanism behind translation and transcription
6. Acquire an in-depth knowledge about mutation and its significance

UNIT-I: DNA structure and organization: DNA as genetic material, Structure of DNA, Types of DNA, Organization of DNA in prokaryote and eukaryotic cells, Chromosome biology – histone and non-histone proteins, organization.

UNIT-II: DNA structure and replication: Replication of DNA in prokaryotes and eukaryotes: Semi-conservative nature of DNA replication, Bi-directional replication, DNA polymerases, Replication complex: Pre-priming proteins, primosome, replisome, Rolling circle replication, Unique aspects of eukaryotic chromosome replication, Fidelity of replication.

UNIT-III: DNA damage, repair and homologous recombination: DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair: Photoreactivation, base excision repair, nucleotide excision repair, mismatch repair, trans-lesion synthesis, recombinational repair, nonhomologous end joining. Homologous recombination: models and mechanism.

UNIT-IV: Transcription and RNA processing: RNA structure and types of RNA, Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA splicing and processing: processing of pre- mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing.

UNIT-V: Regulation of gene expression and translation: Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system), Genetic code and its characteristics, Prokaryotic and eukaryotic translation: ribosome structure and assembly, Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides, Fidelity of translation, Inhibitors of translation, Posttranslational modifications of proteins.

References

1. Karp, G. (2013). *Cell and Molecular Biology: Concepts and Experiments* (7th ed.). Hoboken, US: John Wiley & Sons. Inc.
2. De Robertis, E.D.P., & De Robertis, E.M.F. (2006). *Cell and Molecular Biology* (8th ed.). Lippincott Williams and Wilkins, Philadelphia.
3. Becker, W.M., Kleinsmith, L.J., Hardin. J., & Bertoni, G. P. (2009). *The World of the Cell* (7th ed.). San Francisco: Pearson Benjamin Cummings Publishing.
4. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., & Losick, R.(2008). *Molecular Biology of the Gene* (6th ed.). Cold Spring Harbour Lab. Press, Pearson Pub.

SEMESTER III

16BTU303 **IMMUNOLOGY** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total: 100**

Course Objectives

The main objectives of the course are,

- To understand the basic concepts of immunology.
- To expose students to use these principles of immune system to combats infections.
- To gain the information about the auto immune diseases.
- To elucidate the genetic basis for immunological diversity and the generation of adaptive immune responses
- To understand the basic knowledge of immunological processes at a cellular and molecular level
- To learn central immunological principles and concepts

Course Outcomes

The learners will be able to,

1. Gain about the various cells and organs involved in the immune system.
2. Understand the molecular mechanisms of antigen-antibody interactions and also the molecular mechanisms behind the immune response evoked after infection by various pathogens.
3. Learn the theoretical basis for the various immunological techniques.
4. Describe which cell types and organs present in the immune response
5. Apply basic techniques for identifying antigen antibody interactions.
6. Illustrate various mechanisms that regulate immune responses and maintain tolerance

UNIT-I

Immune Response: An overview, components of mammalian immune system, Antigens- Essential features of Ag, haptens, Carrier molecule, Immunological valence, Antigenic determinants. Adjuvants: Freund's complete and incomplete. Antibodies - Molecular structure of Immuno-globulins or Antibodies, Humoral &Cellular immune responses, T lymphocytes & immune response (cytotoxic T-cell, helper T-cell, suppressor T-cells), T-cell receptors, genome rearrangements during B-lymphocyte differentiation, Antibody affinity maturation class switching, assembly of T-cell receptor genes by somatic recombination.

UNIT-II

Regulation of immunoglobulin gene expression: Clonal selection theory, all of types & idiotypes, allelic exclusion, immunologic memory, heavy chain gene transcription, genetic basis of antibody diversity, hypotheses (germ line &somatic mutation), antibody diversity.

UNIT-III

Hypersensitivity Reactions (HS): Type I: Allergies and anaphylaxis; Type II: Antibody mediated HS reactions; Mechanism and pathogenicity; Type III: Immune complex mediated HS reactions: Mechanism & pathogenicity; Type IV: Delayed type (or) cell-mediated HS reactions; Mechanisms and pathogenicity. Type V: Stimulatory HS reactions. Mechanism and pathogenesis.

UNIT-IV

Major Histocompatibility complexes: Class I &class II MHC antigens, antigen processing. Immunity to infection – immunity to different organisms, pathogen defense strategies, avoidance of recognition. Autoimmune diseases, Immunodeficiency-AIDS.

UNIT-V

Vaccines &Vaccination – adjuvants, cytokines, DNA vaccines, recombinant vaccines, bacterial vaccines, viral vaccines, vaccines to other infectious agents, passive &active immunization Introduction to immunodiagnostics – RIA, ELISA.

References

1. Abbas, A. K., Lichtman, A. H., & Pillai, S. (2007). *Cellular and Molecular Immunology* (6th ed.). Philadelphia: Saunders Publication.
2. Delves, P., Martin, S., Burton, D., & Roitt, I. M. (2006). *Roitt's Essential Immunology* (11th ed.). Wiley-lackwell Scientific Publication, Oxford.
3. Goldsby, R.A., Kindt, T.J., Osborne, B.A. (2007). *Kuby's Immunology* (6th ed.). New York: W.H. Freeman and Company.
4. Murphy, K., Travers, P., &Walport, M. (2008). *Janeway's Immunobiology* (7th ed.). New York : Garland Science Publishers.
5. Peakman, M., & Vergani, D. (2009). *Basic and Clinical Immunology* (2nd ed.). Edinberg: Churchill Livingstone Publishers.
6. Richard, C., & Geiffrey, S. (2009). *Immunology* (6th ed.). Wiley Blackwell Publication.

SEMESTER III

16BTU304A MOLECULAR DIAGNOSTICS 3H -3C

Total hours/week: L:3 T:0 P:0 Marks: Internal: 40 External: 60 Total: 100

Course Objectives

The main objectives of the course are

- To obtain basic concepts of molecules and its effect on human and other animals.
- To ascertain the diagnostics tools for infectious diseases.
- To achieve a complete knowledge about molecular diagnostics techniques on human welfare.
- To understand the utility and limitations of various molecular diagnostic tests used for managing patient care.
- To attain the concepts of molecular methods used in clinical microbiology.
- To recognize the importance of proper specimen collection and preparation for molecular detection.

Course Outcomes

On completion of the course, students are able to

1. Get hold of the knowledge on fundamentals of molecular diagnostic techniques.
2. Expertise on the concepts of infection, diagnosis and control assortment.
3. Acknowledge on the qualitative studies based on biomarker observations.
4. Apply methodologies of laboratory diagnostics to relevant states of health.
5. Be aware of characteristics signs of clinical manifestations.
6. Comprehend and analyse the concept of disease management.

UNIT-I

Enzyme Immunoassays: Comparison of enzymes available for enzyme immunoassays, conjugation of enzymes. Solid phases used in enzyme immunoassays. Homogeneous and heterogeneous enzyme immunoassays. Enzyme immunoassays after immuno blotting. Enzyme immuno histochemical techniques. Use of polyclonal or monoclonal antibodies in enzymes immunoassays. Applications of enzyme immunoassays in diagnostic microbiology.

UNIT-II

Molecular methods in clinical microbiology: Applications of PCR, RFLP, Nuclear hybridization methods, Single nucleotide polymorphism and plasmid finger printing in clinical microbiology Laboratory tests in chemotherapy: Susceptibility tests: Micro-dilution and macro- dilution broth procedures. Susceptibility tests: Diffusion test procedures. Susceptibility tests: Tests for bactericidal activity. Automated procedures for antimicrobial susceptibility tests.

UNIT-III

Diagnosis and Standardization: Automation in microbial diagnosis, rapid diagnostic approach including technical purification and standardization of antigen and specific antibodies.

UNIT-IV

Diagnostic Immunology: Concepts and methods in idiotypes. Anti-idiotypes and molecular mimicry and receptors. Epitope design and applications. Immunodiagnostic tests. Immuno- florescence. Radioimmunoassay.

UNIT-V

GLC, HPLC, Electron microscopy, flow cytometry and cell sorting. Transgenic animals.

References

1. Ananthanarayan, R., & Paniker, C.K.J. (2005). *Textbook of Microbiology* (7th ed.). University Press Publication.
2. Brooks, G.F., Carroll, K.C., Butel, J.S., &Morse, S.A. (2007). Jawetz, Melnick and *Adelberg's Medical Microbiology* (24th ed.). McGraw Hill Publication.
3. Goering, R., Dockrell, H., Zuckerman, M., &Wakelin, D. (2007). *Mims' Medical Microbiology* (4th ed.). Elsevier.
4. Joklik, W.K., Willett, H.P., &Amos, D.B. (1995). *Zinsser Microbiology* (19th ed.). Appleton- Centaury – Crofts publication.
5. Willey, J.M., Sherwood, L.M., &Woolverton, C.J. (2008). *Prescott, Harley and Klein's Microbiology* (7th ed.). McGraw Hill Higher Education.

SEMESTER III

16BTU304B BIOTECHNOLOGY AND HUMAN WELFARE 3H -3C

Total hours/week: L:3 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives:

The main objectives of the course are

- learn the basics and lay strong foundation in understanding the biotechnological techniques in human welfare.
- To ascertain the knowledge about solid waste management and wastewater treatment.
- To achieve a novel treatment strategy for waste.
- To learn DNA based methods used in forensic science laboratory
- To obtain knowledge about biotechnological approaches beneficial for industries
- Exposure of simple concepts that will complement the course "Biotechnology in Human Welfare

Course Outcomes:

On completion of the course, students are able to

1. Apply the biotechnology concept for environmental and social welfare.
2. Expertise on the concepts of treatment strategies for waste to renewable energy.
3. Able to produce by-products from waste with help of biotechnology techniques.
4. Able to apply DNA based methods used in forensic science laboratory
5. Able to entry into a wide range of biotechnology industries and research enterprises.
6. Development of non-toxic therapeutic agents, recombinant live and DNA vaccines and gene therapy.

UNIT- I

Industry: protein engineering; enzyme and polysaccharide synthesis, activity and secretion, alcohol and antibiotic formation.

UNIT-II

Agriculture: N2 fixation: transfer of pest resistance genes to plants; interaction between plants and microbes; qualitative improvement of livestock.

UNIT-III

Environments: e.g. chlorinated and non-chlorinated organ pollutant degradation; degradation of hydrocarbons and agricultural wastes, stress management, development of biodegradable polymers such as PHB.

UNIT-IV

Forensic science: e.g. solving violent crimes such as murder and rape; solving claims of paternity and theft etc. using various methods of DNA finger printing.

UNIT-V

Health: e.g. development of non-toxic therapeutic agents, recombinant live vaccines, gene therapy, diagnostics, monoclonal in *E.coli*, human genome project.

References

1. Sateesh, M.K. (2010). *Bioethics and Biosafety.* I. K. International Pvt Ltd.
2. Sree Krishna,V. (2007) *Bioethics and Biosafety in Biotechnology.* New age international publishers.

SEMESTER III

16BTU311 **PLANT PHYSIOLOGY PRACTICAL** **4H -2C**

Total hours/week: L:0 T:0 P:4 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives:

The main objectives of the course are,

- Know importance and scope of plant physiology.
- To understand the plants and plant cells in relation to water.
- Understand the process of photosynthesis in higher plants with and their pigments.
- Understand the respiration in higher plants with particular emphasis on aerobic and anaerobic respiration.
- Learn about the movement of sap and absorption of water in plant body.
- Understand the plant movements.

Course Outcomes:

The learners will be able to

1. Study and impart knowledge about the occurrence, distribution, structure and life history of plants.
2. Enable the students to learn in detail about mono and dicot plant activity.
3. Learn the phylogeny concepts in plants.
4. Understand water relation of plants with respect to various physiological processes.
5. Explain root nodules from a leguminous plant
6. Classify stress indicators

List of Practicals

1. Preparation of stained mounts of anatomy of monocot and dicot's root, stem & leaf.
2. Demonstration of plasmolysis by *Tradescantia* leaf peel.
3. Demonstration of opening & closing of stomata
4. Demonstration of guttation on leaf tips of grass and garden nasturtium.
5. Separation of photosynthetic pigments by paper chromatography.
6. Demonstration of aerobic respiration.
7. Preparation of root nodules from a leguminous plant.
8. Estimation of stress indicators – Proline and osmolyte estimation

References

1. Dickinson, W.C. (2000). *Integrative Plant Anatomy.* USA: Harcourt Academic Press.
2. Nelson, D.L., &Cox, M.M. (2004). *Lehninger: Principles of Biochemistry* (4^{th}ed.). New York: USA, W.H. Freeman and Company.
3. Salisbury, F.B., &Ross, C.W. (1991). *Plant Physiology*. Wadsworth Publishing Co. Ltd.
4. Taiz, L., & Zeiger, E. (2006). *Plant Physiology* (4th ed.). MA: USA, Sinauer Associates Inc.

Course Objectives
The main objectives of the course are,

- To inculcate practical skill in chromosomal and plasmid DNA separation by electrophoresis.
- To develop skills on extraction of proteins from plant and animal sources
- To detect the reverse mutation for carcinogenicity.
- To learn what genes are and how they are inherited
- To learn what are the solutions required for molecular biology experiments and how to prepare it
- To understand the principles and applications of molecular biology

Course Outcomes
The learners will be able to

1. Perform the experiments for isolation, purification and visualize the nucleic acid from various sources
2. Acquire skills on plasmid DNA extraction.
3. Gain basic knowledge on protein extraction and separation by electrophoresis.
4. Know the protocol for detection of mutation in microbes.
5. Understand what genes are and how they are inherited
6. Know how they control cellular activity and they respond to environment

List of Practicals

1. Preparation of solutions for Molecular Biology experiments.
2. Isolation of chromosomal DNA from bacterial cells.
3. Isolation of Plasmid DNA by alkaline lysis method
4. Agarose gel electrophoresis of genomic DNA &plasmid DNA
5. Preparation of restriction enzyme digests of DNA samples
6. Demonstration of AMES test or reverse mutation for carcinogenicity

References

1. Karp, G. (2010). *Cell and Molecular Biology*: Concepts and Experiments (6th ed.). John Wiley &Sons.Inc.
2. Watson, J. D., Baker, T.A., Bell, S. P., Gann, A., Levine, M., &Losick, R.(2008). *MolecularBiology oftheGene*(6thed.).ColdSpringHarbourLab.Press,PearsonPub.
3. Sambrook, J., Fritsch, E.F., &Maniatis, T. (2001). *Molecular Cloning-A Laboratory Manual.* (3rd ed.). Cold Spring Harbor LaboratoryPress.

16BTU313 IMMUNOLOGY PRACTICAL 4H -2C

Total hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To understand the basic concepts of immunology.
- To expose students to use these principles of immune system to combats infections.
- To gain the information about the auto immune diseases.
- To familiarize students with the various immunological techniques
- To identify the cellular and molecular basis of immune responsiveness.
- To describe immunological response and how it is triggered and regulated.

Course Outcomes

The learners will be able to,

1. Gain about the various cells and organs involved in the immune system.
2. Understand the molecular mechanisms of antigen-antibody interactions and also the molecular mechanisms behind the immune response evoked after infection by various pathogens.
3. Learn the theoretical basis for the various immunological techniques.
4. Transfer knowledge of immunology into clinical decision-making through case studies presented in class.
5. Demonstrate a capacity for problem-solving about immune responsiveness.
6. Describe the roles of the immune system in both maintaining health and contributing to disease.

List of Practicals

1. Differential leucocytes count
2. Total leucocytes count
3. Total RBC count
4. Hemagglutination assay
5. Hemagglutination inhibition assay
6. Separation of serum from blood
7. Double immunodiffusion test using specific antibody and antigen.
8. ELISA.

References

1. Abbas,A.K.,Lichtman,A.H.,&Pillai,S.(2007).*CellularandMolecularImmunology* (6th ed.). Philadelphia: Saunders Publication.
2. Delves, P., Martin, S., Burton, D., &Roitt, I.M. (2006). *Roitt's Essential Immunology*.(11th ed.). Wiley-Blackwell Scientific Publication,Oxford.
3. Goldsby, R.A., Kindt, T.J., &Osborne, B.A. (2007). *Kuby's Immunology* (6th ed.). New York: W.H. Freeman andCompany.
4. Murphy, K., Travers, P., Walport, M. (2008). *Janeway's Immunobiology*(7th ed.).New York :Garland SciencePublishers.
5. Peakman, M. &Vergani, D. (2009). *Basic and Clinical Immunology* (2nd ed.). Edinberg: Churchill LivingstonePublishers.
6. Richard, C., &Geiffrey, S.(2009). *Immunology* (6th ed.). Wiley Blackwell Publication.

SEMESTER III

16BTU314A MOLECULAR DIAGNOSTICS PRACTICAL 3H -1C

Total hours/week: L:0 T:0 P:3 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are

- To obtain basic concepts of molecules and its effect on human and other animals.
- To ascertain the diagnostics tools for infectious diseases – RFLP, RAPD.
- To achieve a complete knowledge about molecular diagnostics techniques on microbial infection.
- To understand the utility and limitations of various molecular diagnostic tests used for managing patient care.
- To attain the concepts of molecular methods used in clinical microbiology.
- To recognize the importance of proper specimen collection and preparation for molecular detection.

Course Outcomes

On completion of the course, students are able to

1. Get hold of the knowledge on fundamentals of molecular diagnostic techniques.
2. Expertise on the concepts of infection, diagnosis and control assortment.
3. Acknowledge on the qualitative studies based on biomarker observations.
4. Apply methodologies of laboratory diagnostics to relevant states of health.
5. Be aware of characteristics signs of clinical manifestations.
6. Comprehend and analyse the concept of disease management.

List of Practicals

1. Perform/demonstrate RFLP, RAPD and analysis
2. Kirby-Bauyer method (disc-diffusion method) to study antibiotic sensitivity of a bacterial culture
3. A kit-based detection of a microbial infection (Widal test)
4. Study of Electron micrographs (any four).
5. Perform any one immuno diagnostic test (Typhoid, Malaria, Dengue)

References

1. Willey, J.M., Sherwood, L.M., & Woolverton, C.J. (2008). *Prescott, Harley and Klein's Microbiology* (7th ed.). McGraw Hill Higher Education.
2. Goering, R., Dockrell, H., Zuckerman, M., & Wakelin, D. (2007). *Mims' Medical Microbiology* (4th ed.). Elsevier.
3. Ananthanarayan, R., & Paniker, C.K.J. (2005). *Textbook of Microbiology* (7th ed.). University Press Publication.
4. Brooks, G.F., Carroll, K.C., Butel, J.S., & Morse, S.A. (2007). Jawetz, Melnick and *Adelberg's Medical Microbiology* (24th ed.). McGraw Hill Publication.
5. Joklik, W.K., Willett, H.P., & Amos, D.B. (1995). *Zinsser Microbiology* (19th ed.). Appleton- Centuary-Crofts publication.

SEMESTER III

16BTU314B BIOTECHNOLOGY AND HUMAN WELFARE PRACTICAL 3H -1C

Total hours/week: L:0 T:0 P:3 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are

- Learn the basics and lay strong foundation in understanding the biotechnological techniques in human welfare.
- To ascertain the knowledge about Endophyte.
- To achieve an estimation treatment strategy.
- To learn about ethical issues.
- To obtain knowledge about biotechnological approaches beneficial for industries
- To expose simple experiments that will complement the course “Biotechnology in Human Welfare

Course Outcomes

On completion of the course, students are able to

1. Apply the biotechnology concept for industry products.
2. Expertise on the concepts of treatment strategy.
3. Able to understand the plant part infected with a microbe.
4. Able to enter into a wide range of research enterprises.
5. Get expertise in Bioethics.
6. Understand the concepts of complement course “Biotechnology in Human Welfare

List of Practicals

1. Ethanol fermentation using Baker’s yeast
2. Study of a plant part infected with a microbe
3. To perform quantitative estimation of residual chlorine in water samples
4. Isolation and analysis of DNA from minimal available biological samples
5. Case studies on Bioethics (any two)

(Wherever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.)

References

1. Sateesh, M.K. (2010). *Bioethics and Biosafety.* I. K. International Pvt Ltd.
2. Sree Krishna, V. (2007). *Bioethics and Biosafety in Biotechnology.* New age international publishers.

SEMESTER IV

16BTU401 **BIOPROCESS TECHNOLOGY** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total: 100**

Course Objectives

The main objectives of the course are,

- To learn the procedure for isolation, screening of industrial important microbes
- To derive industrially important products from microbes.
- To acquire knowledge on Downstream processing.
- To learn the principle and applications of bioprocess technology.
- To learn the fundamental calculation in bioprocessing.
- To learn the schematic diagram of upstream and downstream processing for product recovery and purification.

Course Outcomes

The learners will be able to

1. Gain overall knowledge of industrial biotechnology.
2. Obtain information about the application of industrially important microbes.
3. Know the screening, extraction and purification of enzymes.
4. Designing of bioreactors and control necessary for maximizing production.
5. Select and optimize media for maximum production of microbial metabolites.
6. Designing of protocols for strain improvement and separation of molecules after fermentation process.

UNIT- I

Introduction to bioprocess technology: Range of bioprocess technology and its chronological development. Basic principle components of fermentation technology. Types of microbial culture and its growth kinetics– Batch, Fed batch and Continuous culture.

UNIT-II

Design of bioprocess vessels: Significance of Impeller, Baffles, Sparger; Types of culture/production vessels- Airlift; Cyclone Column; Packed Tower and their application in production processes. Principles of upstream processing– Media preparation, Inocula development and sterilization.

UNIT-III

Bioreactor control and monitoring: Introduction to oxygen requirement in bioprocess; mass transfer coefficient; factors affecting KLa. Bioprocess measurement and control system with special reference to computer aided process control.

UNIT-IV

Downstream processing: Filtration, Centrifugation, Cell disruption, Chromatography, liquid- liquid extraction, product recovery and purification. Effluent treatment- product recovery, sludge process, waste disposal.

UNIT-V

Applications: Microbial production of ethanol, amylase, lactic acid, penicillin G and Single Cell Proteins. Fermentation economics. Microbial cell immobilization.

References

1. Casida, LE. (1991). *Industrial Microbiology.* (1st ed.). Wiley Eastern Limited.
2. Crueger,W., & Crueger, A. (2000).*Biotechnology: A textbook of Industrial Microbiology*(2nd ed.). New Delhi: Panima Publishing Co.
3. Patel, A.H. (1996). *Industrial Microbiology*. (1st ed.). Macmillan India Limited.
4. Stanbury, P.F., Whitaker, A., &Hall, S.J. (2006). *Principles of Fermentation Technology* (2nd ed.). Elsevier Science Ltd.
5. Patel, A.H. (2007). *Industrial Microbiology*. Macmillan India Ltd.
6. Stanbury, P.F., Whitaker, A. &S.J. Hall. (2007).*Principles of fermentation technology*. Elsevier Science Ltd.

SEMESTER IV

16BTU402 RECOMBINANT DNA TECHNOLOGY 4H -4C

Total hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To learn the procedure for isolation nucleic acids and Protein.
- To learn the strategies for gene transfer in plants and animals.
- To acquire knowledge on genome mapping.
- To familiarize the student with emerging field of biotechnology
- To acquaint the students to versatile tools and techniques employed in recombinant DNA technology.
- To learn the history and recent developments in rDNA technology, Enzymes used in rDNA technology

Course Outcomes

On completion of the course, students are able to

1. Outline the fundamental steps in a genetic engineering procedure.
2. Describe the mechanism of action and the use of restriction enzymes in biotechnology research and recombinant protein production.
3. Explain the usefulness of plasmid preparations, how they are performed, and how the concentration and purity of plasmid samples can be determined.
4. Discuss cloning strategies and techniques used to probe DNA for specific genes of interest.
5. Conceptualize PCR technique in medical and forensic science.
6. Summarize various applications of rDNA technology in human health care and safety regulations.

UNIT-I

Introduction to r-DNA technology: Basic tools and applications – isolation and purification of nucleic acids, Enzymes used in cloning - restriction enzymes, ligases, polymerases, kinases, phosphatases. Gene recombination and gene transfer – transformation, episomes, plasmids and other cloning vectors (bacteriophage-derived, artificial chromosomes), microinjection, electroporation, ultrasonication.

UNIT-II

Selection and screening of recombinant clones: Probes – radio labeled and
non radiolabeled, guessmers and degenerate probes. Sequence dependent and independent screening, southern, northern hybridization, colony and plaque hybridization, *in situ* chromosomal hybridization, chromosome walking, Genome mapping, DNA fingerprinting, Polymerase chain reaction (PCR), RT- (Reverse transcription) PCR.

UNIT-III

Expression and Characterization of Cloned DNA: Expression vectors, optimization of protein expression in heterologous systems, Fusion proteins, *In vitro* translation systems. Preparation and comparison of Genomic and cDNA library.

UNIT-IV

Random and Site-directed Mutagenesis: Primer extension and PCR based methods of site directed mutagenesis, Random mutagenesis, Gene shuffling, production of chimeric proteins, Protein engineering concepts and examples (any two).

UNIT-V

Applications of Genetic Engineering: In plants: use of *Agrobacterium tumefaciens* and *A. rhizogenes*, Ti plasmids, Strategies for gene transfer to plant cells, Direct DNA transfer to plants, Gene targeting in plants, Use of plant viruses as episomal expression vectors.

In animals: Production and applications of transgenic mice, role of ES cells in gene targeting in mice, Therapeutic products - blood proteins, human hormones, immune modulators and vaccines (one example each). Ethical, legal and social issues.

References

1. Brown, T.A., (2006). *Gene Cloning and DNA Analysis* (5th ed.). Oxford: UK, Blackwell Publishing.
2. Clark, D.P., & Pazdernik, N.J. (2009). *Biotechnology-Applying the Genetic Revolution*. USA: Elsevier Academic Press.
3. Glick ,B.R.,& Pasternak, J.J. (2003).*Molecular Biotechnology-Principles and Applications of recombinant DNA*. Washington: ASM Press.
4. Primrose, S.B., &Twyman, R.M. (2006). *Principles of Gene Manipulation and Genomics* (7th ed.). Oxford: UK, Blackwell Publishing.

SEMESTER IV

16BTU403 **GENOMICS AND PROTEOMICS** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To import the basic and recent developments in the field of genome sequencing, genome mapping, proteomic data analysis
- To develop the knowledge on gene sequencing methods.
- To know the structure and interactions of proteins.
- To describe advanced genomics and proteomics technologies and the ways in which their data are stored
- To use bioinformatics techniques to query examples of genomic and proteomic databases to analyse cell biology
- To describe the different types of genome variation and their relationship to human diseases

Course Outcomes

On completion of the course, students are able to

1. Have a clear understanding on the application of genetic markers in genome mapping.
2. Application of 2D technique to analyze the structure of protein.
3. Analyze the genomic and proteomic data.
4. Acquire knowledge and understanding of fundamentals of genomics and proteomics, transcriptomics and metabolomics and their applications in various applied areas of biology.
5. Discuss how biological systems information relating to genes, proteins and cellular structures can be used to model living cells, and even to create new synthetic cells
6. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.

UNIT-I

Introduction to Genomics: Gene and Pseudogenes, Gene structure, DNA sequencing methods – manual and automated: Maxam and Gilbert and Sangers method. Pyrosequencing, Genome Sequencing: Shotgun and Hierarchical (clone contig) methods, Computer tools for sequencing projects: Genome sequence assembly software.

UNIT-II

Managing and Distributing Genome Data: Web based servers and software for genome analysis: ENSEMBL, VISTA, UCSC Genome Browser, NCBI genome. Selected Model Organisms' Genomes and Databases.

UNIT-III

Genomic mapping: Genetic markers: VNTR, mini and micro satellites, STS, SNP, ESTs. Types of genome maps, Mapping techniques – Physical and genetic mapping, Map resources, Practical uses genome maps.

UNIT-IV

Protein and structure determination: Introduction to protein structure, Chemical properties of proteins. Physical interactions that determine the property of proteins. Short-range interactions, electrostatic forces, van der Waal interactions, hydrogen bonds, Hydrophobic interactions. Determination of sizes -Sedimentation analysis, gel filteration, Native PAGE, SDS-PAGE. Determination of covalent structures – Edman degradation.

UNIT-V

Proteomics: Introduction to Proteomics, Analysis of proteomes. 2D-PAGE. Sample preparation, solubilization, reduction, resolution. Reproducibility of 2D-PAGE. Mass spectrometry basedmethods for protein identification. De novo sequencing using mass spectrometric data.

References

1. Benjamin Lewin, (2006). *Genes IX*. Johns and Bartlett Publisher.
2. Primrose, S.B. (1987). *Modern Biotechnology* (2nd ed.). Blackwell Publishing.
3. Glick, B.R., Pasternak, J.J., &Patten, C.L. (2010).*Molecular Biotechnology: Principles and Applications of Recombinant DNA* (4thed.).
4. Sambrook &Russell (3rd ed.). (1989). *Molecular Cloning: A Laboratory Manual* (Vols. 1to3).
5. Primrose, S.B.,Twyman,R.M.&Old,R.W.(2001).*Principles of Gene Manipulation* (6th ed.). Blackwell Science.
6. Snustad, D.P., &Simmons, M.J. (2009). *Principles of Genetics* (5th ed.). John Wiley and Sons Inc.
7. Klug, W.S., Cummings, M.R., &Spencer, C.A. (2009). *Concepts of Genetics* (9th ed.). Benjamin Cummings.
8. Russell, P.J. (2009). *Genetics-A Molecular Approach* (3rded.). Benjamin Cummings.
9. Glick, B.R.,& Pasternak,J.J. (2003).*Molecular Biotechnology-Principles and Applications of recombinant DNA*. Washington: ASM Press.

SEMESTER IV

16BTU404A INDUSTRIAL FERMENTATION 3H -3C

Total hours/week: L:3 T:0 P:0 Marks: Internal: 40 External: 60 Total: 100

Course Objectives

The main objectives of the course are,

- To import the basic and recent developments in the field of Industrial fermentation
- To impact knowledge about biological and biochemical technology, with a focus on biological products, the design and operation of industrial practices.
- To discuss the role of microorganisms in industry, as well as to carry out experiments to produce microbial metabolites.
- To learn how to conduct experiments related to industrial fermentation and produce microbial metabolites
- To learn about the downstream and upstream process in fermentation technology.
- To learn about the influence of factors affecting the production of various microbial metabolites

Course Outcomes

On completion of the course, students are able to

1. Have a clear understanding on the application of growth kinetics.
2. Design a fermenter and parameters to be monitored and controlled in fermentation process.
3. Gain knowledge about the principle of sterilization necessary for fermentation.
4. Acquire knowledge about the cell growth and product formation.
5. Evaluate the kinetics and mechanism of microbial growth.
6. Develop protocol for scale-up and harvesting from shake flask to bench top fermenter.

UNIT-I

Production of industrial products: Production of industrial chemicals, biochemicals and chemotherapeutic products. Propionic acid, butyric acid, 2-3 butanediol, gluconic acid, itaconic acid, Biofuels: Biogas, Ethanol, butanol, hydrogen, biodiesel, microbial electricity, starch conversion processes; Microbial polysaccharides; Microbial insecticides; microbial flavours and fragrances, newer antibiotics, anti-cancer agents, amino acids.

UNIT-II

Microbial products and enzymes production: Microbial products of pharmacological interest, steriod fermentations and transformations. Over production of microbial metabolite, Secondary metabolism – its significance and products. Metabolic engineering of secondary metabolism for highest productivity. Enzyme and cell immobilization techniques in industrial processing, enzymes in organic synthesis, proteolytic enzymes, hydrolytic enzymes, glucose isomerase, enzymes in food technology/ organic synthesis.

UNIT-III

Purification and characterization techniques: Purification &characterization of proteins, Upstream and downstream processing, solids and liquid handling. Distribution of microbial cells, centrifugation, filtration of fermentation broth, ultra-centrifugation, liquid extraction, ion- exchange recovery of biological products. Experimental model for design of fermentation systems, Anaerobic fermentations.

UNIT-IV

Kinetics: Rate equations for enzyme kinetics, simple and complex reactions. Inhibition kinetics; effect of pH and temperature on rate of enzyme reactions. Mathematical derivation of growth kinetics, mathematical derivations of batch and continuous culture operations.

UNIT-V

Mass transfer determination and Metabolic engineering: Single stage CSTR; mass transfer in aerobic fermentation; resistance encountered; overall mass transfer co-efficient (Ka) determination, factors depending on scale up principle and different methods of scaling up. Metabolic engineering of antibiotic biosynthetic pathways.

Reference

1. Casida LE. (1991). *Industrial Microbiology*. Wiley Eastern Limited.
2. Crueger W and Crueger A. (2000). *Biotechnology: A text book of Industrial Microbiology* (2nd ed.). Panima Publishing Co. New Delhi.
3. Stanbury PF, Whitaker A and Hall SJ. (2006).*Principles of Fermentation Technology* (2^{nd}ed.). Elsevier Science Ltd.

SEMESTER IV

16BTU404B **ENZYMOLOGY** **3H -3C**

Total hours/week: L:3 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To understand the kinetics and mechanisms of action of enzymes, to become familiar with the basic methods of studying enzymes, and to appreciate how individual reactions are controlled and integrated into the metabolic pathways of the cell.
- To acquire theoretical and experimental knowledge will enable students to find appropriate employment in different development, scientific-research laboratories.
- To understand the topics related to the practical use of enzymes, including nomenclature and kinetics, preparation and storage methods, use of enzymes in biotechnology and bioanalytics including biosensors and enzyme reactors.
- To provide general knowledge on protein structure and function, as well as the experimental techniques in protein chemistry and protein engineering
- To develop the ability of identifying the experimental techniques required to solve specific problems related to proteins and enzyme functions
- To train students in the evaluation of the consequences of biochemical and biological tools in their professional activities

Course Outcomes:

On completion of the course, students are able to

1. Understand the chemical principles of enzyme catalysis, including cofactor chemistry
2. Show insight in the action of enzymes as biocatalysts and in factors that influence enzyme activity
3. Understand the kinetics of enzymatic reactions
4. Show awareness of the influence of enzyme structure on catalytic properties
5. Show experience with purification, handling and characterization of proteins
6. Show insight in the physico-chemical properties of proteins that underlie purification methods.

UNIT-I

Enzymes and Enzyme kinetics: Isolation, crystallization and purification of enzymes, test of homogeneity of enzyme preparation, methods of enzyme analysis. Enzyme classification (rationale, overview and specific examples) Zymogens and their activation (Proteases and Prothrombin). Enzyme substrate complex: concept of E-S complex, binding sites, active site, specificity, Kinetics of enzyme activity, Michaelis-Menten equation and its derivation, Different plots for the determination of Km and V_{max} and their physiological significance, factors affecting initial rate, E, S, temp. & pH. Collision and transition state theories, Significance of activation energy and free energy.

UNIT-II

Enzyme inhibition and regulation: Two substrate reactions (Random, ordered and ping-pong mechanism) Enzyme inhibition types of inhibition, determination of Ki, suicide inhibitor. Mechanism of enzyme action: General mechanistic principle, factors associated with catalytic efficiency: proximity, orientation, distortion of strain, acid-base, nucleophilic and covalent catalysis. Techniques for studying mechanisms of action, chemical modification of active site groups, specific examples-: chymotrypsin, lysozyme, GPDH, aldolase, RNase, Carboxypeptidase and alcohol dehydrogenase. Enzyme regulation: Product inhibition, feed back control, covalent modification.

UNIT-III

Types of Enzymes and its reaction: Allosteric enzymes with special reference to aspartate transcarbomylase and phosphofructokinase. Qualitative description of concerted and sequential models. Negative cooperativity and half site reactivity. Enzyme - Enzyme interaction, Protein ligand binding, measurements analysis of binding isotherm, cooperativity, Hill and scatchard plots, kinetics of allosteric enzymes. Isoenzymes– multiple forms of enzymes with special reference to lactate dehydrogenase.

Multienzyme complexes. Ribozymes. Multifunctional enzyme-eg Fatty Acid synthase.

UNIT-IV

Enzyme Technology: Methods for large scale production of enzymes. Immobilized enzyme and their comparison with soluble enzymes, Methods for immobilization of enzymes. Immobilized enzyme reactors. Application of Immobilized and soluble enzyme in health and industry. Application to fundamental studies of biochemistry. Enzyme electrodes.

UNIT-V

Enzyme engineering: Thermal stability and catalytic efficiency of enzyme, site directed mutagenesis and enzyme engineering–selected examples, Delivery system for protein pharmaceuticals, structure function relationship in enzymes, structural motifs and enzyme evolution. Methods for protein sequencing. Methods for analysis of secondary and tertiary structures of enzymes. Protein folding *in vitro* &*in vivo*.

References

1. Lubert Stryer, (2006). *Biochemistry* (6th ed.). WH Freeman.
2. Robert Murray, K., David Bender, A., Kathleen Botham, M., Peter Kennelly, J., Victor Rodwell, W., Anthony Weil,P. (2009).*Harper's illustrated Biochemistry*(28thed.). McGraw Hill.
3. Donald Voet, & Judith Voet, (1995). *Biochemistry* (2nd ed.). John Wiley and Sons.
4. Mary K., &Shawn O. Farrell, (2005). *Biochemistry* (5thed.). Cenage Learning.
5. Nicholas Price, &Lewis Stevens (1999) *Fundamentals of Enzymology*. Oxford University Press.

16BTU411 BIOPROCESS TECHNOLOGY PRACTICAL 4H -2C
Total hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To learn the procedure for isolation, screening of industrial important microbes
- To derive industrially important products from microbes.
- To acquire knowledge on growth curve.
- To learn the principle and applications of bioprocess technology.
- To learn the fundamental calculation in bioprocessing.
- To learn the schematic diagram of upstream and downstream processing for product recovery and purification.

Course Outcomes

The learners will be able to

1. Gain overall knowledge of bioprocess technology.
2. Obtain information about the application of industrially important microbes.
3. Know the screening, extraction and purification of enzymes.
4. Understand the analysis and control necessary for maximizing production.
5. Select and optimize media for maximum production of microbial metabolites.
6. Designing of protocols for strain improvement and separation of molecules after fermentation process.

List of Practicals

1. Bacterial growth curve.
2. Calculation of thermal death point (TDP) of microbial samples.
3. Production and analysis of ethanol.
4. Production and analysis of amylase.
5. Production and analysis of lactic acid.
6. Isolation of industrially important microorganism from natural resources.

References

1. Casida, L.E. (1991). *Industrial Microbiology* (1st ed.). Wiley Eastern Limited.
2. Crueger, W., & Crueger, A. (2000). *Biotechnology: A textbook of Industrial Microbiology* (2nd ed.). New Delhi: Panima Publishing Co.
3. Patel, A.H., (1996). *Industrial Microbiology* (1st ed.). Macmillan India Limited.
4. Stanbury, P. F. Whitaker, A.& Hall, S.J. (2006). *Principles of Fermentation Technology* (2nd ed.)., Elsevier Science Ltd.

16BTU412 RECOMBINANT DNA TECHNOLOGY PRACTICAL 4H -2C

Total hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To learn the procedure for isolation nucleic acids and Protein.
- To learn the strategies for gene transfer in plants and animals.
- To acquire knowledge on genome mapping.
- To familiarize the student with emerging field of biotechnology
- To acquaint the students to versatile tools and techniques employed in recombinant DNA technology.
- To learn the history and recent developments in rDNA technology, Enzymes used in rDNA technology

Course Outcomes

On completion of the course, students are able to

1. Outline the fundamental steps in a recombinant DNA technique.
2. Describe the mechanism of action and the use of restriction enzymes in biotechnology research and recombinant protein production.
3. Explain the usefulness of plasmid preparations, how they are performed, and how the concentration and purity of plasmid samples can be determined.
4. Discuss cloning strategies and techniques used to probe DNA for specific genes of interest.
5. Conceptualize PCR technique in medical and forensic science.
6. Utilize versatile tools and techniques employed in recombinant DNA technology.

List of Practicals

1. Isolation of chromosomal DNA from plant cells
2. Isolation of chromosomal DNA from *E. coli*
3. Qualitative and quantitative analysis of DNA using spectrophotometer and agarose gel Electrophoresis.
4. Plasmid DNA isolation
5. Restriction digestion of DNA/ Plasmid DNA
6. Ligation of DNA insert into plasmid vector
7. Preparation of Competent cells
7. Transformation of competent cells.
8. Demonstration of PCR

References

1. Brown, T.A., (2006). *Gene Cloning and DNA Analysis* (5th ed.). Oxford: UK, Blackwell Publishing.
2. Primrose, S.B., &Twyman, R.M. (2006). *Principles of Gene Manipulation and Genomics* (7th ed.). Oxford: UK, Blackwell Publishing.
3. Sambrook, J., Fritsch, E.F., & Maniatis, T. (2001). *Molecular Cloning-A Laboratory Manual.* (3rd ed.). Cold Spring Harbor Laboratory Press.

SEMESTER IV

16BTU413 GENOMICS AND PROTEOMICS PRACTICAL 4H -2C

Total hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To import the basic and recent developments in the field of genome sequencing, genome mapping, proteomic data analysis
- To develop the knowledge on gene sequencing methods.
- To know the structure and interactions of proteins.
- To describe advanced genomics and proteomics technologies and the ways in which their data are stored
- To use bioinformatics techniques to query examples of genomic and proteomic databases to analyse cell biology
- To describe the different types of genome variation and their relationship to human diseases

Course Outcomes

On completion of the course, students are able to

1. Have a clear understanding on the application of genetic markers in genome mapping.
2. Application of 2D technique to analyze the structure of protein.
3. Analyze the genomic and proteomic data.
4. Acquire knowledge and understanding of fundamentals of genomics and proteomics, transcriptomics and metabolomics and their applications in various applied areas of biology.
5. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
6. Utilize the various databases at NCBI and other sites for protein localization

List of Practicals

1. Use of SNP databases at NCBI and other sites
2. Use of OMIM database
3. Detection of Open Reading Frames using ORF Finder
4. Proteomics 2D PAGE database
5. Software for Protein localization.
6. Software for protein secondary sequencing prediction
7. Hydropathy plots
8. Native PAGE
9. SDS-PAGE

References

1. Glick, B.R., Pasternak, J.J., & Patten, C.L. (2010). *Molecular Biotechnology: Principles and Applications of Recombinant DNA* (4thed.).
2. Sambrook &Russell (3rd ed.). (1989). *Molecular Cloning: A Laboratory Manual* (Vols. 1to3).
3. Primrose, S.B., &Twyman, R.M. (2006). *Principles of Gene Manipulation and Genomics* (7th ed.). Oxford: UK, Blackwell Publishing.
4. Pevsner, J. (2009). *Bioinformatics and Functional Genomics* (2nd ed.). John Wiley &Sons.

SEMESTER IV

16BTU414A INDUSTRIAL FERMENTATION PRACTICAL 3H -1C

Total hours/week: L:0 T:0 P:3 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To import the basic and recent developments in the field of Industrial fermentation
- To impact knowledge about biological and biochemical technology, with a focus on biological products, the design and operation of industrial practices.
- To discuss the role of microorganisms in industry, as well as to carry out experiments to produce microbial metabolites.
- To learn how to conduct experiments related to industrial fermentation and produce microbial metabolites
- To learn about the downstream and upstream process in fermentation technology.
- To learn about the influence of factors affecting the production of various microbial metabolites

Course Outcomes

On completion of the course, students are able to

1. Have a clear understanding on the application of growth kinetics
2. Design a fermenter and parameters to be monitored and controlled in fermentation process.
3. Gain knowledge about the principle of sterilization necessary for fermentation.
4. Acquire knowledge about the cell growth and product formation.
5. Evaluate the kinetics and mechanism of microbial growth.
6. Develop protocol for scale-up and harvesting from shake flask to bench top fermenter.

List of Practicals

1. Comparative analysis of design of a batch and continuous fermenter.
2. Calculation of Mathematical derivation of growth kinetics.
3. Solvent extraction & analysis of a metabolite from a bacterial culture.
4. Perform an enzyme assay demonstrating its hydrolytic activity (protease/peptidase/glucosidase etc.)

References

1. Casida, L.E. (1991). *Industrial Microbiology* (1st ed.). Wiley Eastern Limited.
2. Crueger, W., & Crueger, A. (2000). *Biotechnology :A textbook of Industrial Microbiology* (2nd ed.). New Delhi: Panima Publishing Co.
3. Patel, A.H., (1996). *Industrial Microbiology* (1st ed.). Macmillan India Limited.
4. Stanbury, P. F., Whitaker, A.& Hall,S.J.(2006).*Principles of Fermentation Technology* (2nd ed.)., Elsevier Science Ltd.

SEMESTER IV

16BTU414B **ENZYMOLOGY PRACTICAL** **3H -1C**

Total hours/week: L:0 T:0 P:3 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To understand the kinetics and mechanisms of action of enzymes, to become familiar with the basic methods of studying enzymes, and to appreciate how individual reactions are controlled and integrated into the metabolic pathways of the cell.
- To acquire experimental knowledge will enable students to find appropriate employment in different development, scientific-research laboratories.
- To understand the topics related to the practical use of enzymes, including nomenclature and kinetics, preparation and storage methods, use of enzymes in biotechnology and bioanalytics including biosensors and enzyme reactors.
- To provide practical knowledge on protein
- To develop the ability of identifying the experimental techniques required to solve specific problems related to proteins and enzyme functions
- To train students in the evaluation of the consequences of biochemical and biological tools in their professional activities

Course Outcomes

On completion of the course, students are able to

1. Understand the chemical principles of enzyme catalysis, including cofactor chemistry
2. Show insight in the action of enzymes as biocatalysts and in factors that influence enzyme activity
3. Understand the kinetics of enzymatic reactions
4. Show awareness of the influence of enzyme structure on catalytic properties
5. Show experience with purification, handling and characterization of proteins
6. Show insight in the physico-chemical properties of proteins that underlie purification methods.

List of Practicals

1. Purification of an enzyme from any natural resource
2. Quantitative estimation of proteins by Bradford/Lowry's method.
3. Perform assay for the purified enzyme.
4. Calculation of kinetic parameters such as Km, V_{max}, K_{cat}

Reference

1. LubertStryer, (2006). *Biochemistry* (6th ed.). WHFreeman.
2. Robert Murray, K., David Bender, A., Kathleen Botham, M., Peter Kennelly, J., Victor Rodwell, W., Anthony Weil, P. (2009). *Harper's illustrated Biochemistry* (28th ed.). McGrawHill.
3. Donald Voet, &Judith Voet. (1995). *Biochemistry* (2nd ed.). John Wiley and Sons.
4. Mary K. Campbell, & Shawn O.Farrell. (2005). *Biochemistry* (5th ed.).Cenageearning.
5. Nicholas Price, & Lewis Stevens. (1999). *Fundamentals of Enzymology*. Oxford University Press
6. Athel Cornish-Bowden, (2004). *Fundamentals of Enzyme Kinetics* (3rd ed.). Portland Press.
7. Hans Bisswanger, (2004). *Practical Enzymology*. Wiley–VCH.
8. Richard, B. (2002). *The Organic Chemistry of Enzyme-catalyzed Reactions*. Silverman Academic Press.

SEMESTER V

16BTU501A PLANT DIVERSITY-I 3H -3C

Total hours/week: L:3 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To understand the physiological conditions of the plants and metabolism.
- To understand the basic concepts of photosystems and their importance in plant growth.
- To gain the information about the economic importance of algae and fungi.
- Learn about the structure, pigmentation, food reserves and methods of reproduction of Algae
- Learn about the structure, pigmentation, food reserves and methods of reproduction of Fungi
- Studied some plant diseases with special reference to the causative agents, symptoms, etiology and control measures.

Course Outcomes

The learners will be able to,

- Gain adequate knowledge on plant biodiversity and importance.
- Understand the molecular mechanisms of macro and micro nutrients in plant growth.
- Get the basic and applied knowledge of plant physiology, growth, development and metabolism.
- Discuss about importance of morphological structure, classification, reproduction and economic importance of Algae.
- Know the control measures of plant diseases.
- Explain about structure, classification, reproduction, life cycle and economic importance of Bryophytes.

UNIT-I

Algae: General character, classification and economic importance. Life histories of algae belonging to various classes: Chlorophyceae – *Volvox, Oedogonium,* Xanthophyceae –*Vaucheria,* Phaeophyceae– *Ectocarpus* Rhodophyceae-*Polysiphonia*

UNIT-II

Fungi: General characters, classification & economic importance. Life histories of Fungi: Mastigomycontina- *Phytophthora,* Zygomycotina-*Mucor,* Ascomycotina- *Saccharomyces,* Basidomycotina - *Agaricus,* Deutromycotina-*Colletotrichum*

UNIT-III

Lichens: Classification, general structure, reproduction and economic importance. Plant diseases: Casual organism, symptoms and control of following plant diseases. Rust and Smut of Wheat. White rust of Crucifers. Late blight of Potato. Red rot of Sugarcane. Citrus Canker.

UNIT-IV

Bryophytes: General characters, classification & economic importance. Life histories of following: *Marchantia. Funaria.*

UNIT-V

Rust and Smut of Wheat. White rust of Crucifers. Late blight of Potato. Red rot of Sugarcane. Citrus Canker.

References

1. Lee, R.E. (2008). *Phycology* (4th ed.). USA: Cambridge University Press.
2. Sambamurty, (2008). *A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany*. IK : International Publishers.
3. Shaw, A.J., &Goffinet, B. (2000). *Bryophyte Biology.* Cambridge University Press.
4. Van den Hoek, C., Mann, D.J. &Jahns, H.M. (1995). *Algae: An introduction to Phycology.* Cambridge Univ. Press.
5. Vander-Poorteri, (2009). *Introduction to Bryophytes*. COP.
6. Webster, J. &Weber, R. (2007). *Introduction to Fungi* (3rd ed.). Cambridge: Cambridge University Press.

SEMESTER V

16BTU501B BASICS OF FORENSIC SCIENCE 3H -3C

Total hours/week: L:3 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To give knowledge on molecular analysis in forensic science.
- To offer knowledge to assess DNA finger printing
- To understand the evidence for suspecting victims in crime
- To handle the evidences left out at the crime scene.
- To understand the basic methods for examine the different types of questioned documents.
- To understand the Classification of fire arms.

Course Outcomes

On completion of the course, students are able to

- Demonstrate competency in the collection, processing, analyses, and evaluation of evidence.
- Demonstrate competency in the principles of crime scene investigation, including the recognition, collection, identification, preservation, and documentation of physical evidence.
- Demonstrate an understanding of the scientific method and the use of problem-solving within the field of forensic science.
- Identify the role of the forensic scientist and physical evidence within the criminal justice system.
- Demonstrate the ability to document and orally describe crime scenes, physical evidence, and scientific processes.
- Identify and examine current and emerging concepts and practices within the forensic science field.

UNIT- I

Introduction and principles of forensic science, forensic science laboratory and its organization and service, tools and techniques in forensic science, branches of forensic science, causes of crime, role of modus operand in criminal investigation. Classification of injuries and their medico-legal aspects, method of assessing various types of deaths.

UNIT-II

Classification of fire arms and explosives, introduction to internal, external and terminal ballistics. Chemical evidence for explosives. General and individual characteristics of handwriting, examination and comparison of handwritings and analysis of ink various samples.

UNIT-III

Role of the toxicologist, significance of toxicological findings, Fundamental principles of fingerprinting, classification of fingerprints.

UNIT-IV

Principle of DNA fingerprinting, application of DNA profiling in forensic medicine, Investigation Tools, eDiscovery, Evidence Preservation, Search and Seizure of Computers,

UNIT-V

Introduction to Cyber security and recent techniques. development of finger print as science for personal identification,

References

1. Bernard J. Glick, Jack J. Pasternak,& Cheryl L. Patten. (2010).*Molecular Biotechnology- Principles and Applications of recombinant DNA* (4th ed.). Washington: ASM Press.
2. Nanda, B.B., &Tiwari, R.K. (2001). *Forensic Science in India: A Vision for the Twenty First Century*. New Delhi : Select Publishers.
3. Bhasin, M.K., & Nath S.(2002). *Role of Forensic Science in the New Millennium*. Delhi: University ofDelhi.
4. James, S.H., & Nordby J.J. (2005). *Forensic Science: An Introduction to Scientific and Investigative Techniques* (2nd ed.). CRC Press, Boca Raton.
5. Eckert, W.G., &Wright, R.K. (1997). *An Introduction to Forensic Sciences* (2nd ed.). CRC Press, Boca Raton (1997).
6. Saferstein R., (2004). *Criminalistics: An Introduction to Forensic Science* (8th ed.). New Jersey: Prentice Hall.

SEMESTER V

16BTU502A **BIOINFORMATICS** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To give knowledge on Bioinformatics and its application
- To offer knowledge to assess biological databases
- To understand and to analyze protein/nucleotide sequences and to predict its 3D structure
- To understand the various online databases for submitting and retrieving data's
- To understand how the phylogeny plays a vital role in finding ambiguities.
- To get practiced with the tools and techniques for analyzing the data.

Course Outcomes

On completion of the course, students are able to

1. Understand The relationship between sequence - structure - function of genes
2. Familiarize with the algorithms required to compare sequences and require to know the phylogenetic relationship between the gene sequences
3. Inculcate knowledge on building 3D structures of genes.
4. Locate and use the main databases at the NCBI and EBI resources
5. Know the difference between databases, tools, repositories and be able to use each one to extract specific information
6. Use selected tools at NCBI and EBI to run simple analyses on genomic sequences

UNIT-I

History and milestone of Bioinformatics. The notion of Homology. Sequence Information Sources, EMBL, GENBANK, Entrez, Unigene, Understanding the structure of each source and using it on the web. Genome sequencing projects – Steps, Human Genome Project and other genome projects.

UNIT-II

Basic concepts of biomolecules – Protein and amino acid, DNA and RNA - Sequence, Structure and function. Protein Information Sources, PDB, SWISSPROT, TREMBL, Understanding the structure of each source and using it on the web. Introduction of Data Generating Techniques and Bioinformatics problem posed by them- Restriction Digestion, Chromatograms, Blots, PCR, Microarrays, Mass Spectrometry.

UNIT-III

Sequence and Phylogeny analysis, Detecting Open Reading Frames, Outline of sequence Assembly, Mutation/Substitution Matrices, Pairwise Alignments, Introduction to BLAST, using it on the web, Interpreting results, Multiple Sequence Alignment, Phylogenetic Analysis. Introduction to BLAST, using it on the web, Interpreting results, Multiple Sequence Alignment, Phylogenetic Analysis.

UNIT-IV

Biological databases: Types of databases, Sequence databases, Nucleic acid sequence databases - Primary (GenBank, EMBL, DDBJ), Secondary (Uni Gene, SGD, EMI Genomes, Genome Biology), Protein sequence database – Primary (PIR, SWISS-PROT), Secondary (PROSITE, Pfam), Structural databases (PDB, SCOP, CATH), Bibliographic databases and Organism specific databases.

UNIT-V

Searching Databases: SRS, Entrez, Sequence Similarity Searches-BLAST, FASTA, Data Submission. Genome Annotation: Pattern and repeat finding, Gene identification tools. Gene prediction: Gene prediction in prokaryote and eukaryotes. Extrinsic approaches and Ab initio approaches. Predicting the protein secondary structure (Domain, blocks, motifs), Predicting protein tertiary structure (Homology, Ab-initio, threading and fold recognition) and visualization of predicted structure.

References

1. Ghosh, Z.& Bibekanand M. (2008). *Bioinformatics: Principles and Applications*. Oxford University Press.
2. Pevsner, J. (2009). *Bioinformatics and Functional Genomics* (2nd ed.). Wiley-Blackwell.
3. Campbell, A. M., & Heyer, L.J. (2006). *Discovering Genomics, Proteomics and Bioinformatics* (2nd ed.). Benjamin Cummings.

SEMESTER V

16BTU502B **PLANT DIVERSITY-II** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To develop the skills on morphological identification of plants.
- Understand the diversity among various plants
- Know the systematic morphology and structure of Pteridophytes.
- Learn about the general characters and classification in Pteridophytes, heterospory and origin of seed habit.
- Know about the structure, life history and Economic importance of Gymnosperms.
- Studied the methods of fossilization and fossil plants

Course Outcomes

The learners will be able to

1. Study and impart knowledge about the occurrence, distribution, structure and life history of plants
2. Learn in detail about vegetative and reproductive parts of plants.
3. Learn the phylogeny and evolutionary concepts in plants.
4. Learn how to handle a fossilized specimen
5. Acquire knowledge about the structure, life history and Economic importance of Gymnosperms
6. Learn the skills on morphological identification of plants

UNIT-I

Pteridophytes: General characters of pteridophytes, affinities with bryophytes and gymnosperms, classification, economic importance study of life histories of fossil pteridophytes – *Rhynia.*

UNIT-II

Pteridophytes: Type studies: Life histories of *Selaginella*- (Heterospory and seed habit), *Equisetum, Pteris, Lycopodium.*

UNIT-III

Gymnosperms: General characters, classification, geological time scale, theories of fossil formation, types of fossils, fossil gymnosperms- *Williamsonia* & *Glossopteris,* telome and stele concept.

UNIT-IV

Gymnosperms: Type studies: Life histories of *Cycas* and *Pinus* and economic importance of gymnosperms.

UNIT-V

Gymnosperms: Type studies: Life histories of *Pinus*, economic importance of gymnosperms

Reference

1. Sambamurty, (2008). *A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany*. IK International Publishers.
2. Bhatnager, S.P. & Moitra, A. (1996). *Gymnosperms.* New Delhi: New Age International (P) Ltd. Publishers.
3. Wickens, G.E. (2004). *Economic Botany: Principles and Practices.* Dordrecht: Netherlands, Springer. Kuwer Publishers.
4. Parihar, N.S. (1996). *The Biology and Morphology of Pteridophytes.* Allahabad: Central Book Depot.

SEMESTER V

16BTU503A **PLANT BIOTECHNOLOGY** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total: 100**

Course Objectives

The main objectives of the course are,

- To introduce biotechnological methods for production of transgenic plants.
- To give knowledge about various methods of gene transfer in plants.
- To cognize and get the knowledge on micro propagation to protect endangered plants.
- To explain the basics of the physiological and molecular processes that occur during plant growth and development and during environmental adaptations
- To use basic biotechnological techniques to explore molecular biology of plants
- To understand the processes involved in the planning, conduct and execution of plant biotechnology experiments

Course Outcomes

On completion of the course, students are able to

1. Understand the growth conditions required to culture the plants in *invitro* conditions.
2. Inculcate the deep understanding of Gene expression system of plants
3. Acquire knowledge on producing Transgenic plants
4. Inculcate the deep knowledge the processes involved in the planning, conduct and execution of plant biotechnology experiments
5. Learn the structure and organization of plant genome
6. Learn the basic techniques for hybridization in producing transgenic plants

UNIT-I

Introduction, Cryo and organogenic differentiation, Types of culture: Seed, Embryo, Callus, Organ, Cell and Protoplast culture. Micropropagation Axillary bud proliferation, Meristem and shoot tip culture and culture, organogenesis, embryogenesis, advantages and disadvantages of micropropagation

UNIT-II

In vitro haploid production Androgenic methods: Anther culture, Microspore culture and oogenesis. Significance and use of haploids, Ploidy level and chromosome doubling, diplodization, Gynogenic haploids, factors effecting gynogenesis, chromosome elimination techniques for production of haploids in cereals.

UNIT-III

Protoplast Isolation and fusion Methods of protoplast isolation, Protoplast development, Somatic hybridization, identification and selection of hybrid cells, Cybrids, Potential of somatic hybridization limitations. Somaclonal variation Nomenclature, methods, applications basis and disadvantages. Plant Growth Promoting bacteria. Nitrogen fixation, Nitrogenase, Hydrogenase, Nodulation, Bio control of pathogens, Growth promotion by free-living bacteria.

UNIT-IV

Structure and organization of plant genome, regulation of plant genome expression, transcriptional, translational and post transcriptional regulation of plant genome. Transfer of nucleic acid to plant cells- Direct transformation by electroporation and particle gun bombardment. - *Agrobacterium*, Ti plasmid vector Theory and techniques for the development of new genetic traits.

UNIT-V

Transgenic plants, herbicides and pest resistant plants; Molecular farming/ pharming: carbohydrates, lipids, therapeutic proteins, edible vaccines, purification strategies; Oleosin partition technology.

References

1. Bhojwani, S.S., & Razdan, (2004). *Plant Tissue Culture and Practice*.
2. Brown, T.A., (2006). *Gene Cloning and DNA Analysis* (5th ed.). Oxford: UK, Blackwell Publishing.
3. Gardner, E.J. ,Simmonns, M.J., & Snustad, D.P. (2008). (8th ed.). *Principles of Genetics*. India:Wiley.
4. Raven, P.H., Johnson, G.B., Losos, J.B., &Singer, S.R. (2005). *Biology.* Tata MC Graw Hill.
5. Reinert, J., &Bajaj, Y.P.S. (1997). *Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture*. Narosa Publishing House.
6. Russell,P.J.(2009).*Genetics–AMolecularApproach*(3rded.).BenjaminCo.
7. Sambrook, &Russel. (2012). *Molecular Cloning: A laboratory manual* (4th ed.). Cold Spring Harbor Laboratory Press.
8. Slater, A., Scott, N.W. ,&Fowler, M.R. (2008). *Plant Biotechnology: The Genetic Manipulation of Plants.* Oxford University Press.

SEMESTER V

16BTU503B EVOLUTIONARY BIOLOGY 4H -4C

Total hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total: 100

Course Objectives

The main objectives of the course are

- To obtain basic concepts of life and gradual evolution of human and other animals
- To ascertain the evolutionary concepts through fossil study of Eukaryotes from Prokaryotes
- To explain Origin of Life especially Prokaryotes as well as Eukaryotes in detail.
- To give detailed explanation of key concepts of Population Genetics in terms of Hardy-Weinberg Law, Genetic Drift and Types of Natural Selection.
- To provide adequate knowledge about Micro-evolutionary changes, Speciation and Adaptive Radiation.
- To impart descriptive knowledge regarding Origin and Evolution of Man

Course Outcomes

On completion of the course, students are able to

1. Get hold of the knowledge on fundamentals of Evolutionary Biology.
2. Expertise on the concepts of evolution, chromosomal aberrations; recombination and random assortment.
3. Acknowledge on the Qualitative Studies Based on Field Observations
4. To develop comprehensive knowledge regarding various Sources of Variations and their role in evolution.
5. To explore salient features of various theories of evolution comprising of Lamarckism, Darwinism and Neo-Darwinism.
6. To impart detailed understanding of Qualitative Studies Based on Field Observations

UNIT- I

Historical Review of Evolutionary Concept. Pre-Darwinian ideas – List of contributors influencing Darwin indicated as a *timeline.* Lamarckism – Merits and demerits. Darwinism – Merits and demerits, Post-Darwinian era –Modern synthetic theory; biomathematics and the theory of population genetics leading to Neo-Darwinism

UNIT- II

Life's Beginnings. Chemogeny– An overview of pre-biotic conditions and events; experimental proofs to abiotic origin of micro- and macro-molecules. Current concept of chemogeny– RNA first hypothesis. Biogeny – Cellular evolution based on proto-cell models (coacervates and proteinoid micro-spheres). Origin of photosynthesis – Evolution of oxygen and ozone buildup. Endosymbiotic theory – Evolution of Eukaryotes from Prokaryotes

UNIT-III

Evidences of Evolution. Paleobiological– Concept of Stratigraphy and geological timescale; fossil study (types, formation and dating methods). Anatomical – Vestigial organs; Homologous and Analogous organs (concept of parallelism and convergence in evolution). Taxonomic – Transitional forms/evolutionary intermediates; living fossils. Phylogenetic – a) Fossil based – Phylogeny of horse as a model. b) Molecule based – Protein model (Cytochrome C); gene model (Globin gene family)

UNIT-IV

Sources of Evolution – Variations as Raw Materials of Change. Types of variations – Continuous and discontinuous; heritable and non-heritable. Causes, classification and contribution to evolution – Gene mutation; chromosomal aberrations; recombination and random assortment (basis of sexual reproduction); gene regulation. Concept of micro- and macro-evolution – A brief comparison

UNIT-V

Forces of Evolution – Qualitative Studies Based on Field Observations. Natural selection as a guiding force – Its attributes and action Basic characteristics of natural selection. Colouration, camouflage and mimicry, Co-adaptation and co-evolution, Man-made causes of change – Industrial melanism; brief mention of drug, pesticide, antibiotic and herbicide resistance in various organisms. Modes of selection, Polymorphism, Heterosis and Balanced lethal systems. Genetic Drift (Sewall Wright effect) as a stochastic/random force – Its attributes and action. Basic characteristics of drift; selection vs. drift, Bottleneck effect. Founder principle.

References

1. Ridley, M. (2004). *Evolution* (3rd ed.). Blackwell.
2. Hall,B.K.,&Hallgrimson,B.(2008).*Strickberger'sEvolution*(4thed.).JonesandBarlett
3. Zimmer,C.,&Emlen,D.J.(2013).*Evolution:MakingSenseofLife.*Roberts&Co.

16BTU504A **ANIMAL BIOTECHNOLOGY** **SEMESTER V** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To introduce biotechnological methods for production of transgenic animals.
- To give knowledge about various methods of gene transfer in animals.
- To cognize and get the knowledge on techniques to protect endangered animals.
- To explain the basics of the physiological and molecular processes for animals facing environmental adaptations
- To use basic biotechnological techniques to explore molecular biology of animals
- To understand the processes involved in the planning, conduct and execution of animal biotechnology experiments

Course Outcomes

On completion of the course, students are able to

1. Understand the growth conditions required to culture the animals in *invitro* conditions.
2. Inculcate the deep understanding of Gene expression system of animals
3. Acquire knowledge on producing Transgenic animal
4. Inculcate the deep knowledge the processes involved in the planning, conduct and execution of animal biotechnology experiments
5. Learn the structure and organization of animal genome
6. Learn the basic techniques for hybridization in producing transgenic animal

UNIT- I

Animal Tissue Culture: Laboratory design: aseptic techniques– handling instruments: Microscopes, Clean-bench, etc., and bio safety. Animal Cell Culture Media: Natural and artificial media – their constituents; Physicochemical properties of media; Serum supplemented and serum-free media; Sterilization methods.

UNIT - II

Primary Cell Culture: Methods of tissue disaggregation - isolations of tissues from chick embryo, mouse and human; Continuous and established cell cultures; Cell separation and characterization; Organ culture- types.

UNIT-III

Gene transfer methods in Animals – Microinjection, Embryonic Stem cell, gene transfer, Retrovirus &Gene transfer. Introduction to transgenesis. Transgenic Animals – Mice, Cow, Pig, Sheep, Goat, Bird, Insect.

UNIT-IV

Animal propagation – Artificial insemination, Animal Clones. Conservation Biology – Embryo transfer techniques. Introduction to Stem Cell Technology and its applications. Expression of bovine growth hormone; production of human proteins in milk and meat. Animal diseases need help of Biotechnology – Foot-and mouth disease, Coccidiosis, Trypanosomiasis, Theileriosis.

UNIT-V

Production and applications; transgenic animals: mouse, cow, sheep, fish, hen. Genetic modification in Medicine - gene therapy, types of gene therapy, vectors in gene therapy, molecular engineering, human genetic engineering, problems and ethics.

References

1. Butler, M. (2004). *Animal cell culture and technology: The basics* (2nd ed.). Bios scientific publishers.
2. Glick, B.R.,& Pasternak, J.J. (2009).*Molecular biotechnology-Principles and applications of recombinant DNA* (4th ed.). Washington, USA: ASM press.
3. Griffiths, A.J.F., Miller, J.H., Suzuki, D.T., Lewontin, R.C., &Gelbart, W.M. (2009). *An introduction to genetic analysis* (9th ed.). NY: USA, Freeman &Co.
4. Watson, J.D., Myers, R.M., Caudy, A., &Witkowski, J.K. (2007). *Recombinant DNA genes and genomes-Ashortcourse* (3rded.).NY: USA, Freeman & Co.

SEMESTER V

16BTU504B **ANIMAL DIVERSITY-I** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To provide the students with an in-depth knowledge of the diversity in form, structure and habits of invertebrates.
- To learn the basics of systematic and understand the hierarchy of different categories.
- To learn the diagnostic characters of different phyla through brief studies of examples.
- To obtain an overview of economically important invertebrate fauna.
- To explain the organizational hierarchies and complexities of invertebrates.
- To describe the evolutionary trends in external morphology and internal structure.

Course Outcomes

The learners will be able to

1. Outline the origin and classification of animal kingdom
2. Describe the origin of animals and how they differ from other living organisms;
3. Explain the relationship between animal diversity and evolutionary derived changes in animal body plans
4. Analyse the various modes of adaptations in animals
5. Identify and classify with examples the invertebrates
6. Analyse the various modes of adaptations in animals

UNIT- I

a) Outline of classification of Non- Chordates up to subclasses. Coelomata, Acoelomata, Symmetries, Deutrostomes, Protostomes.

b) Protozoa: Locomotion, Reproduction, evolution of Sex, General features of *Paramecium* and *Plasmodium*. Pathogenic protozoans

c) Porifera: General characters, outline of Classification; skeleton, Canal System

UNIT-II

a) Coelenterata: General Characters, Outline of classifications Polymorphism, Various types of stinging cells; Metagenesis, coral reefs and their formation.

b) Platyhelminthes- General Characters; Outline of classification; Pathogenic flatworms: Parasitic adaptations.

c) Aschelminthes: General features, Outline of classification, Pathogenic roundworms and their vectors in relation to man: Parasite adaptation.

UNIT-III

a) Annelida: - General features, Outline of classification, Coelom: Metameric segmentation, General features of Earthworm, Vermicomposting.

b) Arthropoda: General Features, Outline of Classification; Larval forms of crustacean, Respiration in Arthropoda; Metamorphosis in insects; Social insects; Insect vectors of diseases; Apiculture, Sericulture.

UNIT-IV

a) Mollusca: general features, Outline of classification, Shell Diversity; Torsioning astropoda,

b) Echinodermata: General features, Outline of Classification Larval forms

c) Hemichordata: Phylogeny: Affinities of *Balanoglossus*

References

1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. &J.I., Spicer (2002).*The Invertebrates: A New Synthesis* (3rd ed.). Blackwell Science.
2. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions* (2nd ed.). E.L.B.S. and Nelson.

3. Ruppert, Edward, E., Fox Richard, S. &Barnes Robert, D. (2009). *Invertebrate Zoology: A Functional Evolutionary Approach* (7th ed.). Thomson Brooks/Cole.
4. Kent, G.C., & Carr, R.K. (2000). *Comparative Anatomy of the Vertebrates* (9th ed.). The McGraw-Hill Companies.

SEMESTER V

16BTU511A PLANT DIVERSITY-I PRACTICAL 3H -1C

Total hours/week: L:0 T:0 P:3 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To understand the physiological conditions of the plants and metabolism.
- To understand the basic concepts of diversified growth.
- To gain the information about the economic importance of algae and fungi.
- Learn about the structure, pigmentation, food reserves and methods of reproduction of Algae
- Learn about the structure, pigmentation, food reserves and methods of reproduction of Fungi
- Studied some plant diseases with special reference to the causative agents, symptoms, etiology and control measures.

Course Outcomes

The learners will be able to,

1. Gain adequate knowledge on plant biodiversity and importance.
2. Understand the molecular mechanisms of macro and micro nutrients in plant growth.
3. Get the basic and applied knowledge of plant physiology, growth, development and metabolism.
4. Discuss about importance of morphological structure, classification, reproduction and economic importance of Algae.
5. Know the control measures of plant diseases.
6. Explain about structure, classification, reproduction, life cycle and economic importance of Bryophytes.

List of Practicals

1. Comparative study of thallus and reproductive organs of various algae mentioned in theory.
2. Comparative study of vegetative and reproductive parts of various fungi mentioned in theory.
3. Study and section cutting and lactophenol mount of plant disease materials studied in theory.
4. Study of various types of lichens.
5. Study of external features & anatomy of vegetative and reproductive parts of Marchantia and Funaria.
6. Collection of algae, fungi, plant diseases materials and bryophytes available locally.

References

1. Agrios, G.N. (2004). *Plant Pathology* (5th ed.). UK: Academic Press.
2. Aneja, K.R.,& Mehrotra, R.S. (2015). *An Introduction to Mycology* (2nd ed.). New Age International pubishers.
3. Kumar, H.D. (1999) *Introductory Phycology*. Aff. East-West Press Pvt Ltd., Delhi.
4. Lee, R.E. (2008). *Phycolog*y (4th ed.). USA: Cambridge University Press.
5. Sambamurty, (2008). *A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany*. IK International Publishers.

SEMESTER V

16BTU511B BASICS OF FORENSIC SCIENCE PRACTICAL 3H –1C

Total hours/week: L:0 T:0 P:3 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To give knowledge on molecular analysis in forensic science.
- To offer knowledge to assess DNA finger printing
- To understand the evidence for suspecting victims in crime
- To handle the evidences left out at the crime scene.
- The basic methods for examine the different types of questioned documents.
- Identify the E-Mail Investigation and related Recovering deleted evidences

Course Outcomes

On completion of the course, students are able to

1. Apply the Laboratory skills to participate in the career needs of Forensic community.
2. Become trained in the laboratory skills of different division of Forensic Science.
3. Be able to work with different R& D organizations.
4. Identify the role of the forensic scientist and physical evidence within the criminal justice system.
5. Demonstrate the ability to document and orally describe crime scenes, physical evidence, and scientific processes.
6. Identify and examine current and emerging concepts and practices within the forensic science field.

List of Practicals

1. Documentation of crime scene by photography, sketching and field notes.
2. a. Simulation of a crime scene for training.
   b. To lift footprints from crime scene.
3. Case studies to depict different types of injuries and death.
4. Separation of nitro compounds (explosives)/ ink samples by thin layer chromatography.
5. Investigate method for developing fingerprints by Iodine crystals.
6. PCR amplification on target DNA and DNA profiling,
7. E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Recovering deleted evidences, Password Cracking.

References

1. Bernard J. Glick, Jack J. Pasternak, &Chery IL. Patten. (2010).*Molecular Biotechnology- Principles and Applications of recombinant DNA* (4th ed.). Washington: ASM Press.
2. Nanda, B.B., &Tiwari, R.K. (2001*). Forensic Science in India: A Vision for the Twenty First Century*. New Delhi : Select Publishers.
3. Bhasin, M.K., & Nath S. (2002). *Role of Forensic Science in the New Millennium.* Delhi: University of Delhi.
4. James, S.H., & Nordby J.J. (2005). *Forensic Science: An Introduction to Scientific and Investigative Techniques* (2nded.). CRC Press, Boca Raton.
5. Eckert, W.G., &Wright, R.K. (1997). *An Introduction to Forensic Sciences* (2nd ed.). CRC Press, Boca Raton (1997).
6. Saferstein R., (2004). *Criminalistics: An Introduction to Forensic Science* (8thed.). New Jersey: Prentice Hall.
7. Tilstone, W.J., Hastrup, M.L., & Hald, C. (2013). *Fisher's Techniques of Crime Scene Investigation*. CRC Press.

SEMESTER V

16BTU512A **BIOINFORMATICS PRACTICAL** **4H -2C**

Total hours/ week: L:0 T:0 P:4 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To give knowledge on Bioinformatics and its application
- To offer knowledge to assess biological databases
- To understand and to analyze protein/nucleotide sequences and to predict its 3D structure
- To understand the various online databases for submitting and retrieving data's
- To understand how the phylogeny plays a vital role in finding ambiguities.
- To get practiced with the tools and techniques for analyzing the data.

Course Outcomes

On completion of the course, students are able to

1. Understand The relationship between sequence - structure - function of genes.
2. Familiarize with the algorithms required to compare sequences and require to know the phylogenetic relationship between the gene sequences.
3. Inculcate knowledge on building 3D structures of genes.
4. Locate and use the main databases at the NCBI and EBI resources
5. Know the difference between databases, tools, repositories and be able to use each one to extract specific information.
6. Use selected tools at NCBI and EBI to run simple analyses on genomic sequences.

List of Practicals

1. Sequence information resource
2. Understanding and use of various web resources: EMBL, Genbank, Entrez, Unigene, Protein information resource (PIR)
3. Understanding and using: PDB, Swissprot, TREMBL
4. Using various BLAST and interpretation of results.
5. Retrieval of information from nucleotide databases.
6. Sequence alignment using BLAST.
7. Multiple sequence alignment using Clustal W.

References

1. Ghosh, Z., & BibekanandM. (2008). *Bioinformatics: Principles and Applications*. Oxford UniversityPress.
2. Pevsner, J. (2009). *Bioinformatics and Functional Genomics* (2nd ed.).Wiley-Blackwell.
3. Campbell ,A. M., &Heyer, L.J. (2006). *Discovering Genomics, Proteomics and Bioinformatics* (2nd ed.). BenjaminCummings.

SEMESTER V

16BTU512B PLANT DIVERSITY II PRACTICAL 4H -2C

Total hours/week:T:0P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To develop the practical skills on morphological identification of plants.
- Understand the diversity among various plants
- Know the systematic morphology and structure of Pteridophytes.
- Learn about the general characters and classification in Pteridophytes, heterospory and origin of seed habit.
- Know about the structure, life history and Economic importance of Gymnosperms.
- Studied the methods of fossilization and fossil plants

Course Outcomes

The learners will be able to

1. Study and impart practical knowledge about the occurrence, distribution, structure and life history of plants
2. Learn in detail about vegetative and reproductive parts of plants.
3. Learn the phylogeny and evolutionary concepts in plants.
4. Learn how to handle a fossilized specimen
5. Acquire knowledge about the structure, life history and Economic importance of Gymnosperms
6. Learn the skills on morphological identification of plants

List of Practicals

1. Examination of morphology and anatomy of vegetative and reproductive parts of *Selaginella, Equisetum* and *Pteris*.
2. Examination of morphology and anatomy of vegetative and reproductive parts of – *Cycas &Pinus*
3. Plant collection (pteridophytes &gymnosperms).

References

1. Sambamurty, (2008). *A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany*. IK International Publishers.
2. Bhatnager,S.P.,&Moitra,A.(1996).*Gymnosperms*.NewDelhi:NewAgeInternational (P) Ltd. Publishers.
3. Parihar, N.S. (1996). *The Biology and Morphology of Pteridophytes*. Allahabad: Central Book Depot.
4. Wickens,G.E. (2004).*Economic Botany: Principles and Practices*. Dordrecht: Netherlands, Springer, Kluwer Publishers.

Total hours/week: T:0 L: 0 P:4 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To develop the skills on morphological identification of suitable explants.
- Understand the growth hormones of culture medium
- Know the systematic morphology and structure of plants.
- Learn about the general culture techniques.
- Know about the sterilization process in PTC Lab.
- Studied the methods of Micropropagation

Course Outcomes

The learners will be able to

1. Study and impart knowledge about the occurrence, distribution, of plants and suitable explants.
2. Learn in detail about growth hormones.
3. Learn the sterilize and prepare an explant of plants.
4. Learn how to handle a PTC equipments
5. Acquire knowledge about aseptic condition maintained in lab
6. Learn the skills on plant culture techniques.

List of Practicals

1. Preparation of simple growth nutrient (knop's medium), full strength, half strength, solid and liquid.
2. Preparation of complex nutrient medium (Murashige & Skoog's medium).
3. To selection, Pure, sterilize and prepare an explant for culture.
4. Significance of growth hormones in culture medium.
5. To demonstrate various steps of Micropropagation using banana/tomato/potato.

References

1. Bhojwani, S.S., & Razdan, (2004). *Plant Tissue Culture and Practice*.
2. Brown, T.A., (2006). *Gene Cloning and DNA Analysis* (5th ed.). Oxford: UK, Blackwell Publishing.
3. Gardner, E.J. ,Simmonns, M.J., &Snustad, D.P. (2008). (8th ed.). *Principles of Genetics*. India:Wiley.
4. Raven, P.H., Johnson, G.B., Losos, J.B., &Singer, S.R. (2005). *Biology*. Tata MC Graw Hill.
5. Reinert, J., &Bajaj, Y.P.S. (1997). *Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture*. Narosa Publishing House.
6. Russell,P.J.(2009).*Genetics–AMolecularApproach*(3rded.).BenjaminCo.
7. Sambrook, &Russel. (2012). *Molecular Cloning: A laboratory manual* (4th ed.). Cold Spring Harbor LaboratoryPress.
8. Slater, A., Scott, N.W. ,&Fowler, M.R. (2008). *Plant Biotechnology: The Genetic Manipulation of Plants*. Oxford University Press.

SEMESTER V

16BTU513A EVOLUTIONARY BIOLOGY PRACTICAL 4H -2C

Total hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total: 100

Course Objectives

The main objectives of the course are

- To obtain practical concepts of types of fossils
- To ascertain the evolutionary concepts through fossil study of Eukaryotes from Prokaryotes
- To explain Origin of Life especially Prokaryotes as well as Eukaryotes in detail.
- To give detailed explanation of key concepts of living fossil
- To provide adequate knowledge about Micro-evolutionary changes, Speciation and Adaptive Radiation.
- To impart descriptive knowledge regarding Origin and Evolution of Man

Course Outcomes

On completion of the course, students are able to

1. Get hold of the practical knowledge on fundamentals of Evolutionary Biology.
2. Expertise on the Sampling techinques.
3. Acknowledge on the Qualitative Studies Based on Field Observations
4. To develop comprehensive knowledge regarding various Sources of Variations and their role in evolution.
5. To explore salient features of various theories of evolution comprising of Lamarckism, Darwinism and Neo-Darwinism.
6. To impart detailed understanding of Analogy, Homology, Paleontological Evidences, Embryological Evidences and Molecular Phylogeny.

List of Practicals

(A) Evidence of fossils

1. Study of types of fossils (e.g. trails, casts and moulds and others) and Index fossils of Palaeozoic era
2. Connecting links/transitional forms - Eg. Euglena, Neopilina, Balanoglossus, Chimaera, Tiktaalik, Archaeopteryx, Ornithorhynchus
3. Living fossils - Eg. Limulus, Peripatus ,Latimeria, Sphaenodon
4. Vestigial, Analogous and Homologous organs using photographs, models or specimen.

(B) Variations

1. Sampling of human height, weight and BMI for continuous variation.
2. Sampling for discrete characteristics (dominant *vs* recessive) for discontinuous variations e.g hitch-hiker's thumb, dexterity, tongue rolling, ear lobe (data categorization into 16 groups based on the combination of 4 traits; assigning each subject to the respective group).

(C) Selection Exemplifying Adaptive strategies (Colouration, Mimetic form, Co-adaptation and co-evolution; Adaptations to aquatic, fossorial and arboreal modes of life) using Specimens.

(D) Neo-Darwinian Studies

1. Calculations of genotypic, phenotypic and allelic frequencies from the data provided
2. Simulation experiments using coloured beads/playing cards to understand the effects of Selection and Genetic drift on gene frequencies (E) Phylogeny.

References

1. Ridley, M. (2004). *Evolution* (3rd ed.). Blackwell.
2. Hall, B. K., & Hallgrimson, B. (2008). *Strickberger's Evolution* (4th ed.). Jones and Barlett
3. Zimmer,C.,&Emlen,D.J.(2013).*Evolution:MakingSenseofLife*.Roberts&Co.
4. Barton, Briggs, Eisen, Goldstein, & Patel, (2007). *Evolution.* Cold Spring Harbor Laboratory Press.

SEMESTER V

16BTU514A ANIMAL BIOTECHNOLOGY PRACTICAL 4H -2C

Total hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total: 100

Course Objectives

The main objectives of the course are,

- To introduce biotechnological methods for ATC.
- To give knowledge about various methods of gene transfer in animals.
- To cognize and get the knowledge Theory and Practical: Glass ware sterilization, Media sterilization, Laboratory sterilization.
- To explain the basics of the physiological and molecular processes for animals facing environmental adaptations
- To use basic biotechnological techniques to explore molecular biology of animals
- To understand the processes involved in the planning, conduct and execution of animal biotechnology experiments

Course Outcomes

On completion of the course, students are able to

1. Understand the growth conditions required to culture the animals in *invitro* conditions.
2. Inculcate the deep understanding of Laboratory sterilization
3. Acquire knowledge on DNA isolation from animal tissue
4. Understand the Minimal Essential Growth medium
5. Inculcate the deep knowledge the processes involved in the planning, conduct and execution of animal biotechnology experiments
6. Learn the structure and organization of animal genome

List of Practicals

1. Sterilization techniques: Theory and Practical: Glass ware sterilization, Media sterilization, Laboratory sterilization.
2. Sources of contamination and decontamination measures.
3. Preparation of Hanks Balanced salt solution
4. Preparation of Minimal Essential Growth medium
5. Isolation of lymphocytes for culturing
6. DNA isolation from animal tissue
7. Quantification of isolated DNA.
8. Resolving DNA on agarose gel.

References

1. Butler, M. (2004). *Animal cell culture and technology: The basics* (2nd ed.). Bios scientific publishers.
2. Glick,B.R.,& Pasternak,J. J. (2009).*Molecular biotechnology-Principles and applications of recombinant DNA* (4th ed.). Washington, USA: ASM press.
3. Griffiths, A.J.F., Miller, J.H., Suzuki, D.T., Lewontin, R.C., &Gelbart, W.M. (2009). *An introduction to genetic analysis* (9th ed.). NY:USA, Freeman &Co.
4. Watson, J.D., Myers, R.M., Caudy, A., &Witkowski, J.K. (2007). *Recombinant DNA genes and genomes-A short course* (3rded.).NY: USA, Freeman & Co.

16BTU514B **ANIMAL DIVERSITY -I PRACTICAL** **SEMESTER V** **4H -2C**

Total hours/week: L:4 T:0 P:4 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To provide the students with an in-depth knowledge of the diversity in form, structure and habits of invertebrates
- To learn the basics of systematic and understand the hierarchy of different categories
- To learn the diagnostic characters of different phyla through brief studies of examples
- To obtain an overview of economically important invertebrate fauna
- To explain the organizational hierarchies and complexities of invertebrates
- To describe the evolutionary trends in external morphology and internal structure

Course Outcomes

The learners will be able to

1. Outline the origin and classification of animal kingdom
2. Describe the origin of animals and how they differ from other living organisms
3. Explain the relationship between animal diversity and evolutionary derived changes in animal body plans
4. Analyze the various modes of adaptations in animals
5. Identify and classify with examples the invertebrates
6. Analyze the various modes of adaptations in animals

List of Practicals

1. Identification and Classification of Any these of the following–Porifera:*Scypha, Leucosolenia, Euspongia, Hylonema, Euplectella Cnidaria: Medrepora, Millepora, Physalia, Porpita, Valella, Aurelia, Metridium* Platyhelminthes: *Taenia, Fasciola*, Aschelminthes*: Ascaris, Ancylostoma, Enterobius* Annelida: *Pheretima, Hirudinaria, Chaetopterus, Nereis, Aphrodite* Arthropoda: *Julus, Scolopendra, Peripatus, Carcinus, Limulus, Lepisma, Dragonfly, Musca, Acheta* ollusca: *Pila, Unio, Mytilus, Loligo, Sepia, Octopus, Solen* Echinodermata: *Asterias, Ophiothrix, Echinus, Holothuria, Astrophyton* Hemichordata:*Balanoglossus*

2. Identification of slides with two points of identification. *Amoeba, Paramoecium, Ceratium, Plasmodium, Opalina*, L.S. Sponge, Spicules of sponges, L.S. *Hydra, Obelia, Bougainvillia*, Larvae of *Fasciola,* Seta of Earthworm, Radula 3. Ecological Note – On any of the specimens in Exercise No 1 Models of dissection of Earthworm, Cockroach Earthworm: Digestive, Nervous System, Cockroach: Digestive Reproductive, Nervous System.

References

1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. &J.I., Spicer (2002).*The Invertebrates: A New Synthesis* (3rd ed.). Blackwell Science.
2. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions* (2nd ed.). E.L.B.S. and Nelson.
3. Ruppert, Edward, E., Fox Richard, S. &Barnes Robert, D. (2009). *Invertebrate Zoology: A Functional Evolutionary Approach* (7th ed.). Thomson Brooks/Cole.
4. Kent, G.C., & Carr, R.K. (2000). *Comparative Anatomy of the Vertebrates* (9th ed.). The McGraw-Hill Companies.

SEMESTER VI

16BTU601A I.P.R., ENTREPRENEURSHIP, BIOETHICS & BIOSAFETY 3H -3C

Total hours/week: L:3 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are

- To understand the basic knowledge of copy rights and related property rights.
- To develop the entrepreneurship skills using biological product formation.
- To provide the information of filling the patents and copy rights
- To disseminate knowledge on trademarks and registration aspects
- To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects
- To learn about current trends in IPR and Govt. steps in fostering IPR

Course Outcomes

On completion of the course, students are able to

- Acquire the knowledge on filling and submission of copy rights and related property rights.
- Gain knowledge in developing new pilot scale / large scale industries and associated formalities
- Understand the importance of patenting /copyrights/Trade marks
- Acquire the knowledge on fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- Disseminate knowledge on patents, patent regime in India and abroad and registration aspects \
- Disseminate knowledge on copyrights and its related rights and registration aspects

UNIT-I

Introduction to Indian Patent Law. World Trade Organization and its related intellectual property provisions. Intellectual/Industrial property and its legal protection in research, design and development. Patenting in Biotechnology, economic, ethical and depository considerations.

UNIT II

Entrepreneurship: Selection of a product, line, design and development processes, economics on material and energy requirement, stock the product and release the same for making etc. The basic regulations of excise: Demand for a given product, feasibility of its production under given constraints of raw material, energy input, financial situations export potential etc.

UNIT III

Bioethics – Necessity of Bioethics, different paradigms of Bioethics – National & International. Ethical issues against the molecular technologies.

UNIT IV

Biosafety– Introduction to biosafety and health hazards concerning biotechnology. Introduction to the concept of containment level.

UNIT V

Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).

References

1. David H. Holt, *Entrepreneurship: New Venture Creation*.
2. Jack M. Kaplan, *Patterns of Entrepreneurship*.
3. Gupta, C.B., Khanka, S.S. (2002). *Entrepreneurship and Small Business Management*. Sultan Chand & Sons.
4. Sateesh, M.K., (2010), *Bioethics and Biosafety*, I. K. International Pvt Ltd.
5. Sree Krishna, V, (2007), *Bioethics and Biosafety in Biotechnology*. New age international publishers,

SEMESTER VI

16BTU601B BIO-ANALYTICALTOOL 3H -3C

Total hours/week: L:3 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are,

- To study the bio-analytical tools and their applications.
- To have sufficient knowledge on the separation of compounds from a mixture.
- To know the application of chromatography in biotechnology.
- To develop the skills to understand the theory and practice of bio analytical techniques.
- To provide scientific understanding of analytical techniques and detail interpretation of results.
- To learn how to design experiments and understand the instrumentation.

Course Outcomes

On completion of the course, students are able to

1. Know the working principle, maintenance, and calibrations of bioanalytical tools and technique
2. Estimate the number of biomolecules using the Bioanalytical tool
3. Implement the bioanalytical techniques to analyze the biomolecules
4. Use selected analytical techniques.
5. Be familiar with working principals, tools and techniques of analytical techniques.
6. To understand the strengths, limitations and creative use of techniques for problem-solving.

UNIT I

Simple microscopy, phase contrast microscopy, florescence and electron microscopy (TEM and SEM), pH meter, absorption and emission spectroscopy

UNIT II

Principle and law of absorption fluorimetry, colorimetry, spectrophotometry (visible, UV, infrared), centrifugation, cell fractionation techniques, isolation of sub-cellular organelles and particles.

UNIT III

Introduction to the principle of chromatography. Paper chromatography, thin layer chromatography, column chromatography: silica and gel filtration, affinity and ion exchange chromatography, gas chromatography, HPLC.

UNIT IV

Introduction to electrophoresis. Starch-gel, polyacrylamide gel (native and SDS-PAGE), agarose-gel electrophoresis,

UNIT V

Pulse field gel electrophoresis, immuno- electrophoresis, isoelectric focusing, Western blotting. Introduction to Biosensors and Nanotechnology and their applications.

References

1. Karp, G. (2013). *Cell and Molecular Biology: Concepts and Experiments* (7th ed.). Hoboken, US: John Wiley &Sons.Inc.
2. De Robertis, E.D.P., & De Robertis, E.M.F. (2006). *Cell and Molecular Biology* (8th ed.). Lippincott Williams and Wilkins,Philadelphia.
3. Cooper, G.M., &Hausman, R.E. (2013). *The Cell: A Molecular Approach* (6th ed.). Washington, USA: ASM Press&S underland, D.C., Sinauer Associates.
4. Becker, W.M., Kleinsmith, L.J., Hardin. J., & Bertoni, G. P. (2009). *The World of the Cell* (7th ed.). San Francisco: Pearson Benjamin Cummings Publishing.

SEMESTER VI

16BTU602A **MEDICAL MICROBIOLOGY** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total: 100**

Course Objectives

The main objectives of the course are

- To identify common infectious agents and the diseases that they cause.
- To evaluate methods used to identify infectious agents in medical microbiology lab.
- To recall microbial physiology including metabolism, regulation and replication of pathogenic microbes.
- To explain general and specific mechanisms by which an infectious agent causes disease.
- To recognize and diagnose common infectious diseases from the clinical presentation and associated microbiology.
- To describe the epidemiology of infectious agents including how infectious diseases are transmitted.

Course Outcomes

On completion of the course, students are able to

1. Apply the biotechnology concept for controlling infectious agents.
2. Expertise on the concepts of metabolism, regulation and replication of pathogenic microbes.
3. Able to get knowledge on the toxins released by microbes.
4. Able to enter into a wide range of biotechnology industries with research enterprises.
5. Develop of non-toxic therapeutic agents from microbes
6. Able to get knowledge on Fungal and Protozoan infections

UNIT- I

Introduction: Normal microflora of human body, nosocomial infections, carriers, septic shock, septicemia, pathogenicity, virulence factors, toxins, biosafety levels. Morphology, pathogenesis, symptoms, laboratory diagnosis, preventive measures and chemotherapy of gram positive bacteria: *S.aureus, S.pyogenes, B.anthracis, C.perferinges, C.tetani, C.botulinum, C.diphtheriae, M.tuberculosis, M. leprae.*

UNIT-II

Morphology, pathogeneis, symptoms, laboratory diagnosis, preventive measures and chemotherapy caused by gram negative bacteria: *E.coli, N. gonorrhoea, N. meningitidis, P. aeruginosa, S. typhi, S. dysenteriae, Y. pestis, B. abortus, H. influenzae, V. cholerae, M. pneumoniae, T. pallidum M. pneumoniae, Rickettsiaceae, Chlamydiae.*

UNIT- III

Diseases caused by viruses- Picornavirus, Orthomyxoviruses, Paramyxoviruses, Rhabdoviruses, Reoviruses, Pox virus, Herpes virus, Papova virus, Retro viruses (including HIV/AIDS) and Hepatitis viruses.

UNIT- IV

Fungal and Protozoan infections. Dermatophytoses (*Trichophyton, Microsporun and Epidermophyton*) Subcutaneous infection (*Sporothrix, Cryptococcus*),systemic infection (*Histoplasma, Coccidoides).*

UNIT- V

Opportunistic fungal infections (*Candidiasis, Aspergillosis*), Gastrointestinal infections (Amoebiasis, Giardiasis), Blood-borne infections (Leishmaniasis, Malaria).

References

1. Brooks, G.F., Carroll, K.C., Butel, J.S., &Morse, S.A. (2007). *Jawetz, Melnick and Adelberg'sMedical Microbiology* (24th ed.). McGraw HillPublication.
2. Goering,R., Dockrell,H., Zuckerman,M., &Wakelin,D. (2007).*Mims'Medical Microbiology* (4th ed.).Elsevier.
3. Willey, J.M., Sherwood, L.M., &Woolverton, C.J. (2008). *Prescott, Harley and Klein's Microbiology* (7th ed.). McGraw Hill Higher Education.

SEMESTER VI

16BTU602B ENVIRONMENTAL BIOTECHNOLOGY 4H -4C

Total hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total: 100

Course Objectives

The main objectives of the course are

- To obtain basic concepts of biotechnology to solve the environmental problems
- To ascertain the knowledge about solid waste management and wastewater treatment.
- To achieve a novel treatment strategy for waste to Bioenergy.
- To gain knowledge about the biological and biotechnological measures for restoring environment.
- To involve in the present scenarios and find valuable solutions for remedy
- To update about the management strategies followed up by the industries and government.

Course Outcomes

On completion of the course, students are able to apply their knowledge on

1. Bio-management of soil
2. Bio-management of Petroleum Contaminants
3. Environmental significance of genetically modified microbes, plants and animals
4. Bioleaching
5. Treatment of municipal waste and Industrial effluents
6. Bioremediation concepts

UNIT-I

Conventional fuels and their environmental impact – Firewood, Plant, Animal, Water, Coal and Gas. Modern fuels and their environmental impact – Methanogenic bacteria, Biogas, Microbial hydrogen Production, Conversion of sugar to alcohol Gasohol

UNIT-II

Bioremediation of soil & water contaminated with oil spills, heavy metals and detergents. Degradation of lignin and cellulose using microbes. Phyto-remediation. Degradation of pesticides and other toxic chemicals by micro-organisms-degradation aromatic and chlorinates hydrocarbons and petroleum products.

UNIT- III

Waste management, Treatment of municipal waste and Industrial effluents Bio-fertilizers Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil. Algal and fungal biofertilizers (VAM)

UNIT- IV

Bioleaching, Enrichment of ores by microorganisms (Gold, Copper and Uranium). Solid waste management (an introduction).

UNIT- V

Environmental significance of genetically modified microbes, plants and animals.

References

1. Santra, S.C.(2011).*EnvironmentalScience*(3rded.).NewCentralBookAgency.
2. Pradipta Kumar Mohapatra, (2007). *Environmental Biotechnology*. I.K. International PublishingHouse.
3. Hans-Joachim Jordening, & Jesef Winter, (Eds.). (2005). *Environmental Biotechnology*: Concepts and Applications. Wiley-VCH.
4. Metcalf, & Eddy, (2003). *Waste Water Engineering: Treatment and Reuse* (4th ed.). Tata McGrawhill.
5. Purohit, S.S. (2003). *Agricultural Biotechnology* (2nd ed.). Updesh Purohit.
6. Alicia, L., Ragout De Spencer, &John Spencer, F.T. (Eds.). (2004).*Environmental Microbiology: Methods and Protocols*. HumanaPress.
7. Milton Wainwright, (1999). *Introduction to Environmental Biotechnology*. Spring.
8. Gilbert Masters, (2007). *Principles of Environmental Engineering* (3rd ed.). Prentice Hall.
9. Metcalf, &Eddy. (2002). *Wastewater Engineering* (4th ed.). McGraw-Hill Higher Education.

SEMESTER VI

16BTU603A	**BIOSTATISTICS**	**4H -4C**
Total hours/week: L:4 T:0 P:0	**Marks: Internal: 40 External: 60 Total:100**	

Course Objectives

The main objectives of the course are

- To gain mathematical approach for analyzing the data.
- To learn the knowledge about graphical and diagrammatic representation of Statistical data.
- To learn the knowledge about Scope and applications of biostatistics
- To learn the knowledge about collection, processing and presentation of data and Testing of hypothesis
- To learn the knowledge about Measures of central tendency, Measures of dispersion
- To learn the knowledge about Correlation analysis and regression analysis

Course Outcomes

On completion of the course, students are able to

1. Apply the statistical tool knowledge for research data analysis.
2. Understand the concept of various hypothesis regarding data analysis.
3. To perform analysis for the data based on graphical representation (Bar, multiple bars, histogram, pie chart etc.)
4. To perform analysis to determine the mean, median, mode and standard deviation of given sample/data
5. To perform analysis, determine the probability of given sample/data
6. To perform the t-test/F-Test and Chi-square test of given data

UNIT I

Statistics – Meaning, Definitions, Introduction to Bio-Statistics -Types of Data, Collection of data; Primary & Secondary data, Classification and tabulation of data, construction of frequency distribution. Graphical and diagrammatic representation of Statistical data.

UNIT II

Measures of central tendency – Mean, Median and Mode. Measures Dispersion – Absolute and relative measures dispersion – Range, Standard deviation and coefficient of variation. Measures of Skewness and Kurtosis.

UNIT III

Probability classical & axiomatic definition of probability, Theorems on total and compound probability), Elementary ideas of Binomial, Poisson and Normal distributions.

UNIT IV

Population and Sample, parameter and statistic, sampling, methods of sampling, confidence level, critical region, testing of hypothesis and standard error, large sample test and small sample test. Problems on test of significance, t-test, *chi*-square test for goodness of fit and analysis of variance (ANOVA)

UNIT V

Correlation –types of correlation, degrees of correlation, methods of calculating correlation coefficient – scatter diagram, Karl Pearson and Spearman rank correlation coefficients. Regression – regression lines, regression equation, regression coefficients, methods of forming regression equations. Emphasis on examples from Biological Sciences.

References

1. Le, C.T. (2003). *Introductory biostatistics*. USA: John Wiley.
2. Glaser, A.N. (2001). *High Yield TM Biostatistics.* USA: Lippincott Williams and Wilkins.
3. Edmondson, A., &Druce, D. (1996). *Advanced Biology Statistics.* Oxford University Press.
4. Danial, W. (2004). *Biostatistics: A foundation for Analysis in Health Sciences*. John Wiley and Sons Inc.

SEMESTER VI

16BTU603B **ENVIRONMENT MANAGEMENT** **4H -4C**

Total hours/week: L:4 T:0 P:0 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are

- To obtain basic concepts of Geological consideration of Atmosphere
- To ascertain the knowledge about Energy transfer in an Ecosystem.
- To obtain knowledge Pollution and environmental Health.
- To gain knowledge about the biotechnological measures for restoring environment.
- To involve in the present scenarios and find valuable solutions for remedy
- To update about the management strategies by Bio-transformation.

Course Outcomes

On completion of the course, students are able to apply their knowledge on

1. Principles & Concepts of Ecosystem
2. Ecological efficiencies
3. Environmental significance of Detection of Environmental pollutants
4. Bio-geochemical cycles
5. Hazardous wastes Environmental cleanup
6. Genetic engineering of bacteria and their potential for bioremediation

UNIT-I

Our Environment: Geological consideration of Atmosphere, Hydrosphere, Lithosphere Scope of Ecology. Development &Evolution of Ecosystem. Principles &Concepts of Ecosystem. Structure of ecosystem. Strata of an ecosystem. Types of ecosystem including habitats. Cybernetics &Homeostasis. Biological control of chemical environment.

UNIT-II

Energy transfer in an Ecosystem. Food chain, food web, Energy budget, Production &decomposition in a system. Ecological efficiencies, Trophic structure &energy pyramids, Ecological energetic, principles pertaining to limiting factors, Bio-geochemical cycles (Nitrogen, Carbon and Phosphate cycles).

UNIT-III

Pollution and environmental Health related to Soil, Water, Air, Food, Pesticides, Metals, Solvents, Radiations Carcinogen, Poisons. Detection of Environmental pollutants. Indicators & detection systems.

UNIT-IV

Environmental biotechnologies, Biotechnologies in protection and preservation of environment. Bioremediation, Waste disposal.

UNIT-V

Bio-transformation, Plastic, Aromatics, Hazardous wastes Environmental cleanup: Case studies

References

1. Robert May, &Angela McLean. (Eds.).(2007). *Theoretical Ecology: Principles and Applications* (3rd ed.). USA: Oxford University Press.
2. Divan Rosencraz, (2002).*Environmental laws and policies in India*. Oxford Publication.
3. Ghosh, S.K., &Singh, R. (2003). *Social forestry and forest management*. Global Vision Publishing House
4. Joseph, B. (2005). *Environmental studies*. Tata Mc GrawHill.
5. Michael Allabay, (2000). *Basics of environmental science* (2nd ed.). Routledge Press.
6. Miller,G.T. (2002).*Sustaining the earth, an integrated approach*(5th ed.). Books/Cole, Thompson Learning, Inc.
7. Mohapatra, P.K., (2007). *Textbook of environmental biotechnology*. IK publication.
8. Rana, S.V.S., (2013). *Environmental pollution – health and toxicology* (2nd ed.). Narosa Publication.
9. Sinha,S. (2010*).Hand book on Wildlife Law Enforsement in India*. India:TRAFFIC.
10. Thakur, I. S. (2011). *Environmental Biotechnology*. IK Publication.

SEMESTER VI

16BTU611A I.P.R., ENTREPRENEURSHIP, BIOETHICS &BIOSAFETY PRACTICAL 3H -1C

Total hours/week: L:0 T: 0 P:3 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are

- To understand the basic knowledge of copy rights and related property rights.
- To develop the entrepreneurship skills using biological product formation.
- To provide the information of filling the patents and copy rights
- To disseminate knowledge on trademarks and registration aspects
- To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects
- To learn about current trends in IPR and Govt. steps in fostering IPR

Course Outcomes

On completion of the course, students are able to

1. Acquire the knowledge on filling and submission of copy rights and related property rights.
2. Gain knowledge in developing new pilot scale / large scale industries and associated formalities
3. Understand the importance of patenting /copyrights/Trade marks
4. Acquire the knowledge on fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
5. Disseminate knowledge on patents, patent regime in India and abroad and registration aspects
6. Disseminate knowledge on copyrights and its related rights and registration aspects

List of Practicals

1. Proxy filing of Indian Product patent
2. Proxy filing of Indian Process patent
3. Planning of establishing a hypothetical biotechnology industry in India
4. A case study on clinical trials of drugs in India with emphasis on ethical issues.
5. Case study on women health ethics.
6. Case study on medical errors and negligence.
7. Case study on handling and disposal of radioactive waste

References

1. David Holt, H., (1992). *Entrepreneurship. New Venture Creation*.
2. Jack Kaplan, M., (2009). *Patterns of Entrepreneurship* (3rd ed.).
3. Gupta, C.B., & Khanka S.S. (2004). *Entrepreneurship and Small Business Management*. Sultan Chand & Sons.
4. Sateesh, M.K. (2010). *Bioethics and Biosafety*. I. K. International Pvt Ltd.
5. Sree Krishna ,V. (2007). *Bioethics and Biosafety in Biotechnology.* New age international publishers.

SEMESTER VI

16BTU611B **BIO-ANALYTICAL TOOL PRACTICAL** **3H -1C**

Total hours/week: L:0 T:0 P:3 **Marks: Internal: 40 External: 60 Total:100**

Course Objectives

The main objectives of the course are,

- To study the bio-analytical tools and their applications.
- To have sufficient knowledge on the separation of compounds from a mixture.
- To know the application of PCR in biotechnology.
- To develop the skills to understand the theory and practice of bio analytical techniques.
- To provide scientific understanding of analytical techniques and detail interpretation of results.
- To learn how to design experiments and understand the instrumentation.

Course Outcomes

On completion of the course, students are able to

1. Know the working principle, maintenance, and calibrations of bioanalytical tools and technique
2. Estimate the number of biomolecules using the Bioanalytical tool
3. Implement the bioanalytical techniques to analyze the biomolecules
4. Use selected analytical techniques.
5. Be familiar with working principals, tools and techniques of analytical techniques.
6. To understand the strengths, limitations and creative use of techniques for problem-solving.

Practical

1. Native gel electrophoresis of proteins
2. SDS-polyacrylamide slab gel electrophoresis of proteins under reducing conditions.
3. Preparation of the sub-cellular fractions of rat liver cells.
4. Preparation of protoplasts from leaves.
5. Separation of amino acids by paper chromatography.
6. To identify lipids in a given sample by TLC.
7. To verify the validity of Beer's law and determine the molar extinction coefficient of NADH.

References

1. Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments* (6th ed.). John Wiley& Sons. Inc.

2. De Robertis, E.D.P. & De Robertis, E.M.F. (2006). *Cell and Molecular Biology* (8th ed.). Philadelphia: Lippincott Williams and Wilkins.

3. Cooper, G.M., & Hausman, R.E. (2009). *The Cell: A Molecular Approach* (5th ed.). Washington : ASM Press & Sunderland & MA: D.C. Sinauer Associates.

4. Becker, W.M.,Kleinsmith,L.J.,Hardin,J.&Bertoni,G.P.(2009).*TheWorldoftheCell* (7th ed.). Pearson Benjamin Cummings Publishing, San Francisco.

SEMESTER VI

16BTU612A MEDICAL MICROBIOLOGY PRACTICAL 4H -2C

Total hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are

- To obtain basic concepts of Identification of pathogenic bacteria
- To ascertain the diagnostics tools for infectious diseases – RFLP, RAPD.
- To achieve a complete knowledge about molecular diagnostics techniques on microbial infection.
- To understand the utility and limitations of various molecular diagnostic tests used for managing patient care.
- To attain the concepts of molecular methods used in clinical microbiology.
- To recognize the importance of proper specimen collection and preparation for molecular detection.

Course Outcomes

On completion of the course, students are able to

1. Get hold of the knowledge on fundamentals of molecular diagnostic techniques.
2. Expertise on the concepts of infection, diagnosis and control assortment.
3. Acknowledge on the qualitative studies based on biomarker observations.
4. Apply methodologies of laboratory diagnostics to relevant states of health.
5. Be aware of characteristics signs of clinical manifestations.
6. Comprehend and analyse the concept of disease management.

List of Practicals

1. Identification of pathogenic bacteria (any two) based on cultural, morphological and biochemical characteristics.
2. Growth curve of a bacterium.
3. To perform antibacterial testing by Kirby-Bauer method.
4. To prepare temporary mounts of *Aspergillus* and *Candida* by appropriate staining.
5. Staining methods: Gram's staining permanent slides showing acid fast staining, Capsule staining and spore staining.

References

1. Brooks, G.F, Carroll, K.C, Butel, J.S., &Morse, S.A. (2007). *Jawetz, Melnick and Adelberg'sMedical Microbiology* (24th ed.). McGraw Hill Publication.
2. Goering, R., Dockrell, H., Zuckerman, M., & Wakelin, D. (2007). *Mims' Medical Microbiology.* (4th ed.). Elsevier.
3. Willey, J.M., Sherwood, L.M., &Woolverton, C.J. (2008). *Prescott, Harley and Klein's Microbiology.* (7th ed.). McGraw Hill Higher Education.

SEMESTER VI

16BTU612B ENVIRONMENTAL BIOTECHNOLOGY PRACTICAL 4H -2C

Total hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are

- To obtain practical knowledge to solve the environmental problems
- To ascertain the knowledge about wastewater treatment.
- To achieve a water treatment strategy.
- To gain knowledge about for restoring environment
- To involve in the present scenarios and find valuable solutions for remedy
- To update about the microbial load in water sample.

Course Outcomes

On completion of the course, students are able to apply their knowledge on

1. Environmental problems
2. Wastewater treatment
3. BOD and its calculation
4. COD and its calculation
5. Bacterial Examination of Water
6. Biofertilizers

List of Practicals

1. Calculation of Total Dissolved Solids (TDS) of water sample.
2. Calculation of BOD of water sample.
3. Calculation of COD of water sample.
4. Bacterial Examination of Water by MPN Method.

References

1. Santra, S.C. (2011).*EnvironmentalScience*(3rded.).New Central Book Agency.
2. Pradipta Kumar Mohapatra, (2007). *Environmental Biotechnology.* I.K. International Publishing House.
3. Hans-Joachim Jordening,&J esef Winter, (Eds.). (2005). *Environmental Biotechnology: Concepts and Applications*. Wiley-VCH.
4. Metcalf, & Eddy, (2003). *Waste Water Engineering: Treatment and Reuse* (4th ed.). Tata Mc Grawhill.
5. Purohit, S.S. (2003). *Agricultural Biotechnology* (2nd ed.). Updesh Purohit.
6. Alicia, L., Ragout De Spencer, &John Spencer, F.T. (Eds.). (2004). *Environmental Microbiology: Methods and Protocols.* Humana Press.
7. Milton Wainwright, (1999). *Introduction to Environmental Biotechnology.* Spring.
8. Gilbert Masters, (2007). *Principles of Environmental Engineering* (3rd ed.). Prentice Hall.

SEMESTER VI

16BTU613A BIOSTATISTICS PRACTICAL 4H -2C

Total hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are

- To gain mathematical approach for analyzing the data.
- To learn the knowledge about graphical and diagrammatic representation of Statistical data.
- To learn the knowledge about Scope and applications of biostatistics
- To learn the knowledge about Dispersion
- To learn the knowledge about SPSS
- To learn the knowledge about Distributions analysis

Course Outcomes

On completion of the course, students are able to

1. Apply the statistical tool knowledge for research data analysis.
2. Understand the concept of various hypothesis regarding data analysis.
3. To perform analysis for the data based on graphical representation (Bar, multiple bars, histogram, pie chart etc.)
4. To perform analysis to determine the mean, median, mode and standard deviation of given sample/data
5. To perform analysis, determine the probability of given sample/data
6. To perform the analysis of given data using SPSS

List of Practicals

Based on graphical Representation

1. Drawing of bar and multiple bar diagram
2. Drawing of Histogram
3. Drawing of Pie diagram Based on measures of Central Tendency
4. Calculation of Mean for individual, discrete series using SPSS Package.
5. Mean for continuous series using SPSS Package.
6. Median for individual and discrete series using SPSS Package.
7. Median for continuous series using SPSS Package.
8. Mode for individual and discrete series using SPSS Package.
   Based on measures of Dispersion
9. Standard deviation for individual and discrete series using SPSS Package.
10. Coefficient of variation for individual and discrete series using SPSS Package. Based on Distributions Binomial, Poisson and Normal
11. Calculation of Mean and variance for binomial distribution using SPSS Package.
12. Calculation of Mean and variance for Poisson distribution using SPSS Package. Based on t, f, z and Chi-square
13. Karl Pearson's Correlation using SPSS Package.
14. Rank Correlation Coefficient for Untied Rank using SPSS Package.
15. Rank Correlation Coefficient for Tied Rank using SPSS Package.

Reference

1. Le, C.T. (2003). *Introductory biostatistics*. USA: John Wiley.
2. Glaser, A.N. (2001). *High Yield TM Biostatistics.* USA: Lippincott Williams and Wilkins.
3. Edmondson, A., & Druce, D. (1996). *Advanced Biology Statistics*. Oxford University Press.
4. Danial, W. (2004). *Biostatistics: A foundation for Analysis in Health Sciences*. John Wiley and Sons Inc.

SEMESTER VI

16BTU613B ENVIRONMENT MANAGEMENT PRACTICAL 4H -2C

Total hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The main objectives of the course are

- To obtain basic concepts of biotic and abiotic components of any simple ecosystem
- To ascertain the knowledge about Simpson's and Shannon- Weiner diversity index.
- To achieve a life table and fecundity table.
- To gain knowledge about Principle of GPS.
- To involve in the present scenarios of types of soil, their texture
- To update about the endangered/ threatened species.

Course Outcomes

On completion of the course, students are able to apply their knowledge on

1. Ecosystem of soil
2. GPS and related concepts
3. Soil and their texture
4. Population density
5. Treatment of municipal waste and Industrial effluents
6. Species variation and threatened species.

List of Practicals

1. Study of all the biotic and abiotic components of any simple ecosystem- natural pond or terrestrial ecosystem or human modified ecosystem.
2. Determination of population density in a terrestrial community or hypothetical community by quad rate method and calculation of the Simpson's and Shannon- Weiner diversity index for the same community.
3. Principle of GPS (Global Positioning System).
4. Study of the life table and fecundity table, plotting of the three types of survivorship curves from the hypothetical data.
5. Study of the types of soil, their texture by sieve method and rapid tests for –pH, chlorides, nitrates, carbonates and organic carbon
6. Study any five endangered/ threatened species- one from each class.

References

1. Divan Rosencraz. (2002). *Environmental laws and policies in India*. Oxford Publication.
2. Ghosh, S.K., &Singh, R. (2003). *Social forestry and forest management.* Global Vision Publishing House
3. Joseph, B. (2005). *Environmental studies.* Tata Mc Graw Hill.
4. Michael Allabay, (2000). *Basics of environmental science* (2nd ed.). Routledge Press.
5. Miller,G.T. (2002).*Sustaining the earth,an integrated approach* (5thed.). Books/Cole,Thompson Learning, Inc.
6. Mohapatra, P.K., (2007). *Textbook of environmental biotechnology.* IKpublication.
7. Rana, S.V.S., (2013). *Environmental pollution – health and toxicology* (2nd ed.). Narosa Publication.
8. Sinha, S.(2010).*Hand book on Wildlife Law Enforsement in India.*India:TRAFFIC.
9. Thakur, I. S. (2011). *Environmental Biotechnology.* I KPublication.

16BTU691 **PROJECT – *VIVA VOCE*** **8H-6C**

Total hours/week:**8 hrs** **Marks:** Internal:40 External:**60** Total: **100**

Course Objectives

The main objectives of the course are

- The hands-on training through one full semester project with thesis gives special expertise within one of the research areas represented at The Department of Biotechnology

Course Outcomes

On completion of the course, students are able to apply their knowledge on

1. This dissertation programme provides the candidate with knowledge, general competence, and analytical skills on an advanced level, needed in industry, consultancy, education and research

KARPAGAM ACADEMY OF HIGHER EDUCATION
DEPARTMENT OF BIOTECHNOLOGY
M.Sc., Biotechnology Curriculum (CBCS)
(2016 – 2017 Batch)

Course code	Name of the course	Objectives and Outcomes		Hrs / Week	Marks			Exam Hrs	Credit (s)
		PEO´s	PO´s & PSO´s		CIA	ESE	Total		
SEMESTER – I									
16BTP101	Biochemistry	I	a, b	4	40	60	100	3	4
16BTP102	Microbiology	I, II	a, b, c, d	4	40	60	100	3	4
16BTP103	Cell Biology and Molecular Genetics	I, II	a, d	4	40	60	100	3	4
16BTP104	Food Biotechnology	I, II	a, d	4	40	60	100	3	4
16BTP105A	Bioinstrumentation and Biostatistics	II, III	d, e, f	4	40	60	100	3	4
16BTP105B	Nano-Biotechnology	II	d						
16BTP105C	Bio-energy Technology	II	d						
16BTP111	Biochemistry, Cell Biology and Molecular Genetics - Practical – I	I, II, III	a, b, d, f	4	40	60	100	3	2
16BTP112	Microbiology, Food Biotechnology - Practical – II	I, II, III	a, b, c, d, f	4	40	60	100	3	2
Journal Paper Analysis & Presentation				2	-	-	-	-	-
Semester total				**30**	**280**	**420**	**700**	**-**	**24**
SEMESTER – II									
16BTP201	Recombinant DNA technology	II, III	d, e	4	40	60	100	3	4
16BTP202	Fermentation Technology	II, III	d, e	4	40	60	100	3	4
16BTP203	Environmental Biotechnology	II, III	d, e	4	40	60	100	3	4
16BTP204	Immunotechnology	II, III	d, e	4	40	60	100	3	4
16BTP205A	Pharmaceutical Biotechnology	II, III	d, e, f	4	40	60	100	3	4
16BTP205B	Biosafety and IPR	IV	g, h						
16BTP205C	Tissue Engineering	IV	g						
16BTP211	Recombinant DNA technology, Immunology -Practical – III	II, III	d, e, f	4	40	60	100	3	2
16BTP212	Fermentation Technology, Environmental Biotechnology - Practical – IV	II, III	d, e, f	4	40	60	100	3	2
Journal Paper Analysis & Presentation				2	-	-	-	-	-
Semester total				**30**	**280**	**420**	**700**	**-**	**24**
SEMESTER – III									
16BTP301	Plant Biotechnology	II, III, IV	d, g, h	4	40	60	100	3	4
16BTP302	Animal Biotechnology	II, III, IV	d, g, h	4	40	60	100	3	4
16BTP303	Bioinformatics	IV	g	4	40	60	100	3	4
16BTP304	Genomics and Proteomics	II, III, IV	d, e, f, g	4	40	60	100	3	4
16BTP305A	Medicinal Plant Biotechnology	IV	g	4	40	60	100	3	4
16BTP305B	Industrial Toxicology	IV	g						
16BTP305C	System Biology	IV	g						
16BTP311	Plant and Animal Biotechnology- Practical – V	II, III, IV	d, g, h, f	4	40	60	100	3	2
16BTP312	Bioinformatics -Practical – VI	II, III, IV	d, g, h, f	4	40	60	100	3	2
Journal Paper Analysis & Presentation				2	-	-	-	-	-
Semester total				**30**	**280**	**420**	**700**	**-**	**24**

Course code	Name of the course	Objectives and Outcomes		Hrs / Week	Marks			Exam Hrs	Credit (s)
		PEO´s	PO´s & PSO´s		CIA	ESE	Total		
SEMESTER – IV									
16BTP491	Project and *Viva Voce*	III, IV	f, g, h, i	-	80	120	200	-	15
Semester total				**-**	**80**	**120**	**200**	**-**	**15**
				90	**640**	**1380**	**2300**		**87**

Elective courses*

Elective – 1		Elective - 2		Elective - 3	
Course code	**Name of the course (Theory)**	**Course Code**	**Name of the course (Theory)**	**Course Code**	**Name of the course (Theory)**
16BTP105A	Bioinstrumentation and Biostatistics	16BTP205A	Pharmaceutical Biotechnology	16BTP305A	Medicinal plant Biotechnology
16BTP105B	Nano-Biotechnology	16BTP205B	Bio-safety and IPR	16BTP305B	Industrial Toxicology
16BTP105C	Bio-energy Technology	16BTP205C	Tissue Engineering	16BTP305C	System Biology

*Electives are Transborder /cross disciplinary/ Discipline centric elective nature.

Blue – Employability **Green – Entrepreneurship** **Red- Skill Development**

PROGRAMME OUTCOMES (POs)

a) Graduates will able to have knowledge on the basic and applied theories.

b) Providing a broad educational and analytical knowledge necessary to make the students for appearing in competitive examinations

c) Ability to design and conduct experiments as well as to interpret the results.

d) An expert to work on Biotechnological concepts and allied fields (immuno, medical, microbial, Food, agricultural, environmental, plant and animal) with modern tools and techniques towards product and process development for academic, industrial and research application.

e) Generating the graduates with an ability to identify, formulate and solve to deliver process/product with professional, societal and ethical responsibilities.

f) Graduates will be able to visualize and work on multidisciplinary laboratory problems.

g) Graduates will be able to update the current knowledge of interdisciplinary subjects related to biotechnology

PROGRAMME SPECIFIC OUTCOMEs (PSOs)

To enable the student to emerge as:

h) Biotechnologist to recognize the societal need and lifelong learning.

i) Proficient to demonstrate entrepreneurial and leadership skills with life-long learning.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO I: The post-graduates of Biotechnology will able to acquire in-depth knowledge of the basic and applied subjects of Biotechnology and allied fields.

PEO II: The post-graduates of Biotechnology are equipped to design, analyze, conduct and interpret the experiments and data for the development of process/product within the realistic constraints.

PEO III: The post-graduates of Biotechnology will able to acquire the knowledge and ability to use the concept of theories, practical skills and recent technological tools in solving any technological and professional issues independently in a global and societal context.

PEO IV: The graduates of Biotechnology will continue learning to update and to become an entrepreneur in a competitive world of technology and also contribute to all forms of life.

MAPPING OF PEOs AND POs

PEOs			Programme Outcome (s)						
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
PEO I	×	×		`					
PEO II			×	×					
PEO III					×	×			
PEO IV							×	×	×

Semester -I

16BTP101 **BIOCHEMISTRY** **4H – 4C**

Total hours/week: **L: 4 T: 0 P: 0** **Marks:** Internal: **40** External: **60** Total: **100**

Course Objectives

The main objectives of the course are

- To understand the key concepts of cellular structure and organization of various biomolecules
- To attain strong theoretical knowledge on three-dimensional construction of biological macromolecules and the principles of molecular recognition
- To understand the functions and importance of various biomolecules
- To describe the various metabolic pathways involved in cells for its normal functioning
- To obtain strong background on how the DNA is selectively expressed as functional proteins
- To obtain necessary knowledge on disorders associated with metabolism of biomolecules

Course Outcomes

On completion of the course, students are able to

1. Understand Biochemistry as discipline and milestone discoveries in life sciences that led to establishment of Biochemistry as separate discipline
2. Understand fundamental properties of elements, their role in formation of biomolecules and in chemical reactions within living organisms
3. Draw or describe the structure of amino acids, proteins, enzymes, chemical messengers, carbohydrates, lipids, and nucleic acid
4. Describe the metabolism of carbohydrates, lipids, proteins and amino acids, and write chemical reactions for the individual steps in each pathway
5. Write the chemical reactions involved in biochemical pathways that produce ATP, such as citric acid cycle and electron transport
6. Be familiar with the enzymes (biocatalysts), and their salient attributes including unique conformation and amazing catalytic properties

UNIT - I

Introduction: Chemical basis of life; Composition of living matter; Water – properties, pH, ionization and hydrophobicity; Emergent properties of biomolecules in water; Biomolecular hierarchy; Macromolecules; Molecular assemblies; Structure-function relationships.

UNIT - II

Biomolecules: Structure and properties of carbohydrates, fatty acids amino acids, proteins. Structure and properties of purines, pyrimidines, nucleosides, nucleotides, polynucleotides, Ribonucleic acids and deoxy ribonucleic acids, nucleoprotein complexes.

UNIT - III

Enzymology: Enzymes classification and nomenclature, Mechanism of action, regulation of enzymatic activity, enzyme kinetics – Michaelis Menton equation, Line Weaver Burk plot and Eadie Hoffstee and Haneswoll equation, enzyme inhibition.

UNIT- IV

Metabolism: Biosyntheses and degradation of fatty acids and cholesterol, Biosyntheses and degradation of amino acids, peptides and proteins; Biosynthesis and degradation of amino acids, peptides and proteins, Biosyntheses and degradation of purines, pyrimidines and nucleic acids.

UNIT –V

Bioenergetics: TCA Cycle, glycolysis, gluconeogenesis, Pentose phosphate shunt, Embden-Meyerhof pathway, urea cycle, interconnection of pathways, Metabolic regulation, Bioenergetics: Respiratory chain, ATP cycle, energy-rich compounds.

REFERENCES

1. Jain, J. L.(2002). *Fundamentals of Biochemistry* (5th ed.).New Delhi: S. Chand & Co.
2. Zubay,G.L., Parson,W.W., &VanceD.E.(1995). *Principles of Biochemistry*. Oxford:MC Brown Publishers.
3. Nelson, D.L., & Cox, M.M. (2013). Lehninger: *Principles of Biochemistry* (6th ed.). New York: W.H. Freeman and Company.
4. Murray, R.K., Bender, D.A., Botham, K.M.,& Kennelly, P.J., (2012). *Harper's illustrated Biochemistry* (29th ed.). London : McGraw-Hill Medical.
5. Voet, G., &Voet,A.(2004). *Fundamentals of Biochemistry* (3 rd ed.).New York: John Wiley and Sons, Inc.

Semester -I

16BTP102 **MICROBIOLOGY** **4H – 4C**

Total hours/week: **L: 4 T: 0 P: 0** **Marks:** Internal: **40** External: **60** Total: **100**

Course Objectives

The main objectives of the course are

- To understand landmark discoveries in Microbiology and different domains classification of living organisms
- To be familiar with general characters of prokaryotes for conventional and molecular characterization using modern methods
- To understand the conceptual knowledge on metabolism of microorganisms
- To attain essential knowledge of cellular organization and life cycle of microorganisms
- To understand the economic importance of microorganisms
- To obtain information regarding diseases caused by microorganisms

Course Outcomes

On completion of the course, students are able to

1. Demonstrate the principles and applications of microscopic techniques
2. Demonstrate microbial structure and similarities and differences among various groups of microorganisms such as bacteria and fungi
3. Illustrate microbial diversity using different methods and systematics of bacteria
4. Discuss the various methods for identification of isolated and unculturable microorganisms
5. Comprehend the various methods for identification of unknown microorganisms
6. Discuss the industrial applications of microorganisms

UNIT -I

Microbial Diversity: Definition, history, scope, discovery and development of microorganisms. Diversity-Bacteria, fungi, algae - distribution, reproduction and characteristics divisions. Autotropic and heterotopic utilization.

UNIT –II

Microscopy Techniques: Principles, types and applications of light, phase contrast, fluorescence, scanning and transmission electron microscopy, cytophotometry and flow cytometry, fixation and staining. Types of media preparation, methods of sterilization, techniques of pure culture, maintenance and preservation. Staining – types of stains and dyes, staining methods. Microbial growth study.

UNIT –III

Microbial metabolism: Common nutrient requirements, nutritional types, uptake of nutrients, culture media, isolation of pure cultures. Microbial growth, growth curve, measurement of microbial growth, continuous culture, influence of environmental factors on growth, control of microorganisms by physical and chemical agents.

UNIT –IV

Biomass production: Production of carbohydrates - higher alkanes and methanol; Edible mushroom and its types. Oyster, paddy straw, button and medicinal mushroom production and their applications.

UNIT - V

Microbial Diseases: Causative agent, pathology, diagnosis, control and treatment of Bacterial - TB, Cholera and Typhoid. Protozoan – Amoebiasis and Malaria. Viral - AIDS. Control of microorganisms – drugs, chemotherapy, antimicrobial agents.

REFERENCES

1. Black, J.G. (2002). *Microbiology Principles and Explorations*. NewYork: John Wiley and Sons Publishing.
2. Prescott, L.M., Harley, J.P.&Klien,D.A. (2005). *Microbiology*. Boston:NY,McGraw - Hill Publishing Company.
3. Talaro, K.P., (2009). *Foundations in Microbiology*. McGraw - Hill Publishing Company, NewYork.
4. Prescott, & Dunn's. (1984). *Industrial Microbiology*(4th ed.). Conneticut: Gerald Reed&AVI Publishing Company Inc.
5. Atlas, R.M.(1997). *Principles of Microbiology Illinois*: USA, WCB McGraw Hill publishers.
6. Pascale, C. (2005). *Cellular Microbiology*. New York:American Society for Microbiology.
7. Hui, Y.H., Goddik,L.M., Hansen,A.S., Josephsen,J., Nip,W.K., Stanfield,P.S., &Toldra, F.(2004). *Handbook of Food and Beverage Fermentation Technology*. London:Taylor and Francis publishers.
8. Pelczar, M.J., Chan, E.C.S., & Krieg, N.R. (1993). *Microbiology*(5thed.). McGraw Hill Book Company.
9. Roland, V.G.(2005).*Applied Food Microbiology*. London:Star Publishing Co.

Semester - I

16BTP103 CELL BIOLOGY AND MOLECULAR GENETICS 4H – 4C

Total hours/week: **L: 4 T: 0 P: 0** **Marks:** Internal: **40** External: **60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Understand the structures and functions of basic components of eukaryotic cells especially macromolecules, membranes, and organelles
- Understand how the cellular components are used to generate and utilize energy in cells
- Understand the cellular components underlying cell division
- To impart knowledge in genetics and genome organizations in organisms
- To understand the principles of extensions to Mendelian inheritance, including multiple allelism, lethal alleles, and gene interactions
- To obtain knowledge on normal chromosome number, structure, and behaviour in human cells, and understand the cause and effect of alterations in chromosome number and structure

Course Outcomes

On successful completion of the course, students will be able to

1. Describe the structures and basic components of eukaryotic cells
2. Illustrate how the cellular components are used for various cellular activities
3. Demonstrate the pathways involved in various cellular events including cell cycle
4. Understand the inheritance of genes among plants and animals and the genetic makeover as well as the physical appearance of organisms
5. Describe Mendelian inheritance, the interaction of genes among organism and to determine the inheritance of gene in human beings
6. Illustrate the effect of chromosomal abnormalities in human diseases

UNIT-I

Cell Organization: Structure of prokaryotic and eukaryotic cells, cellular organelles – Plasma membrane – Properties and functions, cell wall, mitochondria, chloroplast, peroxisomes, golgi complex, Endoplasmic reticulum and lysosome. Cell division.

UNIT - II

Nucleic Acid - Replication –Types of replication, Transcription, Post Transcriptional Modification, Translation and Post Translational modification, regulation of gene expression.

UNIT -III

Genetics: Mendelian and Non-Mendelian principles. Genetic recombination, Genetic mapping, linkage and crossing over. Mutations- Types of Mutation, Genetic analysis of Mutations, DNA repair Mechanisms.

UNIT - IV

Transposons: Types of bacterial transposons, Transposition, Detection of Transposition in Bacteria, Excision of Transposons, Types of Transposons in Eukaryotic cells.

UNIT -V

Bacterial genetics - Gene transfer in Bacteria, Transformation, Transduction and Conjugation. Bacteriophages - General properties, Structure, Lytic- and Lysogenic phages, Role of phages as vectors.

REFERENCES

1. Gardner, E.J. (2001). *Principles of Genetics* (8th ed.). New York: John Wiley and Sons.
2. Karp, G. (2005). *Cell and Molecular Biology: Concepts and Experiments*. London: John Wiley and Sons, Inc.
3. Maloy, S.R., Cronan, J.E., & Freifelder, D.(2006). *Microbial Genetics*.Sudbury:Massachusetts, Jones and Bartlett Publishers.
4. Cooper, G.M. &Hausman,R.E., (2004). *Cell : A Molecular Approach*. Sunderland:Sinauer Associates, Inc.
5. Glick, B.R., &Pasternak,J.J. (2003).*Molecular Biotechnology* (3rd ed.).New Delhi: Panima Publishing Corporation,.
6. Frifielder, D.(2001). *Molecular Biology* (2nd ed.). New Delhi: Narosa Publishing House.
7. Lodish, B. (2004). *Molecular and cell biology* (5th ed.).New York: Freeman and company.
8. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P.(2002). *Molecular Biology of the Cell* (4th ed.). New York: Garland Publishing.

16BTP104 **FOOD BIOTECHNOLOGY** **4H-4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Understand the concepts of food biotechnology along with principles of genetics in food industry
- Attain strong knowledge on primary sources of microorganisms in food
- Explore the methods for development and preservation of fermented foods
- Recognize the nutritive values of fermented foods
- Understand the concepts of food adulteration and food safety
- Obtain strong knowledge on food spoilage

Course Outcomes

On successful completion of the course, students will be able to

1. Understand the beneficial role of microorganisms in fermented foods and in food processing and the microbiology of different types of fermented food products
2. Understand the significance and activities of microorganisms in food and role of intrinsic and extrinsic factors on growth and survival of microorganisms in foods
3. Know the spoilage mechanisms in foods and thus identify methods to control deterioration and spoilage
4. Recognize and describe the characteristics of important pathogens and spoilage microorganisms in foods
5. Learn various methods for their isolation, detection and identification of microorganisms in food and employ in industries
6. Identify ways to control microorganisms in foods and thus know the principles involving various methods of food preservation

Unit – I

Introduction: History and Scope of Food Biotechnology, Nutritive value of food, Role of microbes in food biotechnology – bacteria, fungi and yeast. Fermented foods – Types, Changes during Fermentation, Nutritive value of fermented foods.

Unit - II

Food Microbiology: Primary Sources of Microorganisms in food. Food-borne Bacteria, Molds and Yeasts. Intrinsic- and Extrinsic Parameters of food affecting microbial count. Detection of Microorganisms in food - SPC, Membrane filters, Dry films. Bacterial Toxins - Botulism and Staphylococcal toxin. Fungal Toxins - Aflatoxins.

Unit - III

Fermented Foods: Origin, scope and development and preservation- Cheese, Yoghurt, Butter, miso, tempeh, kefir, koumiss, acidophilus milk, sourkraut, pickles and vinegar. Fresh juice production –Mango, orange, and pineapple. Technological aspects of industrial production of beer, wine and baker's yeast.

Unit - IV

Food Adulteration and Food Safety: HACCP System to food protection, Responsibility for food safety. Food Additives - Definition, Types and Functional characteristics. Natural Colors -Types, Applications, Advantages of natural colors. Sweeteners - Types and Applications. Food packaging materials, and their properties.

Unit - V

Food Spoilage and Preservation: Causes of Food Spoilage, Spoilage of Fruits, Vegetables, Meat, Soft Drinks, Eggs, Dairy products. Food Preservation through chemicals - Acids, Salts, Sugars, Antibiotics, Ethylene oxide, Antioxidants. Other Methods of Food Preservation -Radiations, Low and High temperature and Drying.

REFERENCES

1. Adam, M.R., & Moss, M.O. (2003). *Food Microbiology*. New Delhi: New Age International Pub.
2. Frazier, W.C., & Westhoff, D.C. (2005). *Food Microbiology* (6th ed.). New Delhi: Tata Mc Graw Hill Pub. Company Ltd.
3. Harrigan, W. F., (1998). *Laboratory methods in Food Microbiology* (3rd ed.). NY: USA, Academic Press.
4. Bell, C., Neaves, P., & Williams, A.P. (2005). *Food Microbiology and Laboratory Practice*. Oxford: Blackwell Science.
5. Jay, J.M., Loessner, J.M., & Golden, A.D. (2005). *Modern Food Microbiology* (7th ed.). USA: Springer Science and Business Media. Inc.

		Semester- I
16BTP105A	**BIOINSTRUMENTATION AND BIOSTATISTICS**	**4H-4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Understand fundamental principles of bioinstrumentation commonly used in biomedical engineering research labs and hospitals
- Comprehend the colorimetric principles
- Recognize the concepts on centrifugation and chromatography
- Obtain key knowledge on electrophoresis
- Understand key concepts on biostatistics and its various parameters
- Attain strong knowledge on the applications of biostatistics and its relevant softwares

Course Outcomes

On successful completion of the course, students will be able to

1. Demonstrate an understanding the bioinstrumentation principles with respect to device design and applications
2. Identify, explain and judge safety issues related to biomedical instrumentation
3. Apply the principles in the context of bioinstrumentation interactions with tissues, organs and human body to explain the measurement results and to develop the instrumentations
4. Define the principal concepts about biostatistics
5. Recognize the definition of statistics, its subject and its relation with the other sciences.
6. Collect data relating to variable/variables which will be examined and calculate descriptive statistics from these data

UNIT - I

Colorimetry: Color and absorption spectra, Beer's and Lambert's law. Principle of photoelectric colorimeter, Spectroscopy – Properties of electromagnetic radiations, Instrumentation and applications of – UV Visible light spectroscopy, Spectrofluorimeter, atomic spectroscopy, NMR spectroscopy and MALDI –TOF, Mass spectroscopy GC – MS, IR and FTIR.

UNIT - II

Centrifugation: Principle, types of centrifuges, Principles and applications of analytical- and preparative centrifuge, density gradient and ultra-centrifuge. **Chromatography:** Principles, Type – Paper, thin layer, ion-exchange, affinity, gel filtration, HPLC and HPTLC

UNIT - III

Electrophoresis: Principle, instrumentation and applications of agarose gel electrophoresis, sodium dodecyl sulphate – polyacrylamide gel (SDS-PAGE), native PAGE, isoelectric focusing, immuno, pulse field, gel, capillary, 2D electrophoresis, gel documentation.

UNIT- IV

Biostatistics: Data collection, classification and presentation of tabulation. Measures of central tendency – mean, median and mode. Measures of dispersion – mean deviation, standard deviation, standard error and analysis of variance.

UNIT- V

Applications of biostatistics: Probability and probability distribution – theorems, binomial, poisson and normal distribution. Correlation and regression – simple correlation, correlation co-efficient, simple and linear regression analysis. Test of significance -F, t, DMRT and chi-square test. Statistical and graphical software.

REFERENCES

1. Glover., & Mitchell, H. (2002). *An Introduction to Biostatistics*. Boston: Mc Graw- Hill Co. Inc.
2. Friedfelder, D. (2001). *Physical Biochemistry* (5th ed.). New York: Oxford Publishers.
3. Sharma, B.K. (2004). *Instrumental Methods of Chemical Analysis* (24th ed.). Meerut: Goel Publishing House.
4. Chatwal, G.R., & Anand, S.K. (2003). *Instrumental Methods of Chemical Analysis* (5th ed.). Mumbai: Himalaya Publishing House.
5. Boyer, R. (2000). *Modern Experimental Biochemistry* (3rd ed.). New Delhi: Addision Wesley Longman.
6. Sawhney, S.K., & Singh, R. (2000). *Introductory practical Biochemistry*. New Delhi: Narosa Publishing House.
7. Wilson, K., & Walker. (2006). *Principles and Techniques of Biochemistry and Molecular Biology*. India: Cambridge University Press.
8. Sawhney, S.K., & Singh, R. (Eds.). (2005). *Introductory Practical Biochemistry*. Alpha Science International Ltd.

Semester- I

16BTP105B **NANO BIOTECHNOLOGY** **4H-4C**

Total hours/week: **L: 4 T: 0 P: 0** **Marks:** Internal: **40** External: **60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Obtain fundamental concepts of nanobiotechnology
- Offer a strong knowledge in the interface between chemistry, physics and biology on the nanostructural level with a focus on biotechnological usage
- Provide advanced training in the area of nanobiotechnology
- Understand the interaction of nanomaterials with biological molecules and cells
- Learn nanomaterials and their use with biocomponents to synthesize and address larger systems
- Produce highly skilled individuals suited for the fast-changing requirements of today's advanced workforce

Course Outcomes:

On successful completion of the course, students will be able to

1. Recognize the role of bionanotechnology as an interdisciplinary tool and to understand how to use these new tools in to solve problems in biological systems.
2. Demonstrate knowledge and understanding of biomolecules and biomolecular interactions, and the relationship between molecular dynamics, nanoscale physics and macroscopic system behaviour
3. Explain biophysical mechanisms in the context of nanobiotechnology application areas.
4. Analyze and discuss the engineering requirements of multidisciplinary technology based on biology.
5. Explain the challenges of commercializing new technologies.
6. Demonstrate technical and cognitive skills associated with nanobiotechnology.

UNIT – I

Nanotechnology: Definition, The fundamental Science behind nanotechnology- electrons, atoms and ions, molecules, metals, Biosystems. Nanoanalysis

UNIT - II

Microfluidics and Lab-on-a-chip: Materials of Microfluidic Components. Silicon, Glass, polymers, fluid structure, fabrication methods. Surface modifications, Spotting, Detection mechanics.

UNIT - III

Natural Nano-scale sensors. Biosensors. Biomedical applications: drugs, drug delivery, molecular motors. Neuro electronic interfaces, Nanoluminescent tags, imaging and mapping. Defined networks of Neuronal cells *in vitro,* physiology of information processing within Neuronal Networks, Topographical patterning, Photolithographic patterning, Photochemical patterning.

UNIT – IV

Microcontact printing of proteins: Strategies for printing proteins on surfaces, Contact processing with hydrogel stramps, Affinity contact printing, Micro contact printing polypeptides and proteins, Printing one type of biomolecules, substrates, resolution and contrast of patterns, Activity of printed molecules, Printing multiple types of proteins, Molds and stamps, Surface chemistry, Characterization of printed patterns.

UNIT – V

Applications of Nanotechnology: Nanoparticles in bio- degradation, nano-material-based adsorbents for water treatment, possible mutagenic properties of nanoparticles, nanoparticle bioaccumulation. Nanoparticles in biomedical and clinical applications

REFERENCE

1. Niemeyer, C.M. & Mirkin, C. A. (2004). *Nanobiotechnology Concepts, Application and Properties*. New York: Wiley – VCH Publishers.
2. Rao, C.N.R. (2006). *The Chemistry of Nanomaterial: Synthesis, Properties and Applications* (Vols 1 &3). Springer.
3. Muralidharan, V.S., & Subramanian, A.(2009). *Nanoscience and technology*. New Delhi: CRC Press.
4. Ratner, M., & Ratner, D. (2005). *Nanotechnology- a Gentle Introduction to the Next Big idea*. London: Pearson Education, Inc.
5. Dinh, T.V. (2007). *Nanotechnology in Biology and Medicine: Methods, Devices and Applications*. New Delhi: CRC Press.

Semester- I

16BTP105C **BIO-ENERGY TECHNOLOGY** **4H - 4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Provide an overview of the basic process of bioenergy
- Understand different strategies to convert biomass to biofuels
- Obtain knowledge on the available technologies and how these could meet the growing demand for energy in the future
- Understand biomass biodegradability and bioconversion rate in relation to energy yields
- Describe biochemical processes of biomass conversion to bioenergy production with focus on fermentation and anaerobic digestion
- Understand technological potentials of biogas, bioethanol, biofuel and biohydrogen

Course Outcomes

On successful completion of the course, students will be able to

1. Demonstrate bioenergy production processes adequate to diverse biomass characteristics
2. Discuss state-of-the-art technologies of generating biofuels from sustainable bioresources
3. Discuss and propose feasible biofuel technologies and biofuel products from selected biomasses
4. To illustrate a bio-energy thermo-chemical conversion process
5. Design biogas reactor capacity and propose optimal and economically viable technical operational condition
6. Demonstrate sequential bioethanol and biogas production and compare bioethanol and biogas scenarios with respect to energy recovery

UNIT – I

Biofuel: Introduction, features, undesirable features, Energy crops – wood, sugar and starch crops, hydrocarbon producing crops. Modes of utilization of biomass.

UNIT - II

Biogas: Substrate, digester, microorganisms, process of biogas production, factors affecting biogas yield, precautions, advantages and disadvantages.

UNIT – III

Bioethanol: Introduction, bioethanol vs. petrol, production of bioethanol – yeast, sugar and starch crops, ethanol recovery.

UNIT – IV

Biodiesel: Introduction, lipids as a source of biodiesel – algae, sunflower, rapeseed, linseed, soybean, jatropha, peanut, biodiesel from hydrocarbons. Biobutanol – *Clostridium,* molasses.

UNIT – V

Biohydrogen: Hydrogen as fuel – production - methods - electrolysis of water, gasification, biological agents. Biohydrogen production – anaerobic fermentation, photolyses and photosynthetic methods.

REFERENCES

1. Mazumdar, B.(2003).*A Textbook of Energy Technology*.New York, NY: McGraw-Hill, Inc.
2. Shepard, & Marion L.(2000). *Introduction to Energy Technology*. NewYork, NY:McGraw-Hill, Inc.
3. Grant, W.D., & Long,P.E. (2001). *Environmental Microbiology*. Glasgow: Blakie publications.
4. Reddy, G. M., Reddy,M.N., Saigopal,D.V.R., &Mallaiah, K.V. (2007). *Laboratory Experiments in Microbiology* (2nd ed.).Mumbai:Himalaya Publishing House.

Semester – I

16BTP111 **4H - 2C**

BIOCHEMISTRY, CELL BIOLOGY AND MOLECULAR GENETICS –PRACTICAL I

Total hours/week: L: 0 T: 0 P: 4 **Marks:** Internal**: 40** External**: 60** Total**: 100**

Course Objectives

The objectives of the course are to make the students to

- Give knowledge on Biochemistry, Cell Biology and Molecular Genetics and its application.
- Offer knowledge to execute the experiments flawlessly
- Understand quantification of sugars, aminoacids and lipids
- Understand various cell types and its components
- Understand how to perform fractionation of cellular components
- Get practiced with the tools and techniques for analyzing conjugation and transduction

Course Outcomes

On successful completion of the course, students will be able to

1. Describe the quantification of sugars, aminoacids and lipids
2. Interpret the outcome of experiments that involve the use of cell biology and molecular genetics techniques
3. Discuss the various macromolecular components of cells and their functions
4. Describe cell permeability in plants and animal cells
5. Explain the basic steps involved in Drosophila giant chromosome preparation and nuclear staining
6. Perform conjugation and transduction experiments

List of Practicals

Biochemistry

1. Quantification of proteins – Lowry *et al/* Bradford method
2. Quantification of sugars – Anthrone method
3. Total free amino acids
4. Quantification of lipids
5. Quantification of Ascorbic acid
6. Membrane-based séparation (e.g. Microfiltration/ Ultrafiltration)
7. Thin Layer Chromatography (Amino acids / fatty acids/ sugar/ nucleic acids)
8. Effect of pH, temperature, substrate concentration (any one enzyme - Catalase / SOD by OD method)

Cell Biology

1. Identification of cell types- Microbe/plant /Human
2. Fractionation of cellular component – Nuclear Components, Mitochondria, Chloroplast.
3. Sucrose Fractionation of Castor Bean
4. Lipid Solubility of Membranes
5. Cell permeability – RBC/plant cells.

Molecular Genetics

1. Drosophila Giant Chromosome preparation.
2. Nuclear staining (Giemsa / acridine orange /feulgen)
3. Metaphase preparation and karyotyping (Human leucocytes/ onion root tip)
4. Conjugation
5. Transduction

REFERENCES

1. Boyer, Rodney. (2010). *Biochemistry Laboratory: Modern Theory and Techniques.* New Jersey: Pearson Education, Inc.
2. Palanivelu, P. (2001). *Analytical Biochemistry and Separation Techniques.* Madurai: Kalaimani Printers.
3. Sadasivam. S., & Manickam, A. (2002). *Biochemical Methods.* New Delhi: New Age International Private Limited Publishers.
4. Keith Wilson, & John Walker (Eds.). (2010). *Principles and Techniques of Biochemistry and Molecular Biology.* New York, NY: Cambridge University Press.

Semester- I

16BTP112 **4H-2C**

MICROBIOLOGY AND FOOD BIOTECHNOLOGY - PRACTICAL II

Total hours/week: **L:0 T:0 P:4** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Give knowledge Microbiology and Food Biotechnology techniques
- Offer knowledge to execute the experiments flawlessly
- Understand pure culture technique and microbiological staining techniques
- Gain practical knowledge on Isolation and identification of microbes from food samples
- Attain hands on experience on the production of industrially important enzymes
- Learn how to run fermentor

Course Outcomes

On successful completion of the course, students will be able to

1. Know microbial techniques for isolation of pure cultures of microbes from different food, agricultural and environmental sources
2. Have hands on experience in microbial staining techniques
3. Illustrate motility analyses for bacteria
4. Perform Isolation and identification of microbes from food samples
5. Carry out the production of Industrially important enzymes such as protease and amylase
6. Have practical knowledge on fermentor operation

Microbiology

1. Pure culture technique –pour spread, loop out technique and streaking, preservation
2. Staining technique – Simple, grams, negative, endospore and fungal
3. Motility –Flagellar staining, hanging drop and soft agar analysis
4. Isolation of Mutants - physical and chemical
5. Growth curve
6. Biomass estimation

Food Biotechnology

- Isolation and identification of microbes from food samples
- Wine production
- Citric acid production
- Production of Industrially important enzymes – protease, amylase
- Immobilization of enzymes
- Working of fermenters

REFERENCES

1. Cappuccino, P., & Sherman. (2004). *Microbiology-A Lab Manual*. Singapore: Pearson Education.
2. Dubey, R., & Maheshwari, E. (2004). *Practical Microbiology*. New Delhi: S. Chand & Co.
3. Goldman, E., & Green, L.H. (2008). *Practical Handbook of Microbiology*. (2nd ed.). London: CRC press.
4. Kannan, P. (2002). *Laboratory Manual in General Microbiology*. Tamilnadu: Palani Paramount Publishers.

JOURNAL PAPER ANALYSIS AND PRESENTATION 2H-0C

Semester- II

16BTP201 RECOMBINANT DNA TECHNOLOGY 4H-4C

Total hours/week: **L: 4 T: 0 P: 0** **Marks:** Internal: **40** External: **60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Be familiarize with emerging field of biotechnology: Recombinant DNA Technology
- Understand the basic concepts of recombinant DNA Technology and genetic engineering
- Acquaint versatile tools and techniques employed in recombinant DNA technology
- Obtain the principles of versatile DNA modifying enzymes, cloning strategies and vector types for selection and screening of recombinant clones
- Understand the concepts of nucleic acid labeling techniques
- Illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences and to use recombinant DNA technology in biotechnological research

Course Outcomes

On successful completion of the course, students will be able to

1. Outline the fundamental steps in recombinant DNA technology
2. Demonstrate the mechanism of action and the use of restriction enzymes in biotechnology research and recombinant protein production
3. Explain the value of plasmid preparations and how the concentration and purity of plasmid samples can be determined
4. Confer cloning strategies and techniques used in DNA probing for specific genes of interest.
5. Conceptualize PCR technique in clinical research
6. Recapitulate various applications of recombinant DNA technology in human health care and safety regulations

UNIT - I

Tools in Genetic Engineering: Nucleic acid manipulating enzymes- restriction-nucleases, ligases, polymerases, modification enzymes - kinases, phosphatases, adapters and linkers. Polynucleotide tailing.

UNIT -II

Cloning Vectors: Plasmid - conjugative and non-conjugative plasmid, Types of Plasmid- Natural plasmids, Artificial plasmid- pBR322 and PUC series. Phage vectors. Plant Vector – Ti plasmid. Animal viral vectors - Retroviral viral vectors, Shuttle vectors, cosmid, phagemid, phasmid. Artificial chromosomes –BACs, YACs.

UNIT-III

Gene transfer methods: Physical, chemical and biological methods of gene transfer- prokaryotes - eukaryotes. Screening and analysis of recombinants, DNA and RNA probes – construction. Analysis of cloned foreign genes. Hybridization techniques – Southern Blotting, Northern Blotting and Western Blotting.

UNIT -IV

Analytical Techniques: PCR, RAPD, RFLP, AFLP, SSCP, protein engineering- site directed mutagenesis, PCR mediated. Alteration of restriction sites, Molecular diagnosis and therapy of cancer, DNA based detection of microbial infection/ contamination, sequence analysis, SNP, NGS, gene editing tool CRISPR.

UNIT -V

Application: Antisense technology, RNAi technology, terminator gene technology, gene therapy- *in vivo* and *ex vivo*. Gene delivery systems - viral and non-viral; DNA marker technology in plants, DNA fingerprinting, genetically engineered biotherapeutics and vaccines.

REFERENCES

1. Glick, B.R., & Pasternack, J.J. (2009). *Molecular Biotechnology*. New Delhi: Panima Publication.
2. Primrose, S.B., Twyman, R. M., & Old, R. W. (2006). *Principles of Gene Manipulation* (7th ed.). Germany: Blackwell Science Publishing Company.
3. Brown, T.A., (2006). *Gene Cloning and DNA Analysis* (5th ed.). Oxford: UK, Blackwell Publishing.
4. Brown, T.A., (2006). *Gene cloning - An introduction* (3rd ed.). New York, NY: Stanley thrones Publishers Ltd.
5. Winnacker, E.L., (2003). *From Genes to Clones*. New Delhi: Panima Educational Book Agency.
6. Watson, J.D., Gilman, M., & Witkowski, J. (2000). *Recombinant DNA*. (2nd ed.). New York: Freeman Publication.

Semester -II

16BTP202 FERMENTATION TECHNOLOGY 4H-4C

Total hours/week: **L: 4 T: 0 P: 0** **Marks:** Internal: **40** External: **60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Be familiarize with knowledge about biological and biochemical technology, with a focus on biological products, the design and operation of industrial practices
- Describe power requirements in bioreactors, modeling of bioprocesses, and traditional and new concepts in bioprocess monitoring, and the biological basis for industrial fermentations
- Understand biological and engineering principles for cultivating microorganisms in fermentors
- Obtain knowledge on assessing biological and engineering principles for cultivating microorganisms in fermentors
- Understand the importance of monitoring foam control, nutrient dosing, sterile sampling and filter sterilization
- Attain key concepts in calibration and maintenance of process critical for fermentation such as aeration, agitation and pH

Course Outcomes

On successful completion of the course, students will be able to

1. Evaluate factors that contribute in enhancement of cell and product formation during fermentation process
2. Analyze kinetics of cell and product formation in batch, continuous and fed-batch cultures
3. Differentiate the rheological changes during fermentation process
4. Develop protocol for scale-up and harvesting from shake flask to bench top fermentor
5. Analyze the bioprocess paradigms including scale-down, bioprocess simulation and economics in biological manufacturing
6. Examine considerations in bioprocess simulation and economics, sterilization in biological manufacturing, and clinical implications of bioprocesses

UNIT -I

Introduction: Isolation and screening of industrially important strains- primary and secondary screening. Strain improvement, mutation, selection of mutants, recombination – bacteria, fungi and actinomycetes, assay and fermented products. Fermentations- submerged, solid state.

UNIT - II

Media: Media formulation – sterilization – batch and continuous sterilization, sterilization of air, fibrous filters. Microbial kinetics: batch, fed-batch and continuous cultures, phases of batch growth. kinetics of cell growth, product formation, substrate utilization, product inhibition kinetics, yield concept and productivity.

UNIT - III

Design of fermenter: types – CSTR, Tower, jet loop, air lift fermenter, bubble column, packed bed. Fundamentals of process control and monitoring – on line and off line analysis, feed back control, PID controller, computer aided control.

UNIT - IV

Kinetics: Transport phenomena – Rheological properties, determination of O_2 mass transfer, heat transfer, role of aeration and agitation, factors affecting O_2 transfer. Production of chemicals – alcohol, antibiotics – Penicillin and Streptomycin, Single cell proteins.

UNIT -V

Downstream processing: Cell distribution methods for intracellular products; foam separation, precipitation. Filtration – micro and ultra-filtration; Solvent extraction-, chromatographic separation- FPLC, HPLC, dialysis, centrifugation, distillation, drying, crystallization, turbidity analysis and cell yield determination. Fermentation products- available in market.

REFERENCES

1. Stanbury PF, Whitaker A and Hall SJ. (2006). *Principles of Fermentation Technology* (2nd ed.). Elsevier Science Ltd.
2. James Bailey,E., & David Follis. (1999). *Biochemical Engineering Fundamentals* (2nd ed.). Boston: Mc Graw Hill Book Company.
3. Wulf Crueger, & Anneliese Crueger. (2004). *Textbook of Industrial Biotechnology* (2nd ed.). New Delhi: Panima Publishing Corporation.
4. Pauline Doran,M., (1995).*Bioprocess Engineering*. New York: Academic press.
5. Rajiv Dutta, (2008). *Fundamentals of Biochemical Engineering*. India: Ane Books.
6. Shuler, M.L., &Kargi, F. (2008). *Bioprocess Engineering Basic concepts* (2nded.) NJ: Prentice Hall International Series in the Physical and Chemical Engineering Sciences.

16BTP203 **ENVIRONMENTAL BIOTECHNOLOGY** **4H-4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Understand the various components of the environmental biotechnology including ecosystems, biodiversity, threats and policy
- Obtain knowledge on the sources for environmental pollution and its remedial measures
- Understand toxic chemicals and their impact on environment and human health
- Attain key concepts on the role of microbes in remediation of environmental pollutants
- Learn various technologies, tools and techniques in the field of environmental biotechnology
- Understand the importance of biological techniques in controlling air pollution

Course Outcomes

On successful completion of the course, students will be able to

1. Demonstrate various types of ecosystems, biodiversity components, environmental threats and Policy
2. Discuss the impact of environmental pollution and its remediation measures
3. Recognize various global and regional environmental concerns due to natural causes and/or human activities
4. Illustrate the role of Toxic chemicals in the environment and their associated health issues in humans
5. Investigate some examples of different types of environmental pollution and their impacts
6. Appreciate the scientific, ethical and/or social issues associated with certain applications of biotechnology for alleviating the environmental concerns

Unit - I

Limiting factors, energy transfer and biogeochemical cycling in ecological systems; Response of microbes, plant and animals to environmental stresses; Concept of ecosystems and ecosystem management, Environmental problems- ozone depletion, greenhouse effect, water, air and soil pollution, land degradation.

Unit - II

GEMs in environment; Role of environmental biotechnology in management of environmental problems, Bioremediation, advantages and disadvantages; In situ and ex-situ bioremediation; slurry bioremediation; Bioremediation of contaminated ground water and phytoremediation of soil metals; microbiology of degradation of xenobiotics.

Unit - III

Sewage and waste water treatment and solid waste management, chemical measure of water pollution, conventional biological treatment, role of microphyte and macrophytes in water treatment; Recent approaches to biological waste water treatment, composting process and techniques, use of composted materials.

Unit – IV

Biological decomposition of organic carbon, Nitrogen and Phosphate removal. Biological removal, biotransformation, and biosorption of metal ions. Aerobic- and Anaerobic degradation of Xenobiotics.

Bioaugmentation for degradation of Xenobiotics. Industrial sources of waste water. Treatment strategies.

Unit - V

Biofuels and biological control of air pollution, plant derived fuels, biogas, landfill gas, bioethanol, biohydrogen; use of biological techniques in controlling air pollution; Removal of chlorinated hydrocarbons from air.

REFERENCES

1. Evans, G.M., & Furlong., (2003). *Environmental Biotechnology: Theory and Applications*. England: John Wiley & Sons Ltd.
2. Jördening, H.J., & Winter, J. (2005). *Environmental Biotechnology.* Germany: Wiley-VCH Verlag GmbH & Co. KGaA.
3. Agarwal, S.K. (2002). *Environmental Biotechnology*. New Delhi: APH Publishing Corporation.
4. Mara, D. (2003). *The Handbook of Water and Wastewater Microbiology.* London: Academic Press.

16BTP204 **IMMUNOTECHNOLOGY** **4H-4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Understand about our immune system and the immune response of cells and organs
- Obtain key concepts on gene-re-arrangement of immunoglobulin and T-cell receptor genes, and antigen processing and presentation
- Comprehend the principles of immunological techniques like hybridoma technology and catalytic antibodies synthesis
- Understand strong fundamental knowledge in tumor immunology
- Attain the principles involved in vaccine technology including recombinant vaccines
- Recognize the basic concepts in bone marrow and other organs transplantation

Course Outcomes

On successful completion of the course, students will be able to

1. Demonstrate various immunological process including innate and adaptive immunity, cells and organs of immune system, antigen and antibody interaction, immunogenicity and antigenicity, epitopes and antibody structure
2. Describe the organization of Ig genes, class switching in constant regions of genes and expression and regulation of Ig genes
3. Recognize how antigens are processed, presented and immune activation occurs via B- and T- cells activation
4. Appreciate the underlying mechanisms of auto-immune diseases and allergic reactions
5. Illustrate the role of immune system in tumor formation
6. Apply the knowledge of this course in research and pharmacological industries

UNIT -I

Introduction: History and scope, Immunity – types, Antigen and Antibody - biology, structure and functions, super antigens, antigen- antibody interactions, primary and secondary immune response. Humoral and cell mediated immunity**.**

UNIT -II

Immune system: Hematopoiesis and differentiation, Lymphocytes, Lymphoid organs**:** Primary and secondary lymphoid organs. Antigen recognition and presentation, activation of B and T lymphocytes, cytokines and their role in immune regulation. **Complement system** - Classical and alternate pathway.

UNIT-III

Transplantation: MLR, MHC and HLA typing, bone marrow transplantation, organ transplants, immunosuppressive therapy. Hybridoma technology and monoclonal antibodies, immuno-diagnosis and application of monoclonal antibodies in biomedical research, human monoclonal antibodies and catalytic antibodies, Xeno transplantation from various species.

UNIT -IV

Hyper-sensitivity reactions, auto-immune disorders. Tumor immunology: Tumor antigens, immune response to tumours, cancer immunotherapy. Immunodeficiencies – primary and secondary.

UNIT -V

Vaccines: Vaccine technology including DNA vaccines, identification of B and T epitopes for vaccine development. Immunodiagnosis of infectious diseases, immuno screening of recombinant library.

REFERENCES

1. Goldsby, R.A., Kindt, T. J., Osborne,B. A., &Kuby, W.H.J. (2004). *Immunology* (5th ed.).USA: Freeman and Company.
2. Tizard, I.R. (2004). *Immunology* (5th ed.). New York: Saunders College Publishing.
3. Abbas,A.K., Lichtman,A. H., &Pillai,S. (2007). *Cellular and Molecular Immunology: With student consult*. Australia: Online Access. Elsevier Science.
4. Abbas,A.K., Lichtman,A. H., &Baker, D.L. (2008). *Basic Immunology: Functions and Disorders of the Immune System*.Australia: Elsevier Health Sciences.
5. Roitt, I., Brstoff,J., &Male, D. (2002). *Immunology* (3rd ed.).London: Mosby Yearbook Europe Ltd,.
6. Goldsby, R. A., Kind,T.J., &. Osborne, B.A.(2004). *Immunology* (5th ed.). New York: Freeman and Company.
7. Turgeon, M. L. (2008). *Immunology and Serology in Laboratory Medicine*. Australia: Elsevier Health Sciences.
8. Surendranath, A., & Narain, R. (2004). *Immunobiotechnology*. New York: Dominant Publishers and Distributors.

Semester - II

16BTP205 A **PHARMACEUTICAL BIOTECHNOLOGY** **4H-4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives:
The objectives of the course are to make the students to

- Obtain basic skills necessary for employing biotechnology principles in together with various pharmaceutical parameters
- Understand novel formulation approaches for better delivery of biotechnology derived drugs, such as reverse micelles, liposomes, microemulsions and microencapsulation
- Attain knowledge on the delivery of peptides and proteins by the parenteral, oral, transdermal and nasal routes of administration
- Recognize novel biotechnology products and their use in therapeutics and diagnostics
- Comprehend the physical and chemical properties of the solution/colloidal/dispersion that influence physical stability of the bioactive macromolecule with emphasis on aggregation behavior, its identification and its impact on bioactivity
- Learn about special storage, handling, reconstitution and administration conditions and techniques for drug delivery systems containing bioactive macromolecules

Course Outcomes:
On successful completion of the course, students will be able to

1. Evaluate different pharmaceutical parameters of current biotechnology products
2. Determine parameters related to stability and formulation of biotechnology products
3. Discuss quality control procedures related to biotechnology products
4. Demonstrate novel formulation methods for better delivery of biotechnology derived drugs
5. Evaluate different techniques related to separation and purification of cell types; conduct techniques for measuring cell turnover and growth, conduct cytotoxicity assays
6. Join pharmaceutical biotechnology lab and industries as a research assistant

UNIT -I
Introduction: Classification of Pharmaceuticals - Solutions, suspensions, tablets, capsules. Drugs and its sources, Routes of Drug Administration, Absorption and Bioavailability, Distribution, Drug metabolism, Drug theories, Drug Receptor interactions, Pro-drug concept.

UNIT -II
Biotechnology and health: Drug design; drug development; random screen up, target identification and validation, drug discovery, drug delivery. Drug abuse, self-poisoning. pharmacogenomics, biochip.

UNIT -III
Biotechnology and Pharmacy: Genetically engineered protein and peptide agents, novel drug delivery systems – non convectional routes of administration, Anti-AIDS drug development, oncogenes as targets for drugs, Multi-drug resistance, vaccine development and role of genetic engineering in controlling infectious diseases, gene therapy, and stem cell therapy.

UNIT -IV

Enzyme Technology: Sources of enzymes, extraction and purification: Applications pharmaceutical, therapeutic and clinical. Production of amyloglucosidase, glucose isomerase, amylase and trypsin, Techniques of immobilization of enzymes and their applications in the industry. Reactors for immobilized systems and perspective of enzyme engineering.

UNIT -V

Novel Drug Delivery Systems: Introduction to the drug carrier, liposome as a drug carrier, biodegradable polymers as a drug-carrier. Modified Drug Release: The sustained release, first order release approximation, multiple dosing.

REFERENCES

1. Jay Rho,P., Stan Louie,G.,(2003). *Hand book of Pharmaceutical Biotechnology*. New York: Pharmaceutical products press.
2. http://munatih-alsahab.blogspot.com/2009/03/fundamentals-of-medicinalchemistry.html. (E-book)
3. Ajay Banga, K. (2004).*Therapeutic Peptides and Proteins: Formulation, Processing, and Delivery Systems.* (2nd ed.).USA: Mercer University.
4. Satoskar, R. S., Bhandhakan, S. D., & Alinaoure, S.S. (2000). *Pharmacology and Pharmacotherapeutics* (17th ed.). Mumbai: Popular Prakashan Publishers.
5. Bhagvan, N.V.(2002). *Medical Biochemistry*. New York: Academic Press.
6. Harvey, R. E., Lipin, & Walters, W. C. (2002). *Pharmacology* (4th ed.). New York: Kluwer Company.
7. Daan, J. A., Crommelin, & Sindelar, R. D. (2002). *Pharmaceutical Biotechnology* (3 rd ed.). New York: Routledge Taylor and Francis Inc.
8. Sethi, P.D. (2005). *Quantitative Analysis of Drugs in Pharmaceutical Formulations* (3 rd ed.). New Delhi: CBS Publishers and Distributers.
9. Manfred Wolff, E. (2000). *Burger's Medicinal Chemistry and Drug Discovery* (5th ed.). USA: Wiley and Sons.
10. Daan Crommelin & Robert Sindelar, D. (2002). *Pharmaceutical Biotechnology*. New York: Taylor and Francis Publications.

16BTP205B **BIOSAFETY AND IPR** **4H-4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Introduce basic concepts of safety that is essential for different disciplines of science and procedures involved and protection of intellectual property and related rights
- Discuss about various aspects of biosafety regulations and IPR concerns arising from the commercialization of biotech products
- Understand balanced integration of scientific and social knowledge in sustainable development
- Attain the benefits of GM technology and related issues
- Identify and discuss the issues and concepts salient to the research process
- Recognize and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project

Course Outcomes

On successful completion of the course, students will be able to

1. Interpret basics of biosafety and its impact on all the biological sciences and the quality of human life
2. Recognize importance of biosafety practices and guidelines in research
3. Apply intellectual property law principles including copyright, patents, designs and trademarks to real problems and analyze the social impact of intellectual property law and policy
4. Comprehend the importance of protection of new knowledge and innovations and its role in business
5. Gain more insights into the regulatory affairs
6. Demonstrate knowledge of research processes such as reading, evaluating, and developing, and to identify, explain, compare, and prepare the key elements of a research proposal and report

UNIT -I

Biosafety: Introduction; Historical Background; Biological Safety Cabinets; Primary Containment for Biohazards; Biosafety Levels; Biosafety Levels of Specific Microorganisms; Recommended Biosafety Levels for Infectious Agents. Cartagena protocol on biosafety

UNIT –II

Biological risk assessment: Biosafety guidelines for Genetically Modified Microorganisms (GMM) and Plants (GMP)-Risk assessment and contained use of GMM and GMPs-guidelines for research activities-import and shipment quality control of biologicals produced by rDNA technology. Guidelines for environmental release of GMM, GMP and GLP.

UNIT –III

Intellectual Property Rights: Types of IP: Patents, Trademarks, Copyright and Related Rights. **Agreements and Treaties:** History of GATT and TRIPS Agreement; Madrid Agreement; Hague Agreement; WIPO Treaties; Budapest Treaty; PCT; Indian Patent Act 1970 and recent amendments

UNIT – IV

Research methodology: Scope and significance – Types of Research – Research Process – Characteristics of good research – Problems in Research – Identifying research problems. Research Designs – Features of good designs, Report writing – Introduction, review of Literature, Result interpretation, bibliography.

UNIT – V

Sampling Design: Meaning – Concepts – Steps in sampling – Criteria for good sample design. Scaling measurements – Techniques – Types of scale.

REFERENCES

1. Martin. M.W., & Schinzinger, R. (2003). *Ehics in engineering* (3rd ed.). NewDelhi: Tata McGraw-Hill,.
2. BAREACT, (2007). *Indian Patent Act 1970*. Acts and Rules, Universal Law Publishing Co. Pvt. Ltd.
3. Kankanala, C. (2007). *Genetic Patent Law and Strategy* (1st ed.).India: Manupatra Information Solution Pvt. Ltd.
4. *Biosafety issues related to transgenic crops.*DBT guidelines, New Delhi: Biotech Consortium Ltd,
5. http://www.actahort.org/members/showpdf?booknrarnr=447_125
6. http://www.biomedcentral.com/content/pdf/1472-6939-2-2.pdf
7. http://www.wipo.int/portal/index.html.en
8. http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html

16BTP205C **TISSUE ENGINEERING** **4H-4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Understand tissue growth and development as well as the tools and theoretical information necessary to design tissues and organs
- Recognize the need of controlling all factors related to biomaterials architecture such as cell biology, biochemistry pathways, and surface characterization and modification
- Comprehend various physical and chemical stimuli that control the structure of biomaterials
- Get knowledge in which cell types are available to be used in tissue engineering applications
- Understand the relevance of the extracellular matrix and its interaction with materials
- Obtain knowledge on bioreactors used in tissue engineering

Course Outcomes

On successful completion of the course, students will be able to

1. Describe and use the fundamental tools and techniques used in tissue engineering
2. Compare and contrast various strategies for repairing tissues
3. Show mastery of fundamental topics in tissue engineering including stem cells, plasticity, trans differentiation, and cloning
4. Describe and the developments of biomaterials for regenerative therapies and tissue engineering
5. Discuss and give an example of how biomaterials are used to fabricate devices for clinical use
6. Illustrate the basic concepts of cell culture and critical components of bioreactor/tissue design

Unit I

Tissue engineering –Introduction to tissue engineering; Basic definition; Cell sources and stem cells; Cell isolation and selection; Tissue preservation; Tissue types; Structure and organization of tissues; Epithelial, connective; vascularity and angiogenesis; Extracellular matrices; Cell-matrix interactions; development and use in therapeutic and *in-vitro* testing.

Unit II

Cell culture types and morphology: cell biology, Isolation, cell growth, Different cell types, progenitor cells and differentiations, different kind of matrix, cell-cell interaction. sterile techniques, plastics, enzymes, reactors and cryopreservation and migration; cell expansion, cell transfer, cell storage and cell characterization, Bioreactors.

Unit III

Cell analysis: Different cell types, staining, hormones, growth factors (receptor- ligand binding) and chemokines in signaling (eg. G-proteins). Growth factor- delivery and applications (angiogenesis) in tissue engineering. Cell junctions in tissues, Growth factor delivery in tissue engineering and cell surface markers.

Unit IV

Scaffold and transplant: Engineering biomaterials, Degradable materials (collagen, silk and polylactic acid), porosity, mechanical strength, 3-D architecture and cell incorporation. Engineering tissues for replacing bone, cartilage, tendons, ligaments, skin and liver.

Unit V

Bioreactors in Tissue engineering: Importance of tissue engineering, applications in pharmaceuticals industry. Case study and regulatory issues: Case study of multiple approaches: cell transplantation for liver, musculoskeletal, cardiovascular, neural, visceral tissue engineering. Ethical, FDA and regulatory issues of tissue engineering.

REFERENCES

1. Palsson, B.O., & Sangeeta Bhatia, N. 2003. *Tissue Engineering*. Prentice Hall.
2. Lanza, R., Langer,R.& Vacanti,J. (2007). *Principles of Tissue Engineering* (3rd ed.), Academic Press.
3. Ravi, B. (2014). *Introduction to Tissue Engineering: Applications & challenges*. Wiley Publishing.
4. Lanza, R., Langer, R., &William, L. *Principles of tissue engineering*. Academic press.
5. Fisher, J.P., Mikos, A.G.,Bronzino,J.D.,& Peterson,D.R.(2012). *Tissue Engineering: Principles and practices.* CRC Press.
6. Wong, J.Y., Bronzino, J.D.,& Peterson, D.R.(2012). *Biomaterials: Principles and practices.* CRC Press.
7. http://web.mit.edu/langerlab/
8. http://faculty.virginia.edu/laurencin/index.htm

16BTP211 **4H-2C**

RECOMBINANT DNA TECHNOLOGY, IMMUNOLOGY -PRACTICAL III

Total hours/week: **L: 0 T: 0 P: 4** **Marks:** Internal: **40** External: **60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Be familiarize with practical knowledge in the emerging field of biotechnology: Recombinant DNA technology
- Perform basic molecular biology techniques including DNA and RNA isolation from microbes, plants and animals
- Acquaint versatile tools and techniques employed in recombinant DNA technology such as restriction and digestion, ligation, transformation and PCR
- Obtain practical knowledge on basic immunological techniques such as serum/plasma preparation and ABO blood grouping
- Gain hands on experience in immunological tools used in diagnosis, such as Immunoelectrophoresis, ELISA and WIDAL test
- Comprehend the applications of recombinant DNA technology and Immunological techniques in human health care

Course Outcomes

On successful completion of the course, students will be able to

1. Carry out DNA and RNA isolation from microbes, plants and animals
2. Perform recombinant DNA techniques including restriction and digestion, ligation, transformation and PCR
3. Explain the preparation of antigens and antibody in the blood sample
4. Describe the basic knowledge about antigen and antibody interaction using Rocket immune electrophoresis
5. Perform various techniques like Immunoelectrophoresis, and ELISA etc.
6. Join in research and clinical labs as a project/ research assistant

List of Practicals

Recombinant DNA Technology

1. Isolation of total DNA from Microbes (*E. coli*), plant and animal cells
2. Isolation of plasmid DNA
3. Isolation of total RNA from Yeast
4. Quality and quantity checking of Nucleic acids
5. Restriction digestion of DNA
6. Ligation of DNA
7. Transformation of plasmid DNA using calcium chloride
8. Amplification by PCR
9. SDS-Polyacrylamide gel electrophoresis method
10. Southern blotting

11. Northern blotting
12. Western blotting

Immunology

1. ABO blood grouping
2. Preparation of serum from blood
3. Methods of immunization
4. Methods of bleeding
5. Hemolysis
6. Single radial immunodiffusion
7. Double immunodiffusion
8. Immunoelectrophoresis
9. Rocket Immunoelectrophoresis
10. Counter Current Immunoelectrophoresis
11. WIDAL test
12. DOT-ELISA

REFERENCES

1. Glover, D.M., & Hames, B.D. (2000). *DNA Cloning- a Practical Approach.*Oxford:IRL Press.
2. James, J.G., &Rao, V.B. (2001). *Recombinant DNA Principles and Methodologies.*NewYork: Marcel Dekker Publications.
3. Maliga, P.(2000). *Methods in Plant Molecular Biology. A Laboratory Course Manual.*NewYork: Cold Spring Harbour Laboratory Press.
4. Brook, J.S., Fritsch,E.F., &Maniatis, T. (2000). *Molecular Cloning: A Laboratory Manual*. New York: Cold Spring Harbor Laboratory Press.
5. Hay, F.C., &Westwood, M.R. (2004). *Practical Immunology.*London: Blackwell Science Publishers.

Semester – II

16BTP212 **4H-2C**

FERMENTATION TECHNOLOGY AND ENVIRONMENTAL BIOTECHNOLOGY – PRACTICAL IV

Total hours/week: **L: 0 T: 0 P: 4** **Marks:** Internal: **40** External: **60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Be familiarize with practical knowledge in fermentation and environmental biotechnology fields.
- Perform isolation and secondary screening of industrially important microorganisms.
- Acquaint versatile tools and techniques employed in fermentation biotechnology such as enzyme immobilization, wine production and downstream processing.
- Obtain practical knowledge on basic environmental techniques such as water quality test.
- Gain hands on experience in quantifying chemical oxygen demand and biological oxygen demand.
- Comprehend the protocol to analyze heavy metals.

Course Outcomes

On successful completion of the course, students will be able to

1. Carry out isolation and screening of industrially important microorganisms
2. Perform analytical techniques including thermal death point and thermal death time
3. Explain the principles of enzyme immobilization, wine production and downstream processing
4. Describe the basic knowledge about testing the water quality via pH analysis
5. Perform various techniques to quantify total solids, chemical oxygen demand and biological oxygen demand
6. Join as a technician in quality control section in fermentation-based industries and environmental analysis labs

List of Practicals

Fermentation Technology

1. Isolation and secondary screening of industrially important microorganisms
2. Auxotrophic mutants
3. Thermal death point and Thermal death time
4. Production of amylase and protease
5. Enzyme immobilization
6. Wine Production an alcohol determination by chromic acid method
7. Downstream processing by Solvent extraction
8. Partial purification by Ammonium sulphate precipitation
9. Partial purification by Dialysis
10. Quality checking by SDS PAGE

Environmental Biotechnology

1. Water quality tests for pH
2. Determination of total solids
3. Determination of Chemical Oxygen Demand
4. Determination of Biological Oxygen Demand
5. Analysis of heavy metals (Iron/Chromium)

REFERENCES

1. Aneja, K.R.(2004). *Experiments in Microbiology Plant Pathology and Biotechnology.* New Delhi: New Age International.
2. Metcalf, L., &Eddy, R. (2005). *Waste Water Engineering.* New Delhi: Tata McGraw Hill.
3. Palvannan,T., Shanmugam,S., & Sathish Kumar, T. (2005). *Laboratory Manual on Biochemistry, Bioprocess and Microbiology.*Chennai: SciTech Publications India Pvt. Ltd.

Semester- III

16BTP301 **PLANT BIOTECHNOLOGY** **4H-4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Introduce biotechnological methods for production of transgenic plants
- Give knowledge about various methods of gene transfer in plants
- Cognize and get the knowledge on micro propagation to protect endangered plants
- Explain the basics of the physiological and molecular processes that occur during plant growth and development and during environmental adaptations
- Use basic biotechnological techniques to explore molecular biology of plants
- Understand the processes involved in the planning, conduct and execution of plant biotechnology experiments

Course Outcomes

On successful completion of the course, students will be able to

1. Understand the growth conditions required to culture the plants in *in vitro* conditions
2. Inculcate the deep understanding of Gene expression system of plants
3. Acquire knowledge on producing Transgenic plants
4. Inculcate the deep knowledge the processes involved in the planning, conduct and execution of plant biotechnology experiments
5. Learn the structure and organization of plant genome
6. Learn the basic techniques for hybridization in producing transgenic plants

Unit I

Introduction: Principles of Plant Breeding: Important conventional methods of breeding – self, cross pollinated and vegetatively propagated crops. Non-conventional methods. Polyploidy, Genetic variability. Genome organization in plants – mitochondria and chloroplast. Cytoplasmic male sterility.

Unit II

Micropropagation: Tissue culture media – composition and preparation, Callus and suspension culture, somaclonal variation, micropropagation, organogenesis, somatic embryogenesis, Embryo culture and embryo rescue. Haploidy; protoplast fusion and somatic hybridization; cybrids; anther, pollen and ovary culture for production of haploid plants and homozygous lines. Plant hardening transfer to soil, green house technology.

Unit III

Plant Genome Organization – Chloroplast, Mitochondria, and Nucleus Strategies in bioconversion. Production of pharmaceutical compounds. Mass cultivation of plant cells. Secondary metabolite Production from Suspension Culture, Bioreactors – Photo bioreactor. Production of secondary metabolite in plants, stages of secondary metabolite production, uses of tissue culture techniques in secondary metabolites.

Unit IV

Plant genetic Engineering: Methodology; Plant transformation with Ti plasmid of *Agrobacterium tumifacians*; Ti plasmid derived vector systems, Ri plasmids; Physical methods of transferring genes to plants - Microprojectile bombardment, Electroporation; Manipulation of gene expression in plants; Production of marker free transgenic plants.

Unit V

Application of Genetic transformation: Productivity and performance: herbicide resistance, insect resistance, virus resistance, fungal resistance, nematode resistance, Induction of abiotic stress and cold stress. Delay in fruit ripening, LEA protein, plantibodies, edible vaccines - primary and secondary metabolite modification, biopolymers, plant-based enzyme engineering.

REFERENCES

1. Slater, A., Scott, N. W., & Fowler, M. R. (2008). *Plant Biotechnology.* Oxford: Oxford University Press.
2. Ignacimuthu, S.(2004).*Plant Biotechnology.*New Delhi:Oxford and IBH Publishing House.
3. Chawla, H.S.(2002). *Introduction to Plant Biotechnology.* New Delhi: Oxford and IBHP Publishing Co. Pvt. Ltd.
4. Kumar,U.(2008). *Plant Biotehnology and biodiversity conservation.* Jodhpur: Agrobios.
5. Stewart, N.C. (2008). *Plant Biotechnology and Genetics* .New Jersey: John Wiley & Sons, Inc.
6. Halford, N., & Halford, N. G.(2006). *Plant Biotechnology: Current and Future Applications of Genetically Modified Crops*. New Jersey: John Wiley & Sons.
7. Nirmala, C.B., Rajalakshmi,G., & Karthik, C.(2009). *Plant Biotechnology.* Chennai: MJP Publication.

Semester - III

16BTP302 **ANIMAL BIOTECHNOLOGY** **4H-4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Introduce biotechnological methods for production of transgenic animals
- Give knowledge about various methods of gene transfer in animals
- Cognize and get the knowledge on techniques to protect endangered animals
- Explain the basics of the physiological and molecular processes for animals facing environmental adaptations
- Use basic biotechnological techniques to explore molecular biology of animals
- Understand the processes involved in the planning, conduct and execution of animal biotechnology experiments

Course Outcomes

On successful completion of the course, students will be able to

1. Understand the growth conditions required to culture the animals *in invitro* conditions
2. Inculcate the deep understanding of Gene expression system of animals
3. Acquire knowledge on producing Transgenic animals
4. Inculcate the deep knowledge the processes involved in the planning, conduct and execution of animal biotechnology experiments
5. Discuss the structure and organization of animal genome
6. Demonstrate the basic techniques for hybridization in producing transgenic animals

UNIT -I

Animal cells: culture media, types of media, balances salt solutions. Physical, chemical and metabolic functions of different constituents of culture medium; role of carbon dioxide, serum, growth factors, glutamine in cell culture; serum and protein free defined media and their applications.

UNIT -II

Cell culture: Types, disaggregation of tissue, primary culture, established culture; suspension culture, organ culture, three-dimensional culture and tissue engineering, feeder layers; cell synchronization; cryopreservation. Biology and characterization of cultured cells, tissue typing; cell – cell interaction; measuring parameters of growth; measurement of cell death – apoptosis and its determination.

UNIT-III

Molecular cell techniques: cell transformation- physical, chemical and biological methods; manipulation of genes; cell and organism cloning; green fluorescent protein and its application. Gene therapy.

UNIT -IV

Embryology: Collection and preservation of embryos; culturing of embryos; gametogenesis and fertilization in animals; types of cleavage pattern; role of maternal contributions in early embryonic development; *In vitro* fertilization and stem cell research.

UNIT -V

Transgenics: Transgenic animals; production and application; transgenic animals as models for human diseases; transgenic animals in live- stock improvement; expression of the bovine growth hormone; transgenics in industry. Ethical issues in animal biotechnology.

REFERENCES

1. Ranga, M. M. (2003). *Animal Biotechnology*. (2nd ed.). Jodhpur: Agrobios.
2. Freshney, R.I. (2000). *Animal Cell Culture: A Practical Approach* (4th ed.). New York: John Wiley Publications.
3. Glick, B.R., & Pasternack, J.J. (2003). *Molecular Biotechnology*(3rded.). UK: Blackwell Science.
4. Gordon, I. (2003). *Laboratory Production of Cattle Embryos* (2nd ed.). New Delhi: CAB International.
5. Yagasaki, K., Miura, Y., Hatori, M.& Nomura, Y. (2008). *Animal Cell Technology: Basic and Applied Aspects* (Vols 13). New York: Springer-Verlag.
6. Primrose, S.B., Twyman, R.M., & Old, R.W. (2001). *Principles of Gene Manipulation* (6th ed.). Germany: Blackwell Science Publishing Company.
7. Portner, R. (2007). *Animal Cell Biotechnology: Methods and Protocols* (Vols 24). New York: Springer-Verlag.

Total hours/week: **L: 4 T: 0 P: 0** **Marks:** Internal: **40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Give knowledge on Bioinformatics and its applications
- Offer knowledge to assess biological databases
- Understand and to analyze protein/nucleotide sequences and to predict its 3D structure
- Understand the various online databases for submitting and retrieving data
- Attain how the phylogeny plays a vital role in finding ambiguities
- Get practiced with the tools and techniques for analyzing the data

Course Outcomes

On successful completion of the course, students will be able to:

1. Understand The relationship between sequence - structure - function of genes
2. Familiarize with the algorithms required to compare sequences and require to know the phylogenetic relationship between the gene sequences
3. Inculcate knowledge on building 3D structures of genes
4. Locate and use the main databases at the NCBI and EBI resources
5. Know the difference between databases, tools, repositories and be able to use each one to extract specific information
6. Use selected tools at NCBI and EBI to run simple analyses on genomic sequences

Unit - I

Introduction: Definitions, Objectives, Scope, Applications of Bioinformatics, History and milestones of bioinformatics, Genome sequencing projects – Steps, Human Genome Project and other genome projects.

Unit - II

Basic concepts of biomolecules and computers: Basic concepts of biomolecules – Protein and amino acid, DNA and RNA - Sequence, Structure and function.

Basic Computer components - Hardware, software, operating systems, computer networks, programming, internet, browsers, search engines, email, databases.

Unit - III

Biological databases: Types of databases, Sequence databases, Nucleic acid sequence databases - Primary (GenBank, EMBL, DDBJ), Secondary (UniGene, SGD, EMI Genomes, Genome Biology), Protein sequence database – Primary (PIR, SWISS-PROT), Secondary (PROSITE, Pfam), Structural databases (PDB, SCOP, CATH), Bibliographic databases and Organism specific databases.

Unit - IV

Database searching and Sequence Alignment: Similarity searching programs-BLAST, Sequence alignment - Pair-wise and Multiple-sequence alignment (Methods and Algorithms), CLUSTAL-W, Protein structure alignment (Methods, algorithms- DALI) Phylogenetic analysis (Methods, algorithms).

Unit - V

Gene prediction: Gene prediction in prokaryote and eukaryotes. Extrinsic approaches and Ab initio approaches. Predicting the protein secondary structure (Domain, blocks, motifs), predicting protein tertiary structure (Homology, Ab-initio, threading and fold recognition) and visualization of predicted structure.

REFERENCES

1. Jinxing, (2006). *Essential Bioinformatics*, Cambridge University Press.
2. Attwood, K., & Smith, J. P. (2003). *Introduction to Bioinformatics*. Singapore: Pearson Education.
3. Rajaraman, V. (2003). *Introduction to information technology*. New Delhi: Prentice Hall of India Pvt. Ltd.
4. Lesk, A. M. (2002). *Introduction to Bioinformatics*. London: Oxford University Press.
5. Ghosh, Z., & Bibek Anand, M. (2008). *Bioinformatics: Principles and Applications*. Oxford University Press.
6. http://www.ncbi.nlm.nih.gov/ .
7. http://www.ebi.ac.uk/2can/databases.

Semester -III

16BTP304 **GENOMICS AND PROTEOMICS** **4H – 4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Import the basic and recent developments in the field of genome sequencing, genome mapping, proteomic data analysis
- Develop the knowledge on gene sequencing methods
- Know the structure and interactions of proteins
- Describe advanced genomics and proteomics technologies and the ways in which their data are stored
- Use bioinformatics techniques to query examples of genomic and proteomic databases to analyse cell biology
- Describe the different types of genome variation and their relationship to human diseases

Course Outcomes

On successful completion of the course, students will be able to

1. Have a clear understanding on the application of genetic markers in genome mapping
2. Application of 2D technique to analyze the structure of protein
3. Analyze the genomic and proteomic data
4. Acquire knowledge and understanding of fundamentals of genomics and proteomics, transcriptomics and metabolomics and their applications in various applied areas of biology
5. Discuss how biological systems information relating to genes, proteins and cellular structures can be used to model living cells, and even to create new synthetic cells
6. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study

UNIT -I

Genome Sequencing: Gene and pseudogenes, Gene structure, Genomes, Sequencing Genomes- methodology, chain termination method, chemical degradation method, automated DNA sequencing, shotgun sequencing and assembly of contiguous DNA sequence. cDNA and Genomic library construction.

UNIT -II

Genomic Mapping: Different types of genome maps and their practical uses, Genetic and Physical mapping techniques. Map resources. Practical uses of genome maps, Association mapping, Haplotypes. Genetic Markers - Mini and Micro satellite, STS and EST, SNPs,.

UNIT -III

Gene Expressions and Microarrays: Expression systems - Bacteria, Yeast and Viral. Concepts of microarrays, spotter analysis, Normalization –total intensity, using regression techniques, ratio statistics. Clustering Gene expression profiles-hierarchical, single-linkage, complete linkage, and average linkage. Tools for microarray analysis- MADAM, spot finder, SAGE Applications of Microarrays- Bioinformatics challenges in micro array design and analysis.

UNIT -IV

Experimental Proteomics: Proteome analysis- 2D gel electrophoresis: general strategy, immobilized pH gradients, sample preparation, isoelectric focussing, staining, transfer of proteins from gels, image acquisition and analysis of gels. 2DE databases.

UNIT -V

Analytical Proteomics: RP-HPLC, Mass Spectrometry – ESI MS and MALDI techniques and applications. Characterization of protein complexes – Protein - DNA, Protein-protein interactions, yeast two-hybrid system and protein micro-arrays – biomarkers.

REFERENCES

1. Brown, T.A. (2002). *Genomes.* Singapore: John Wiley & Sons,.
2. Cantor, C.R., & Smith, C. L. (1999). *Genomics: The Science and Technology behind the Human Genome Project*. Singapore: John Wiley and Sons.
3. Primrose, S.B., &Twyman, R.M. (2003). *Principles of Genome Analysis*. Oxford: Blackwell Publishing,
4. Reiner, W., &Naven, T. (2002). *Proteomics in Practice.*Weinheim: Wiley – VCH.
5. Gibson, W., & Muse, V. (2003). *A Primer of Genome Science.* New York: Sinauer Associates Inc. Publishers.
6. Stekal, D. (2003). *Microarray Bioinformatics.* Cambridge: Cambridge University Press.
7. Liebler, L.H. (2001). *Introduction to Proteomics, Tools for the New Biology.* New Jersey: Humana Press.
8. Richard, P.S. (2004). *Proteins and Proteomics. A Laboratory Manual.* New York: Cold Spring Harbor Laboratory Press.
9. Pennington, S., & Dunn, M.J. (2001). *Proteomics: From Sequence to Function.* Oxford: Bios Scientific Pub.Ltd.
10. Bourne, P.E., & Weissig, H. (2003). *Structural Bioinformatics.* Singapore: John Wiley & Sons,.

Semester -III

16BTP305 A MEDICINAL PLANT BIOTECHNOLOGY 4H – 4C

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Learn about the biochemical parameters used in the in the identification and utilization of medical plants
- Understand about the extraction of phytochemicals and to procedures
- Exploit and explore the medicinal values of plants
- Gain knowledge about various drugs, its effects, drug metabolism, drug receptors, drug tolerance, dependence and resistance with therapeutic monitoring of drugs
- Understand comprehensive information and insights in pharmaceutical biotechnology and the development of biopharmaceuticals in pharmaceutical industry
- Obtain scientific knowledge of designing and mechanism of action of drugs

Course Outcomes

On successful completion of the course, students will be able to:

1. Recall the biosynthesis of primary and secondary metabolites involved in plants
2. Understand the concept of phyto-chemical extraction and principles involved in DNA and chemical fingerprinting techniques
3. Know about applications of phyto-constituents in development of drug
4. Validate the results obtained using the techniques involved in photochemical analysis
5. Imparting a comprehension of basic skills necessary for employing biotechnology principles
6. Understand and evaluate the different pharmaceutical parameters of the current and future biotechnology related products on the market

UNIT – I

Phytochemistry: Biosynthesis of primary and secondary metabolites - alkaloids, terpenoids, Phenolic compounds and coumarins. Classification of alkaloids and phenolic compounds.

UNIT – II

General extraction and isolation techniques: Alkaloids and phenolic compounds from plants. Techniques involved in extraction of phytochemicals – Perculation, Soxhlet extraction, reflux and other methods.

UNIT –III

Biotechnology of medicinal plants: Production of secondary metabolites from cultured plant cells, elicitation, immobilization and biotransformation. DNA bar coding. DNA finger-printing of medicinal plants – DNA isolation and fingerprinting techniques.

UNIT – IV

Bioactive studies: Anticancer, antidiabetic, anti-inflammatory, hepatoprotectives, antimicrobials from medicinal plants. Antioxidants of plant origin – Reactive Oxygen Species (ROS). Toxicity studies on medicinal plant products and herbal formulations.

UNIT - V

Pharmacognosy: Authentication of medicinal plants – Organoleptic and other pharmacognostic studies. Anatomical studies. Organic cultivation of medicinal plants

REFERENCES

1. Harborne, J.B. (1998). *Phytochemical methods to modern techniques of plant analysis.* London: Chapman and Hall.
2. Irfan Khan, A., & Aditya Khanum. (2004). *Role of Biotechnology in medicinal and Aromatic plant* (Vols. 1-10). Hyderabad: Ukaaz Publications.
3. Slater, A., Scott, N.W., & Fowler, M.R. (2008). *Plant Biotechnology: The Genetic Manipulation of plants*. Oxford University press.

16BTP305 B **INDUSTRIAL TOXICOLOGY** **4H – 4C**

Total hours/week: L: 4 T: 0 P: 0 **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Students will acquire knowledge and learn the terminology of the field of Industrial toxicology, understand and be able to describe in detail the toxicological effects of certain dangerous substances
- Describe the relationship of dose - response, and the principle of determining the theoretical expertise on the mutagenic, teratogenic and carcinogenic effects of toxic substances
- Obtain knowledge of current legislation on health protection while working with chemical agents, carcinogenic and mutagenic factors, and biological factors
- Learn about toxic effects of elements and their compounds. Toxic effects of heavy metals.
- Understand the classification of substances under the new legislation
- Gather and critically interpret toxicological information from diverse resources for human health hazard and risk assessment

Course Outcomes

On successful completion of the course, students will be able to

1. Describe toxicology as a discipline in the overall health sciences framework
2. Explain the basic concepts of chemical hazard and exposure as determinants of chemical toxicity
3. Describe key pathways and mechanisms of chemical absorption, distribution, metabolism, storage and excretion in the human body
4. Explain dose-response relationships as the basis of toxicity
5. Outline the derivation of reference dose and other related measures of occupational exposure
6. Describe the scientific basis of occupational exposure assessments and practical methods for their determination

UNIT – I

Introduction: Scope, Divisions of Toxicology, General principles of toxicology, - Classification of Toxic Agents. Mechanism of action of toxicants, Routes of exposure-absorption and translocation.

UNIT - II

Toxicokinetics: Absorption, Distribution, Metabolism and Excretion, Factors influencing Toxicity, Dose-effect and Dose response relationship- LD50, LC50.

UNIT - III

Human Toxicology: Pollution induced biochemical, hematological and pathological changes, Immunotoxicity, genotoxicity and carcinogenic effects

UNIT -IV

Ecotoxicology: Influence of ecological factors on the effects of toxicity; Pollution of the Ecosphere by industries; degradable and non-degradable toxic substances; food chain. Eco-system influence on the fate and transport of toxicants.

UNIT - V

Regulatory issues and testing: Bacterial mutation assays, Mammalian cell mutation assays, *in vitro* chromosome aberration assays, *In vivo* carcinogenicity assays and Comet assay.

REFERENCES

1. Finkol, A.J. (1983). *Hemitton and Hardy's Industrial toxicology.* London: John Wright, PSG Inc.
2. Mohammad Khan, (2013). *Pesticides in Aquatic Environments*. Springer Science & Business Media
3. Murthy, A.S. (1999). *Toxicity of pesticides to fish.* Florida: CRC Press Inc.
4. Jim Riviere, E. (2006). *Biological Concepts and Techniques in Toxicology: An Integrated Approach.* CRC Press.

Semester -III

16BTP305 C **SYSTEM BIOLOGY** **4H – 4C**

Total hours/week: **L:4 T:0 P:0** **Marks:** Internal: **40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Understand the new concept of system biology applied to the area of biotechnology
- Build the knowledge in computational methods in biotechnology
- Acquire requisite skills for the design and development of high throughput screening and to retrieve and submit the data, genome database and other databases and analysis
- Learn the computational tools for applying biotechnology in research
- Study the techniques involved in structural and functional proteomics
- Utilize the bioinformatics tools to design and development of novel drugs

Course Outcomes

On successful completion of the course, students will be able to

1. Understand the basic concepts of System Biology
2. Differentiate various Metabolic Networks and Models in System Biology
3. Understand the various databases available for data collection and interpretation
4. Understand the scope and applications of tools
5. Utilize the computational tools for applying biotechnology in research
6. Study and deduce the molecular characterization of human genome

Unit -I

Introduction to Systems Biology: Introduction to Systems Biology. Need for System Analysis in Biology. Basic Concepts in System Biology: Component vs System, Links and Functional States, Links to Networks, Hierarchical Organization in Biology.

systems, scales, static/dynamic, approaches, limitations, reductionism; central dogma; mathematical models; computational analysis; statistics of prokaryotes and eukaryotes.

Unit- II

Metabolic Networks and Models in System Biology: Basic Features of Metabolic Networks. Reconstruction Methods of Metabolic Networks. Models as Dynamical Systems. SYN1, SYN3 and molecular simulation, Parameter Problem. Meanings of Robustness.

Unit -III

Systems Biology Databases KEGG (Kyoto Encyclopedia of Genes and Genomes). BRENDA (BRaunschweigENzymeDAtabase). BioSilico. EMP (Embden-Meyerhof-Parnas). MetaCyc and AraCyc. SABIO-RK (System for the Analysis of Biochemical Pathways - Reaction Kinetics). BioModels.

Unit -IV

Tools for System Biology: Cell Designer. Ali Baba. Cell Profiler. JDesigner. Bio-SPICE (Biological Simulation Program for Intra and Inter Cellular Evaluation). SBML (Systems Biology Markup Language). SBGN (Systems Biology Graphical Notation). SBML-SAT (SBML based Sensitivity Analysis Tool).

Unit - V

Premises & Promises of Systems Biology: Premise of Systems Biology. Promise of Systems Biology. Challenges of Systems Biology. Applications of Systems Biology.

REFERENCES

1. Bernhard Palsson,O. (2006). *Systems Biology: Properties of Reconstructed Networks.* New York: Cambridge University Press.
2. Björn Junker, H., Falk Schreiber. (2008). *Analysis of Biological Networks.*New Jersey:John Wiley & Sons, Inc.
3. Huma Lodhi, M., &Stephen Muggleton,H.,*Elements of Computational Systems Biology.*New Jersey: John Wiley & Sons, Inc.
4. Cánovas, M., Iborra,J.L., &Manjón,A. (2006). *Understanding and Exploiting Systems Biology in Biomedicine and Bioprocesses.*Spain: CajaMurcia Foundation.
5. Brown, T. A. (2002). *Genomes* (2nd ed.).UK: BIOS Scientific Publishers, Ltd.
6. Sensen, C.W. (2002).*Essentials of Genomics and Bioinformatics*, Wiley-VCH.
7. Pennington,S.R.&Dunn,M.J. (2002). *Proteomics.*New Delhi: Viva Books Pvt. Ltd.
8. http://www.systemsbiology.org
9. http://www.systems-biology.org

16BTP311 PLANT AND ANIMAL BIOTECHNOLOGY - PRACTICAL V 4H-2C

Total hours/week: **L:0 T:0 P:4** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Understand the new concept of system biology applied to the area of biotechnology
- Gain hands-on experience and to learn the principles behind plant and animal biotechnology
- Know the process involved in isolation, separation, manipulation of plant and animal tissues
- Apply the technology in research and development and pharmaceutical industries
- Execute the recent technology involved in plant and animal cell culture
- Describe the principles of gene manipulation

Course Outcomes

On successful completion of the course, students will be able to

1. Acquaint with principles, technical requirement, scientific and commercial applications in plant and animal biotechnology
2. Support methodologies in plant and animal tissue/cell culture
3. Be able to describe basic principles and techniques in genetic manipulation and genetic engineering
4. Be able to describe gene transfer technologies in plants and animals
5. Be able to describe techniques and problems in plant and animal cloning
6. Become motivated to set goals towards pursuing higher-level positions, such as lab manager and key scientist in plant and animal biotechnological research institutes and industries

Plant Tissue Culture Techniques

1. Laboratory organization for plant tissue culture.
2. Media Preparation
3. *In vitro* Germination of Seeds
4. Micropropagation
5. Callus induction, differentiation and regeneration
6. Suspension culture
7. Embryo Culture
8. Synthetic seed production.
9. Protoplast Isolation
10. Agrobacterium-mediated gene transformation

11. Preparation and Filter-sterilization of Animal Tissue Culture Medium
12. Chicken embryo fibroblast Culture
13. Quantification of cells by haemocytometer
14. Quantification of viable and non-viable cells by trypan blue dye exclusion method
15. Identification of leukocyte subsets and total count.
16. Blood leukocyte culture
17. Soft agar assay
18. Cryopreservation and revival of cell lines
19. Transfection

REFERENCES

1. Bhojwani, S.S., & Razdan,(2004).*Plant Tissue Culture and Practice.*
2. Brown, T. A. (2006). *Gene cloning and DNA analysis: An Introduction.* Blackwell Publication.
3. Gardner, E.J., Simmons, M.J., & Snustad, D.P. (2008). *Principles of Genetics.* (8th ed.). India: Wiley.
4. Raven, P.H., Johnson, GB., Losos, J.B., &Singer, S.R. (2005). *Biology.* Tata MC Graw Hill.
5. Russell, P.J. (2009). *Genetics – A Molecular Approach* (3rded.). Benjamin Co.
6. Slater, A., Scott, N.W. & Fowler, M.R. (2008). *Plant Biotechnology: The Genetic Manipulation of plants*. Oxford University press.
7. Butler, M. (2004). *Animal cell culture and technology: The basics* (2nd ed.). Bios scientific publishers.
8. Glick, B.R., & Pasternak, J.J. (2009). *Molecular biotechnology- Principles and applications of recombinant DNA* (4th ed.). USA: ASM press.
9. Griffiths, A.J.F., Miller, J.H., Suzuki, D.T., Lewontin, R.C., & Gelbart, W.M. (2009). *An introduction to genetic analysis* (9th ed.).NY: USA, Freeman & Co.
10. Watson, J.D., Myers, R.M., Caudy, A., & Witkowski, J.K. (2007). *Recombinant DNA genes and genomes- A short course* (3rd ed.).NY: USA, Freeman & Co.

16BTP312 BIOINFORMATICS -PRACTICAL VI 4H-2C

Total hours/week: L:0 T:0 **P:4** **Marks:** Internal:**40** External:**60** Total: **100**

Course Objectives

The objectives of the course are to make the students to

- Give knowledge on Bioinformatics and its application
- Offer knowledge to assess biological databases
- Understand and to analyze protein/nucleotide sequences and to predict its 3D structure
- Understand the various online databases for submitting and retrieving data
- Understand how the phylogeny plays a vital role in finding ambiguities
- Get practiced with the tools and techniques for analyzing the data

Course Outcomes

On successful completion of the course, students will be able to

1. Understand The relationship between sequence - structure - function of genes
2. Familiarize with the algorithms required to compare sequences and require to know the phylogenetic relationship between the gene sequences
3. Inculcate knowledge on building 3D structures of genes
4. Locate and use the main databases at the NCBI and EBI resources
5. Know the difference between databases, tools, repositories and be able to use each one to extract specific information
6. Use selected tools at NCBI and EBI to run simple analyses on genomic sequences

List of Practicals

Bioinformatics

1. Using RasMol through command line
2. Quaternary structural analysis
3. Investigation of molecular interactions using the program KineMage
4. Similarity search using the Blast and interpretation of the results
5. Pair-wise and multiple sequence sequence alignment by using ClustalW
6. Introduction of BioEdit
7. Phylogenetic analysis using web tools
8. Protein Structure Prediction (Homology Modeling) using SPDBV
9. Molecular modeling using SPARTAN
10. Model Building and Energy minimization
11. Quantum chemical and molecular mechanics practicals
12. Basic UNIX commands, pine, telnet, ftp
13. Molecular dynamics simulation using GROMACS etc.
14. Molecular Docking and Drug designing by using Chimera

REFERENCES

1. Bunin Barry, A.,Siesel Brian, Morales Guillermo & Bajorath Jurgen.(2006). *Chemoinformatics.*New York: Theory, Practice, & Products Publisher & Springer.ISBN: 1402050003.
2. Gasteiger Johann, &Engel Thomas. (2003).*Chemoinformatics: A Textbook.*WileyVCH. ISBN: 3527306811.
3. Leach Andrew R., Valerie J. Gillet. (2003).*An introduction to chemoinformatics*. Kluwer academic. ISBN: 1402013477.

4. Gasteiger Johann, (2003). *Handbook of Chemoinformatics: From Data to Knowledge (Vols 4).* Wiley-VCH. ISBN: 3527306803.

16BTP491 **PROJECT – *VIVA VOCE*** **15C**

Total hours/week: **L:0 T:0 P:0** **Marks:** Internal:**80** External:**120** Total: **200**

Course Objectives

The main objectives of the course is

- The hands-on training through one full semester project with thesis gives special expertise within one of the research areas represented at The Department of Biotechnology.

Course Outcomes

On completion of the course, students are able to apply their knowledge on

1. This dissertation programme provides the candidate with knowledge, general competence, and analytical skills on an advanced level, needed in industry, consultancy, education and research

பகுதி – I, தமிழ்பருவம் I

16LSU101 : தமிழ்முதல்தாள் 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, ‘தமிழ் இலக்கிய வரலாறு’ குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, ‘அறிவியல் தமிழ்’ ; ‘இணைய தமிழ்’ குறித்த பன்னோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I :இக்காலஇலக்கியம்: (10 மணிநேரம்)

கல்வி : மகாகவிபாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணி தேசிக விநாயகம் பிள்ளை–
ஒற்றுமையே உயிர்நிலை.
மனிதநேயம் :கவிஞர்சிற்பிபாலசுப்பிரமணியன் –மலையாளக் காற்று.
சூழலியல் :கவிஞர்வைதீஸ்வரன் - விரல் மீட்டிய மழை.
பெண்ணியம் :கவிஞர்சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை.

அலகு – II :அறஇலக்கியம்: (10 மணிநேரம்)

கொன்றை வேந்தன்: 1-50 பாடல்கள்

திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்

பழமொழி நானூறு: 5 பாடல்கள்

அலகு - III :சிற்றிலக்கியம்: (10 மணிநேரம்)

மூவருலா: 1-26 கண்ணிகள்

திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்

கலிங்கத்துப் பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV :கட்டுரை: (10 மணிநேரம்)

1. உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்
2. கட்டிடக்கலை - அ. இராசமாணிக்கனார்
3. வாழ்க்கை - இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V :மொழிப்பயிற்சி: **(8 மணிநேரம்)**

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை,கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப் பயிற்சிகள்

பாடநூல்:கற்பகச்சோலை – தமிழ்ஏடு.கற்பகம்பல்கலைக்கழகத்தமிழ்த்துறைவெளியீடு.

Semester-I

16ENU101 **ENGLISH – 1** **4H 4C**

Instruction Hours/week:L:40 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

- To enable the learners to acquire English language skills at a faster pace.
- To train the learners to reflect on the literary works and communicate flexibly.
- Know about the Prose and Poetry
- To develop the Short Story:
- Learn about Vocabulary, Grammar and Composition:
- Know about Proverb Expansion

Course Outcomes

1. Enable the learners to acquire English language skills at a faster pace.
2. Trained the learners to reflect on the literary works and communicate flexibly.
3. Knowledge about the Prose and Poetry
4. Development of the Short Story:
5. Learnt about Vocabulary, Grammar and Composition:
6. Knowledge about Proverb Expansion

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O’ Henry
Vocabulary: Words Often Confused, Anagrams

Grammar: Preposition, Voice- Active and Passive

UNIT V

Short Story: The Bird – Amar Jalil

One-Act Play: The Cellphone Epidemic – Claudia I. Haas

Vocabulary: Portmanteau Words, One Word Substitution

Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. *Spring* 2013**.** Emerald Publishers: Chennai.

Suggested Book:

Shyamala, V. (2006). *English for Communication*. Chennai, Emerald Publishers.

Semester-I

16CHU101 ATOMIC STRUCTURE AND CHEMICAL BONDING5H 5C

Instruction Hours/week:L: 5 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

Students should be able

- To discuss the limitations of classical mechanics and its drawbacks.
- To discuss the radial and angular part of orbitals
- To explain the fundamentals of quantum mechanics and Schrödinger equation for simple atoms.
- To predict and write the electronic configuration of elements.
- To explain a different types of bonding like ionic and covalent bonding.
- To interpret a knowledge about the various theories of bonding like VSEPR, Valence Bond Theory and Molecular Orbital Theory of covalent bonding.

Course Outcomes

The students

1. Explain the atomic theory of matter, composition of the atom, which defines the identity of a given element.
2. Understood the radial and angular part of orbitals
3. Explain the relative sizes, masses, and charges of the proton, neutron, and electron, and their assembly to form different atoms.
4. Define the term isotope, and their atomic and mass numbers.
5. Use the Periodic Table to rationalize similarities and differences of elements, including physical and chemical properties and reactivity.
6. Predict common ionic charges of group 1A, 2A, 3A, 6A, and 7A elements based on position in the periodic table.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

Atomic Structure:

UNIT I

Review of: Bohr's theory and its limitations, dual behaviour of matterand radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atomspectra. Need of a new approach to atomic structure.What is Quantum mechanics? Time independent Schrodinger equation and meaning ofvarious terms in it. Significance of ψ and ψ^2, Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for 1*s*, 2*s*, 2*p*, 3*s*, 3*p* and 3*d* orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1*s* and 2*s* atomic orbitals.

UNIT II

Significance of quantum numbers, orbital angular momentum and quantum numbers *ml* and *ms*. Shapes of *s*, *p* and *d* atomic orbitals, nodal planes. Discovery of spin, spin quantum number (*s*) and magnetic spin quantum number (*ms*).Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stabilityof half-filled and completely filled orbitals, concept of exchange energy. Relative energies ofatomic orbitals, Anomalous electronic configurations.

Chemical Bonding and Molecular Structure
UNIT III
.
Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character

UNIT IV
Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basisof VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar,tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures in various inorganic and organic compounds.

UNIT V

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and theircharacteristics for *s-s*, *s-p* and *p-p* combinations of atomic orbitals, nonbonding combinationof orbitals, MO treatment of homonuclear diatomic molecules of 1^{st} and 2^{nd} periods(including idea of *s-p* mixing) and heteronuclear diatomic molecules such as CO, NO andNO^+. Comparison of VB and MO approaches.

Suggested Readings:
Text Books:

1. Lee, J.D. (2010). *Concise Inorganic Chemistry*.ELBS.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. (2008). *Basic Inorganic Chemistry*. 3rd ed.Hohn Wiley& sons.

Reference Books:

1. Douglas, B.E., McDaniel, D.H. & Alexander, J.J. (2010).*Concepts and Models in InorganicChemistry*. John Wiley & Sons.
2. Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. (2006).*Inorganic Chemistry: Principles of Structure and Reactivity*. Pearson Education India.

Semester-I

5H 5C

16CHU102 PHYSICAL CHEMISTRY I(States of matter and ionic equilibrium)

Instruction Hours/week:L: 5 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

Enable the students

- To understand the Kinetic molecular model of a gas and about the molecular velocities
- To provide a knowledge about the behaviour of real gases
- To provide knowledge about the structure of the liquid state and its properties like surface tension and viscosity.
- To provide knowledge about the solid state, symmetries present and different types of crystals.
- To provide a knowledge about the theory of ionic equilibria, ionisation of electrolytes and salt hydrolysis.
- To provide a knowledge about the buffer solutions and acid-base titrations.

Course outcomes (CO's)
Students are able to

1. Understand the postulates of Kinetic theory of gases, kinetic molecular model of gases and about the molecular velocities
2. Has the knowledge, why real gases deviate from ideal gases, Vander Waals equation of state
3. and about critical constants.
4. Has the knowledge about the structure of the liquid state and its properties like surface tension and viscosity.
5. Understood about the solid state, symmetries present and different types of crystals.
6. Has knowledge about the theory of ionic equilibria, ionisation of electrolytes and salt hydrolysis.
7. Know to formulate the buffer solutions and the choice of indicators to acid-base titrations

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Gaseous state: Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path and viscosity of gases, including their temperature and pressure dependence, relation between mean free path and coefficient of viscosity, calculation of ζ from η; variation of viscosity with temperature and pressure. Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities.

UNIT II

Behaviour of real gases: Deviations from ideal gas behaviour, compressibility factor, Z, and its variation with pressure and temperature for different gases. Causes of deviation from ideal behaviour. Van der Waals equation of state, its derivation and application in explaining real gas behaviour, calculation of Boyle temperature. Isotherms of real gases and their comparison with Van der Waals isotherms, continuity of states, critical state, relation between critical constants and Van der Waals constants, law of corresponding states.

Liquid state: Qualitative treatment of the structure of the liquid state; physical properties of liquids, vapour pressure, surface tension coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Explanation of cleansing action of detergents. Temperature variation of viscosity of liquids and comparison with that of gases.

UNIT III

Solid state: Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Analysis of powder diffraction patterns of NaCl, CsCl and KCl.

UNIT IV

Ionic equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono and diprotic acids. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts.

UNIT V

Buffer solutions; derivation of Henderson equation and its applications. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. Qualitative treatment of acid – base titration curves (calculation of pH at various stages). Theory of acid–base indicators; selection of indicators and their limitations.

Suggested Readings:

Text Books:

1. Atkins, P. W. & Paula, J. de Atkin's. (2006).*Physical Chemistry Ed*. Oxford University Press.
2. Ball D. W. (2007).*Physical Chemistry*.India : Thomson Press.

Reference Books:

1. Castellan, G. W. (2004). *Physical Chemistry*. 4th Ed. Narosa.
2. Mortimer, R. G. (2009).*Physical Chemistry*. 3rd Ed. NOIDA, UP : Elsevier.

Semester-I

16CHU103 ORGANIC CHEMISTRY I(Basics and Hydrocarbon) 4H 4C

Instruction Hours/week:L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

- To describe knowledge on the basics of organic chemistry
- To gain knowledge in particularly the shapes of molecules, electron displacement effects, reagents, intermediates and fundamental types of reactions.
- To explain the students about the stereochemistry, projection formulae of molecules, geometrical isomerism and optical isomerism
- To explain the preparation and conformation analysis of alkanes.
- To paraphase a knowledge about the preparation and properties of alkenes and alkynes, mechanisms of reactions and rules behind the reactions.
- To summarise a knowledge about the aromaticity of molecules and about electrophilic aromatic substitutions.

Course outcomes

1. Describe molecular structure and bonding in organic molecules.
2. Classify organic compounds by structure, use the IUPAC nomenclature, and identify conformational effects in organic compounds.
3. Predict the products of reactions of alkenes and describe the mechanisms showing how the products are formed.
4. Draw and interpret reaction coordinate diagrams, and relate the energetic changes associated with chemical reactions to equilibrium constants and rate; and differentiate kinetic versus thermodynamic control of reactions.
5. Identify the types of isomerism in organic compounds, to identify and classify chiral centers, and explain the physical and chemical consequences of chirality.
6. Correctly represent the structures and bonding of alkynes, and describe the mechanisms for reactions of alkynes and predict the products of such reactions.
7. Identify compounds in which resonance is important, predict the effect of resonance on the stability of compounds and reactive intermediates, and draw resonance structures.
8. Identify conjugated pi systems and explain the effect of conjugation on molecular structure and reactivity; and predict the products of reactions of dienes.
9. Describe mechanisms for substitution and elimination reactions, and predict the effect of nucleophile, leaving group, and solvent on the relative rates of S 1 versus S 2 reactions, and E1 versus E2 reactions, as well as on the relative rates of substitution versus elimination.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Basics of Organic Chemistry

Hybridization, Shapes of molecules
Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation anddipole moment; Hydrogen bonding (Applications to be discussed with relevant topics) Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Types, shape and relative stability of Carbocations, Carbanions, Free radicals and Carbenes. Introduction to types of organic reactions: Addition, Elimination and Substitution reactions.

UNIT II
Stereochemistry:
Fischer,Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis–trans , syn-anti and E/Z notations with C.I.P rules.
Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Diastereoisomers, meso structures, Racemic mixture and their resolution. Relative and absolute configuration: D/L and R/S designations.

UNIT III
Chemistry of Aliphatic Hydrocarbons
Carbon-Carbon sigma bonds
General methods of preparation, physical and chemical properties of alkanes: Wurtz Reaction, Wurtz-Fittig Reactions, Free radical substitutions: Halogenation-relative reactivity and selectivity.

Cycloalkanes and Conformational Analysis
Conformational analysis of alkanes: Relative stability and Energy diagrams. Types of cycloalkanes and their relative stability, Baeyer strain theory: Chair, Boat and Twist boat forms of cyclohexane with energy diagrams; Relative stability of mono substituted cycloalkanes.

Unit IV
Chemistry of Aliphatic Hydrocarbons
Carbon-Carbon pi bonds:
General methods of preparation, physical and chemical properties of alkenes and alkynes, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations. Electrophilic additions and their mechanisms (Markownikoff/ Anti Markownikoff addition), mechanism of oxymercuration-demercuration, hydroboration- oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti-hydroxylation(oxidation). 1,2-and 1,4-addition reactions in conjugated dienes and Diels-Alder reaction; Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene.
Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT V
Aromatic Hydrocarbons
Aromaticity: Hückel’s rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft’s alkylation/acylation with their mechanism. Directing effects of the groups.

Suggested Readings:
Text Books

1. Morrison, R. N. & Boyd, R. N. (1992). *Organic Chemistry*. India: Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. (2002). *Organic Chemistry*.Volume 1. India: Dorling Kindersley (India) Pvt. Ltd. (PearsonEducation).

Reference Books:

1. Finar, I. L. (2002).*Organic Chemistry:Stereochemistry and the Chemistry of Natural Products.*Volume 2. India: Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Eliel, E. L. &Wilen, S. H. (1994). Stereochemistry of Organic Compounds.London :Wiley.
3. Kalsi, P. S. (2005). *Stereochemistry Conformation and Mechanism*. New Age International.

Semester-I

16CHU111 ATOMIC STRUCTURE AND CHEMICAL BONDING PRACTICAL **2H 1C**

Instruction Hours/week:L: 0 T:0 P:2 Marks: Internal:40 External: 60 Total:100

Course objectives

- To illustrate the principles of volumetric analysis.
- To categorize a versatile knowledge of solution preparations
- To prepare solutions with appropriate concentrations, titrations
- How to handle the apparatus while doing a titration.
- To analyse the knowledge about the calculations involved in the estimation of compounds using volumetric analysis.
- To estimate the amount of solution present quantitatively.

Course outcomes (CO's)

The Students are able

1. Summarize the principles of volumetric analysis.
2. Gained knowledge about the preparations of solutions
3. Understood the preparation of appropriate concentrations, titrations
4. Handled the respective apparatus while doing a titration.
5. Analyse the calculations involved in volumetric analysis and in the estimation of compounds using volumetric analysis.
6. The lab will also provide hands-on opportunities to develop and apply this knowledge

Methodology

Titrations, Volumetric analysis.

Inorganic Chemistry - Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Estimation of oxalic acid by titrating it with $KMnO_4$.
3. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$.
4. Estimation of Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator.
5. Estimation of Cu (II) ions iodometrically using $Na_2S_2O_3$.

Suggested Readings:

Text Book:

1. Svehla, G. (2012).*Vogel's Qualitative Inorganic Analysis*. Pearson Education.

Reference Book:

1. Mendham, J. (2009) *Vogel's Quantitative Chemical Analysis*, Pearson.

Semester-I

16CHU112 STATES OF MATTER AND IONIC EQUILIBRIUM PRACTICAL 2H 1C

Instruction Hours/week:L: 0 T:0 P:2 Marks: Internal:40 External: 60 Total:100

Course Objectives

The students develop the skills to categorize

- Surface tension of a liquid
- Study the variation of surface tension with different concentration of detergent solutions.
- Viscosity of a liquid
- Prepare a buffer solution and to measure its pH.
- Monitor the pH of a solution during the course of a titration.
- Indexing of a given powder diffraction pattern of a cubic crystalline system.

Course Outcomes

The students develops the practical skill have categorized the

1. Determination of surface tension of a liquid
2. Determination the viscosity of a liquid
3. Prepare a buffer solution and to measure the pH of a solution
4. Monitor the pH of a solution during the course of a titration.
5. The lab will also provide hands-on opportunities to develop and apply this knowledge
6. Indexing of a given powder diffraction pattern of a cubic crystalline system.

Methodology

Surface tension & viscosity measurements, XRD data, PH meter and buffer solutions.

1. **Surface tension measurements**
   a. Determination of the surface tension of a liquid.
   b. Study the variation of surface tension with different concentration of detergent solutions.

2. **Viscosity measurement.**
   a. Determination of co-efficient of viscosity of an unknown aqueous solution.
   b. Study the variation of co-efficient of viscosity with different concentration of Poly Vinyl Alcohol (PVA) and determine molar of PVA.
   b. Study the variation of viscosity with different concentration of sugar solutions.

3. **Solid State:**
   a. Indexing of a given powder diffraction pattern of a cubic crystalline system.

4. **pH metry**:
   a. Study the effect of addition of HCl/NaOH on pH to the solutions of acetic acid, sodium acetate and their mixtures.
   b. Preparation of buffer solutions of different pH values (i). Sodium acetate-acetic acid (ii). Ammonium chloride-ammonium hydroxide
   c. pH metric titration of (i) strong acid with strong base, (ii) weak acid with strong base.

Determination of dissociation constant of a weak acid.

Suggested Readings:

Text Books:

1. Khosla, B. D., Garg, V. C. & Gulati, A.(2011).*Senior Practical Physical Chemistry*. New Delhi : R. Chand &Co.

Reference Books:

1. Garland, C. W., Nibler, J. W. & Shoemaker, D. P. (2003). *Experiments in Physical Chemistry.* 8th Ed.New York : McGraw-Hill.
2. Halpern, A. M. & McBane, G. C.(2003).*Experimental Physical Chemistry*. 3rd Ed. New York : W.H. Freeman & Co.

Semester-I 16CHU113 BASICS AND HYDROCARBON PRACTICAL4H 2C

Course objectives

To develop skills in

- To purify organic compounds by crystallisation.
- To calibrate the thermometer, determine the melting point, and to analyse the effect of
- impurities on the melting point.
- To determine the boiling point of a liquid by distillation method.
- To explain the principles of chromatography and to separate organic compounds by paper and thin layer chromatography.
- To detect the elements present in an organic compound.
- To prepare few organic compounds using standard organic reactions.

Course Outcomes (CO's)

The student will be able to

1. Purify organic compounds by crystallisation.
2. Characterisation of the compounds by elemental analysis, melting point, and effect of impurities on the melting point.
3. To separate organic compounds by paper chromatographic and TLC methods
4. To Preparation of organic compounds.
5. The lab will also provide hands-on opportunities to develop and apply this knowledge.
6. Understood the principles of chromatography and to separate organic compounds by paper and thin layer chromatography

Methodology

Laboratory experiments, Melting point apparatus, paper chromatography, Heating mantles

1. Checking the calibration of the thermometer
2. Purification of organic compounds by crystallization using the following solvents:
   a.Water, b.Alcohol, c.Alcohol-Water
3. Determination of the melting points of unknown organic compounds.
4. Effect of impurities on the melting point – mixed melting point of two unknown organic Compounds
5. Determination of boiling point of liquid compounds. (boiling point lower than and more than 100 °C by distillation)
6. Chromatography
   a.Separation of a mixture of two amino acids by ascending paperchromatography
   b.Separation of a mixture of two sugars by ascending paper chromatography
   c.Separation of a mixture of o-and p-nitrophenol or o-and p-aminophenol by thin layer chromatography (TLC)
7. Detection of extra elements
8. Organic Preparations
   (i) Bromination of acetanilide / aniline / phenol
   (ii) Nitration of nitrobenzene / toluene.

SuggestedReadings:

Text Books:

1. Mann, F.G. & Saunders, B.C.(2009). *Practical Organic Chemistry*. Pearson Education.

Reference Books:

1. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell A.R. (2012). *Practical Organic*

Chemistry. 5th Ed. Pearson.

பகுதி – I, தமிழ்பருவம் II 16LSU201 : தமிழ் இரண்டாம் தாள் 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

- **பாடத்திட்டப் பயன் விளைவு**

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I :பக்தி இலக்கியம் (10 மணிநேரம்)

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. சைவம் -பெரியபுராணம் - திருமூலநாயனார் புராணம்.

2.வைணவம் - பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

அலகு – II :சங்கஇலக்கியம் : (15 மணிநேரம்)

சங்க இலக்கியங்கள் அறிமுகம்

அ).எட்டுத்தொகை

நற்றிணை : பிரசம் கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு –

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை: சுடர்தொடீ கேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு: அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி - 48

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள் – 'சிறுதினை மலரொடு' என்பதிலிருந்துதொடங்கி, 'அறிந்தவாறே' என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – 'தெய்வம் சான்ற' என்பதிலிருந்து தொடங்கி, 'நல்குமதி' என்பது வரையிலான தொடர்கள்: 286-295.

அலகு - III :காப்பியம் (6 மணிநேரம்)

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29) – கண்ணகியின் சிறப்பு:

'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி,

'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234)- சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485)- செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை:பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

அலகு – IV :சிறுகதை (10 மணிநேரம்)

1. **குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்**
2. **காட்டில் ஒரு மான் - அம்பை**
3. **நாற்காலி – கி.ராஜநாராயணன்**
4. **நகரம் – சுஜாதா**

அலகு- V :மொழிப்பயிற்சி **(7 மணிநேரம்)**

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
மொழிபெயர்ப்பு

பாடநூல்:கற்பகச்சோலை – தமிழ்ஏடு.கற்பகம்பல்கலைக்கழகத்தமிழ்த்துறை வெளியீடு.

16CHU201 PHYSICAL CHEMISTRY II(ChemicalSemester-II Thermodynamics and its applications)5H 5C

Instruction Hours/week:L: 5 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

- To provide the basics of chemical thermodynamics and the concept of first law of Thermodynamics.
- To provide the knowledge about the thermo chemistry and to explain about the 2nd law of Thermodynamics.
- To explain the concepts of third law of thermodynamics and systems of variable composition.
- To explain about the usage of chemical thermodynamics in chemical equilibrium.
- To provide a knowledge about solutions and colligative properties.
- To recognise the forces which drive the chemical reactions in forward direction and the concept of the interchange of energy in a system.

Course Outcomes

1. Students will explain and apply the concepts of thermodynamics to chemical and physical systems. Know to calculate Q, W, ΔU and ΔH for various process.
2. Students understood the concepts of thermochemistry and the concept of entropy.
3. Students know about the third law of thermodynamics, free energy functions and about the Systems of Variable Composition
4. Students will be able to derive essential mathematical relationships in thermodynamics, and chemical equlibria.
5. Know to list the colligative properties of solutions, explaining how and why each property is affected by an increase by the amount of solute
6. Recognise the forces which drive the chemical reactions in forward direction and the concept of the interchange of energy in a system.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Chemical Thermodynamics: Intensive and extensive variables; state and path functions;isolated, closed and open systems.

First law: Concept of heat, Q, work, W, internal energy, U, and statement of first law; enthalpy, H, relation between heat capacities, calculations of Q, W, ΔU and ΔH for reversible, irreversible and free expansion of gases (ideal and Van der Waals) under isothermal and adiabatic conditions.

UNIT II

Thermochemistry: Heats of reactions: standard states; enthalpy of formation and enthalpy of combustion and its applications; effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions.

Second Law: Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics. Calculation of entropy change for reversible and irreversible processes.

UNIT III

Third Law: Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules. Free Energy Functions: Gibbs and Helmholtz energy; variation of S, G, A with T, V, P; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and other thermodynamic parameters; inversion temperature; Gibbs-Helmholtz equation; Maxwell relations; thermodynamic equation of state.

Systems of Variable Composition: Partial molar quantities, dependence of thermodynamic parameters on composition; Gibbs Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases.

UNIT IV

Chemical Equilibrium: Criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibria in ideal gases. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient. Equilibrium constants and their quantitative dependence on temperature, pressure and concentration (Le Chatelier Principle, Quantitatively). Free energy of mixing and spontaneity. equilibrium between ideal gases and a pure condensed phase.

UNIT V

Solutions and Colligative Properties: Dilute solutions; lowering of vapour pressure, Raoult's and Henry's Laws and their applications. Thermodynamic derivation using chemical potential to derive relations between the four colligative properties [(i) relative lowering of vapour pressure, (ii) elevation of boiling point, (iii) Depression of freezing point, (iv) osmotic pressure] andamount of solute. Applications in calculating molar masses of normal, dissociated and associated solutes in solution.

Suggested Readings

Text Books:

1. Peter, A. & Paula, J. de.(2011).*Physical Chemistry*. 9th Ed. Oxford University Press.
2. Castellan, G. W. (2004).*Physical Chemistry.* 4th Ed. Narosa.

Reference Books:

1. Engel, T. & Reid, P. (2012).*Physical Chemistry.* 3rd Ed. Prentice-Hall
2. McQuarrie, D. A. & Simon, J. D. (2004). New Delhi: Molecular Thermodynamics Viva Books Pvt. Ltd.
3. Assael, M. J., Goodwin, A. R. H., Stamatoudis, M., Wakeham, W. A. & Will, S. (2011).*Commonly Asked Questions in Thermodynamics*. NY : CRC Press.
4. Levine, I .N. (2010). *Physical Chemistry.* 6th Ed. Tata Mc Graw Hill. •
5. Metz, C.R.(2006). *2000 solved problems in chemistry*. Schaum Series

Semester-II
16CHU202 INORGANIC CHEMISTRY II(Metallurgy and S-Block and P-block elements) 4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

The student will recite knowledge on

- The general principles of metallurgy
- S-block elements
- Complexes of s-block elements
- Chemistry of p-block elements
- Chemistry Hydrides, oxides and oxacids
- Preparation, properties, structure and uses of some types of inorganic compounds.

Course Outcomes

It enabled the students have discuss

1. The basic principles and methods involved in the metallurgy
2. The basic properties of s-block elements and their compounds
3. The complex formation tendency of s-block elements and their structure
4. The basic properties of p-block elements and their compounds.
5. Chemistry Hydrides, oxides and oxacids
6. The preparation, properties, structure and uses of borazine, silicates, silicones, interhalogen compounds, phosphonitrilic and clathrates.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

General Principles of Metallurgy

Chief modes of occurrence of metals based on standard electrode potentials. Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agent. Electrolytic Reduction, Hydrometallurgy with reference to cyanide process for silver and gold. Methods of purification of metals: Electrolytic process, Van Arkel-de Boer process and Mond's process, Zone refining.

UNIT II

Chemistry of *s* Block Elements:

(i) General characteristics: melting point, flame colour, reducing nature, diagonal relationships and anomalous behavior of first member of each group.

(ii) Reactions of alkali and alkaline earth metals with oxygen, hydrogen, nitrogen and water.

(iii) Common features such as ease of formation, thermal stability and solubility of the following alkali and alkaline earth metal compounds: hydrides, oxides, peroxides, superoxides, carbonates, nitrates, sulphates.

UNIT III

(i) Complex formation tendency of s-block elements; structure of the followingcomplexes: crown ethers and cryptates of Group I; basic beryllium acetate, beryllium

nitrate, EDTA complexes of calcium and magnesium.
(ii) Solutions of alkali metals in liquid ammonia and their properties.

UNIT IV

Chemistry of *p* Block Elements:
Electronic configuration, atomic and ionic size, metallic/non-metallic character, melting point, ionization enthalpy, electron gain enthalpy, electronegativity, Allotropy of C, P, S; inert pair effect, diagonal relationship between B and Si and anomalous behaviour of first member of each group.

Structure, bonding and properties: acidic/basic nature, stability, ionic/covalent nature, oxidation/reduction, hydrolysis, action of heat of the following:
Hydrides: hydrides of Group 13 (only diborane), Group 14, Group 15 (EH_3 where E = N, P, As, Sb, Bi), Group 16 and Group 17.
Oxides: oxides of phosphorus, sulphur and chlorine
Oxoacids: oxoacids of phosphorus and chlorine; peroxy acids of sulphur
Halides: halides of silicon and phosphorus

UNIT V
Preparation, properties, structure and uses of the following compounds:
• Borazine
• Silicates, silicones,
• Phosphonitrilic halides {$(PNCl_2)_n$ where n = 3 and 4}
• Interhalogen and pseudohalogen compounds
• Clathrate compounds of noble gases, xenon fluorides (MO treatment of XeF_2).

Suggested Readings:

Text Books:
1. Lee, J.D. (2010). *Concise Inorganic Chemistry*. Pearson Education.
2. Douglas .B.E, Mc Daniel, D.H. & Alexander J.J. (1994). *Concepts & Models of Inorganic Chemistry*.3rdEd. N.Y. : John Wiley Sons.

Reference Books:
1. Greenwood, N.N. & Earnshaw. (2005). *Chemistry of the Elements*, Butterworth-Heinemann.
2. Cotton, F.A. & Wilkinson, G. (1999). *Advanced Inorganic Chemistry*. Wiley, VCH.
3. Miessler, G. L. & Donald, A. Tarr. (2011).*Inorganic Chemistry*.5thEd.(adapted).Pearson,
4. Shriver, D.F., Atkins P.W & Langford, C.H. (2010).*Inorganic Chemistry*. *5th*Ed.Oxford University Press.

Semester-II

16CHU203 ORGANIC CHEMISTRY II 5H 5C
(Oxygen containing Functional Groups)

Instruction Hours/week:L:5 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

To provide the students a knowledge on

- Chemistry of halogenated compounds alkyl
- The preparation, properties and relative reactivity of alcohols and phenols
- Preparation, properties and standard reactions of carbonyl compounds.
- Chemistry of Organometallic compounds, Ethers and Epoxides and Addition reactions
- Chemistry of carboxylic acids and their derivatives.
- Chemistry of aryl halidies and their uses

Course Outcomes (CO's)

The students will able to

1. Understand the chemistry of alkyl halides and aryl halides.
2. Understand the preparation, properties and relative reactivity of alcohols and phenols
3. Understand Preparation, properties and standard reactions of carbonyl compounds
4. Understand the preparations, reactions and applications of epoxides, ethers and organometallic compounds
5. Understand the preparations and properties of carboxylic acid and its derivatives.
6. Explain the chemistry of aryl halides.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Chemistry of Halogenated Hydrocarbons:

Alkyl halides: Methods of preparation and properties, nucleophilic substitution reactions – SN1, SN2 and SNi mechanisms with stereochemical aspects and effect of solvent; nucleophilic substitution vs. elimination.

Aryl halides: Preparation (including preparation from diazonium salts) and properties, nucleophilic aromatic substitution; SNAr, Benzyne mechanism.
Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

UNIT II

Alcohols, Phenols:

Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouvaelt-BlancReduction; Oxidation of diols by periodic acid and lead tetraacetate, Pinacol-Pinacolone rearrangement;

Phenols: Preparation and properties; Acidity and factors affecting it, Ring substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions, Fries and Claisen rearrangements with mechanism;

UNIT III

Carbonyl Compounds:

Structure, reactivity, preparation and properties; Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism; Mechanisms of Aldol and Benzoin condensation, Knoevenagel condensation, Claisan-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann and Benzil-Benzilic acid rearrangements, haloform reaction and Baeyer Villiger oxidation, α – substitution reactions, oxidations and reductions (Clemmensen, Wolff-Kishner,$LiAlH_4$, $NaBH_4$, MPV, PDC)

UNIT IV

Organometallic compounds, Ethers and Epoxides and Addition reactions

Organometallic compounds of Mg (Grignard reagent) – Use in synthesis of organic compounds. *Ethers and Epoxides:* Preparation and reactions with acids. Reactions of epoxides with alcohols, ammonia derivatives and $LiAlH_4$

Addition reactions of α, β- unsaturated carbonyl compounds: Michael addition.
Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate.

UNIT V

Acids and their Derivatives:

General methods of preparation, physical properties and reactions of monocarboxylic acids, effect of substituents on acidic strength. Typical reactions of dicarboxylic acids , hydroxy acids and unsaturated acids.
Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilicsustitution at acyl group -Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann- bromamide degradation and Curtius rearrangement.

Suggested Readings:

Text Books:

1. Morrison, R. T. & Boyd, R. N. (1992). *Organic Chemistry*. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Reference Books:

1. Finar, I. L. (2002). *Organic Chemistry.* Volume 1. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Graham Solomons, T.W. (2012).*Organic Chemistry*. John Wiley & Sons, Inc.

Semester-II16CHU211 CHEMICAL THERMODYNAMICS AND ITS APPLICATIONS PRACTICAL 2H 1C

Instruction Hours/week:L: 0 T:0 P:2 Marks: Internal:40 External: 60 Total:100

Course Objectives

The Students have a present knowledge

- To measure the heat capacity of a calorimeter
- To determine the enthalpy of neutrilisation.
- To determine the ionisation of solution.
- To determine the enthalpy of hydration of salt.
- To measure the integral enthalpy of solution
- To determine the basicity of a diprotic acid

Course Outcomes (CO's)

It enables the students calculate

1. The heat capacity of a calorimeter
2. The enthalpy of neutrilisation,
3. Calculated the ionisation of solution.
4. Calculated the enthalpy of hydration of salt.
5. The integral enthalpy of solution
6. The basicity of a diprotic acid

Methodology

Calorimeters, thermometers,

Thermochemistry:

(a) Determination of heat capacity of a calorimeter for different volumes using (i) change ofenthalpy data of a known system (method of back calculation of heat capacity of calorimeterfrom known enthalpy of solution of sulphuric acid or enthalpy of neutralization), and (ii) heatgained equal to heat lost by cold water and hot water respectively

(b) Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.

(c) Determination of the enthalpy of ionization of ethanoic acid.

(d) Determination of integral enthalpy (endothermic and exothermic) solution of salts.

(e) Determination of basicity of a diprotic acid by the thermochemical method in terms of the changes of temperatures observed in the graph of temperature versus time for different additions of a base. Also calculate the enthalpy of neutralization of the first step.

(f) Determination of enthalpy of hydration of salt.

(g) Study of the solubility of benzoic acid in water and determination of ΔH.

SuggestedReadings:

Text Books:

1. Khosla, B. D.; Garg, V. C. & Gulati, A.(2011). *Senior Practical Physical Chemistry*. New Delhi: R. Chand & Co.

Reference Books:

2. Athawale, V. D. & Mathur, P. (2011). *Experimental Physical Chemistry*.New Delhi: New Age International.

Semester-II

16CHU212 S-BLOCK ANDP-BLOCK ELEMENTS PRACTICAL4H 2C

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

The students have to be analyse

- The estimate the metal ions by iodimetric titrations
- The estimate the metal ions by complexemetric titrations using EDTA
- The carryout the preparations of inorganic metal complexes.
- Prepare cuprous chloride
- Prepare Manganese (III) phosphate
- Prepare potash alum and chrome alum.

Course Outcomes

The students have analyse

1. The iodometric titration methods.
2. The complexometric titration methods
2. The preparation the s and p-block metal complexes.
4. Preparation of cuprous chloride
5. Preparation of Manganese (III) phosphate
6. Preparation of potash alum and chrome alum.

Methodology

Iodimetric titrations, Complexometric titrations, Inorganic preperations.

(A) Iodo / Iodimetric Titrations

(i) Estimation of Cu(II) and $K_2Cr_2O_7$ using sodium thiosulphate solution (Iodometrically).

(ii) Estimation of antimony in tartar-emetic iodimetrically

(B) Complexometric titrations using disodium salt of EDTA

(i) Estimation of Mg^{2+}, Zn^{2+}

(ii) Estimation of $Ca^{2+}$by substitution method

(C) Inorganic preparations

(i) Cuprous Chloride, Cu_2Cl_2

(ii) Manganese(III) phosphate, $MnPO_4.H_2O$

(iii) Aluminium potassium sulphate $KAl(SO_4)_2.12H_2O$ (Potash alum) or
Chrome alum.

Suggested Readings

Text Books

1. Vogel, A.I. (1978). *A Textbook of Quantitative Inorganic Analysis*, ELBS.

Reference Books

2. Marr, G. and Rockett, R.W. (1972). *Practical Inorganic Chemistry*, Van Nostrand Reinhold.
3. Deepak Pant.P. (2010). *Inorganic Chemistry Practical*, BookRix.

Semester-II

16CHU 213 OXYGEN CONTAINING FUNCTIONAL GROUPS PRACTICAL **2H 1C**

Instruction Hours/week:L: 0 T:0 P:2 Marks: Internal:40 External: 60 Total:100

Course Objectives

The Students have a present knowledge

- To analyse the organic functional groups like alcohols, phenols carbonyl and carboxylic acid groups
- To demonstrate the preparations of organic compounds by acylation reactions
- To demonstate the preparations of organic compounds by benzyloation reactions.
- To carry out the iodoform reactions and selective reductions.
- To prepare semicarbazone derivatives of ketones
- To prepare S-Benzylisothiouronium salt of aromatic acids.

Course Outcomes

The student know to classifying the

1. Identification the organic functional groups like alcohols, phenols carbonyl and carboxylic acid groups
2. Preparation organic compounds by acylation reactions
3. Preparation organic compounds by benzoylation reactions.
4. Iodoform reactions and selective reductions.
5. Preparations semicarbazone derivatives of ketones
6. Preparations S-Benzylisothiouronium salt of aromatic acids.

Methodology

Laboratory experiments, acylation, benzyolation

1.Functional group tests for alcohols, phenols, carbonyl and carboxylic acid group.

2.Organic preparations:

i. Acetylation of one of the following compounds: amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine) and phenols (β -naphthol, vanillin, salicylic acid) by any one method:

a. Using conventional method.

b. Using green approach

ii. Benzolyation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m-,p-anisidine) and one of the following phenols (β -naphthol, resorcinol, p- cresol)by Schotten-Baumann reaction.

iii. Oxidation of ethanol/ isopropanol (Iodoform reaction).

iv. Selective reduction of meta dinitrobenzene to m-nitroaniline.

v. Hydrolysis of amides and esters.

vi. Semicarbazone of any one of the following compounds: acetone, ethyl methyl ketone, cyclohexanone, benzaldehyde.

vii. S-Benzylisothiouronium salt of one each of water soluble and water insoluble acids (benzoic acid, oxalic acid, phenyl acetic acid and phthalic acid).

viii. Aldol condensation using either conventional or green method.

The above derivatives should be prepared using 0.5-1g of the organic compound. The solid samples must be collected and may be used for recrystallization and melting point.

SuggestedReadings

Text Books:

1. Mann, F.G. & Saunders, B.C.(2009). *Practical Organic Chemistry*. Pearson Education.
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. (2012). *Practical Organic Chemistry*. 5th Ed., Pearson.

Reference Books:

1. Ahluwalia, V.K. &Aggarwal, R. (2000).*Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis*. University Press.
2. Ahluwalia, V.K. &Dhingra, S. (2000). *Comprehensive Practical Organic Chemistry: Qualitative Analysis*. University Press.

Semester-II

16AEC201 ENVIRONMENTAL STUDIES4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

It enables the students to

- The fundamental terms and definitions of environment
- Recall the Renewable and Non-renewable Resources.
- Quote the Biodiversity and Its Conservation
- Outline about Environmental Pollution
- Discuss the disaster management
- Discuss the Social Issues and the Environment

Course outcomes (CO's)

The students know about the explanation of

1. Fundamental terms and definitions of environment
2. Renewable and Non-renewable Resources.
3. Biodiversity and Its Conservation
4. Environmental Pollution
5. Gained knowledge about disaster management
6. Social Issues and the Environment

UNIT-I

Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

UNIT II: Natural Resources

Renewable and Non-renewable Resources:

Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources : Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Fire accidents and prevention.

UNIT III: Biodiversity and Its Conservation

Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT IV: Environmental Pollution

Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution , Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Diaster management: Foods, earthquake, cyclone and landslides.

UNIT V: Social Issues and the Environment

From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rahabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions.Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation.Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

Suggested Readings:

Text Books

1.Tripathy.S.N. & Sunakar Panda. (2004). *Fundamentals of Environmental Studies*. 2nd Edition. New Delhi: Vrianda Publications Private Ltd.
2. Arvind Kumar .(2004). *A Textbook of Environmental Science*.New Delhi: APH Publishing Corporation.
3. Verma P.S., &.Agarwal. V.K.(2001). *Environmental Biology :Principles of Ecology*. New Delhi: S.Chand and Company Ltd.

Reference Books

1. Anubha Kaushik, C.P.&Kaushik, (2004). *Perspectives in Environmental Studies*. New Delhi: New Age International Pvt. Ltd. Publications.
2. Singh, M.P., Singh, B.S. & Soma S. Dey, (2004). *Conservation of Biodiversity and Natural Resources*.Delhi: Daya Publishing House.
3. Daniel B.Botkin & Edward A.Keller. (1995). *Environmental Science*. NewYork:John Wiley and Sons, Inc.
4. Uberoi, N.K., (2005). *Environmental Studies*,New Delhi, India: Excel Books Publications.

Semester-III

16CHU301 PHYSICAL CHEMISTRY III 4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The students should be able

- To illustrate the phase equilibrium.
- Understand the Clacius-Clapeyron equation and its applications.
- To explain the theory behind three component systems
- To summarize about electrochemical cells and EMF measurements
- To discuss the applications of EMF measurements
- To contrast the fundamentals of surface chemistry

Course Outcomes

The students have gained knowledge to summarise

1. The concept of Phase equilibria and phase diagrams
2. Understood the Clacius-Clapeyron equation and its applications.
3. About three component systems and their characteristic properties
4. Different types of electrochemical cells and EMF measurements
5. Applictions of EMF measurements in determining thermodynamic properties
6. The basics of surface chemistry.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Phase Equilibria: Concept of phases, components and degrees of freedom, derivation of Gibbs Phase Rule for nonreactive and reactive systems; Clausius-Clapeyron equation and itsapplications to solid-liquid, liquid-vapour and solid-vapour equilibria, phase diagram for onecomponent systems (H_2O and S), with applications. Phase diagrams for systems of solid-liquid equilibria involving eutectic, congruent and incongruent melting points.

UNIT II

Three component systems: triangular plots, water-chloroform-acetic acid system. Binary solutions: Gibbs-Duhem-Margules equation, its derivation and applications to fractional distillation of binary miscible liquids (ideal and non ideal), azeotropes, lever rule, partial miscibility of liquids, CST, miscible pairs, steam distillation. Nernst distribution law: its derivation and applications.

UNIT III

Electrochemical Cells: Rules of oxidation/reduction of ions based on half-cell potentials,applications of electrolysis in metallurgy and industry. Chemical cells, reversible and irreversible cells with examples. Electromotive force of a cell and its measurement, Nernst equation; Standard electrode (reduction) potential and its application to different kinds of half-cells.

UNIT IV

Application of EMF measurements in determining (i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinone-hydroquinone, glass and SbO/Sb_2O_3 electrodes. Concentration cells with and without transference, liquid junction potential; determination of activity coefficients and transference numbers. Qualitative discussion of potentiometric titrations (acid-base, redox, precipitation).

UNIT V

Surface chemistry: Physical adsorption, chemisorption, adsorption isotherms (Langmuir and Freundlich). nature of adsorbed state. Qualitative discussion of BET.

Suggested Readings:

Text Books:

1. Peter Atkins & Julio De Paula.(2010).*Physical Chemistry*. 9th Ed. Oxford University Press.
2. Castellan, G. W. (2004).*Physical Chemistry*. 4th Ed. Narosa
3. McQuarrie, D. A. & Simon, J. D. (2004).*Molecular Thermodynamics*. New Delhi : Viva Books Pvt. Ltd. • Engel, T. & Reid, P.(2012).*Physical Chemistry*. 3rd Ed. Prentice-Hall

Reference Books

1. Assael, M. J., Goodwin, A. R. H., Stamatoudis, M., Wakeham, W. A. & Will, S. (2011). *CommonlyAsked Questions in Thermodynamics*. NY : CRC Press.
2. Zundhal, S.S. (2011). *Chemistry concepts and applications*. Cengage India • Ball, D. W. (2012). *Physical Chemistry*. Cengage India.
3. Mortimer, R. G. (2009).*Physical Chemistry*. 3rd Ed. Elsevier: NOIDA, UP.
4. Levine, I. N. (2011).*Physical Chemistry*. 6th Ed. Tata McGraw-Hill.
5. Metz, C. R. (2009).*Physical Chemistry*. 2nd Ed. Tata McGraw-Hill.

Semester-III

16CHU302 INORGANIC CHEMISTRY III

(Coordination Chemistry) 4H 4C

Instruction Hours/week:L:40 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The students should be able

- To discuss the key features of coordination compounds,
- Understand the nomenclature, isomerism and types in coordination compounds.
- To describe thevarious theories to explain the characteristics of coordination compounds.
- To contrast the nature of transition elements and their compounds.
- To contrast about the occurrence, preparation and properties of Lanthanides and actinides.
- To discuss about the fundamentals of Inorganic reaction mechanisms.

Course Outcomes

The students have gained knowledge to summarise

1. Recognise the role played by transition metal complexes play in Inorganic Chemistry.
2. Understood the nomenclature, isomerism and types in coordination compounds.
3. Describe the structure and bonding theories, electronic and magnetic properties of the transition metal complexes and their kinetic studies.
4. Explain the theories of bonding in coordination compounds and their experimental behaviour.
5. Recognise and explain the interaction of metal ions with biological ligands.
6. Explain the role of Inorganic “substances” in living systems and the use of metal ions in medicinal therapy and diagnosis

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Coordination Chemistry:

Werner’s theory, valence bond theory (inner and outer orbital complexes), electroneutrality principle and back bonding. Crystal field theory, measurement of 10 Dq (Δo), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of 10 Dq (Δo, Δt). Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem, square planar geometry. Qualitative aspect of Ligand field and MO Theory.

UNIT II

IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, polynuclear complexes, Labile and inert complexes.

UNIT III

Transition Elements:

General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer diagrams) Different between the first, second and third transition series. Chemistry of Cr, Mn, Fe and Co in various oxidation states with special reference to the following compounds: peroxo compounds of chromium, potassium dichromate, potassium permanganate, potassium ferrocyanide, potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite.

UNIT IV

Lanthanoids and Actinoids:

Electronic configuration, oxidation states, colour, spectral and magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only).

UNIT V

Inorganic Reaction Mechanism

Introduction to inorganic reaction mechanisms. Substitution reactions in square planarcomplexes, Trans- effect, theories of trans effect. Thermodynamic and Kinetic stability.

Suggested Readings

Text Books:

1. Purcell, K.F & Kotz, J.C. (1980).*An Introduction toInorganic Chemistry*.W.B. Saunders Co.
2. Huheey, J.E. (1993).*Inorganic Chemistry*. Prentice Hall.

Reference Books

1. Cotton, F.A. & Wilkinson, G. (1999).*Advanced Inorganic Chemistry*.Wiley-VCH.
2. Greenwood, N.N. & Earnshaw A. (2006).*Chemistry of the Elements*. Butterworth-Heinemann.
3. Miessler, G. L. &. Tarr, Donald A. (2009).*Inorganic Chemistry.* 3rd Ed.(adapted),Pearson.

Semester-III

16CHU303 ORGANIC CHEMISTRY III 4H 4C

(Nitrogen Containing Functional Groups, Heterocyclic chemistry and natural products)

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

CourseObjectives

The students should be able

- To contrast the preparation and properties of compounds with nitrogen containing functional groups.
- Understand the preparation and properties of diazoniumsalts.
- Learn about polynuclear hydrocarbons,
- Know about five, six and fused membered heterocyclic compounds.
- To discuss the preparation and reactions of alkaloids
- To discuss the preparation and reactions of terpenes.

CourseOutcomes

The students have summarise

1. The preparation and properties of compounds with nitrogen containing functional groups.
2. Understood the preparation and properties of diazonium salts.
3. Learned about the polynuclear hydrocarbons.
4. Knowledge about five, six and fused membered heterocyclic compounds.
5. The preparation and reactions of alkaloids
6. The preparation and reactions of terpenes.

Methodology

Blackboard teaching, Power point presentation and group discussion.

UNIT I

Nitrogen Containing Functional Groups

Preparation and important reactions of nitro compounds, nitriles and isonitriles.

Amines: Preparation and properties: Effect of substituent and solvent on basicity; Gabriel phthalimide synthesis, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction; Distinction between 1°, 2° and 3° amines with Hinsberg reagent and nitrous acid.

UNIT II

Diazonium Salts: Preparation and their synthetic applications.

Polynuclear Hydrocarbons

Aromaticity of polynuclear hydrocarbons, structure elucidation of naphthalene; Preparation and properties of naphthalene, phenanthrene and anthracene.

UNIT III

Heterocyclic Compounds

Classification and nomenclature, Structure, aromaticity in 5-numbered and 6-membered rings containing one heteroatom; Synthesis, reactions and mechanism of substitution reactions of: Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis),

UNIT IV

Indole(Fischer indole synthesis and Madelung synthesis), Quinoline and isoquinoline, (Skraup synthesis, Friedlander's synthesis, Knorr quinoline synthesis, Doebner- Miller synthesis, Bischler-Napieralski reaction, Pictet-Spengler reaction, Pomeranz-Fritsch reaction)

UNIT V

Alkaloids

Natural occurrence, General structural features, Isolation and their physiological action, Hoffmann's exhaustive methylation, Emde's modification; Structure elucidation and synthesis of Nicotine. Medicinal importance of Nicotine, Hygrine, Quinine, Morphine, Cocaine, and Reserpine.

Terpenes

Occurrence, classification, isoprene rule; Elucidation of stucture and synthesis of Citral.

SuggestedReadings

Text Books:

1. Morrison, R. T. & Boyd, R. N.(1992). *Organic Chemistry*. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. (2002).*Organic Chemistry*. Volume 1. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Reference Books

1. Finar, I. L.(2002).*Organic Chemistry*: *Stereochemistry and the Chemistry of Natural Products*. Volume 2. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Acheson, R.M. (1976). *Introduction to the Chemistry of Heterocyclic compounds*. John Welly& Sons.
3. Graham Solomons, T.W.(2012).*Organic Chemistry*. John Wiley & Sons, Inc.
4. Kalsi, P. S.(2009).*Textbook of Organic Chemistry*. 1st Ed. New Age International (P) Ltd. Pub.
5. Clayden, J., Greeves, N., Warren, S. & Wothers, P.(2012).*Organic Chemistry*. Oxford University Press.
6. Singh, J.; Ali, S.M. & Singh, J. (2010).*Natural Product Chemistry*. PrajatiParakashan.

Semester-III

16CHU311 PHASE EQUILIBRIA AND CHEMICAL KINETICS4H 2C PRACTICAL

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

It enables the students to Paraphrase the

- To Determine of critical solution temperature (CST) and
- To Determine of eutectic temperature
- To Determine distribution coefficients of two immisible solutions.
- To construct of the phase diagram using cooling curves or ignition tube method: a. simple eutectic and b. congruently melting systems.
- To apply their knowledge in Potentiometry to laboratory.
- To perform the potentiometric titrations.

Course Outcomes

The students able to determine,

1. Apply their knowledge in Phase equilibria
2. Determination of critical solution temperature (CST) and
3. Determination of eutectic temperature
4. Determination distribution coefficients of two immisible solutions.
5. Apply their knowledge in Potentiometry to laboratory.
6. Perform the titrations potentiometrically.

Methodology

Potentiometer, electrochemical experiments

Phase Equilibria:

I. Determination of critical solution temperature and composition at CST of the phenolwater system and to study the effect of impurities of sodium chloride and succinic acid on it.

II. Phase equilibria: Construction of the phase diagram using cooling curves or ignition tube method: a. simple eutectic and b. congruently melting systems.

III. Distribution of acetic/ benzoic acid between water and chloroform or cyclohexane.

IV. Study the equilibrium of at least one of the following reactions by the distribution method:

(i) $I_2(aq) + I^-(aq) \rightarrow I_3(aq)$

(ii) $Cu^{2+}(aq) + nNH_3 \rightarrow Cu(NH_3)_n^{2+}$

Potentiometry:

V. Perform the following potentiometric titrations: i. Strong acid vs. strong base ii. Weak acid vs. strong base iii. Dibasic acid vs. strong base iv. Potassium dichromate vs. Mohr's salt

SuggestedReadings

Text Books:

1. Khosla, B. D., Garg, V. C. & Gulati, A. (2011). *Senior Practical Physical Chemistry*.25. New Delhi: R. Chand& Co.
2. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. (2003).*Experiments in Physical Chemistry*. 8th Ed. McGraw-Hill: New York.

Reference Books

1. Halpern, A. M. & McBane, G. C. (2003). *Experimental Physical Chemistry*. 3rd Ed.New York : W.H.Freeman & Co.

Semester-III

16CHU312 COORDINATION CHEMISTRY PRACTICAL 4H 2C

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

- Explain the principle of gravimetric analysis
- To estimate the amount of nickel present in the NiDMG
- Prepare coordination complexes
- To measure the 10Dq by spectrophotometrically.
- Justify the properties of coordination complexes
- To synthesise the ligand transfer reaction by substitution method.

Course outcomes

The students have to

1. Determine metals like Ni, Cu and Fe using the principle of gravimetric analysis
2. Estimate the amount of nickel present in the NiDMG
3. Prepare coordination complexes
4. Measurement of 10 Dq by spectrophotometric method
5. Justify the properties of coordination complexes
6. Synthesis of ammine complexes of Ni(II) and its ligand exchange reactions (e.g.bidentate ligands like acetylacetone, DMG, glycine) by substitution method.

Methodology

Precipitation and estimation, preparation of complexes, Measurement of properties

Gravimetric Analysis:

i. Estimation of nickel (II) using Dimethylglyoxime (DMG).
ii. Estimation of copper as CuSCN
iii. Estimation of iron as Fe_2O_3 by precipitating iron as $Fe(OH)_3$.
iv. Estimation of Al(III) by precipitating with oxine and weighing as $Al(oxine)_3$ (aluminium oxinate).

Inorganic Preparations:

i. Tetraamminecopper (II) sulphate, $[Cu(NH_3)_4]SO_4.H_2O$
ii. Acetylacetonate complexes of Cu^{2+}/Fe^{3+}
iii. Tetraamminecarbonatocobalt (III) nitrate
iv. Potassium tri(oxalato)ferrate(III)

Properties of Complexes

i. Measurement of 10 Dq by spectrophotometric method
ii. Synthesis of ammine complexes of Ni(II) and its ligand exchange reactions (e.g. bidentate ligands like acetylacetone, DMG, glycine) by substitution method.

Suggested Readings

TextBook

1. Vogel, A.I. (2002).*A text book of Quantitative Analysis*. ELBS.

Reference Book

1. Marr, G. & Rockett, B.W. (1972).*Practical Inorganic Chemistry*. Van Nostrand Reinhold.

Semester-III

16CHU313 NITROGEN CONTAINING FUNCTIONAL GROUPS, 4H 2C HETEROCYCLICCHEMISTRY AND NATURAL PRODUCTS PRACTICAL

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objective

This course enables the student to

- Identify the presence of nitro
- Identify the presence of amine
- Identify the presence of amide groups
- Identify functional groups like alcohols.
- Identify functional groups of carboxylic acids.
- Identify the functional groups like phenols , carbonyl compounds and esters

Course Outcome

The students have analyse the

1. Functional group tests for nitrogen containing organic compounds
2. Identification of nitro group
3. Identification of amine group
4. Identification of amide
5. Tests used in the Identification of functional groups like alcohols, carboxylic acids
6. Identification of phenols , carbonyl compounds and esters

Methodology

Qualitative analysis of organic compounds

1.Functional group test for nitro, amine and amide groups.

2.Qualitative analysis of unknown organic compounds containing simple functional groups (alcohols, carboxylic acids, phenols , carbonyl compounds and esters)

SuggestedReadings

Text Books:

1. Mann, F.G. & Saunders, B.C.(2009). *Practical Organic Chemistry*. Pearson Education
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. (2012). *Practical Organic Chemistry*.5th Ed. Pearson.
3. Ahluwalia, V.K. &Aggarwal, R.(2000).*Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis*. University Press

Reference Books

1. Ahluwalia, V.K. &Dhingra, S. (2000).*Comprehensive Practical Organic Chemistry: QualitativeAnalysis*. University Press.

Semester-III

16CHU304A PHARMACEUTICAL CHEMISTRY 3H 3C

Instruction Hours/week:L:03 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the students to

- Perform the drug discovery process.
- To utalize the software to predict the ADMET.
- Build the synthesis of analgesic, antipyretic, anti-inflammatory agents
- Build the synthetic process of Central Nervous System and cardiovascular drugs.
- Restate the fermentation process
- Modify to prepare antibiotics and related compounds.

Course Outcome

The students have knowledge to create about the

1. Drug discovery
2. Utalization of the software using prediction of ADMET
3. Procedures to prepare analgesic, antipyretic, anti-inflammatory agents
4. Synthesis of Central Nervous System and cardiovascular drugs.
5. Fermentation process and preparation of antibiotics.
6. Modified the preparation of antibiotics and related compounds

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT 1

Drug discovery, design and development; Basic Retrosynthetic approach.

UNIT II

Synthesis of the representative drugs of the following classes: analgesic agents, antipyretic agents, anti-inflammatory agents (Aspirin, paracetamol, lbuprofen); antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir),

UNIT III

Synthesis of the representative drugs of the following classes: Central Nervous System agents (Phenobarbital, Diazepam),Cardiovascular (Glyceryl trinitrate), antilaprosy (Dapsone), HIV-AIDS related drugs (AZT- Zidovudine).

Fermentation

UNIT IV

Aerobic and anaerobic fermentation. Production of Ethyl alcohol and citric acid,

UNIT V

Production of (i) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.

Suggested Readings

Text Books:

1. Patrick, G.L.(1995). *Introduction to Medicinal Chemistry*.65. UK: Oxford University Press
2. Hakishan, V.K. Kapoor,(1996). *Medicinal and Pharmaceutical Chemistry,* New Delhi: Vallabh Prakashan. Pitampura.

Reference Books

1. William O. Foye, Thomas L., Lemke & David A. William.(2008).*Principles of MedicinalChemistry*. New Delhi: B.I. Waverly Pvt. Ltd.

Semester-III

16CHU304B IT SKILLS FOR CHEMISTS3H 3C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course Objectives

The course enables the student to gain knowledge in the mathematics and computer science to

- Interpret the Uncertainty in experimental techniques
- Statistical treatment
- Error analysis
- Summarise the types of algeberic operations
- Explain computer programming and to handle numeric data
- Illustrate the numerical modelling

Course Outcomes

1. Interpret the Uncertainty in experimental techniques and Statistical treatment
2. Under stood the knowledge of error analysis.
3. Formulate a set of calculations that can address a relevant research question;
4. Use one or several computer programs and extract useful information;
5. Write a research paper that describes methods, results, and interpretation;
6. Assess the meaning and validity of calculations that appear in the chemical literature

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Mathematics

Fundamentals, mathematical functions, polynomial expressions, logarithms, the exponential function, units of a measurement, interconversion of units, constants and variables, equation of a straight line, plotting graphs. Uncertainty in experimental techniques: Displaying uncertainties, measurements in chemistry, decimal places, significant figures, combining quantities. Uncertainty in measurement: types of uncertainties, combining uncertainties. Statistical treatment. Mean, standard deviation, relative error. Data reduction and the propagation of errors. Graphical and numerical data reduction. Numerical curve fitting: the method of least squares (regression).

UNIT II

Algebraic operations on real scalar variables (e.g. manipulation of Van der Waals equation in different forms).Roots of quadratic equations analytically and iteratively (e.g. pH of a weak acid). Numerical methods of finding roots (Newton-Raphson, binary –bisection, e.g. pH of a weak acid not ignoring the ionization of water, volume of a van der Waals gas, equilibrium constant expressions). Differential calculus: The tangent line and the derivative of a function, numerical differentiation (e.g., change in pressure for small change in volume of a Van der Waals gas, potentiometric titrations). Numerical integration (Trapezoidal and Simpson's rule, e.g. entropy/enthalpy change from heat capacity data).

UNIT III

Computer programming:

Constants, variables, bits, bytes, binary and ASCII formats, arithmetic expressions, hierarchy of operations, inbuilt functions. Elements of the BASIC language. BASIC keywords and commands. Logical and relative operators. Strings and graphics. Compiled versus interpreted languages. Debugging. Simple programs using these concepts. Matrix addition and multiplication. Statistical analysis.

UNIT IV

Introductory writing activities: Introduction to word processor and structure drawing (ChemSketch) software. Incorporating chemical structures, chemical equations, expressions from chemistry (e.g. Maxwell-Boltzmann distribution law, Bragg's law, van der Waals equation, etc.) into word processing documents.

Handling numeric data: Spreadsheet software (Excel), creating a spreadsheet, entering and formatting information, basic functions and formulae, creating charts, tables and graphs. Incorporating tables and graphs into word processing documents. Simple calculations, plotting graphs using a spreadsheet (Planck's distribution law, radial distribution curves for hydrogenic orbitals, gas kinetic theory- Maxwell-Boltzmann distribution curves as function of temperature and molecular weight), spectral data, pressure-volume curves of van der Waals gas (van der Waals isotherms), data from phase equilibria studies. Graphical solution of equations.

UNIT V

Numeric modelling: Simulation of pH metric titration curves. Excel functions LINEST and Least Squares. Numerical curve fitting, linear regression (rate constants from concentrationtime data, molar extinction coefficients from absorbance data), numerical differentiation (e.g. handling data from potentiometric and pH metric titrations, pKa of weak acid), integration (e.g. entropy/enthalpy change from heat capacity data).

Statistical analysis: Gaussian distribution and Errors in measurements and their effect on data sets. Descriptive statistics using Excel.

Suggested Readings

Text Books:

1. McQuarrie, D. A. (2008). *Mathematics for Physical Chemistry*. University Science Books
2. Mortimer, R.(2005). *Mathematics for Physical Chemistry*. 3rd Ed. Elsevier
3. Steiner, E. (1996). *The Chemical Maths Book*. Oxford University Press.
4. Yates, P.(2007). *Chemicalcalculations.* 2nd Ed. CRC Press.
5. Harris, D. C. (2007). *Quantitative Chemical Analysis*. 6th Ed. Freeman Chapters 3-5.

Reference Books

1. Levie, R. de. (2001). *How to use Excel in analytical chemistry and in general scientific data Analysis*. Cambridge Univ. Press 487 pages.
2. Noggle, J. H. (1985).*Physical chemistry on a Microcomputer.* Little Brown & Co.
3. Venit, S.M. (1996).*Programming in BASIC: Problem solving with structure and style*. Delhi :Jaico Publishing House.

Semester-III

16CHU314A PHARMACEUTICAL CHEMISTRY PRACTICAL 3H 1C

Instruction Hours/week:L:0 T:0 P:03 Marks: Internal:40 External: 60 Total:100

Course Objective

The course enables the student to

- Develop the synthesis of pharmaceutical drugs like aspirin
- Synthesis of magnesium bisilicate.
- Determine the melting point of aspirin
- Spectral characterization of aspirin
- Determine the melting point of antacid
- Spectral characterization of antacid

Course Outcome

The students restate the

1. Synthesis of pharmaceutical drugs like aspirin
2. Synthesis of magnesium bisilicate.
3. Determination of the melting point of aspirin
4. Spectral characterization of aspirin
5. Determine the melting point of antacid
6. Spectral characterization of antacid

Methodology

Practicals

1. Preparation of Aspirin and its analysis.
2. Preparation of magnesium bisilicate (Antacid).

Suggested Readings

Text Books:

1. Patrick G.L. (1995): Introduction to *Medicinal Chemistry*. UK:Oxford UniversityPress.
2. Hakishan, V.K. Kapoor, (1996)*Medicinal and Pharmaceutical Chemistry*.New Delhi: VallabhPrakashan. Pitampura.

Reference Books

1. William O. Foye, Thomas L., Lemke ,& David A. William.(2008).*Principles of MedicinalChemistry*. New Delhi: B.I. Waverly Pvt. Ltd.

Semester-III

16CHU314B IT SKILLS FOR CHEMISTS PRACTICAL3H 1C

Instruction Hours/week: L:0 T:0 P:3Marks: Internal: 40 External: 60 Total:100

Course Objectives

The course enables the student to

- Describe the rules and the methods to be followed in the computer programming.
- Describe the basic programme of curve fitting
- Describe the numerical differentiation and intergration.
- Interpret Statistical analysis of the numeric data.
- Draw the chemical structure using software
- Understand the statistical significance testing.

Course Outcome

The students have to explained the

1. The rules and the methods to be followed in the computer programming.
2. the basic programme of curve fitting
3. The numerical differentiation and intergration.
4. Interpretion of Statistical analysis of the numeric data.
5. Draw the chemical structure using software
6. Under stood the statistical significance testing.

Methodology

Computer programming, Chem draw or related softwares.

BASIC programs for curve fitting, numerical differentiationand integration (Trapezoidal rule, Simpson's rule), finding roots (quadratic formula, iterative, Newton-Raphson method).
Structure drawing software.

Statistical significance testing: The *t* test. The *F* test.
Presentation: Presentation graphics

SuggestedReadings

Text Books:

1. McQuarrie, D. A.(2008). *Mathematics for Physical Chemistry*. University Science Books
2. Mortimer, R. (2005).*Mathematics for Physical Chemistry*. 3rd Ed. Elsevier.
3. Steiner, E. (1996).*The Chemical Maths Book.* Oxford University Press. Yates, P.(2007)*Chemical calculations*. 2nd Ed. CRC Press.
4. Harris, D. C. (2007). *Quantitative Chemical Analysis*. 6th Ed. Freeman Chapters 3-5.

Reference Books

1. Levie, R. de. (2001). *How to use Excel in analytical chemistry and in general scientific data analysis*, Cambridge Univ. Press 487 pages.
2. Noggle, J. H.(1985).*Physical chemistry on a Microcomputer.* Little Brown & Co.
3. Venit, S.M. (1996).*Programming in BASIC: Problem solving with structure and style*. Delhi : Jaico Publishing House.

Semester-IV

16CHU401 PHYSICAL CHEMISTRY IV(Electrochemistry) 4H 4C

Instruction Hours/week:L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the students to

- Explain the types of conductance measurements and the factors affecting it
- Describe the ionic mobilities and the applications of conductance measurements
- Discuss the order and molecularity of reactions and the integrated rate expressions for different types of first order reactions.
- To knowledge about chemical kinetics
- Summarize the fundamentals of catalysis
- Restate the fundamentals of photochemistry.

Course Outcome

The students have to restated

1. The types of conductance measurements and the factors affecting it.
2. The ionic mobilities and the applications of conductance measurements
3. The order and molecularity of reactions and the integrated rate expressions for different types of first order reactions.
4. Gained knowledge about chemical kinetics.
5. The fundamentals of catalysis
6. The fundamentals of photochemistry.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Conductance: Quantitative aspects of Faraday's laws of electrolysis Arrhenius theory ofelectrolytic dissociation. Conductivity, equivalent and molar conductivity and their variationwith dilution for weak and strong electrolytes. Molar conductivity at 29 infinite dilution.Kohlrausch law of independent migration of ions. Debye-Hückel-Onsager equation, Wien effect,Debye-Falkenhagen effect, Walden's rules.

UNIT II

Ionic velocities, mobilities and their determinations,transference numbers and their relation to ionic mobilities, determination of transferencenumbers using Hittorf and Moving Boundary methods. Applications of conductancemeasurement: (i) degree of dissociation of weak electrolytes, (ii) ionic product of water (iii)solubility and solubility product of sparingly soluble salts, (iv) conductometric titrations, and (v)hydrolysis constants of salts.

UNIT III

Chemical Kinetics: Order and molecularity of a reaction, rate laws in terms of the advancementof a reaction, differential and integrated form of rate expressions up to second order reactions,experimental methods of the determination of rate laws, kinetics of complex reactions (integratedrate expressions up to first order only): (i) Opposing reactions (ii) parallel reactions and (iii)consecutive reactions and their differential rate equations (steady-state approximation in reactionmechanisms) (iv) chain reactions.

Unit IV

Temperature dependence of reaction rates; Arrheniusequation; activation energy. Collision theory of reaction rates, Lindemann mechanism,qualitative treatment of the theory of absolute reaction rates.
Catalysis: Types of catalyst, specificity and selectivity, mechanisms of catalyzed reactions at solid surfaces. Enzyme catalysis, Michaelis-Menten mechanism, acid-base catalysis.

Unit V
Photochemistry: Characteristics of electromagnetic radiation, Lambert-Beer's law and itslimitations, physical significance of absorption coefficients. Laws, of photochemistry, quantumyield, actinometry, examples of low and high quantum yields, photochemical equilibrium and thedifferential rate of photochemical reactions, photosensitised reactions, quenching. Role of
photochemical 34 reactions in biochemical processes, photostationary states,chemiluminescence.

Suggested Readings
Text Books:

1. Atkins, P.W & Paula, J.D.(2011).*Physical Chemistry*. 9th Ed. Oxford University Press.
2. Castellan, G. W.(2004).*Physical Chemistry*. 4th Ed. Narosa.
3. Mortimer, R. G. (2009).*Physical Chemistry*. 3rd Ed. Elsevier: NOIDA, UP.
4. Barrow, G. M.(2006). *Physical Chemistry*. 5th Ed. New Delhi : Tata McGraw Hill.

Reference Books

1. Engel, T. & Reid, P. (2012). *Physical Chemistry*. 3rd Ed. Prentice-Hall.
2. Rogers, D. W. (2010).*Concise Physical Chemistry*. Wiley.
3. Silbey, R. J., Alberty, R. A. & Bawendi, M. G. (2005).*Physical Chemistry*. 4th Ed. John Wiley & Sons,Inc.

Semester-IV

16CHU402 INORGANIC CHEMISTRY IV(Organometallic Chemistry)4H 4C

Instruction Hours/week:L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the student to discuss

- The Theoretical Principles in Qualitative Analysis to identify the cations and anions
- The classification of organometallic compounds based on bond type
- The few important metal complexes of commercial importance
- About 18 electron rule
- The catalytic property of organometallic compounds.
- The Metal ions present in biological systems

Course Outcome

The student have discussed

1. The Theoretical Principles in Qualitative Analysis to identify the cations and anions
2. The classification of organometallic compounds based on bond type
3. Few important metal complexes of commercial importance
4. About 18 electron rule
5. The catalytic property of organometallic compounds.
6. The Metal ions present in biological systems

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Theoretical Principles in Qualitative Analysis (H_2S Scheme)

Basic principles involved in analysis of cations and anions. Solubility products, common ion effect. Principles involved in separation of cations into groups and choice of group reagents. Interfering anions (fluoride, borate, oxalate and phosphate) and need to remove them after Group II.

UNIT II

Organometallic Compounds

Definition and classification of organometallic compounds on the basis of bond type.

Concept of hapticity of organic ligands. Metal carbonyls: 18 electron rule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d series. General methods of preparation (direct combination, reductive carbonylation, thermal and photochemical decomposition) of mono and binuclear carbonyls of 3d series. Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT. π-acceptor behaviour of CO (MO diagram of CO to be discussed), synergic effect and use of IR data to explain extent of back bonding.

UNIT III

Zeise's salt: Preparation and structure, evidences of synergic effect and comparison of synergic effect with that in carbonyls. Metal Alkyls: Important structural features of methyl lithium (tetramer) and trialkyl aluminium (dimer), concept of multicentre bonding in these compounds. Ferrocene: Preparation and reactions (acetylation, alkylation, metallation, Mannich Condensation). Structure and aromaticity. Comparison of aromaticity and reactivity with that of benzene.

UNIT IV

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals. Sodium / K-pump, carbonic anhydrase and carboxypeptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug.

Iron and its application in bio-systems, Haemoglobin, Myoglobin; Storage and transfer of iron.

UNIT V

Catalysis by Organometallic Compounds

Study of the following industrial processes and their mechanism:

1. Alkene hydrogenation (Wilkinson's Catalyst)
2. Synthetic gasoline (Fischer Tropsch reaction)
3. Polymerisation of ethene using Ziegler-Natta catalyst

Suggested Readings

Text Books:

1. Cotton, F.A., Wilkinson, G., & Gaus, P.L.(1993). *Basic Inorganic Chemistry*.3rd Ed. Wiley India.
2. Huheey, J. E., Keiter, E.A. & Keiter, R.L. (2006). *Inorganic Chemistry: Principles ofStructure and Reactivity*. 4th Ed.Harper Collins.Pearson.
3. Sharpe, A.G. (2005). *Inorganic Chemistry*, 4th Indian Reprint. Pearson Education.
4. Douglas, B. E.; McDaniel, D.H. & Alexander, J.J.(1994).*Concepts and Models in Inorganic Chemistry*. 3rdEd.NY*:*John Wiley and Sons.
5. Greenwood, N.N. & Earnshaw, A. (1997). *Chemistry of the Elements*.2nd Ed, Elsevier, (Ziegler Natta Catalyst and Equilibria in Grignard Solution).
6. Lee, J.D. (2008). *Concise Inorganic Chemistry*.5th Ed.John Wiley and sons.

Reference Books

1. Powell, P. (1988). *Principles of Organometallic Chemistry*, Chapman and Hall.
2. Shriver, D.D., Atkins, P. and Langford, C.H. (1994).*Inorganic Chemistry*.2nd Ed. OxfordUniversity Press.
3. Miessler, G. L. & Tarr, Donald A. (2010).*Inorganic Chemistr*. 4th Ed.Pearson.
4. Crabtree, Robert H. (2000). *The Organometallic Chemistry of the Transition Metals*.NY: John Wiley New York.
5. Spessard, Gary O., & Miessler, Gary L. (1996). *Organometallic Chemistry*. Upper SaddleRiver, NJ: Prentice-Hall.

Semester-IV

16CHU403 ORGANIC CHEMISTRY IV(Organic spectroscopy)4H 4C

Instruction Hours/week:L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the students to

- Discuss the principle and the theory behind the UV spectroscopy.
- Discuss the principle and the theory behind the IR spectroscopy.
- Explain the principle and the theory behind the NMR spectroscopy.
- Summarize about the occurrence, classification and their biological importance carbohydrates
- Justify about the classification of dyes.
- Justify about polymers and their types, prepartion and uses.

Course Outcome

The Student have gained knowledge about

1. The principle and the theory behind the UV spectroscopy.
2. The principle and the theory behind the IR spectroscopy.
3. The principle and the theory behind the NMR spectroscopy.
4. The occurrence, classification and their biological importance carbohydrates
5. The classification of dyes
6. Preparation ,types, properties and uses of polymers.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT 1

Organic Spectroscopy

General principles to absorption and emission spectroscopy.

UV Spectroscopy: Types of electronic transitions, λ_{max}, Chromophores and Auxochromes, Bathochromic and Hypsochromic shifts, Intensity of absorption; Application of Woodward Rules for calculation of λmax for the following systems: α,β-unsaturated aldehydes, ketones, carboxylic acids and esters; Conjugated dienes: alicyclic, homoannular and heteroannular; Extended conjugated systems (aldehydes, ketones and dienes); distinction between cis and trans isomers.

UNIT II

IR Spectroscopy: Fundamental and non-fundamental molecular vibrations; IR absorption positions of O, N and S containing functional groups; Effect of H-bonding, conjugation, resonance and ring size on IR absorptions; Fingerprint region and its significance; application in functional group analysis.

UNIT III

NMR Spectroscopy: Basic principles of Proton Magnetic Resonance, chemical shift and factors influencing it; Spin – Spin coupling and coupling constant; Anisotropic effects in alkene, alkyne, aldehydes and aromatics, Interpetation of NMR spectra of simple compounds.
Applications of IR, UV and NMR for identification of simple organic molecules.

UNIT IV

Carbohydrates

Occurrence, classification and their biological importance.
Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani- Fischer synthesis and Ruff degradation;
Disaccharides – Structure elucidation of maltose, lactose and sucrose.
Polysaccharides – Elementary treatment of starch, cellulose and glycogen.

UNIT V

Dyes

Classification, Colour and constitution; Mordant and Vat Dyes; Chemistry of dyeing;
Synthesis and applications of: Azo dyes – Methyl orange; Triphenyl methane dyes -
Malachite green and Rosaniline ; Phthalein Dyes – Phenolphthalein; Natural dyes – structure elucidation and synthesis of Alizarin and Indigotin; Edible Dyes with examples.

Polymers

Introduction and classification including di-block, tri-block and amphiphilic polymers;
Polymerisation reactions -Addition and condensation -Mechanism of cationic, anionic and free radical addition polymerization; Metallocene-based Ziegler-Natta polymerisation of alkenes;
Preparation and applications of plastics – thermosetting (phenol-formaldehyde, Polyurethanes) and thermosoftening (PVC, polythene); Fabrics – natural and synthetic (acrylic, polyamido, polyester); Rubbers – natural and synthetic: Buna-S, Chloroprene and Neoprene; Vulcanization; Polymer additives; Introduction
to; Biodegradable and conducting polymers with examples.

Suggested Readings

Text Book:

1. Kalsi, P. S.(2009).*Textbook of Organic Chemistry*. 1st Ed. New Age International (P) Ltd. Pub.
2. Morrison, R. T. & Boyd, R. N.(1992).*Organic Chemistry*. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Billmeyer, F. W.(1984).*Textbook of Polymer Science*. John Wiley & Sons, Inc.
4. Gowariker, V. R., Viswanathan, N. V. &Sreedhar, J.(2003).*Polymer Science*. New Age

International (P) Ltd. Pub.

Reference Books

1. Finar, I. L.(2002). *OrganicChemistry: Stereochemistry and the Chemistry of Natural Products.*Volume 2. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Clayden, J., Greeves, N., Warren, S. & Wothers, P.(2000).*Organic Chemistry*. Oxford University Press.
3. Singh, J.; Ali, S.M. & Singh, J. (2010).*Natural Product Chemistry*. PrajatiPrakashan.

Semester-IV

16CHU411 ELECTROCHEMISTRY PRACTICAL 4H 2C

Instruction Hours/week:L:0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the students to

- Perform in the conductance measurement,
- Determine of cell constant
- Determine the conductometric titrations
- Determine the kinetic aspects and rate measurements of different types of reactions.
- Determine the Acid hydrolysis of methyl acetate with hydrochloric acid.
- Determine the Saponification of ethyl acetate

Course Outcome

The Student have interpreted to

1. Measured the conductance
2. Determination of the cell constant
3. Determination of conductometric titrations
4. The kinetic aspects and rate measurements of different types of reactions.
5. Determination the Acid hydrolysis of methyl acetate with hydrochloric acid.
6. Determination of the Saponification of ethyl acetate

Methodology

Measurements with conductivity meters, reaction rate measurements

Conductometry:

I. Determination of cell constant

II. Determination of conductivity, molar conductivity, degree of dissociation and dissociation constant of a weak acid.

III. Perform the following conductometric titrations: i. Strong acid vs. strong base ii. Weakacid vs. strong base iii. Mixture of strong acid and weak acid vs. strong base iv. Strongacid vs. weak base

Chemical Kinetics:

IV. Study the kinetics of the following reactions.

1. Iodide-persulphate reaction (i) Initial rate method; (ii)Integrated rate method
2. Acid hydrolysis of methyl acetate with hydrochloric acid.
3. Saponification of ethyl acetate.
4. Comparison of the strengths of HCl and H_2SO_4 by studying kinetics of hydrolysis ofmethyl acetate.

Suggested Readings

Text Books:

1. Khosla, B. D., Garg, V. C. & Gulati, A. (2011).*Senior Practical Physical Chemistry*.New Delhi: R. Chand & Co.
2. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P.(2003).*Experiments in Physical Chemistry*.8th Ed. New York : McGraw-Hill

Reference Books

1. Halpern, A. M. & McBane, G. C. (2003).*Experimental Physical Chemistry*. 3rd Ed.New York: W.H. Freeman & Co.

Semester-IV

16CHU412 ORGANOMETALLIC CHEMISTRY PRACTICAL 4H 2C

Instruction Hours/week:L:0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

This lab course enables the student to

- Identify the anions and the cations in a mixture by Qualitative semimicro analysis
- Understand the chemistry of different reactions
- Identify the interfering anion
- Outline the principles behind the spot tests
- chromatographic separations
- Paper chromatographic separation of nickel and cobalt, copper and cadmium

Course Outcome

The students have

1. Identified the anions and the cations in a mixture by Qualitative semi micro analysis
2. Understood the chemistry of different reactions.
3. Identified the interfering anion
4. Define the principles behind the spot tests and
5. Define the Principles of chromatographic separations
6. Paper chromatographic separation of nickel and cobalt, copper and cadmium

Methodology

Qualitative semimicro analysis

Qualitative semimicro analysis of mixtures containing 3 anions and 3 cations. Emphasis should be given to the understanding of the chemistry of different reactions. The following radicals are suggested:
CO_3^{2-}, NO^{2-}, S^{2-}, SO_3^{2-},$S_2O_3^{2-}$, CH_3COO^-, F^-,Cl^-, Br^-, I-, NO^{3-}, BO_3^{3-}, $C_2O_4^{2-}$, PO_4^{3-}, NH^{4+}, K^+, Pb^{2+}, Cu^{2+}, Cd^{2+}, Bi^{3+}, Sn^{2+}, Sb^{3+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Zn^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}

Mixtures should preferably contain one interfering anion, **or** insoluble component ($BaSO_4$, $SrSO_4$, $PbSO_4$, CaF_2or Al_2O_3) **or** combination of anions e.g. $CO_3^{2-}$and SO_3^{2-}, NO2-and NO_3^-, Cl-and Br-Cl-and I-, Br-and I, $NO_3^-$and Br^-, $NO_3^-$and I^-

Spot tests should be done whenever possible.
Principles involved in chromatographic separations. Paper chromatographic separation of following metal ions:
i. Ni (II) and Co (II)
ii. Cu(II) and Cd(II)

Suggested Reading

1. Svehla,G. (1996)Vogel's*Qualitative Inorganic Analysis*, Longman, New York.

Semester-IV

16CHU413 ORGANIC SPECTROSCOPY PRACTICAL 4H 2C

Instruction Hours/week:L:0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course objectives

The student will able to develop and identify the

- Extraction caffeine from tea leaves.
- Preparation urea formaldehyde resin
- Qualitative analysis of unknown organic compounds
- Simple organic compounds by IR spectroscopy
- Simple organic compounds by NMR spectroscopy
- Preparation of methyl orange

Course outcome

The students have to catagorize and demonstrate

1. About the Extraction of caffeine from tea leaves.
2. The Preparation of urea formaldehyde resin
3. The qualitative analysis of unknown organic compounds
4. Identify simple organic compounds by IR spectroscopy
5. Identify simple organic compounds by NMR spectroscopy
6. The Preparation of methyl orange

Methodology

Spectroscopic methods UV, IR and NMR

1.Extraction of caffeine from tea leaves.

2.Preparation of urea formaldehyde resin.

3.Qualitative analysis of unknown organic compounds containing monofunctional groups (carbohydrates, aryl halides, aromatic hydrocarbons, nitro compounds, amines and amides) and simple bifunctional groups, e.g. salicylic acid, cinnamic acid, nitrophenols etc.

4.Identification of simple organic compounds by IR spectroscopy and NMR spectroscopy (Spectra to be provided).

5.Preparation of methyl orange.

Suggested Readings

Text Books:

1. Vogel, A.I. (2012).*Quantitative Organic Analysis*. Part 3. Pearson.
2. Mann, F.G. & Saunders, B.C. (2009). *Practical Organic Chemistry*. Pearson Education
3. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. &Tatchell, A.R. (2012). *Practical Organic Chemistry*. 5th Ed. Pearson.

Reference Books

1. Ahluwalia, V.K. &Aggarwal, R. (2000*). Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis*. University Press.
2. Ahluwalia, V.K. &Dhingra, S. (2000).*Comprehensive Practical Organic Chemistry: QualitativeAnalysis*. University Press.

Semester-IV

16CHU404A GREEN METHODS IN CHEMISTRY 3H 3C

Instruction Hours/week:L:3 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the students to

- Summarize the twelve principles of green chemistry
- To know the special emphasis of an atom economy.
- Explain the catalysis and alternate sources of energy.
- Describe the process involved in the real word cases likeSurfactants for CO_2
- Synthetic azo pigments to replace toxic organic and inorganicpigments.
- Determination of environmentally safe marine antifoulant and plastic (poly lactic acid) made from corn.

Course outcome

1. Recognise the impact of green chemistry on human health and the environment.
2. Knowledge about the special emphasis of an atom economy.
3. Demonstrate the knowledge of the twelve principles of Green Chemistrywhich they can apply to a range of work places for a safer, less toxic and heal thier environment.
4. Described the process involved in the real word cases likeSurfactants for CO_2
5. Synthetic azo pigments to replace toxic organic and inorganicpigments.
6. Determination of environmentally safe marine antifoulant and plastic (poly lactic acid) made from corn.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Theory and Hand-on Experiments

Introduction: Definitions of Green Chemistry. Brief introduction of twelve principles of Green Chemistry, with examples, special emphasis on atom economy, reducing toxicity, green solvents,

UNIT II

Green Chemistry and catalysis and alternative sources of energy, Green energy and sustainability

UNIT III

The following Real world Cases in Green Chemistry should be discussed:

Surfactants for carbon dioxide – Replacing smog producing and ozone depletingsolvents with CO2 for precision cleaning and dry cleaning of garments.

UNIT IV

Designing of environmentally safe marine antifoulant.

Rightfit pigment: Synthetic azo pigments to replace toxic organic and inorganicpigments.

UNIT V

An efficient, green synthesis of a compostable and widely applicable plastic (polylactic acid) made from corn.

Suggested Readings

Text Books:

1. Anastas, P.T. & Warner, J.K. (2005).*Green Chemistry- Theory and Practical*. Oxford University Press.
2. Matlack, A.S. (2001).*Introduction to Green Chemistry*. Marcel Dekker.

Reference Books

1. Cann, M.C. & Connely, M.E. (2000). *Real-World cases in Green Chemistry*, American Chemical Society. Washington.

Semester-IV

16CHU404B ANALYTICAL CLINICAL BIOCHEMISTRY3H 3C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course objectives

This course enables the student to

- Classify the basic structure of carbohydrates, and fermentation processes.
- Classification and biological importance of Proteins.
- Classification and biological importance of lipids.
- Properties, functions and biochemical functions of steroid hormones
- Know the about enzyme ,classification , mechanism and factors affectingenzyme activity.
- Identify the biochemistry of diseases.

Courseoutcome

The students have knowledge to categorize

1. The basic structure of carbohydrates.
2. Classification and biological importance of Proteins.
3. Classification and biological importance of lipids.
4. Properties, functions and biochemical functions of steroid hormones
5. Knowledge about enzyme, classification, mechanism and factors affectingenzyme activity.
6. The biochemistry of diseases.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

Unit I

Carbohydrates: Biological importance of carbohydrates, Metabolism, Cellular currency of energy (ATP), Glycolysis, Alcoholic and Lactic acid fermentations, Krebs cycle.
Isolation and characterization of polysachharides.

Unit II

Proteins: Classification, biological importance; Primary and secondary and tertiary structures of proteins: α-helix and β- pleated sheets, Isolation, characterization, denaturation of proteins.
Enzymes: Nomenclature, Characteristics (mention of Ribozymes), Classification; Active site, Mechanism of enzyme action, Stereospecificity of enzymes, Coenzymes and cofactors, Enzyme inhibitors, Introduction to Biocatalysis: Importance in "Green Chemistry" and Chemical Industry.

Unit III

Lipids: Classification. Biological importance of triglycerides and phosphoglycerides and cholesterol; Lipid membrane, Liposomes and their biological functions and underlying applications.

Lipoproteins.

Unit IV

Properties, functions and biochemical functions of steroid hormones.
Biochemistry of peptide hormones.
Structure of DNA (Watson-Crick model) and RNA, Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation, Introduction to Gene therapy.
Enzymes: Nomenclature, classification, effect of pH, temperature on enzyme activity, enzyme inhibition.

Unit V

Biochemistry of disease: A diagnostic approach by blood/ urine analysis.
Blood: Composition and functions of blood, blood coagulation. Blood collection and preservation of samples. Anaemia, Regulation, estimation and interpretation of data for blood sugar, urea, creatinine, cholesterol and bilirubin.
Urine: Collection and preservation of samples. 6. Formation of urine. Composition and estimation of constituents of normal and pathological urine.

Suggested Readings

Text Books:

1. Cooper, T.G. (1977). *Tool of Biochemistry.* John Wiley and Sons.
2. Keith Wilson & John Walker.(1994).*Practical Biochemistry*. Cambridge University Press.
3. Alan H Gowenlock,(2005). Varley's.*Practical Clinical Biochemistry*.CBS Publisher.
4. Thomas M. Devlin.(2009).*Textbook of Biochemistry*. Academic Internet Publishers.
5. Berg, J.M., Tymoczko, J.L. & Stryer, L.(2002).*Biochemistry*. W.H. Freeman.

Reference Books

1. Nelson, D. L. & Cox, M. M.(2008).*Lehninger's Principles of Bioch*emistry. 7th Ed.W. H. Freeman.
2. Harwood. (1990). *Series on Analytical Chemistry*. John Wiley & Sons.

Semester-IV

16CHU414A GREEN METHODS IN CHEMISTRY PRACTICAL3H 1C

Instruction Hours/week:L:0 T:0 P:3 Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the student to

- Apply the principles and the practical aspects of green chemistry
- Prepare biodiesel from vegetable oil.
- Prepare phthalocyaninecomplex of Cu (II).
- Characterise the biodiesel.
- Mechano chemical solvent free synthesis of azomethine.
- Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper(II)

Course outcome

The students have to use

1. The basic principles and practical aspects like preparations and characterization in green approach.
2. Preparation and characterization of biodiesel from vegetable oil.
3. Characterization of biodiesel from vegetable oil.
4. Preparation of phthalocyaninecomplex of Cu(II).
5. Mechano chemical solvent free synthesis of azomethine.
6. Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper(II).

Methodology

Greener methods of preparation and characterisation

Practical's

1. Preparation and characterization of biodiesel from vegetable oil.
2. Extraction of D-limonene from orange peel using liquid CO2 prepared from dry ice.
3. Mechano chemical solvent free synthesis of azomethine.
4. Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper(II).

SuggestedReadings

Text Books:

1. Anastas, P.T. & Warner, J.K.(2005).*Green Chemistry- Theory and Practical*. Oxford University Press.
2. Matlack, A.S. (2001). *Introduction to Green Chemistry*. Marcel Dekker
3. Cann, M.C. & Connely, M.E. (2000).*Real-World cases in Green Chemistry*, American

Chemical Society. Washington.

Reference Books

1. Ryan, M.A. & Tinnesand, M. (2002).*Introduction to Green Chemistry*. American Chemical Society. Washington.
2. Lancaster, M.(2010).*Green Chemistry: An introductory text.* 2ndEdition.RSC publishing

Semester-IV

16CHU414B ANALYTICAL CLINICAL BIOCHEMISTRY PRACTICAL3H 1C

Instruction Hours/week: L:0 T:0 P:3Marks: Internal: 40 External: 60 Total:100

Course outcome

The course enables the student to

- Identify and estimate carbohydrates.
- Identify and estimate lipids.
- Estimate the iodine number of oils
- Determine the saponification number of oils.
- Determine Cholesterol.
- Determine proteins

Course outcome

The students have to perform

1. The Identification and estimation of carbohydrates, iodine number and saponification number of oils
2. The Identification and estimation of lipids.
3. Estimation of the iodine number of oils
4. Determination the saponification number of oils.
5. Determination of Cholesterol
6. The determination of proteins

Methodology

Identification and estimation of the following:

1. Carbohydrates – qualitative and quantitative.
2. Lipids – qualitative.
3. Determination of the iodine number of oil.
4. Determination of the saponification number of oil.
5. Determination of cholesterol using Liebermann- Burchard reaction.
6. Proteins – qualitative.
7. Isolation of protein.
8. Determination of protein by the Biuret reaction.
9. Determination of nucleic acids

Suggested Readings

Text Books:

6. Cooper, T.G. (1977). *Tool of Biochemistry.* John Wiley and Sons.

7. Keith Wilson & John Walker.(1994).*Practical Biochemistry*. Cambridge University Press.
8. Alan H Gowenlock,(2005). Varley's.*Practical Clinical Biochemistry*.CBS Publisher.
9. Thomas M. Devlin.(2009).*Textbook of Biochemistry*. Academic Internet Publishers.
10. Berg, J.M., Tymoczko, J.L. & Stryer, L.(2002).*Biochemistry*. W.H. Freeman.

Reference Books

3. Nelson, D. L. & Cox, M. M.(2008).*Lehninger's Principles of Bioch*emistry. 7th Ed.W. H. Freeman.
4. Harwood. (1990). *Series on Analytical Chemistry*. John Wiley & Sons.

Semester-V

16CHU501A CHEMOINFORMATICS3H 3C

Instruction Hours/week: L:3 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the student to

- Describe the principles of cheminformatics
- Explain the Representation of molecules and chemical reactions
- Predict the searching methods for chemical structures
- Predict the properties of molecules using computational methods
- QSAR studies
- Intepret the computer assisted structure elucidations.

Course outcomes

The students have presented the knowledge about

1. The principles of cheminformatics
2. The Representation of molecules and chemical reactions
3. The searching methods for chemical structures
4. The prediction of the properties of molecules using computational methods
5. QSAR studies
6. The computer assisted structure elucidations

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction to Chemoinformatics: History and evolution of chemoinformatics, Use of chemoinformatics, Prospects of chemoinformatics, Molecular Modelling and Structure elucidation.

UNIT II

Representation of molecules and chemical reactions: Nomenclature, Different types of notations, SMILES coding, Matrix representations, Structure of Molfiles and Sdfiles, Libraries and toolkits, Different electronic effects, Reaction classification.

UNIT III

Searching chemical structures: Full structure search, sub-structure search, basic ideas, similarity search, three dimensional search methods, basics of computation of physical and chemical data and structure descriptors, data visualization.

UNIT IV

Applications: Prediction of Properties of Compounds; Linear Free Energy Relations; Quantitative Structure-Property Relations; Descriptor Analysis; Model Building; Modeling

Toxicity; Structure-Spectra correlations; Prediction of NMR, IR and Mass spectra;

UNIT V

Computer Assisted Structure elucidations; Computer Assisted Synthesis Design, Introduction to drug design; Target Identification and Validation; Lead Finding and Optimization; Analysis of HTS data; Virtual Screening; Design of Combinatorial Libraries; Ligand-Based and Structure Based Drug design; Application of Chemoinformatics in Drug Design.

Suggested Readings

Text Books:

1. Andrew R. Leach & Valerie, J. Gillet (2007). *An introduction to Chemoinformatics.* Springer: The Netherlands.
2. Gasteiger, J. & Engel, T. (2003).*Chemoinformatics: A text-book.* Wiley-VCH.

Reference Book

1. Gupta, S. P. (2011).*QSAR & Molecular Modeling.* New Delhi: Anamaya Pub.

Semester-V

16CHU501B CHEMISTRY OF COSMETICS & PERFUMES3H 3C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course objectives

This skill enhancement course helps the student to

- Develop the preparation of hair dyes, hair spray and shampoos
- Develop the preparation of Hair spray
- Describe the preparation and uses of lotions,
- Describe the preparation and uses lipsticks
- Describe the preparation and uses talcum powder and Creams.
- Demonstrate the chemistry of essential oils

Course outcome

The students have formulate the knowledge about

1. The preparation of hair dyes, hair spray and shampoos
2. The preparation and uses of lotions,
3. The preparation and uses of lipsticks and
4. The preparation and uses of talcum powder
5. The preparation and uses of creams
6. The chemistry of essential oils

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

Unit I

A general study including preparation and uses of the following: Hair dye, hair spray, Shampoo.

Unit II

preparation and uses of suntan lotions, face powder, lipsticks, talcum powder, nail enamel,

Unit III

preparation and uses of creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours.

Unit IV

Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil

Unit V

Essential oils and their importance in cosmetic industries with reference to eucalyptus, rose oil, 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone.

Suggested Readings

Text Books:

1. E. Stocchi. (1990).*Industrial Chemistry*. Vol –I. UK : Ellis Horwood Ltd.
2. P.C. Jain, M. Jain (2004).*Engineering Chemistry*. Delhi: Dhanpat Rai & Sons.

Reference Books

1. Sharma, B.K. & Gaur, H. (1996).*Industrial Chemistry*.Meerut : Goel Publishing House.

Semester-V

16CHU511A CHEMOINFORMATICS PRACTICAL3H 1C

Instruction Hours/week: L:0 T:0 P:3 Marks: Internal:40 External: 60 Total:100

Course objectives

The course helps the student to

- Apply the applications of chemiinformatics in drug design.
- Draw the chemical structure using chemdraw software.
- Molecular docking studies were carried using Autodock software.
- Predict ADME using swissadme software
- Learn Lipinski's rule of five using swissadme software.
- Predict drug likeness

Course outcome

The students know to perform the cheminformatics aspects in the drug designing process.

1. Applied the applications of chemiinformatics in drug design.
2. Draw the chemical structure using chemdraw software.
3. Molecular docking studies were carried using Autodock software.
4. Prediction ADME using swissadme software
5. Learned Lipinski's rule of five using swissadme software.
6. Prediction of drug likeness

Methodology

Computer softwares

Hands-on Exercises

Application of Chemoinformatics in Drug Design

Suggested Readings

Text Books:

1. Andrew R. Leach & Valerie, J. Gillet. (2007). *An introduction to Chemoinformatics.* Springer: The Netherlands.
2. Gasteiger, J. & Engel, T. (2003).*Chemoinformatics: A text-book.* Wiley-VCH.

Reference Book

1. Gupta, S. P. (2011). *QSAR & Molecular Modeling.* New Delhi: Anamaya Pub.

Semester-V

16CHU511B CHEMISTRY OF COSMETICS & PERFUMES PRACTICAL 3H 1C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course objectives

This course enables the student to

- Prepare of talcum powder.
- Prepare of shampoo.
- Prepare of enamels.
- Prepare of hair remover.
- Prepare of face cream.
- Prepare of nail polish and nail polish remover.

Course outcomes

Students have knowledge to compose about the

1. Preparation of talcum powder.
2. Preparation of shampoo.
3. Preparation of enamels.
4. Preparation of hair remover.
5. Preparation of face cream.
6. Preparation of nail polish and nail polish remover

Methodology

Preparations of cosmetics and perfumes

1. Preparation of talcum powder.
2. Preparation of shampoo.
3. Preparation of enamels.
4. Preparation of hair remover.
5. Preparation of face cream.
6. Preparation of nail polish and nail polish remover.

SuggestedReadings

Text Books:

1. E. Stocchi. (1990).*Industrial Chemistry*, Vol –I. UK: Ellis Horwood Ltd.
2. P.C. Jain, M. Jain(2004). *Engineering Chemistry*. Delhi: Dhanpat Rai & Sons.

Reference Book

1. Sharma, B.K. & Gaur, H. (1996). *Industrial Chemistry*. Meerut: Goel Publishing House.

Semester-V

16CHU502A POLYMER CHEMISTRY 4H 4C

Instruction Hours/week:L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the student to

- Recognize the history of polymeric materials, criteria, kinetics and characterization of polymerisation.
- Criteria for polymeric material formation.
- Learn Kinetics of polymerization.
- Understand Characterisation of polymerisation.
- To know the Structure property relationships of polymer
- Justify the properties of polymers

Course outcome

The students have list the knowledge like

1. History of polymeric materials.
2. Criteria for polymeric material formation.
3. Learned Kinetics of polymerization.
4. Understood Characterisation of polymerisation.
5. Knowledge about Structure property relationships of polymer.
6. Properties of polymers.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction and history of polymeric materials:

Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.

Functionality and its importance:

Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization. Bifunctional systems, Poly-functional systems.

UNIT II

Kinetics of Polymerization:

Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques.

Crystallization and crystallinity:
Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting point.

UNIT III

Nature and structure of polymers-Structure Property relationships.

Determination of molecular weight of polymers (*Mn*, *Mw*, etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersity index.

UNIT IV

Glass transition temperature (Tg) and determination of Tg, Free volume theory, WLF equation, Factors affecting glass transition temperature (Tg).

Polymer Solution – Criteria for polymer solubility, Solubility parameter, Thermodynamics of polymer solutions, entropy, enthalpy, and free energy change of mixing of polymers solutions, Flory- Huggins theory, Lower and Upper critical solution temperatures.

UNIT V

Properties of Polymers (Physical, thermal, Flow & Mechanical Properties).
Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers. Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers, polydienes,
Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide polypyrrole, polythiophene)].

Suggested Readings

Text Books:

1. Seymour R.B., Charles E (2003). *Seymour's Polymer Chemistry: An Introduction.*Marcel Dekker, Inc.
2. G. Odian.(2004). *Principles of Polymerization*. John Wiley.
3. F.W. Billmeyer.(1972).*Text Book of Polymer Science*. John Wiley.
4. P. Ghosh. (2001). *Polymer Science & Technology*. Tata Mcgraw-Hill.

Reference Book

1. R.W. Lenz.(1968). *Organic Chemistry of Synthetic High Polymers.*John Wiley.

Semester-V

16CHU502B APPLICATIONS OF COMPUTERS IN CHEMISTRY 4H 4C

Instruction Hours/week: L:04 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

This course enables the student to

- Understand the basics of computers in chemistry
- Understand the numerical methods to find the roots of equation
- Understand the differential and integral calculus
- Understand to handle experimental data using simuntaneous equations
- Understand the molecular modelling.
- Learn about MO methods

Course Outcomes

1. Understood the basics of computers in chemistry
2. Understood the numerical methods to find the roots of equation
3. Understood the differential and integral calculus
4. Understood to handle experimental data using simuntaneous equations
5. Understood the molecular modelling.
6. Learnt about MO methods

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Basics:

Constants, variables, bits, bytes, binary and ASCII formats, arithmetic expressions, hierarchy of operations, inbuilt functions. Elements of the BASIC language. BASIC keywords and commands. Logical and relative operators. Strings and graphics. Compiled versus interpreted languages. Debugging. Simple programs using these concepts. Matrix addition and multiplication. Statistical analysis.

UNIT II

Numerical methods:

Roots of equations: Numerical methods for roots of equations: Quadratic formula, iterative method, Newton-Raphson method, Binary bisection and Regula-Falsi.

UNIT III

Differential calculus: Numerical differentiation.

Integral calculus: Numerical integration (Trapezoidal and Simpson's rule), probability distributions and mean values.

UNIT IV

Simultaneous equations: Matrix manipulation: addition, multiplication. Gauss-Siedal method.

Interpolation, extrapolation and curve fitting: Handling of experimental data.

UNIT V

Conceptual background of molecular modelling: Potential energy surfaces. Elementary ideas of molecular mechanics and practical MO methods.

SuggestedReadings

Text Books:

1. Harris, D. C. (2007). *Quantitative Chemical Analysis*. 6th Ed.(Chapters 3-5). Freeman.
2. Levie, R. De. (2001).*How to use Excel in analytical chemistry and in general scientific data analysis*, Cambridge Univ. Press 487 pages.

Reference Books

1. Noggle, J. H. (1985).*Physical chemistry on a Microcomputer.* Little Brown & Co.
2. Venit, S.M.(1996).*Programming in BASIC: Problem solving with structure and style.* Delhi:JaicoPublishing House.

Semester-V

16CHU503A INORGANIC MATERIALS OF4H 4C
INDUSTRIAL IMPORTANCE

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the students to

- Understand about the different types of silicate materials like glass, ceramics and cement and their industrial importance
- Understand the different types of fertilizers
- Understand the surface coatings and their industrial importance
- Understand about the different types of batteries and their industrial importance
- Understand about the types of catalysts and their industrial importance
- Understand about the types of explosives and their industrial importance

Course Outcomes

On successful completion of course the students have the knowledge

1. Understood about the different types of silicate materials like glass, ceramics and cement and their industrial importance
2. Understood the different types of fertilizers
3. Understood the surface coatings and their industrial importance
4. Understood about the different types of batteries and their industrial importance
5. Understood about the types of catalysts and their industrial importance
6. Understood about the types of explosives and their industrial importance

Methodology

Blackboard teaching, Power point presentation and group discussion.

UNIT I

Silicate Industries

Glass: Glassy state and its properties, classification (silicate and non-silicate glasses).

Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.
Ceramics: Brief introduction to types of ceramics. Superconducting and semiconducting oxides, fullerenes, carbon nanotubes and carbon fibre.
Cements: Manufacture of cement and the setting process, quick setting cements.

UNIT II
Fertilizers:
Different types of fertilizers (N, P and K). Manufacture of the following fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates, superphosphate of lime.

Surface Coatings:
Brief introduction to and classification of surface coatings. Paints and pigments - formulation, composition and related properties. Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Dyes, Wax polishing, Water and Oil paints, Metallic coatings (electrolytic and electroless), metal spraying and anodizing.

UNIT III
Batteries:
Working of the following batteries: Pb acid, Li-Battery, Solid state electrolyte battery. Fuel cells, Solar cell and polymer cell.

UNIT IV
Catalysis:
General principles and properties of catalysts, homogenous catalysis (catalytic steps and examples) and heterogenous catalysis (catalytic steps and examples) and their industrial applications, Deactivation or regeneration of catalysts.
Application of zeolites as catalysts.

UNIT V
Chemical explosives:
Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX). Introduction to rocket propellants.

SuggestedReadings
Text Books:

1. Stocchi, E. (1990).*Industrial Chemistry*. Vol I. UK : Ellis Horwood Ltd.,
2. Felder, R. M. & Rousseau, R.W. (2005). *Elementary Principles of Chemical Processes*. New Delhi: Wiley Publishers.

3. Kent, J. A. (ed). (1997).*Riegel's Handbook of Industrial Chemistry*.9th Ed. New Delhi:CBS Publishers.

Reference Books

1. Jain, P. C. and Jain, M. (2005). *Engineering Chemistry*. Delhi: Dhanpat Rai & Sons.
2. Gopalan, R., Venkappayya, D. and Nagarajan, S. (2004). *Engineering Chemistry*.New Delhi: VikasPublications,
3. Sharma, B. K. (2006). *Engineering Chemistry*. Meerut: Goel Publishing House.

Semester-V

16CHU503B ANALYTICAL METHODS IN CHEMISTRY 4H 4C

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

This course enable the student to

- Understand the various Qualitative analysis
- Understand the quantitative aspects of analysis
- Understand the different Optical methods of analysis
- Understand the various methods of Thermal and electroanalytical methods
- Understand various chromatographic separation techniques
- Understand the various instrumentation method of analysis.

Course Outcomes

On successful completion of course the students have the knowledge

1. Understood the various Qualitative analysis
2. Understood the quantitative aspects of analysis
3. Understood the different Optical methods of analysis
4. Understood the various methods of Thermal and electroanalytical methods
5. Understood various chromatographic separation techniques
6. Understood the various instrumentation method of analysis.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Qualitative and quantitative aspects of analysis:

Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression, normal law of distribution if indeterminate errors, statistical test of data; F, Q and t test, rejection of data, and confidence intervals.

UNIT II

Optical methods of analysis:

Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law.

UV-Visible Spectrometry: Basic principles of instrumentation (choice of source, monochromator and detector) for single and double beam instrument;

Basic principles of quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, keto-enol tautomers. Determination of composition of metal complexes using Job's method of continuous variation and mole ratio method.
Infrared Spectrometry: Basic principles of instrumentation (choice of source, monochromator & detector) for single and double beam instrument; sampling techniques.
Structural illustration through interpretation of data, Effect and importance of isotope substitution.
Flame Atomic Absorption and Emission Spectrometry: Basic principles of instrumentation (choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction; Method of background correction, sources of chemical interferences and their method of removal. Techniques for the quantitative estimation of trace level of metal ions from water samples.

UNIT III

Thermal methods of analysis:
Theory of thermogravimetry (TG), basic principle of instrumentation.
Techniques for quantitative estimation of Ca and Mg from their mixture.

Electroanalytical methods:
Classification of electroanalytical methods, basic principle of pH metric, potentiometric and conductometric titrations. Techniques used for the determination of equivalence points. Techniques used for the determination of pKa values.

UNIT IV

Separation techniques:
Solvent extraction: Classification, principle and efficiency of the technique.
Mechanism of extraction: extraction by solvation and chelation. Technique of extraction: batch, continuous and counter current extractions. Qualitative and quantitative aspects of solvent extraction: extraction of metal ions from aqueous solution, extraction of organic species from the aqueous and nonaqueous media. Chromatography: Classification, principle and efficiency of the technique. Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms: frontal, elution and displacement methods.
Qualitative and quantitative aspects of chromatographic methods of analysis: IC, GLC, GPC, TLC and HPLC.

UNIT V

Separation and analysis: Measurement of optical rotation, calculation of Enantiomeric excess (ee)/ diastereomeric excess (de) ratios and determination of enantiomeric composition using NMR, Chiral solvents and chiral shift reagents. Chiral chromatographic techniques using chiral columns (GC and HPLC). Role of computers in instrumental methods of analysis.

SuggestedReadings

Text Books:

1. Christian, G.D. (2004).*Analytical Chemistry*, 6th Ed.New York: John Wiley & Sons.
2. Harris, D. C.(2001).*Exploring Chemical Analysis*. Ed. New York: W.H. Freeman.
3. Khopkar, S.M. (2009). *Basic Concepts of Analytical Chemistry*. New Age, International Publisher.

Reference Books

1. Skoog, D.A., Holler F.J. & Nieman, T.A.(2006).*Principles of Instrumental Analysis*, Cengage Learning India Ed.
2. Mikes, (1979). O. *Laboratory Hand Book of Chromatographic & Allied Methods*, EllesHarwood Series on Analytical Chemistry. John Wiley & Sons.

Semester-V

16CHU504A INSTRUMENTAL METHODS OF4H 4C
CHEMICAL ANALYSIS

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the students to

- Understand the spectroscopic techniques like IR, spectral analysis
- UV-Visible Spectral analysis
- NMR spectroscopy and
- mass spectroscopy for analytical analysis
- Understand the Chromatographic separation techniques for analysis
- Understand the quantitative techniques like elemental analysis, electro analytical techniques, and XRD analysis

Course Outcomes

On successful completion of course the students have the knowledge

1. Understood the spectroscopic techniques like IR, spectral analysis
2. UV-Visible Spectral analysis
3. NMR spectroscopy and
4. mass spectroscopy for analytical analysis
5. Understood the Chromatographic separation techniques for analysis
6. Understood the quantitative techniques like elemental analysis, electro analytical techniques, and XRD analysis

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction to spectroscopic methods of analysis:

Recap of the spectroscopic methods covered in detail in the core chemistry syllabus: Treatment of analytical data, including error analysis. Classification of analytical methods and the types of instrumental methods. Consideration of electromagnetic radiation.

UNIT II

Molecular spectroscopy:

Infrared spectroscopy:

Interactions with molecules: absorption and scattering. Means of excitation (light sources), separation of spectrum (wavelength dispersion, time resolution), detection of the signal (heat, differential detection), interpretation of spectrum (qualitative, mixtures, resolution), advantages of Fourier Transform (FTIR). Samples and results expected. Applications: Issues of quality assurance and quality control, Special problems for portable instrumentation and rapid detection. *UV-Visible/ Near IR* – emission, absorption, fluorescence and photoaccoustic. Excitation sources (lasers, time resolution), wavelength dispersion (gratings, prisms, interference filters, laser, placement of sample relative to dispersion, resolution), Detection of signal (photocells, photomultipliers, diode arrays, sensitivity and S/N), Single and Double Beam instruments, Interpretation (quantification, mixtures, absorption vs. fluorescence and the use of time, photoaccoustic, fluorescent tags).

UNIT III
Separation techniques
Chromatography: Gas chromatography, liquid chromatography, supercritical fluids, Importance of column technology (packing, capillaries), Separation based on increasing number of factors (volatility, solubility, interactions with stationary phase, size, electrical field), Detection: simple vs. specific (gas and liquid), Detection as a means of further analysis (use of tags and coupling to IR and MS), Electrophoresis (plates and capillary) and use with DNA analysis.
Immunoassays and DNA techniques
Mass spectroscopy: Making the gaseous molecule into an ion (electron impact, chemical ionization), Making liquids and solids into ions (electrospray, electrical discharge, laser desorption, fast atom bombardment), Separation of ions on basis of mass to charge ratio, Magnetic, Time of flight, Electric quadrupole. Resolution, time and multiple separations, Detection and interpretation (how this is linked to excitation).

UNIT IV
Elemental analysis:
Mass spectrometry (electrical discharges).
Atomic spectroscopy: Atomic absorption, Atomic emission, and Atomic fluorescence. Excitation and getting sample into gas phase (flames, electrical discharges, plasmas), Wavelength separation and resolution (dependence on technique), Detection of radiation (simultaneous/scanning, signal noise), Interpretation (errors due to molecular and ionic species, matrix effects, other interferences).

UNIT V
NMR spectroscopy: **P**rinciple, Instrumentation, Factors affecting chemical shift, Spincoupling, Applications.

Electroanalytical Methods: Potentiometry & Voltammetry

Radiochemical Methods

X-ray analysis and electron spectroscopy (surface analysis)

Suggested Readings

Text books:

1. Douglas A. Skoog, James Holler, F. & Stanley Crouch.(2007).*Principles of Instrumental Analysis*. 6th Edition. (ISBN 0-495-01201-7).

2. Willard, Merritt, Dean & Settle.(1989). *Instrumental Methods of Analysis*. 7th ed.

3. P.W. Atkins. (2014). *Physical Chemistry*. Oxford University Press

Reference Books

1. C.N. Banwell.(1966). *Fundamentals of Molecular Spectroscopy*.McGraw Hill

2. Brian Smith.(1998) *Infrared Spectral Interpretations: A Systematic Approach*.CRC press.

3. W.J. Moore.(1999). *Physical Chemistry*. Longman Green & Co. Ltd.,

Semester-V

16CHU504B NOVEL INORGANIC SOLIDS 4H 4C

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course objectives

The course enables the students have to perform

- The Synthesis and modification of inorganic solids of technological importance
- Understand about the inorganic solids of technological importance
- The Synthesis and properties of nanomaterials
- The Synthesis of engineering materials used for mechanical construction
- The Synthesis and properties of composite materials
- The Synthesis and properties of speciality polymers

Course outcome

The student have identified

1. The Synthesis and modification of inorganic solids
2. Understood about inorganic solids of technological importance
3. The Synthesis and properties of nanomaterials
4. The Synthesis of engineering materials used for mechanical construction
5. The Synthesis and properties of composite materials
6. The Synthesis and properties of speciality polymers

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Synthesis and modification of inorganic solids:

Conventional heat and beat methods, Co-precipitation method, Sol-gel methods, Hydrothermal method, Ion-exchange and Intercalation methods.

Inorganic solids of technological importance:

Solid electrolytes – Cationic, anionic, mixed Inorganic pigments – coloured solids, white and

black pigments.
Molecular material and fullerides, molecular materials & chemistry – one-dimensional metals, molecular magnets, inorganic liquid crystals.

UNIT II
Nanomaterials:
Overview of nanostructures and nanomaterials: classification.
Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture-one dimensional control. Carbon nanotubes and inorganic nanowires. Bio-inorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials, bionano composites.

UNIT III
Introduction to engineering materials for mechanical construction:
Composition, mechanical and fabricating characteristics and applications of various types of cast irons, plain carbon and alloy steels, copper, aluminium and their alloys like duralumin, brasses and bronzes cutting tool materials, super alloys thermoplastics, thermosets and composite materials.
UNIT IV
Composite materials:
Introduction, limitations of conventional engineering materials, role of matrix in composites, classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforced composites, environmental effects on composites, applications of composites.
UNIT V
Speciality polymers:
Conducting polymers - Introduction, conduction mechanism, polyacetylene, polyparaphenylene and polypyrrole, applications of conducting polymers, Ion-exchange resins and their applications. Ceramic & Refractory: Introduction, classification, properties, raw materials, manufacturing and applications.

SuggestedReadings
Text Books:
1. Shriver & Atkins. (2014). *Inorganic Chemistry*, Oxford University Press.
2. Peter Alkins, Tina Overton, Jonathan Rourke,Mark Weller and Fraser Armstrong. (2011-2012). 5th Edition. Oxford University Press.
3. Adam, D.M. (1974) *Inorganic Solids: An introduction to concepts in solid-state structuralchemistry*. John Wiley & Sons.

Reference Books
1. Poole, C.P. & Owens, F.J. (2003). *Introduction to Nanotechnology*.John Wiley & Sons.
2. Rodger, G.E. (2002). *Inorganic and Solid State Chemistry*. Cengage Learning India Edition.

Semester-V

16CHU512A POLYMER CHEMISTRY PRACTICAL4H 2C

Instruction Hours/week:L:0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the student have to apply

- Have hands on experience to prepare different types of polymers by various methods
- To do the purification of polymers
- To characterise the polymers by chemical and instrumental methods.
- To prepare isopthaloyl chloride
- Determine hydroxyl number of a polymer using colorimetric method
- Analyse the polymers

Course outcome

The students have demonstrate and perform

1. The preparation of different types of polymers by various methods
2. The purification of polymers
3. The characterization the polymers by chemical and instrumental methods.
4. Preparation of isopthaloyl chloride
5. Determination of hydroxyl number of a polymer using colorimetric method
6. Analysis of the polymers

Polymer synthesis

1. Free radical solution polymerization of styrene (St) / Methyl Methacrylate (MMA) / Methyl Acrylate (MA) / Acrylic acid (AA).

a. Purification of monomer

b. Polymerization using benzoyl peroxide (BPO) / 2,2'-azo-bis-isobutylonitrile (AIBN)

2. Preparation of nylon 66/6

1. Interfacial polymerization, preparation of polyester from isophthaloyl chloride (IPC) and phenolphthalein

a. Preparation of IPC

b. Purification of IPC
c. Interfacial polymerization
3. Redox polymerization of acrylamide
4. Precipitation polymerization of acrylonitrile
5. Preparation of urea-formaldehyde resin
6. Preparations of novalac resin/resold resin.
7. Microscale Emulsion Polymerization of Poly(methylacrylate).

Polymer characterization
1. Determination of molecular weight by viscometry:
(a) Polyacrylamide-aq.NaNO2 solution
(b) (Poly vinyl proplylidine (PVP) in water
2. Determination of the viscosity-average molecular weight of poly(vinyl alcohol) (PVOH) and the fraction of ―head-to-head‖ monomer linkages in the polymer.
3. Determination of molecular weight by end group analysis: Polyethylene glycol (PEG) (OH group).
4. Testing of mechanical properties of polymers.
5. Determination of hydroxyl number of a polymer using colorimetric method.
Polymer analysis
1. Estimation of the amount of HCHO in the given solution by sodium sulphite method
2. Instrumental Techniques
3. IR studies of polymers
4. DSC analysis of polymers
5. Preparation of polyacrylamide and its electrophoresis
*at least 7 experiments to be carried out.

SuggestedReadings
Text Books:

1. Malcohm P. Stevens(1999). *Polymer Chemistry: An Introduction*. 3rd Ed. Oxford University Press.
2. Harry R. Allcock, Frederick W. Lampe and James E. Mark, (2003). *Contemporary Polymer Chemistry*. 3rd ed. Prentice-Hall
3. Fred W. Billmeyer, (1984). *Textbook of Polymer Science*. 3rd ed. Wiley-Interscience
4. Joel R. Fried, (2003). *Polymer Science and Technology*. 2nd ed. Prentice-Hall.
5. Petr Munk & Tejraj M. Aminabhavi, (2002).*Introduction to Macromolecular Science*. 2nd ed. John Wiley & Sons
Reference Books
1. L. H. Sperling,. (2005). *Introduction to Physical Polymer Science*. 4th ed. John Wiley & Sons.
2. Malcolm P. Stevens, (2005). *Polymer Chemistry: An Introduction*. 3rd ed. Oxford University Press.
3. Charles E. Carraher,.(2013). *Seymour/ Carraher's Polymer Chemistry*. 9th ed. Jr.

Semester-V

16CHU512B APPLICATIONS OF COMPUTERS IN CHEMISTRY-4H 2C PRATCTICAL

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

This lab course enable the student to do experiments and to

- Understand the basics of computers in chemistry
- Understand to find the roots of equation
- Understand the the numerical differentiation and integration
- Understand integration
- Understand matrix operations.
- Understand matrix operations

Course Outcomes

The students have the knowledge of

1. Understood the basics of computers in chemistry
2. Understood to find the roots of equation
3. Understood the the numerical differentiation and integration
4. Understood integration
5. Understood matrix operations.
6. Understood matrix operations

Methodology

Computer programmes

Computer programs based on numerical methods for

1. Roots of equations: (e.g. volume of van der Waals gas and comparison with ideal gas, pH of a weak acid).

2. Numerical differentiation (e.g., change in pressure for small change in volume of a van der Waals gas, potentiometric titrations).

3. Numerical integration (e.g. entropy/ enthalpy change from heat capacity data), probability distributions (gas kinetic theory) and mean values.

4. Matrix operations. Application of Gauss-Siedel method in colourimetry.

5. Simple exercises using molecular visualization software.

Suggested Readings

Text Books:

1. McQuarrie, D. A.(2008).*Mathematics for Physical Chemistry*.University Science Books.
2. Mortimer, R.(2005).*Mathematics for Physical Chemistry*. 3rd Ed. Elsevier.
3. Steiner, E. (1996).*The Chemical Maths Book* . Oxford University Press.
4. Yates, P. (2007).*Chemical Calculations.* 2nd Ed. CRC Press.
5. Harris, D. C. (2007). *Quantitative Chemical Analysis*. 6th Ed.Chapters 3-5. Freeman.

Reference Books

1. Levie, R. De. (2001). *How to use Excel in analytical chemistry and in general scientific data analysis*, Cambridge Univ. Press 487 pages.
2. Noggle, J. H. (1985).*Physical Chemistry on a Microcomputer.* Little Brown & Co.
3. Venit, S.M.(1996). *Programming in BASIC: Problem solving with structure and style.*Delhi: Jaico Publishing House.

Semester-V

16CHU513A INORGANIC MATERIALS OFINDUSTRIAL4H 2C IMPORTANCE- PRACTICAL

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

The lab course enables the students to

- Determine the free acidity in fertilizers
- Estimate calcium and phosphoric acid in fertilizers
- Determine the composition of dolomite
- Analysis of metals in alloys
- Estimation of phosphoric acid in superphosphate fertilizer.
- Electroless metallic coatings on ceramic and plastic material.

Course Outcomes

The students have the knowledge of

1. Determineation of the free acidity in fertilizers
2. Estimation calcium and phosphoric acid in fertilizers
3. Determination of the composition of dolomite
4. Analysis of metals in alloys
5. Estimation of phosphoric acid in superphosphate fertilizer.
6. Electroless metallic coatings on ceramic and plastic material.

Methodology

Lab experiments involving titrations

1. Determination of free acidity in ammonium sulphate fertilizer.

2. Estimation of Calcium in Calcium ammonium nitrate fertilizer.
3. Estimation of phosphoric acid in superphosphate fertilizer.
4. Electroless metallic coatings on ceramic and plastic material.
5. Determination of composition of dolomite (by complexometric titration).
6. Analysis of (Cu, Ni); (Cu, Zn) in alloy or synthetic samples.
7. Analysis of Cement.
8. Preparation of pigment (zinc oxide).

SuggestedReadings
Text Books:

1. Stocchi, E. (1990). *Industrial Chemistry*, Vol I. UK: Ellis Horwood Ltd.
2. Felder, R. M. & Rousseau, R.W. (2005).*Elementary Principles of Chemical Processes*. New Delhi: Wiley Publishers.
3. Kingery, W. D., Bowen H. K. & Uhlmann, D. R.(1976).*Introduction to Ceramics.* New Delhi:Wiley Publishers.

Reference Books

1. Kent, J. A. (ed). (1997). *Riegel's Handbook of Industrial Chemistry*.9th Ed. New Delhi:CBS Publishers.
2. Jain, P. C. & Jain, M. (2004). *Engineering Chemistry*, Delhi:Dhanpat Rai & Sons,
3. Gopalan, R., Venkappayya, D. & Nagarajan, S. (2004). *Engineering Chemistry*.New Delhi: VikasPublications.
4. Sharma, B. K. (2006). *Engineering Chemistry*. Meerut: Goel Publishing House.

Semester-V

16CHU513B ANALYTICAL METHODS IN CHEMISTRYPRACTICAL4H 2C

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

This lab course enables the students to

- Learn the skills in paper chromatography
- Thin layer chromatographic techniques
- Learn the skills in different types of solvent extraction techniques
- Learn the skills in spectrophotometric method of analysis
- Determine PH measurements
- Separation of mixtures

Course Outcomes

On completion of the course the students have knowledge

1. Learnt the skills in paper chromatography
2. Thin layer chromatographic techniques
3. Learnt the skills in different types of solvent extraction techniques

4. Learnt the skills in spectrophotometric method of analysis
5. Determination PH measurements
6. Separation of mixtures

Methodology

Paper chromatography, TLC, solvent extractions methods

I. Separation Techniques

1. Chromatography:

(a) Separation of mixtures

(i) Paper chromatographic separation of $Fe^{3+,}$ $Al^{3+,}$ and $Cr^{3+.}$

(ii) Separation and identification of the monosaccharides present in the given mixture (glucose & fructose) by paper chromatography. Reporting the Rf values.

(b) Separate a mixture of Sudan yellow and Sudan Red by TLC technique and identify them on the basis of their Rf values.

(c) Chromatographic separation of the active ingredients of plants, flowers and juices by TLC

II. Solvent Extractions:

(i) To separate a mixture of Ni^{2+}, & Fe^{2+} by complexation with DMG and extracting the Ni^{2+}-DMG complex in chloroform, and determine its concentration by spectrophotometry.

(ii) Solvent extraction of zisconium with amberliti LA-1, separation from a mixture of irons and gallium.

3. Determine the pH of the given aerated drinks fruit juices, shampoos and soaps.

4. Determination of Na, Ca, Li in cola drinks and fruit juices using flame photometric techniques.

5. Analysis of soil:

(i) Determination of pH of soil.

(ii) Total soluble salt

(iii) Estimation of calcium, magnesium, phosphate, nitrate

6. Ion exchange:

(i) Determination of exchange capacity of cation exchange resins and anion exchange resins.

(ii) Separation of metal ions from their binary mixture.

(iii) Separation of amino acids from organic acids by ion exchange chromatography.

III Spectrophotometry

1. Determination of pKa values of indicator using spectrophotometry.

2 Structural characterization of compounds by infrared spectroscopy.

3 Determination of dissolved oxygen in water.

4 Determination of chemical oxygen demand (COD).

5 Determination of Biological oxygen demand (BOD).

6 Determine the composition of the Ferric-salicylate/ ferric-thiocyanate complex by Job's method.

Suggested Readings

Text Books:

1. Christian, Gary D. (2004).*Analytical Chemistry*. 6th Ed. New York : John Wiley & Sons.
2. Harris, Daniel C. (2001).*Exploring Chemical Analysis*. Ed. New York: W.H. Freeman
3. Khopkar, S.M. (2009). *Basic Concepts of Analytical Chemistry*. New Age, Internationa Publisher.

Reference Books

1. Skoog, D.A. Holler F.J. & Nieman, T.A.(2006).*Principles of Instrumental Analysis*, Cengage Learning India Ed.
2. Mikes, O.(1979)*Laboratory Hand Book of Chromatographic & Allied Methods*, John Wiley & Sons.
3. Ditts, R.V. (1974).*Analytical Chemistry; Methods of Separation*. van Nostrand,

Semester-V

16CHU514A INSTRUMENTAL METHODS OFCHEMICAL ANALYSIS- PRACTICAL 4H 2C

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the student to

- Understand the testing of chemicals using UV-Visible spectrophotometer
- Understand the testing of chemicals using IR spectrophotometer
- Understand the testing of chemicals using chemical methods
- Titration curve of an amino acid.
- Potentiometric Titration of a Chloride-Iodide Mixture
- Use of fluorescence to do ―presumptive tests‖ to identify blood or other body fluids.

Course Outcomes

On completion of the course the students have knowledge

1. Understood the testing of chemicals using UV-Visible spectrophotometer
2. Understood the testing of chemicals using IR spectrophotometer
3. Understood the testing of chemicals using chemical methods
4. Titration curve of an amino acid.
5. Potentiometric Titration of a Chloride-Iodide Mixtur
6. Use of fluorescence to do ―presumptive tests‖ to identify blood or other body fluids

Methodology

Absorption measurements and potentiometric titrations

1. Safety Practices in the Chemistry Laboratory
2. Determination of the isoelectric pH of a protein.
3. Titration curve of an amino acid.
4. Determination of the void volume of a gel filtration column.
5. Determination of a Mixture of Cobalt and Nickel (UV/Vis spec.)
6. Study of Electronic Transitions in Organic Molecules (i.e., acetone in water)
7. IR Absorption Spectra (Study of Aldehydes and Ketones)

8. Determination of Calcium, Iron, and Copper in Food by Atomic Absorption
9. Quantitative Analysis of Mixtures by Gas Chromatography (i.e., chloroform and carbon tetrachloride)
12. Potentiometric Titration of a Chloride-Iodide Mixture
14. Nuclear Magnetic Resonance
15. Use of fluorescence to do ―presumptive tests‖ to identify blood or other body fluids.
16. Use of ―presumptive tests‖ for anthrax or cocaine
17. Collection, preservation, and control of blood evidence being used for DNA testing
20. Laboratory analysis to confirm anthrax or cocaine
22. Detection of illegal drugs or steroids in athletes
23. Detection of pollutants or illegal dumping
24. Fibre analysis

At least 10 experiments to be performed.

SuggestedReadings

Text Books:

1.Douglas A. Skoog, James Holler,F. & Stanley Crouch (2007). *Principles of Instrumental Analysis* . 6th Edition. (ISBN 0-495-01201-7).

Reference Books

1. Willard, Merritt, Dean, Settle.(1989). *Instrumental Methods of Analysis*. 7th ed. ACS publications

Semester-V

16CHU514BNOVEL INORGANIC SOLIDSPRACTICAL 4H 2C

Instruction Hours/week: L:0 T:0 P:02 Marks: Internal: 40 External: 60 Total:100

Course objectives

The course helps the student to

- Explain the ion exchange method
- Expalin the cation exchange method
- coprecipitation methods of novel inorganic solids
- Discuss the method for the preparation of nanoparticles
- Nano partical preparation using green method
- Prepare the hydrogel by coprecipitation method

Course outcome

The students have demonstrated

1. The cation exchange method
2. The ion exchange method
3. coprecipitation methods of novel inorganic solids
4. The method for the preparation of nanoparticles
5. Nano partical preparation using green method

Preparation of the hydrogel by coprecipitation method

1. Determination of cation exchange method
2. Determination of total difference of solids.
3. Synthesis of hydrogel by co-precipitation method.

4. Synthesis of metal nanoparticles.

Suggested Reading :

1. Fahlman, B.D. (2004).*Materials Chemistry*, Springer.

Semester-VI

16CHU601A BASIC ANALYTICAL CHEMISTRY 3H 3C

Instruction Hours/week: L:3 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

The course enables the students have to interpret

- The interdisciplinary nature of analytical chemistry
- The various methods involved in the analysis of soil ,
- Analyse water
- Analys food products
- Concepts of *p*H
- The various methods involved in the analysis of cosmetics

Course outcome

The course enables the students have to interpreted

1. The interdisciplinary nature of analytical chemistry
2. The various methods involved in the analysis of soil ,
3. Analysis water
4. Analysis of food products
5. Concepts of *p*H
6. The various methods involved in the analysis of cosmetics

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction: Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.

UNIT II

Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators

a. Determination of pH of soil samples.

b. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.

UNIT III

Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods.

a. Determination of pH, acidity and alkalinity of a water sample.

b. Determination of dissolved oxygen (DO) of a water sample.

UNIT IV

Analysis of food products: Nutritional value of foods, idea about food processing and food preservations and adulteration.

a. Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc.

b. Analysis of preservatives and colouring matter.

Chromatography: Definition, general introduction on principles of chromatography, paper chromatography, TLC etc.

a. Paper chromatographic separation of mixture of metal ion ($Fe3+$ and $Al3+$).

b. To compare paint samples by TLC method.

Ion-exchange: Column, ion-exchange chromatography etc.

Determination of ion exchange capacity of anion / cation exchange resin (using batch procedure if use of column is not feasible).

UNIT V

Analysis of cosmetics: Major and minor constituents and their function

a. Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.

b. Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.

SuggestedReading

Text Books:

1. Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A.(1988).*Instrumental Methods of Analysis*. 7th Ed.Belmont, California, USA : Wadsworth Publishing Co. Ltd.
2. Skoog, D.A. Holler F.J. & Nieman, T.A.(1998). *Principles of Instrumental Analysis*, Cengage Learning India Ed.
3. Skoog, D.A.; West, D.M. & Holler, F.J.(1992).*Fundamentals of Analytical Chemistry* 6thEd.Fort Worth : Saunders College Publishing.

4. Harris, D. C. (2006). *Quantitative Chemical Analysis*. W. H. Freeman and Company Ltd.,
5. Dean, J. A. (1992). *Analytical Chemistry Notebook*. McGraw Hill.

Reference Books

1. Day, R. A. & Underwood, A. L. (1991). *Quantitative Analysis*. Prentice Hall of India.
2. Freifelder, D. (1982).*Physical Biochemistry*.2nd Ed.N.Y. USA: W.H. Freeman and Co.
3. Cooper, T.G. (1977).*The Tools of Biochemistry*.16.N.Y. USA: John Wiley and Sons.
4. Robinson, J.W.(1995).*Undergraduate Instrumental Analysis*.5th Ed.NewDelhi:Marcel Dekker Inc.,

Semester-VI

16CHU601B PESTICIDE CHEMISTRY3H 3C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course objectives

The course enables the students to design

- The synthesis and manufacture of many natural fertilizers
- The synthesis and manufacture of many synthetic fertilizers
- The synthesis and manufacture of organochlorines
- The synthesis and manufacture organophosphorous compounds
- The synthesis and manufacture of quinine pesticides
- The synthesis and manufacture of anilides

Course outcomes

The students have designed

1. The synthesis and manufacture of many natural fertilizers
2. The synthesis and manufacture of many synthetic fertilizers
3. The synthesis and manufacture of organochlorines
4. The synthesis and manufacture organophosphorous compounds
5. The synthesis and manufacture of quinine pesticides
6. The synthesis and manufacture of anilides

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

Unit I

General introduction to pesticides (natural and synthetic), benefits and adverse effects.

Unit II

Changing concepts of pesticides, structure activity relationship.

Unit III

Synthesis and technical manufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene,)

Unit IV

Synthesis and technical manufacture and uses of Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl)

Unit V

Synthesis and technical manufacture and uses of Quinones (Chloranil), Anilides (Alachlor and Butachlor).

Practicals

1. To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications.
2. Preparation of simple organophosphates, phosphonates and thiophosphates

Suggested Reading

1. Cremlyn, R. (1978). *Pesticides. Preparation and Modes of Action*. New York: John Wiley & Sons.

Semester-VI

16CHU611A BASIC ANALYTICAL CHEMISTRYPRACTICAL3H 1C

Instruction Hours/week: L:0 T:0 P:3 Marks: Internal:40 External: 60 Total:100

Course objectives

The course enables the students to design

- The synthesis and manufacture of many natural fertilizers
- The synthesis and manufacture of many synthetic fertilizers
- The synthesis and manufacture of organochlorines
- The synthesis and manufacture organophosphorous compounds
- The synthesis and manufacture of quinine pesticides
- The synthesis and manufacture of anilides

Course outcomes

The students have designed

1. The synthesis and manufacture of many natural fertilizers
2. The synthesis and manufacture of many synthetic fertilizers
3. The synthesis and manufacture of organochlorines
4. The synthesis and manufacture organophosphorous compounds
5. The synthesis and manufacture of quinine pesticides
6. The synthesis and manufacture of anilides

Methodology

Estimation of metal ion by flame photometry, Spectrophotemetric procedures

Applications (Any one):

a. To study the use of phenolphthalein in trap cases.

b. To analyze arson accelerants.

c. To carry out analysis of gasoline.

Instrumental demonstrations:

a. Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry.

b. Spectrophotometric determination of Iron in Vitamin / Dietary Tablets.

c. Spectrophotometric Identification and Determination of Caffeine and Benzoic Acid in Soft Drink.

SuggestedReading

Text Books:

1. Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. (1988). *Instrumental Methods of Analysis*. 7th Ed.Belmont, California, USA : Wadsworth Publishing Co. Ltd.
2. Skoog, D.A. Holler F.J. & Nieman, T.A.(1998). *Principles of Instrumental Analysis*, Cengage Learning India Ed.
3. Skoog, D.A.; West, D.M. & Holler, F.J.(1992).*Fundamentals of Analytical Chemistry* 6th Ed.Fort Worth : Saunders College Publishing.
4. Harris, D. C. (2006). *Quantitative Chemical Analysis*. W. H. Freeman and Company Ltd.,
5. Dean, J. A. (1992). *Analytical Chemistry Notebook*. McGraw Hill.

Reference Books

1. Day, R. A. & Underwood, A. L. (1991). *Quantitative Analysis*. Prentice Hall of India.
2. Freifelder, D. (1982).*Physical Biochemistry*.2nd Ed.N.Y. USA: W.H. Freeman and Co.
3. Cooper, T.G. (1977).*The Tools of Biochemistry*.16.N.Y. USA: John Wiley and Sons.
4. Robinson, J.W.(1995). *Undergraduate Instrumental Analysis*.5th Ed.NewDelhi:Marcel Dekker Inc.,

Semester-VI

16CHU611B PESTICIDE CHEMISTRY3H 1C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course objectives

The lab course enables the student to solve

- the calculation of acidity in given sample of pesticide formulation
- the calculation of alkalinity in given sample of pesticide formulation
- the synthesis of simple organophosphates,
- the synthesis of phosphonates
- the synthesis of thiophosphates
- Alayse organophosphates, phosphonates and thiophosphates

Course outcomes

The students have solved

1. the calculation of acidity in given sample of pesticide formulation
2. the calculation of alkalinity in given sample of pesticide formulation
3. the synthesis of simple organophosphates
4. the synthesis of phosphonates
5. the synthesis of thiophosphates
6. Alaysis of organophosphates, phosphonates and thiophosphates

Methodology

.PH measurements, Fertilizer preparation

Practicals

1. To calculate acidity/alkalinity in given sample of pesticide formulations.
2. Preparation of simple organophosphates, phosphonates and thiophosphates

Suggested Reading:

1. Cremlyn, R.(1978).*Pesticides. Preparation and Modes of Action*. NewYork: John Wiley & Sons.

Semester-VI

16CHU602A MOLECULAR MODELING AND DRUG DESIGN4H 4C

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Scope

The course deals with the concepts of Molecular Modelling used in drug design

Course objectives

The course enables the students to summarize

- The introductory concepts of molecular modelling
- The force fields involved with different types of interactions
- The Energy Minimization and Computer Simulation
- The Molecular Dynamics & Monte Carlo Simulation
- The Structure Prediction and Drug Design
- QSAR studies

Course outcomes

The students are contrast

1. The introductory concepts of molecular modelling
2. The force fields involved with different types of interactions
3. About the Energy Minimization and Computer Simulation
4. About the Molecular Dynamics & Monte Carlo Simulation
5. About the Structure Prediction and Drug Design
6. QSAR studies

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction to Molecular Modelling:

Introduction. Useful Concepts in Molecular Modelling: Coordinate Systems. Potential Energy Surfaces. Molecular Graphics. Surfaces. Computer Hardware and Software. The Molecular Modelling Literature.

UNIT II

Force Fields:
Fields. Bond Stretching. Angle Bending. Introduction to nonbonded interactions. Electrostatic interactions. van der Waals Interactions. Hydrogen bonding in Molecular Mechanics. Force Field Models for the Simulation of Liquid Water.

UNIT III

Energy Minimization and Computer Simulation:
Minimization and related methods for exploring the energy surface. Non-derivative method, First and second order minimization methods. Computer simulation methods. Simple thermodynamic properties and Phase Space. Boundaries. Analyzing the results of a simulation and estimating Errors.

UNIT IV
Molecular Dynamics & Monte Carlo Simulation:
Molecular Dynamics Simulation Methods. Molecular Dynamics using simple models. Molecular Dynamics with continuous potentials. Molecular Dynamics at constant temperature and pressure. Metropolis method. Monte Carlo simulation of molecules. Models used in Monte Carlo simulations of polymers.

UNIT V

Structure Prediction and Drug Design:
Structure prediction - Introduction to comparative Modeling. Sequence alignment. Constructing and evaluating a comparative model. Predicting protein structures by 'Threading', Molecular docking. Structure based de novo ligand design,
Drug Discovery – Chemoinformatics – QSAR.

SuggestedReadings
Text Books:

1. Leach, A.R. (2001). *Molecular Modelling Principles and Application*, Longman.
2. Haile, J.M. (1997). *Molecular Dynamics Simulation Elementary Methods*, John Wiley and Sons.
3. Gupta, S.P. (2008).*QSAR and Molecular Modeling*. Springer. Anamaya Publishers.

Semester-VI

16CHU602B INDUSTRIAL CHEMICALS AND ENVIRONMENT4H 4C

Instruction Hours/week: L:4 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course Objectives

The course enables the students to

- Understand the industrial gases and inorganic chemicals which have an impact on the environment
- Understand about the general principles of metallurgy
- Understand the environment and its segments
- Understand about the water pollution and water treatment
- Understand about the energy and the environment
- Understand the environment and its segments

Course outcomes

The students are contrast

1. Understood the industrial gases and inorganic chemicals which have an impact on the environment
2. Understood about the general principles of metallurgy
3. Understood the environment and its segments
4. Understood about the water pollution and water treatment
5. Understood about the energy and the environment
6. Understood the environment and its segments

Methodology

Blackboard teaching, Power point presentation and group discussion.

UNIT I

Industrial Gases and Inorganic Chemicals

Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene.

Inorganic Chemicals: Manufacture, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate.

UNIT II

Industrial Metallurgy

General Principles of Metallurgy

Chief modes of occurrence of metals based on standard electrode potentials. Ellingham diagrams for reduction of metal oxides using carbon as reducing agent.
Hydrometallurgy, Methods of purification of metals (Al, Pb, Ti, Fe, Cu, Ni, Zn): electrolytic, oxidative refining, Kroll process, Parting process, van Arkel-de Boer process and Mond's process.
Preparation of metals (ferrous and nonferrous) and ultrapure metals for semiconductor technology.

Environment and its segments

Ecosystems. Biogeochemical cycles of carbon, nitrogen and sulphur.
Air Pollution: Major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature; Photochemical smog: its constituents and photochemistry.

UNIT III

Environmental effects of ozone, Major sources of air pollution. Pollution by SO2, CO_2, CO, NOx, H_2S and other foul smelling gases. Methods of estimation of CO, NOx, SOx and control procedures.
Effects of air pollution on living organisms and vegetation. Greenhouse effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal. Control of particulates.

UNIT IV

Water Pollution: Hydrological cycle, water resources, aquatic ecosystems, Sources and nature of water pollutants, Techniques for measuring water pollution, Impacts of water pollution on hydrological and ecosystems. Water purification methods. Effluent treatment plants (primary, secondary and tertiary treatment).
Industrial effluents from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc.Sludge disposal. Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water.

UNIT V

Energy & Environment

Sources of energy: Coal, petrol and natural gas. Nuclear Fusion / Fission, Solar energy, Hydrogen, geothermal, Tidal and Hydel, etc. Nuclear Pollution: Disposal of nuclear waste, nuclear disaster and its management.

Biocatalysis

Introduction to biocatalysis: Importance in “Green Chemistry” and Chemical Industry.

SuggestedReadings

Text Books:

1. Stocchi, E.(1990).*Industrial Chemistry*, Vol-I. UK.: Ellis Horwood Ltd.
2. Felder,R.M. & Rousseau, R.W.(2004).*Elementary Principles of Chemical Processes*. New Delhi: WileyPublishers.
3. Kent, J. A.(1997).*Riegel’s Handbook of Industrial Chemistry*. New Delhi: *CBS* Publishers.
4. Dara, S. S.(2014). *A Textbook of Engineering Chemistry*. NewDelhi: S. Chand & Company Ltd.
5. K. De.(2007). *Environmental Chemistry*. New Delhi: New Age International Pvt., Ltd.

Reference Books:

1. Khopkar, S. M.(1993).*Environmental Pollution Analysis*. New Delhi: Wiley Eastern Ltd.
2. Manahan,S.E. (2005).*Environmental Chemistry*. CRC Press.
3. Miller, G.T. (2006).*Environmental Science*.11th edition. Brooks/ Cole
4. Mishra,A. (2005).*Environmental Studies*. New Delhi: Selective and Scientific Books.

Semester-VI

16CHU603A GREEN CHEMISTRY 4H 4C

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

- To introduce the concept of Green chemistry.
- To introduce the 12 principles of Green chemistry
- The tools of Green chemistry.
- To demonstrate how to evaluate a reaction or process
- Determine "Greener" alternatives.
- To focus on the application of greener route to improve industrial processes and to produce important products.

Course Outcomes

1. Introduce the concept of Green chemistry.
2. Introduce the 12 principles of Green chemistry as well as
3. the tools of Green chemistry.
4. .Demonstrate how to evaluate a reaction or process
5. Determination of "Greener" alternatives.
6. Focus on the application of greener routes to improve industrial processes and to produce important products.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction to Green Chemistry

What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry.
Limitations/ Obstacles in the pursuit of the goals of Green Chemistry

Principles of Green Chemistry and Designing a Chemical synthesis

Twelve principles of Green Chemistry with their explanations and examples and special emphasis on the following: Designing a Green Synthesis using these principles; Prevention of Waste/ byproducts;maximum incorporation of the materials used in the process into the final products , Atom Economy, calculation of atom economy of the rearrangement, addition, substitution and elimination reactions. Prevention/ minimization of hazardous/ toxic products reducing toxicity. risk = (function) hazard × exposure; waste or pollution prevention hierarchy.
Green solvents– supercritical fluids, water as a solvent for organic reactions, ionic liquids, fluorous biphasic solvent, PEG, solventless processes, immobilized solvents and how to compare greenness of solvents.

UNIT II

Energy requirements for reactions – alternative sources of energy: use of microwaves and ultrasonic energy. Selection of starting materials; avoidance of unnecessary derivatization – careful use of blocking/protecting groups. Use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis. Prevention of chemical accidents designing greener processes, inherent safer design, principle of ISD "What you don't have cannot harm you", greener alternative to Bhopal Gas Tragedy (safer route to carcarbaryl) and Flixiborough accident (safer route to cyclohexanol) subdivision of ISD, minimization, simplification, substitution, moderation and limitation. Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes.

UNIT III

Examples of Green Synthesis/ Reactions and some real world cases

1. Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis)
2. Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents
Diels-Alder reaction and Decarboxylation reaction
3. Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine)
4 Surfactants for carbon dioxide – replacing smog producing and ozone depleting solvents with CO_2 for precision cleaning and dry cleaning of garments.
5 Designing of Environmentally safe marine antifoulant.

UNIT IV

1. Rightfit pigment: synthetic azopigments to replace toxic organic and inorganicpigments.
2 An efficient, green synthesis of a compostable and widely applicable plastic (polylactic acid) made from corn.
3 Healthier fats and oil by Green Chemistry: Enzymatic interesterification for production of no Trans-Fats and Oils
4 Development of Fully Recyclable Carpet: Cradle to Cradle Carpeting

UNIT V

Future Trends in Green Chemistry
Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal controlled solid state synthesis (C_2S_3); Green chemistry in sustainable development.

Suggested Readings

Text Books:

1. Ahluwalia, V.K. & Kidwai, M.R. (2005). *New Trends in Green Chemistry*, Anamalaya Publishers.
2. Anastas, P.T. & Warner, J.K. (1998). *Green Chemistry - Theory and Practical*. Oxford University Press.
3. Matlack, A.S. (2001). *Introduction to Green Chemistry*. Marcel Dekker.
4. Cann, M.C. & Connely, M.E. (2000). *Real-World cases in Green Chemistry*. Washington: American Chemical Society.

Reference Books:

1. Ryan, M.A. & Tinnesand, M. (2002). *Introduction to Green Chemistry*. Washington: American Chemical Society.
2. Lancaster, M. (2010).*Green Chemistry: An Introductory Text*. 2nd Edition. RSC Publishing.

Semester-VI

16CHU603B MOLECULES OF LIFE 4H 4C

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The course enable the student to

- Understand the structures of different types of carbohydrates
- Understand the synthesis and functions of proteins
- Understand the functions of enzymes
- Understand the synthesis and functions of nucleic acid
- Understand the classification of lipids
- concept of energy in biosystems

Course Outcomes

1. Understopd the structures of different types of carbohydrates
2. Understood the synthesis and functions of proteins
3. Understood the functions of enzymes
4. Understood the synthesis and functions of nucleic acid
5. Understood the classification of lipids
6. concept of energy in biosystems

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

CARBOHYDRATES

Classification of carbohydrates, reducing and non-reducing sugars, General Properties of Glucose and Fructose, their open chain structure. Epimers, mutarotation and anomers. Determination of configuration of Glucose (Fischer proof). Cyclic structure of glucose. Haworth projections. Cyclic structure of fructose. Linkage between monosachharides, structure of disacharrides (sucrose, maltose, lactose) and polysacharrides (starch and cellulose) excluding their structure elucidation.

UNIT II

AMINO ACIDS, PEPTIDES AND PROTEINS

Classification *of Amino Acids*, Zwitterion structure and Isoelectric point. Overview of Primary, Secondary, Tertiary and Quaternary structure of proteins. Determination of primary structure of peptides, determination of N-terminal amino acid (by DNFB and Edman method) and C–terminal amino acid (by thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple peptides (upto dipeptides) by N-protection (tbutyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid phase synthesis.

UNIT III

ENZYMES AND CORRELATION WITH DRUG ACTION

Mechanism of enzyme action, factors affecting enzyme action, Coenzymes and cofactors and their role in biological reactions, Specificity of enzyme action(Including stereospecificity), Enzyme inhibitors and their importance, phenomenon of inhibition(Competitive and Noncompetitive inhibition including allosteric inhibition). Drug action-receptor theory. Structure –activity relationships of drug molecules, binding role of –OH group,-NH2 group, double bond and aromatic ring,

UNIT IV

NUCLEIC ACIDS

Components of Nucleic acids: Adenine, guanine, thymine and Cytosine (Structure only), other components of nucleic acids, Nucleosides and nucleotides **(nomenclature**), Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA(**types of RNA**), Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation.

UNIT V

LIPIDS

Introduction to lipids, classification. Oils and fats: Common fatty acids present in oils and fats, Omega fatty acids, Trans fats, Hydrogenation, Saponification value, Iodine number. Biological importance of triglycerides, phospholipids, glycolipids, and steroids (cholesterol).

Concept of energy in Biosystems

Calorific value of food. Standard caloric content of carbohydrates, proteins and fats. Oxidation of foodstuff (organic molecules) as a source of energy for cells. Introduction to Metabolism (catabolism, anabolism), ATP: the universal currency of cellular energy, ATP hydrolysis and free energy change. Conversion of food into energy. Outline of catabolic pathways of Carbohydrate- Glycolysis, Fermentation, Krebs Cycle. Overview of catabolic pathways of Fats and Proteins. Interrelationships in the metabolic pathways of Proteins, Fats and Carbohydrates.

Suggested Readings

Text Books:

1. Morrison, R. T. & Boyd, R. N.(1992)*Organic Chemistry*. Dorling Kindersley (India) Pvt.Ltd. (Pearson Education).
2. Finar, I. L. (2002). *Organic Chemistry.* Volume 1. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. (2002). *Organic Chemistry.* Volume 2. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Reference Books:

1. Nelson, D. L. & Cox, M. M.(2012)*Lehninger's Principles of Biochemistry*.7th Ed.W. H.Freeman.
2. Berg, J.M., Tymoczko, J.L. & Stryer, L. (2002).*Biochemistry*. W.H. Freeman.

Semester-VI

16CHU612A MOLECULAR MODELING AND DRUG DESIGN PRACTICAL 4H 2C

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course objectives

The lab course enables the students to analyse

- Qualititative and qualitative calculations involved in the molecular modelling and its usefulness in drug design
- Compare the optimized C-C bond lengths in ethane, ethene, ethyne and benzene.Visualize the molecular orbitals of the ethane σ bonds and ethene, ethyne, benzeneand pyridine π bonds.
- Perform a conformational analysis of butane. (b)
- Determine the enthalpy of isomerization of *cis* and *trans*2-butene.
- Relate the charge on the hydrogen atom in hydrogen halides with their acidcharacter.
- Compare the basicities of the nitrogen atoms in ammonia, methylamine,dimethylamine and trimethylamine.
- Compare the shapes of the molecules: 1-butanol, 2-butanol, 2-methyl-1-propanol,and 2-methyl-2-propanol.

Course outcomes

The students have analysed

1. The Qualititative and qualitative calculations involved in the molecular modelling and its usefulness in drug design
2. Comparision of the optimized C-C bond lengths in ethane, ethene, ethyne and benzene.Visualize the molecular orbitals of the ethane σ bonds and ethene, ethyne, benzeneand pyridine π bonds.
3. Performed a conformational analysis of butane.
4. Determination of the enthalpy ofisomerization of *cis a*nd *trans2*-butene.
5. Relate the charge on the hydrogen atom in hydrogen halides with their acidcharacter.
6. Comparision of the shapes of the molecules: 1-butanol, 2-butanol, 2-methyl-1-propanol, and 2-methyl-2-propanol.
7. Compare the shapes of the molecules: 1-butanol, 2-butanol, 2-methyl-1-propanol,and 2-methyl-2-propanol.

Methodology

Free Computer softwares

i. Compare the optimized C-C bond lengths in ethane, ethene, ethyne and benzene. Visualize the molecular orbitals of the ethane σ bonds and ethene, ethyne, benzene and pyridine π bonds.

ii. (a) Perform a conformational analysis of butane. (b) Determine the enthalpy of isomerization of *cis* and *trans* 2-butene.

iii. Visualize the electron density and electrostatic potential maps for LiH, HF, N_2, NO and CO and comment. Relate to the dipole moments. Animate the vibrations of these molecules.

iv. (a) Relate the charge on the hydrogen atom in hydrogen halides with their acid

character. (b) Compare the basicities of the nitrogen atoms in ammonia, methylamine, dimethylamine and trimethylamine.
v. (a) Compare the shapes of the molecules: 1-butanol, 2-butanol, 2-methyl-1-propanol, and 2-methyl-2-propanol. Note the dipole moment of each molecule. (b) Show how the shapes affect the trend in boiling points: (118 ºC, 100 ºC, 108 ºC, 82 ºC,respectively).
vi. Build and minimize organic compounds of your choice containing the following functional groups. Note the dipole moment of each compound: (a) alkyl halide (b) aldehyde (c) ketone (d) amine (e) ether (f) nitrile (g) thiol (h) carboxylic acid (i) ester (j) amide.
vii. (a) Determine the heat of hydration of ethylene. (b) Compute the resonance energy of benzene by comparison of its enthalpy of hydrogenation with that of cyclohexene.
viii. Arrange 1-hexene, 2-methyl-2-pentene, (*E*)-3-methyl-2-pentene, (*Z*)-3-methyl-2-pentene, and 2,3-dimethyl-2-butene in order of increasing stability.
ix. (a) Compare the optimized bond angles H2O, H2S, H2Se. (b) Compare the HAH bond angles for the second row dihydrides and compare with the results from qualitative MO theory.
Note: Software: ChemSketch, ArgusLab (www.planaria-software.com), TINKER 6.2 (dasher.wustl.edu/ffe), WebLab Viewer, Hyperchem, or any similar software.

Suggested Readings
Text Books:

1. Leach, A.R. (2001). *Molecular Modelling Principles and Application*. Longman.
2. Haile, J.M. (1997). *Molecular Dynamics Simulation Elementary Methods*, John Wiley and Sons.

Reference Book:

1. Gupta, S.P. (2008). *QSAR and Molecular Modeling*. Springer - Anamaya Publishers.

Semester-VI

16CHU612B CHEMISTRY-DSE LAB: INDUSTRIAL CHEMICALS4H 2C AND ENVIRONMENT PRACTICAL

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The course will enable the student to

- Determine the dissolved oxygen,
- Determine the CO_2,
- Determine the COD and
- Determine the BOD in water
- Determine the chloride, alkalinity of water
- Determine the sulphate content and alkalinity of water

Course Outcomes

The studends have the knowledge

1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Percentage of available chlorine in bleaching powder.
5. Measurement of chloride, sulphate and salinity of water samples by simple titration method (AgNO3 and potassium chromate).
6. Estimation of total alkalinity of water samples (CO_3^{2-}, HCO_3^-) using double titration method.

Methodology

Titrations

1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Percentage of available chlorine in bleaching powder.
5. Measurement of chloride, sulphate and salinity of water samples by simple titration method (AgNO3 and potassium chromate).
6. Estimation of total alkalinity of water samples (CO_3^{2-}, HCO_3^-) using double titration method.
7. Measurement of dissolved CO_2.
8. Study of some of the common bio-indicators of pollution.
9. Preparation of borax/ boric acid.

Suggested Readings

Text Books:

1. Felder, R.M. & Rousseau, R.W.(2004). *Elementary Principles of Chemical Processes*. New Delhi: Wiley Publishers.

2. Kent, J. A.(1997). *Riegel's Handbook of Industrial Chemistry.* New Delhi: *CBS* Publishers.
3. Dara, S. S.(2014). *A Textbook of Engineering Chemistry*. New Delhi: S. Chand & Company Ltd.
4. K. De. (2007). *Environmental Chemistry*. New Delhi: New Age International Pvt., Ltd.

Reference Books:

1. Khopkar, S. M.(1993). *Environmental Pollution Analysis*. New Delhi: Wiley Eastern Ltd.
2. Manahan, S.E. (2005). *Environmental Chemistry*. CRC Press.
3. Miller, G.T. (2006). *Environmental Science.* 11th edition. Brooks/ Cole
4. Mishra, A. (2005). *Environmental Studies*. New Delhi: Selective and Scientific Books.

Semester-VI

16CHU613A GREEN CHEMISTRY PRACTICAL 4H 2C

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The lab course will enable to

- Select safer raw materials
- Identify to use renewable resources
- Understand avoiding waste
- Understand to use alternate green sources of solvents and energy
- To Avoiding waste
- To Use of enzymes as catalysts

Course Outcomes

1. Select safer raw materials
2. Identifying the use renewable resources
3. Understood avoiding waste
4. Understood to use alternate green sources of solvents and energy
5. Avoiding waste
6. Use of enzymes as catalysts

Methodology

Preparation of nanoparticles, Enzyme catalysis, microwave assisted synthesis.

1. Safer starting materials

Preparation and characterization of nanoparticles using tea leaves.

2. Using renewable resources

Preparation of biodiesel from vegetable/ waste cooking oil.

3. Avoiding waste

Principle of atom economy.

Use of molecular model kit to stimulate the reaction to investigate how the atom economy can illustrate Green Chemistry.

Preparation of propene by two methods can be studied

(I) Triethylamine ion + OH- → propene + trimethylpropene + water

(II) 1-propanol H_2SO_4/propene + water

Other types of reactions, like addition, elimination, substitution and rearrangement should also be studied for the calculation of atom economy.

4. Use of enzymes as catalysts

Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.

5. Alternative Green solvents

Extraction of D-limonene from orange peel using liquid CO_2 prepared form dry ice.

Mechanochemical solvent free synthesis of azomethines

6. Alternative sources of energy
Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II).
Photoreduction of benzophenone to benzopinacol in the presence of sunlight.

Suggested Readings

Text Books:

1. Anastas, P.T & Warner, J.C. (1998). *Green Chemistry: Theory and Practice.*Oxford University Press.
2. Kirchoff, M. & Ryan, M.A. (2002).*Greener approaches to undergraduate chemistry experiment*. Washington DC: American Chemical Society.
3. Ryan, M.A. (2002). *Introduction to Green Chemistry*. Tinnesand (Ed). Washington DC: American Chemical Society.

Reference Book:

1. Cann, M.C.,& Connelly, M. E. (2008).*Real world cases in Green Chemistry*. American Chemical Society.

Semester-VI

16CHU613B MOLECULES OF LIFE PRACTICAL4H 2C

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

The lab course enable a student to

- Separate amino acids by paper chromatography
- To determine the concentration of glycine solution by formylation method.
- Study of titration curve of glycine
- Study the action of salivary amylase on starch
- Study the effect of temperature on the action of salivary amylase on starch.
- To determine the saponification value of an oil/fat.
- To determine the iodine value of an oil/fat
- Differentiate between a reducing/ nonreducing sugar.
- Extract of DNA from onion/cauliflower
- To synthesise aspirin by acetylation of salicylic acid and compare it with the ingredient of an aspirin tablet by TLC.

Course Outcomes

1. Separate amino acids by paper chromatography
2. Determination of the concentration of glycine solution by formylation method.
3. Study of titration curve of glycine
4. Study the action of salivary amylase on starch
5. Study the effect of temperature on the action of salivary amylase on starch.
6. Determination of the saponification value of an oil/fat.
7. Determination the iodine value of an oil/fat
8. Differentiate between a reducing/ nonreducing sugar.
9. Extract of DNA from onion/cauliflower
10. synthesis of aspirin by acetylation of salicylic acid and compare it with the ingredient of an aspirin tablet by TLC.

Methodology

Paper chromatography, titrations, extraction of DNA, TLC

1. Separation of amino acids by paper chromatography
2. To determine the concentration of glycine solution by formylation method.
3. Study of titration curve of glycine
4. Action of salivary amylase on starch
5. Effect of temperature on the action of salivary amylase on starch.
6. To determine the saponification value of an oil/fat.
7. To determine the iodine value of an oil/fat
8. Differentiate between a reducing/ nonreducing sugar.
9. Extraction of DNA from onion/cauliflower
10. To synthesise aspirin by acetylation of salicylic acid and compare it with the ingredient of an aspirin tablet by TLC.

Suggested Readings

Text Books:

1. Furniss, B.S., Hannaford, A.J., Rogers, V., Smith, P.W.G. &Tatchell, A.R. (1978). *Vogel's Textbook of Practical Organic Chemistry*. ELBS.
2. Ahluwalia, V.K. & Aggarwal, R.(2004). *Comprehensive Practical Organic Chemistry*. Universities Press.

		Semester-VI
16CHU691	**PROJECT WORK**	**8H 6C**

Instruction Hours/week: L:0 T:0 P:8Marks: Internal: 40 External: 60 Total:100

M.Sc. CHEMISTRY
CHOICE BASED CREDIT SYSTEM (CBCS)

Curriculum and Syllabus
Regular (2016 – 2017)

Enable | Enlighten | Enrich

KARPAGAM
UNIVERSITY
(Established Under Section 3 of UGC Act, 1956)

DEPARTMENT OF CHEMISTRY
FACULTY OF ARTS, SCIENCE AND HUMANITIES

KARPAGAM UNIVERSITY

(Deemed University Established Under Section 3 of UGC Act, 1956)
Eachanari (Post), Coimbatore – 641 021, Tamil Nadu, India

Preamble

Karpagam University has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of the University. The measures taken to enhance the quality in higher education include innovation and improvements in curriculum, teaching-learning process, and examination and evaluation systems. The grading system is considered to be better than the conventional marks system and is followed. This will facilitate student mobility across institutions within and across countries and also enable potential employers to assess the performance of students.

Choice Based Credit System (CBCS): The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses will be evaluated following the grading system, which is considered to be better than the conventional marks system.

Outline of Choice Based Credit System:

1. Core Course: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. Elective Course: Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

3. Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem.

Objectives of the Programme

The student will acquire a foundation of chemistry of sufficient breadth and depth to enable them to understand and critically interpret the primary chemical literature. It provides a broad foundation in chemistry that stresses scientific reasoning and analytical problem solving with a molecular perspective. The student will learn the laboratory skills needed to design, safely conduct and interpret chemical research. The student will learn professionalism, including the ability to work in teams and apply basic ethical principles. The course also prepares the graduates for employment as chemists as well as to pusue research.

Programme Learning Outcomes (PLO)

a. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries.
b. Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.
c. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
d. Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large.
e. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
f. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
g. Students will be able to function as a member of an interdisciplinary problem solving team.
h. The graduate has specific skills in planning and conducting advanced chemical experiments and applying structural-chemical characterisation techniques.
i. Are able to use modern instrumentation and classical techniques, to design experiments, and to properly record the results of their experiment.
j. Are able to use modern library searching and retrieval methods to obtain information about a topic, chemical, chemical technique, or an issue relating to chemistry.

Programme Specific outcome (PSO)

k. A graduate with a Master's degree in Chemistry has in-depth and detailed functional knowledge of the fundamental theoretical concepts and experimental methods of chemistry.
l. Students should have an advanced level understanding of the following areas of chemistry - Analytical, Inorganic, Organic, and Physical Chemistry. They should master graduate level understanding of their major area(s) of research.
m. Students should be able to communicate scientific results in writing and in oral presentation.
n. Students should become proficient in their specialized area of chemistry and acquire the basic tools needed to carry out independent chemical research

Programme Educational Objectives

PEO-1

The Masters in Chemistry will extend your depth and breadth of knowledge in all branches of chemistry, suitable for a professional chemist capable of conducting research.

PEO-2

To carryout research in the trust areas of chemistry. Will be able to communicate effectively the scientific information and research results in written and oral formats, to both professional scientists and to the public.

PEO-3

To motivate critical thinking and analytical skills to solve complex chemical problems and the Ability to handle problems of practical relevance to society while complying with economical, environmental, ethical, and safety factors.

PEO-4

To practice chemistry by performance of experiments in the laboratory classes. To perform accurate quantitative measurements with an understanding of the theory and use of contemporary chemical instrumentation, interpret experimental results, perform calculations on these results and draw reasonable, accurate conclusions

Mapping

PO	a	b	c	d	e	f	g	h	i	j	k	l	m	n
PEO 1	x	x			x			x	x		x	x	x	
PEO 2		x	x	x	x			x	x		x		x	x
PEO 3			x	x		x	x			x			x	x
PEO 4	x	x	x			x		x		x	x	x		x

KARPAGAM UNIVERSITY
DEPARTMENT OF CHEMISTRY
M.Sc. CHEMISTRY
(Scheme of Examination for 2016-2017 onwards)

Code	Course(s)	Objectives and outcomes		Ins*	Marks			Exam Hrs	Credit
		PEO'S	PO'S		CIA	ESE	Total		
	SEMESTER – I								
16CHP101	Organic Chemistry – I (Reaction Mechanisms)	1,2,3	a,c,e	4	40	60	100	3	4
16CHP102	Inorganic Chemistry –I (Nuclear Chemistry and Metallic Clusters)	1,2,3	a,c,e	4	40	60	100	3	4
16CHP103	Physical Chemistry- I (Quantum Chemistry and Group Theory)	1,2,3	a,c,e	4	40	60	100	3	4
16CHP104	Organic and Inorganic Spectroscopy	1,2,3,4	a,b,c,h.j	4	40	60	100	3	4
16CHP105A 16CHP105B 16CHP105C	Elective I	1,2,3	a,c,e	4	40	60	100	3	4
16CHP111	Organic Chemistry Practical-I (Qualitative Analysis and Single Stage Preparations)	3,4	b,h,j	4	40	60	100	6	2
16CHP112	Organic Chemistry Practical-II (Quantitative Analysis and Double Stage Preparations)	3,4	b,h,j	4	40	60	100	6	2
	Journal Paper Analysis & Presentation	1,2,3	a,b,c,d,e,h,j	2	-	-	-	-	-
Semester total				**30**	**280**	**420**	**700**		**24**
	SEMESTER – II								
16CHP201	Organic Chemistry-II (Rearrangements, Reactions, Photochemistry and Pericyclic Reactions)	1,2,3	a,c,e	4	40	60	100	3	4
16CHP202	Inorganic Chemistry-II (Co-ordination Chemistry)	1,2,3	a,c,e	4	40	60	100	3	4
16CHP203	Physical Chemistry II (Chemical Kinetics and Electrochemistry)	1,2,3	a,c,e	4	40	60	100	3	4
16CHP204	Industrial chemicals and environment	3,4	f,h	4	40	60	100	3	4
16CHP205A	Elective – 2 (CBCS)	1,2,	a,c,	4	40	60	100	3	4

16CHP205 B 16CHP205 C		3	e						
16CHP211	Inorganic Chemistry Practical-I (Qualitative Analysis and Preparations)	3,4	b,h, j	4	40	60	100	6	2
16CHP212	Inorganic Chemistry Practical-II (Quantitative Analysis and Complex Preparations)	3,4	b,h, j	4	40	60	100	6	2
	Journal Paper Analysis & Presentation	1,2, 3	A,b, c,d, e,h,j	2	-	-	-	-	-
Semester total					**280**	**420**	**700**		**24**
	SEMESTER – III								
16CHP301	Organic Chemistry-III (Natural Products)	1,2, 3	a,c, e	4	40	60	100	3	4
16CHP302	Physical Chemistry –III (Thermodynamics)	1,2, 3	a,c, e	4	40	60	100	3	4
16CHP303	Physical Methods in Chemistry (Instrumentation)	1,2, 3	a,c, e	4	40	60	100	3	4
16CHP304	Nanochemistry	3,4	F,h	4	40	60	100	3	4
16CHP305 A 16CHP305 B 16CHP305 C	Elective –3 (CBCS)	1,2, 3	a,c, e	4	40	60	100	3	4
16CHP311	Physical Chemistry Practical I (Molecular Weight Determination and Conductometric Titrations)	3,4	b, h,i	4	40	60	100	6	2
16CHP312	Physical Chemistry Practical II (Chemical Kinetics and Potentiometric Titrations)	3,4	b, h,i	4	40	60	100	6	2
	Journal Paper Analysis & Presentation	1,2, 3	A,b, c,d, e,h,j	2	-	-	-	-	-
Semester total				**30**	**280**	**420**	**700**		**24**
	SEMESTER – IV								
	Project and Viva Voce	1,2, 3	A,b, c,d, e,h,j	-	80	120	200	-	15
Semester total				-	80	120	**200**	**-**	**15**
				90	**920**	**1380**	**2300**		**87**

List of Core Course Elective					
Elective-I		**Elective-II**		**Elective-III**	
Code	**Course**	**Code**	**Course**	**Code**	**Course**
16CHP105A	Green Chemistry	16CHP205A	Research methodology for chemistry	16CHP305A	Polymer Chemistry
16CHP105B	Medicinal Chemistry	16CHP205B	Analytical Chemistry	16CHP305B	Textile Chemistry
16CHP105C	Molecular Modelling & Drug Design	16CHP205C	Organometallic Chemistry	16CHP305C	Industrial Chemistry

Semester-I

16CHP101 **ORGANIC CHEMISTRY- I (REACTION MECHANISMS)** **4H 4C**

Instruction Hours/week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

- To understand aromaticity.
- To provide a versatile knowledge of different name reactions and their application in synthesis.
- To learn about familiar addition and elimination reactions.
- To gain knowledge about reaction intermediates.
- To understand the principles and reaction mechanisms involving various electrophilic and nucleophilic, addition and elimination reactions.
- To relate the different organic reaction mechanisms.

Course outcomes (CO's)

1. Learned the concept aromaticity and various types of aromaticity
2. Familiarized the various types of electrophilic and nucleophilic substitution reactions and their Mechanism
3. Learned the familiar addition and elimination reactions
4. Learned the concept of reaction intermediates.
5. Understood about the synthesise aromatic compounds using electrophilic and nucleophilic substitution, addition and elimination reactions.
6. Described the various organic reaction mechanisms.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT – I

Aromaticity and chemical methods in mechanisms: Aromaticity - introduction - aromaticity of benzenoid and heterocyclic compounds. Non-benzenoid aromatics – annulenes, azulenes, ferrocenes and fulvenes.

Kinetic and non-kinetic methods of study of reaction mechanisms - kinetic methods- Primary and secondary kinetic isotopic effects. Non-kinetic methods - study of intermediates, isotopic labeling, stereochemical studies, energy profile diagrams and cross over experiments. Hammond's postulate. Kinetic and thermodynamic control.

Linear free energy relationship - Hammett equation and Taft equation.

UNIT – II

Addition reactions: Electrophilic, nucleophilic and free radical addition to double and triple bonds - hydration, hydroxylation, Michael addition, hydroboration and epoxidation. Addition reactions to carbonyl compounds – Mannich reaction, Meerwein Pondroff-

Verley reduction, Grignard, Claisen, Dieckmann, Stobbe, Knovenagel, Darzen, Wittig, Thorpe and Benzoin reactions.

UNIT – III

Electrophilic substitution reactions: Aromatic electrophilic substitution reactions-formylations–Gattermann, Gattermann Koch and Riemer Tiemann reactions. Kolbes, Bischler-Napieralski and Hofmann-Martius reactions. Friedel crafts alkylation and acylations and Vilsmeier-Haack reaction.

Aliphatic electrophilic substitution reactions - mechanisms- SE1, SE2 and SEi - structure reactivity relationship, typical electrophilic substitution reactions - Friedel crafts acylation at olefinic carbon, Stork enamine reaction and decarboxylation of aliphatic acids.

UNIT – IV

Nucleophilic substitution reactions: Aliphatic nucleophilic substitution reactions-mechanisms - SN1, SN2, ion pair and SNi- substitution at vinyl carbon. Stereochemistry of nucleophilic substitution reaction - effect of substrate structure - solvent effects - leaving group effect – nucleophilicity, ambident nucleophiles and ambident substrates-neighbouring group participation.

Aromatic nucleophilic substitution reactions - benzyne mechanism, intermediate complex mechanism and SN1 mechanism, structure reactivity relationship.

Ziegler alkylation and Chichibabin reaction.

UNIT – V

Elimination reactions: Mechanisms - E1, E2, Ei and E1cB mechanisms- stereochemistry of eliminations. Hofmann rule-Saytzeff rule-Bredts rule – Substitution versus Elimination. Typical elimination reaction - Chugaev reaction, Hofmann degradation and Cope elimination.

Carbenes and nitrenes - structure, generation and reactions.

SUGGESTED READINGS:

Text Books:

1. Smith, M. B., & March, J. (2007). *March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure* (VI Edition). New Jersey: John Wiley & Sons, Inc., Hoboken.
2. Finar, I. L. (2000). *Organic Chemistry Vol. II: Stereochemistry and the Chemistry of Natural Products* (V Edition). New Delhi: Addison Wesley Longman (Singapore) Pvt. Ltd- Indian Branch.
3. Chatwal, G. R. (2011). *Organic Chemistry of Natural Products Vol. II*. New Delhi: Himalaya Publishing House.

Reference Books

1. Sanyal, S. N. (2006). *Reactions, Rearrangements and Reagents* (IV Edition). New Delhi: Bharathi Bhawan (Publishers and Distributors).
2. Tewari, N. (2011). *Advanced Organic Reaction Mechanism* (III Edition). Kolkata: Books and Allied (P) Ltd.
3. Agarwal, O. P. (2004). *Natural Product Chemistry Vol. II*. Meerut: Goel Publishing House.
4. Chatwal, G. R. (2011). *Organic Chemistry of Natural Products. Vol. I*. New Delhi: Himalaya Publishing House.

Semester-I

16CHP102 INORGANIC CHEMISTRY-I 4H 4C

(NUCLEAR CHEMISTRY AND METALLIC CLUSTERS)

Instruction Hours/week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

- To learn the nuclear structure, stable and unstable atomic nuclei, nuclear reactions and different modes of radioactive decay and also methods for measurements of radioactivity.
- To analyses the various defects and its application on inorganic crystals.
- To understand the detection of radioactive rays and to measure the radiation.
- To learn about the fundamentals of metallic clusters.
- To understand the chemistry of boranes and related compounds.
- To apply the knowledge to know about the various forms of inorganic compounds

Course outcomes

1. Described the basic concepts of nuclear chemistry and types of nuclear reactions.
2. Discriminate the various defects and also known about its application on inorganic crystals
3. Understood the Basics of metallic clusters, preparation, properties and applications of metallic clusters
4. Learned the structure and bonding in molecules / ions and predict the structure of molecules / ions.
5. Described the type of defects in metals and about semi conductors
6. Understood the inorganic and organometallic chemistry, catalysis in the molecular level

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT – I

Inorganic chains – rings - cages and clusters (definition and structure) - metal clusters - dinuclear clusters - trinuclear clusters - tetranuclear clusters - hexanuclear clusters – organometallic clusters.

Boranes, boron hydrides (structure and properties) – carboranes - metallocarboranes - Wade's theory -closo-nido and arachno structures - borazines, phosphazenes – Sulphur-Nitrogen ring compounds. Isopoly and heteropoly acids of V, Cr, Mo and W.

UNIT – II

Metallic state-free electron, band and zone theories - non stoichiometry - point defects in solids - Schottky and Frenkel defects - linear effects - dislocation - effects due to dislocation - electrical properties of solids - insulators-intrinsic semiconductors - n and p type and super conductors - ceramics elementary treatment.
Organometallic compounds in homogeneous catalytic reactions-coordinative unsaturation – acid-base behavior reaction – migration of atoms or groups from metal to ligand –

insertion reaction – reactions of coordinated ligands – catalytic reactions of alkenes – isomerisation of alkenes – hydrogenation – hydroformylation and hydrosilation of alkenes – alkene polymerization and oligomerisation – fluxional molecules.

UNIT – III

Nuclear Chemistry - the nucleus - subatomic particles and their properties, binding energy. N/P ratios in stable and meta stable nuclei - different type of nuclear forces - liquid model- shell model. Modes of radioactive decay - α, β and γ decay radiation, electron capture, nuclear isomerism and internal conversion.

UNIT – IV

Experimental methods - Cloud chamber, nuclear emulsion, bubble chamber, proportional counters-G.M counter, scintillation counters, semi conductor detector.
Particle accelerators - Cyclotron, synchrotron, betatron and bevatron.

UNIT – V

Nuclear reactions - Bethes's notation, Q-value, columbic barrier, cross section, different types of nuclear reactions - projectiles capture - particle emission, spallation, fission, fusion, theories of fission, use of fission products, nuclear reactors - fissile and fertile isotopes- U^{233},U^{235},Pu^{239},Th^{232},-atomic power projects in India, stellar energy, synthetic elements - application of radio isotopes - Hot atom chemistry**.**

SUGGESTED READINGS:

Text Books:

1. Huheey, J. E., Keitler, E. A., & Keitler, R. L. (2002). *Inorganic Chemistry-Principles of Structure and Reactivity* (IV Edition). Singapore: Pearson Education.
2. Shekar, C. V. (2005). *A Text Book of Nuclear Chemistry* (I Edition). New Delhi: Dominant publishers and Distributors.
3. Arnikar, H. J. (2003). *Essentials of Nuclear Chemistry* (IV Edition). New Delhi: New Age International Publishers Pvt. Ltd.
4. Chakrabarty, D. K. (2005). *Solid State Chemistry* (I Edition). New Delhi: New Age International Publishers.
5. Cotton, F. A., Wilkinson, G., Murillo, C. A., & Bochmann, M. (1999). *Advanced Inorganic Chemistry* (VI Edition). New York: John Wiley & Sons.

Reference Books:

1. Glasstone, S. (1967). *Source Book on Atomic Energy* (III Edition). New Delhi: East West Press.
2. Gurdeep Raj, (2002). *Advanced Inorganic Chemistry Vol. I* (24^{th} Revised Edition). Meerut: Goel Publishing House.
3. Madan, R. D. (2005). *Modern Inorganic Chemistry*. New Delhi: S. Chand & Co.
4. Puri, B. R., & Sharma, L. R. (2002). *Principles of Inorganic Chemistry*. New Delhi: Shoban Lal & Co.
5. Wahid Malik, Madan. R.D., and Tuli, G.D. (2004). Selected topics in Inorgani Chemistry. New Delhi. S. Chand & Co.

Semester-I

16CHP103 PHYSICAL CHEMISTRY- I 4H 4C

(QUANTUM CHEMISTRY AND GROUP THEORY)

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

- To study the fundamentals and applications of classical mechanics and quantum chemistry
- To understand the structure of an atom and different approximation methods
- To learn the concept of Group theory and their applications.
- To discuss the molecular phenomena and its model problems
- To explain the probabilities, amplitudes, averages, expectation values and observables.
- To analyses the concept of group theory to predict the spectroscopic properties of a molecules

Course Outcomes (CO's)

Students have learned and understood

1. The differences between classical and quantum mechanics. The limitations of classical mechanics.
2. the connection of quantum mechanical operators to observables
3. probabilities, amplitudes, averages, expectation values, and observables
4. how molecular phenomena can be related to model problems
5. the fundamentals of group theory
6. the connection between common approximation methods and standard chemical frameworks (Born-Oppenheimer approximation, molecular orbitals, for example)
7. Identified the point groups of molecules and apply the concept of group theory to predict the spectroscopic properties.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT – I

Failure of classical mechanics and the success of quantum theory in explaining black body radiation and photoelectric effect.

The time dependent and time independent Schrodinger equations - Born's interpretation of the wave function. Requirements of the acceptable wave function.

Algebra of operators. Sums and products of operators - commutator - linear operators- eigen functions and eigen values - correspondence between physical quantities in classical mechanics and operators in quantum mechanics - Hamiltonian operator - angular momentum operator. Quantization of angular momentum and its spatial orientation - average values - postulates of quantum mechanics.

UNIT – II

Particle in a one-dimensional box - quantization of energy - normalization of wave function - orthogonality of the particle in a one-dimensional box wave functions. Illustration of the uncertainty principle and correspondence principle with reference to the particle in a one-dimensional box - particle in a three dimensional box - separation of variables.

Solving of Schrodinger equation for one-dimensional harmonic oscillator. Harmonic oscillator model of a diatomic molecule. Illustration of the uncertainty principle and correspondence principle with reference to harmonic oscillator.

Solving of Schrodinger equation for a rigid rotor. Rigid rotor model of a diatomic molecule.

UNIT – III

Schrodinger equation for the H-atom (or H-like species)- separation of variables - energy levels. Radial distribution functions - orbitals and orbital shapes. Probability density and radial distribution functions.

Need for approximation methods. The perturbation theory- application of perturbation method to systems such as anharmonic oscillator and He-atom.

The variation method - application of variation method to systems such as anharmonic oscillator and He-atom.

UNIT – IV

Symmetry elements and symmetry operations - definition of identical and equivalent elements configurations - effect of performing successive operations commutative and non-commutative - inverse operations.

Groups and their basic properties - definition of a group - basic properties of a group- definition of abelian - cyclic- isomorphic, finite, infinite groups and subgroup. Symmetry classification of molecules into point groups-Schoenflies symbol (only-difference between point group and space group).

Matrices- Definition of matrix, square matrix, diagonal matrix, null matrix, unit matrix, row matrix, column matrix, symmetric matrix, skew symmetric matrix and conjugate matrix. Multiplication, commutative and non commutative-determination of inverse of a matrix, block multiplication of matrices-addition and subtraction of matrices.

Matrix notations for symmetry operations of C_{2v} and C_{3v} groups-construction of character tables for C_{2v} and C_{3v} point groups**.**

UNIT – V

Definition of reducible and irreducible representations - irreducible representations as orthogonal vectors - direct product rule, the great orthogonality theorem and its consequences - determinations of the characters for irreducible representation of C_{2v} and C_{3v} point groups using the orthogonality theorem.

Group theory and Vibrational spectroscopy - vibrational modes as basis for group representation - symmetry selection rules for IR and Raman spectra, Mutual exclusion principle - classification of vibrational modes.
Group theory and dipole moment.

SUGGESTED READINGS:

Text Books:

1. Prasad, R. K. (2004). *Quantum Chemistry* (II Edition). New Delhi: New Age International Publishers Pvt. Ltd.
2. Cotton, F. A. (2002). *Chemical Applications of Group Theory* (III Edition). Texas: A Wiley Inter Science Publication.
3. Chandra, A. K. (2002). *Quantum Chemistry* (IV Edition). New Delhi: Tata McGraw – Hill Publishing Company Ltd.
4. House, J. E. (2003). *Fundamental of Quantum Chemistry* (II Edition). New Delhi: Academic Press.
5. Levine, I. N. (2004). *Quantum Chemistry* (V Edition). New Delhi: Pearson Education Pvt. Ltd.

Reference Books:

1. Raman, K.V. (2002). *Group Theory and its Applications to Chemistry*. New Delhi: Tata McGraw Publishing Company.
2. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2013). *Principles of Physical Chemistry* (46th Edition). Jalandar: Vishal Publishing Co.
3. Veera Reddy, K. (2009). *Symmetry and Spectroscopy of Molecules*. New Delhi: New Age International Pvt. Ltd.
4. Atkins, P., & De Paula, J. (2014). *Atkins Physical Chemistry* (X Edition). Oxford: Oxford University Press.

Semester-I

16CHP104 ORGANIC AND INORGANIC SPECTROSCOPY 4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objective

This course enables the students

- To learn about Electronic spectroscopy.
- To understand about IR spectroscopy.
- To understand the basic concept of NMR spectroscopy
- To apply the different aspects of NMR spectroscopy to predict the structure of compounds.
- To learn about the mass spectroscopy and Mossbauer spectroscopy.
- To learn about the invaluable tools in synthetic chemistry for the confirmation of known molecules and elucidation of shape and structures of unknown compounds of high complexity with a high degree of certainty.

Course outcomes

On completion of this course, students to have

1. Understood the basic concepts of Electronic and IR spectroscopy.
2. Understood the valuable concepts in NMR spectroscopy.
3. Learned the basic knowledge about Mass spectroscopy.
4. Applied the different aspects of NMR spectroscopy to predict the structure of compounds.
5. Analyzed and identified simple organic molecules by using UV, IR, ^{1}H-NMR and ^{13}C-NMR and Mass spectral data.
6. The students learned how to interpret the spectral data and to identify the structure of the molecules

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT- I

Ultraviolet and Visible Spectroscopy: Electronic spectra of diatomic molecules - laws of photochemistry - electronic absorption transitions-correlation of electronic structure with molecular structure - simple chromophoric groups - effects of conjugation - Woodward -Fisher rules for α,β unsaturated carbonyl compounds & dienes - aromatic systems with extended conjugation - applications to organic and inorganic compounds - Instrumentation**.**

UNIT-II

Infrared Spectroscopy: The vibrating diatomic molecules-the simple harmonic oscillator and unharmonic oscillator - the diatomic rotor - factors influencing vibrational frequencies - identification of fundamental groups. Fingerprint region-application to organic and inorganic compounds-Instrumentation**.**

UNIT-III

NMR Spectroscopy: Principle of NMR spectroscopy – description of the PMR instrument, factors affecting chemical shifts-chemical shift equivalence and magnetic equivalence - spin-spin coupling - first order and non first order spectra - Hetero nuclear coupling in ^{1}H NMR - deuterium exchange - high field spectra - double resonance-shift reagents-applications to organic and inorganic compounds. FT NMR.

^{13}C NMR spectroscopy-factors affecting the chemical shifts - broad band and off-resonance decoupling - applications in organic chemistry.

UNIT – IV

Mass Spectroscopy: Principles of mass spectrometry – resolution - description of single focusing and double focusing electron impact mass spectrometers - presentation and analysis of spectra - determination of molecular formulae - Nitrogen rule- Stevenson's rule - isotope abundance analysis - meta stable ions and peaks the molecular ion peak - fragmentation processes - Retro Diels - Alder rearrangement - McLafferty rearrangement - ortho effect - fragmentation associated with functional groups - aldehydes, ketones, carboxylic acids, esters, amides, alcohols, thiols, amine, ethers, sulphides and halides..

UNIT – V

Mossbauer and Problems: Mossbauer spectroscopy – principles - spectrometer - isomer shift - quadrapole interaction - nuclear zeeman splitting – applications.

Problems involving UV, IR, NMR, Mass spectral data (for compounds not more than 10 carbon atoms).

SUGGESTED READINGS:

Text Books:

1. Jag Mohan. (2007). *Organic Spectroscopy: Principles and Applications* (II Edition). New Delhi: Narose Publishing House.
2. Kemp, W. (2004). *Organic Spectroscopy* (III Edition). New York: Palgrave Macmillan.
3. Sharma, Y. R. (2007). Elementary Organic Spectroscopy: Principles and Chemical Applications (V Edition). New Delhi: S. Chand & Company Limited.
4. Silverstein, R. M., Webster, F. X., & Kiemle, D. (2005). *Spectroscopy of Organic Compounds* (VI Edition). New York: John Wiley & Sons.

Reference Books:

1. Levine, I. N. (2004). *Quantum Chemistry* (V Edition). New Delhi: Pearson Education Pvt. Ltd.
2. Prasad, R. K. (2004). *Quantum Chemistry* (II Edition). New Delhi: New Age International Publishers Pvt. Ltd.
3. Drago, R .S. (1965). *Physical Methods in Inorganic Chemistry*. New York: Reinhold Publishing Corporation.

Semester-I

ELECTIVE I

16CHP105-A **GREEN CHEMISTRY** **4H 4C**

Instruction Hours/week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

Course Objectives

This course enables the students

- To introduce the concept of Green chemistry.
- To understand the basics of Medicinal chemistry.
- To introduce the 12 principles of Green chemistry as well as the tools of Gree chemistry.
- To demonstrate how to evaluate a reaction or process and determine “Greener” alternatives.
- To focus on the application of greener routes to improve industrial processes and to produce important products.
- To understand the greener synthetic pathway to produce pharmacological compounds.

Course outcomes

The student understood the following

1. Designed of chemical products and processes that reduce or eliminate the use and generation of hazardous substances.
2. Created awareness for reducing waste, minimizing energy consumption in organic synthesis.
3. Implemented techniques of green synthesis in organic reactions
4. Used the various alternative resources for green technology in organic synthesis.
5. Understood the various greener synthetic pathways and implement it in the production of pharmacological compounds.
6. Applied the concept of microwaves and ionic liquids in various chemical reactions.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction to Green Chemistry and Principles of Green Chemistry:

What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry.
Limitations/ Obstacles in the pursuit of the goals of Green Chemistry.
Twelve principles of Green Chemistry with their explanations.

UNIT II

Designing a Green Chemical synthesis:

Designing a Green synthesis using these principles: prevention of waste/ byproducts; maximum incorporation of the materials used in the process into the final products, atom economy, calculation of atom economy of the rearrangement, addition, substitution and elimination reactions. Green solvents– supercritical fluids, water as a solvent for organic reactions, ionicliquids, fluorous biphasic solvent, PEG, solvent less processes, immobilized solvents and how to compare greenness of solvents.

UNIT III

Energy requirements for reactions – alternative sources of energy: use of microwaves and ultrasonic energy.

Microwave assisted reactions in water: Hofmann elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents. Diels-Alder reaction and decarboxylation reaction.
Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to iodine).

UNIT IV

Green synthesis/reaction: Green starting materials, Green reagents, Green solvents, reaction conditions, Green catalysis and Green synthesis- Real world cases (Traditional processes and green ones) Synthesis of Ibuprofen, Adipic acid , disodium iminodiacetate (alternative to Strecker synthesis).

UNIT V

Hazard assessment and mitigation in chemical industry: Future trends in Green Chemistry-oxidation-reduction reagents and catalysts; biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; Noncovalent derivatization. Biomass conversion, emission control and biocatalysis.

SUGGESTED READINGS:

Text Books:

1. Ahluwalia, V. K., & Kidwai, M. (2007). *New Trends in Green Chemistry* (II Edition). New Delhi: Anamalaya Publisher.
2. Anastas, P. T., & Warner, J. C. (1998). *Green Chemistry: Theory and Practice*. Oxford: Oxford University Press.
3. Matlack, A. S. (2001). *Introduction to Green Chemistry*. New York: Marcel Dekker.
4. Cann, M. C., & Connely, M. E. (2000). *Real-World cases in Green Chemistry*. Washington: American Chemical Society.

Reference Books:

1. Ryan, M. A., & Tinnesand, M. (2002). *Introduction to Green Chemistry*, Washington: American Chemical Society.
2. Lancaster, M. (2010). *Green Chemistry: An Introductory Text* (II Edition). Cambridge: RSC Publishing.

3. Clark, J. H, & Macquarrie, D. J. (2002). *Handbook of Green Chemistry & Technology*. Abingdon: Blackwell Publishing.

Semester-I

ELECTIVE I

16CHP105-B MEDICINAL CHEMISTRY 4H 4C

Instruction Hours/week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

This course enables the students

- To understand the basics of Medicinal chemistry.
- To know the drug targets, drug metabolism and about clinical training..
- To understand the in-silico techniques involved in drug development.
- To clear discussion about membrane and receptors in drug delivery process.
- To apply the various theoretical laws to predict the pharmaco-kinetics of the compounds.
- To analyses the molecular receptor binding and molecular recognition of the natural and synthetic compounds.

Course Outcomes

On the completion of the course, students to

1. Understood the basics of Medicinal chemistry.
2. Knew the drug targets, drug metabolism and about clinical training.
3. Understood in-silico techniques involved in drug development.
4. Discussed about membrane and receptors in drug delivery process.
5. Applied the various theoretical laws to predict the pharmaco-kinetics of the compounds.
6. Analyzing the molecular receptor binding and molecular recognition of the natural and synthetic compounds.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Drug discovery, design and development: Synthesis of the representative drugs of the following classes: analgesic, antipyretic and anti-inflammatory agents (Aspirin, paracetamol and lbuprofen); antibiotics (Chloramphenicol); antibacterial agents (Sulphonamides), antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital and Diazepam).

UNIT II

Insilco Drug Design and Computer Assisted New Lead Design: Introduction, historical perspective, drug compounds, preparation and organization for drug seeking, common stages in the drug seeking campaign, sources of hits, leads and candidate drugs, natural products: higher plant and animal products, combinational libraries, lead optimization. Introduction, basic concepts, molecular recognition by receptor and ligand design, active conformation, approaches to discover new functions, approaches to the cases with known and unknown receptor structure and molecular docking study.

Introduction to drug metabolism, toxicity and pharmacokinetics, toxicology considerations, problems and drawbacks on drug discovery and development.

UNIT III

Membranes and Receptors: Drug transport mechanism and absorption processes, pharmacodynamic and pharmacokinetic aspects, prodrugs and bioactivation, receptor theories and receptor models, drug receptor interactions drug design, physiochemical principles and basis of drug design, different methods of drug design,

UNIT IV

QSAR: Electronic effects; Hammett equation, Lipophilicity effects; Hansch equation, Steric Effects; Taft Equation; Experimental and theoretical approaches for the determination of physico-chemical parameters, parameter inter-dependence; linearity versus non-linearity; The importance of biological data in the correct form; Molecular docking and dynamics: Rigid docking, flexible docking and manual docking.

UNIT V

Molecular Recognition in Drug-Receptor Binding: Molecular forces and binding energetic, enzyme inhibitors - modes of inhibition and general approaches. Antibacterial drugs - major drug classes and drug resistance, antiviral drugs- major drug classes and drug resistance, anticancer drugs- major cancer drug targets, major drug classes and drug resistance.

SUGGESTED READINGS:

Text Books:

1. Ahluwalia, V. K. (2012). *Green Chemistry-Environmentally Benign Reactions*. New Delhi: Ane Books Pvt Ltd.
2. Ghose, J. (2005). *A Text book of Pharmaceutical Chemistry*. New Delhi: S. Chand Pub Ltd.
3. Ilango, K., & Valentina, P. (2007). *Text Book of Medicinal Chemistry. Vol I*. Chennai: Keerthi Publishers.
4. Ashutosh Kar, (2005). *Medicinal Chemistry* (III Edition). New Delhi: New Age International Publishers.

Reference Books:

1. Stanley E. Manahan, (2006). *Green Chemistry and the Ten Commandments of Sustainability* (II Edition). Columbia, Missouri U.S.A: ChemChar Research. Inc Publishers Columbia.
2. Chatterjea, M. N., & Shinde, R. (2012). *Textbook of Medicinal Biochemistry*. New Delhi: Jaypee Brothers. Medical Publishers (P) Ltd**.**
3. G.L. Patrick, (1995). *Introduction to Medicinal Chemistry* (I Edition). UK: Oxford University Press.
4. Wermuth, C. G. (1992). *Medicinal Chemistry for the 21st Century*. Oxford: Blackwell.

Semester-I

ELECTIVE I

16CHP105-C MOLECULAR MODELLING & DRUG DESIGN 4H 4C

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the students

- To the students should be acquainted with theoretical and practical knowledge of molecular modeling tools and techniques for drug design and discovery.
- To get knowledge of molecular modeling software will be useful for commercial projects related to drug discovery and developments.
- To understand the detailed knowledge and skill is given in the course and the students get acquired the same after studying the course.
- To study about the importance of pharmacophores in drug discovery process.
- To practice some online softwares to predict the physical and biological properties of natural/synthesized molecules.
- To apply the in-silico techniques to evaluate the drug-receptor binding affinities of the compounds.

Course outcomes (CO's)

On completion of this course, students have

1. Gained the knowledge on the molecular modeling and field effects as a part of drug discovery.
2. Understood on the various stages and various targets of drug discovery.
3. Learned the importance of the pharmacophores in drug discovery.
4. Studied the importance of the role of computer aided drug design in drug discovery.
5. Practiced some online softwares to predict the physical and biological properties of natural/synthesized molecules.
6. Applied the in-silico techniques to evaluate the drug-receptor binding affinities of the compounds.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction to Molecular Modelling:

Introduction-Useful concepts in molecular modelling: Coordinate systems.
Potential energy surfaces. Molecular graphics. Surfaces. Computer hardware and software. The molecular modelling literature.

UNIT II

Force Fields:

Fields. Bond stretching. Angle bending. Introduction to nonbonded interactions.
Electrostatic interactions. Van der Waals Interactions. Hydrogen bonding in molecular mechanics. Force field models for the simulation of liquid water.

UNIT III

Basics of molecular modelling, methods, steps involved in MM, selection of target and template, homology modelling, refinement and validation-SAVES server, the critical assessment of protein structure prediction (CASP), superposition of proteins using different tools, RMSD, presentation of protein conformations, hydrophobicity factor, shape complementary.

UNIT IV

Pharmacophore

Historical perspective and viewpoint of pharmacophore, functional groups considered as pharmacophores, Ehrlich's "Magic Bullet", Fischer's "Lock and Key", two-dimensional pharmacophores, three-dimensional approach of pharmacophores, criteria for pharmacophore model, pharmacophore model generation software tools, molecular alignments, handling flexibility, alignment techniques, scoring and optimization, pharmacophores, validation and usage, automated pharmacophore generation methods, GRID-based pharmacophore models, pharmacophores for hit identification, pharmacophores for human ADME/tox-related proteins.

UNIT V

Computer aided Chemistry: Structure Prediction and Drug Design:

Introduction to molecular docking, rigid docking, Flexible docking, manual docking, advantage and disadvantage of flex-X, flex-S, AUTODOCK and other docking software, scoring functions, simple interaction energies, GB/SA scoring (implicit solvation), CScore (consensus scoring algorithms).

SUGGESTED READINGS:

Text Books:

1. Leach, A. R. (2001). *Molecular Modelling Principles and Application* (II Edition). Longman: Prentice Hall.
2. Haile, J. M. (1997). *Molecular Dynamics Simulation Elementary Methods* (I Edition). UK: John Wiley and Sons.

Reference Books:

1. Gupta, S. P. (2008). *QSAR and Molecular Modeling* (I Edition). Springer-Netherlands: Anamaya Publishers.

Semester -I

16CHP111 ORGANIC CHEMISTRY PRACTICAL-I 4H 2C
(QUALITATIVE ANALYSIS AND SINGLE STAGE PREPARATIONS)

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the students should have

- To learn about the qualitative analysis by semi micro-qualitative analysis method.
- To learn the preparation of inorganic complexes.
- To describe the basic concept and advantages of semi- micro qualitative analysis.
- To understand the systematic separation d-block elements
- To study the step wise procedure to predict the anions along with metals
- To identify the d-block elements with their special tests.

Course Outcomes

Students have to,

1. Learned about the qualitative analysis by semi micro-qualitative analysis method.
2. Learned the preparation of inorganic complexes.
3. Described the basic concept and advantages of semi- micro qualitative analysis.
4. Understood the systematic separation d-block elements
5. Studied the step wise procedure to predict the anions along with metals
6. Identified the d-block elements with their special tests.

Methodology

Blackboard teaching and Demonstration.

Contents

Analysis of two – component mixtures: Separation and characterization of compounds.

Note: Each student should analyze a minimum of six organic mixtures.

Preparations involving one stage comprising of the following process: Nitration, acylation, halogenation, diazotisation, rearrangement, hydrolysis, reduction, alkylation and oxidation and one preparation illustrating the following: Benzoin condensation, Canizzaro reaction, Perkin reaction, Reimer-Tiemann reaction, Sandmayer reaction, Fries rearrangement, Skraup synthesis- single stage.

Note: Each student should do a minimum of six preparations involving single stage.

SUGGESTED READINGS:

Text Books:

1. Thomas, A. O., (2003). *Practical Chemistry*. Cannanore: Scientific Book Center.
2. Bansal, R. K, (2008). *Laboratory Manual of Organic Chemistry* (IV Edition). New Delhi: New Age Publishers.
3. Arun Sethi, (2003). *Laboratory experiments in Organic Chemistry*. New Delhi: New Age Publisher.

Reference Books:

1. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R., (2004). *Vogel's Textbook of Practical Organic Chemistry* (V Edition). Singapore: Pearson Education Ltd.
2. Lepse, P. A., & Lyle B. P., (1986). Lab Manual for Lingren's Essentials of Chemistry. New Delhi: Prentice Hall.

Semester - I

16CHP112 ORGANIC CHEMISTRY PRACTICAL-II 4H 2C

(QUANTITATIVE ANALYSIS AND DOUBLE STAGE PREPARATIONS)

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

Course enables the students should have

- To learn about the basic principles about quantitative analyses.
- To study the concepts and systematic procedure in gravimetric analysis.
- To must know about the systematic procedure for estimation.
- To describe the synthesis method for in-organic co-ordination complexes
- To separate the molecules and identify its nature through chromatography technique.
- To apply this ideas and concepts to water treatment process, food science and forensic fields.

Course Outcomes

On successful completion of the course the students should have

1. Learned about the basic principles about quantitative analyses.
2. Studied the concepts and systematic procedure in gravimetric analysis.
3. Knew about the systematic procedure for estimation.
4. Described the synthesis method for in-organic co-ordination complexes
5. Known about separate the molecules and identify its nature through chromatography technique.
6. Applied this ideas and concepts to water treatment process, food science and forensic fields.

Methodology

Blackboard teaching and Demonstration.

Contents

Estimation of phenol, ethyl methyl ketone, glucose, nitro, amino and methoxy groups, unsaturation in an organic compound.

Analysis of oils Reichert- Meissl value, Iodine value, saponification value and acetyl value.

Double stage preparations- Anthranilic acid and pthalimides.

Extraction and estimation of active constituents

Only for learning purpose and demo (Not for exam)

a. Lactose from milk.
b. Caffeine from tea.
c. Nicotine from tobacco extract.
d. Citric acid or ascorbic acid from a tablet or from a natural source.
e. Curcumin from turmeric.
f. Lycopene from tomato.

SUGGESTED READINGS:
Text Books:

1. Arun Sethi, (2003). *Laboratory experiments in Organic Chemistry*. New Delhi: New Age Publisher.
2. Bansal, R. K, (2008). *Laboratory Manual of Organic Chemistry* (IV Edition). New Delhi: New Age Publishers.
1. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R., (2004). *Vogel's Textbook of Practical Organic Chemistry* (V Edition). Singapore: Pearson Education Ltd.

Reference Books:

1. Lepse, P. A., & Lyle B. P., (1986). *Lab Manual for Lingren's Essentials of Chemistry*. New Delhi: Prentice Hall.
2. Mendham, J., Denney, R. C., Barnes, J.D., & Thomas, M. (2002). *Vogel's textbook of quantitative Chemical Analysis* (VI Edition). Singapore: Pearson Education Ltd.

Semester - II

16CHP201 ORGANIC CHEMISTRY-II 4H 4C

(REARRANGEMENTS, REACTIONS, PHOTOCHEMISTRY AND PERICYCLIC REACTIONS)

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the students

- To know about versatile knowledge of rearrangements
- To understand the different organic (radical and concerted) reactions and their applications in synthesis.
- To learn the principles of conformational analysis and stereochemistry.
- To explain the concepts in organic photochemistry
- To describe the basic ideas about pericyclic reactions
- To implement this basic concept to design and produce the new organic molecules

Course outcomes (CO's)

On successful completion of the course the students should have

1. Understood the versatile knowledge of rearrangements
2. Understood the different organic reactions (radical and concerted).
3. Learned about the principle of conformational analysis and stereochemistry.
4. Explained about the molecular rearrangements, Pericyclic reactions and Cyclo addition and sigmatropic reactions
5. Described the basic ideas of pericyclic reactions.
6. Designed new form of organic compounds using these basic concepts.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT – I

Molecular rearrangements: Intramolecular 1,2 - shifts - Wagner - Meerwein and Pinacol-Pinacolone rearrangements.

Migration to carbonyl carbon – Demyanov and Neber rearrangements.

Rearrangements to electron deficient nitrogen and oxygen – Baeyer – Villiger, Dienone - phenol, Favorskii, Fries, Wolff, Benzidine, Hoffmann Rearrangement and Stevens rearrangements.

Non-cyclic rearrangements – Chapman and Wallach rearrangements.

UNIT – II

Conformational analysis and stereochemistry: Stereochemistry of sulphur and nitrogen compounds, stereoselective and stereospecific reactions - R/S-notation of optically active carbon compounds. Optical isomerism of biphenyls, allenes and spiranes. Planar chirality - cyclophanes and ansa compounds - geometrical isomerism - E/Z notation-configuration in aldoximes and ketoximes. Conformation in cyclic system– decalins, perhydrophenanthrene and perhydroanthracene. Conformation and reactivity of cyclohexanes.

UNIT – III

Radical reactions: Configuration and generation of short lived free radicals-characteristics of free radical reactions – radical substitution, radical additions and rearrangement of free radicals. Typical reactions such as Sandmeyer, Gomberg, Pechmann, Ullmann, Pschorr and Hunsdiecker reactions.

Oxidation and reductions- mechanisms – aromatisation, oxidation of alcohols and glycols, ozonolysis, Sommelet reaction and selectivity in reduction-metal hydride reduction- reduction of nitro compounds and acyloin condensation.

UNIT – IV

Organic photochemistry: Introductory theory of light absorption- Jablonski diagram-photophysical processes- excimers and exciplexes - energy transfer-geometry of excited states – quantum efficiency - photochemical reaction of ketones- Norrish type-I and type-II reactions. Paterno Buchi reaction- cis and trans isomerisation-Photo-Fries rearrangement and Ene reaction and Di-pi methine rearrangement.

UNIT – V

Pericyclic reactions: Definition-classification-characteristic features- the electrocyclic reaction-Woodward – Hofmann rules- orbital correlation diagram- the Frontier molecular orbital theory-electrocyclic conversion of 1,3-dienes and 1,3,5-trienes. Cycloaddition – [2+2] addition-Diel's Alder reaction- stereochemistry of Diel's Alder reaction. Sigmatropic reactions – [1,3], [1,5] and [3,3] sigmatropic shifts - Cope and Claisen rearrangements.

SUGGESTED READINGS:

Text Books:

1. Smith, M. B., & March, J. (2007). *March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure* (VI Edition). New Jersey: John Wiley & Sons, Inc., Hoboken.
2. Mukherji, S. M., & Singh, S. P. (2002). *Reaction Mechanism in Organic Chemistry* (III Edition). New Delhi: Rajiv Beri for Macmillan India Ltd.
3. Nasipuri, D. (2003). *Stereochemistry of Organic Compounds: Principles and Applications* (II Edition). New Delhi: New Age International (P) Ltd.
4. Tewari, N. (2011). *Advanced Organic Reaction Mechanism* (III Edition). Kolkata: Books and Allied (P) Ltd.

Reference Books:

1. Sanyal, S. N. (2006). *Reactions, Rearrangements and Reagents* (IV Edition). New Delhi: Bharathi Bhawan (Publishers and Distributors).
2. Ramesh, P. (2005). *Basic Principles of Organic Stereochemistry* (I Edition). Madurai: Meenu Publications.
3. Depuy, C. H., & Chapman, O. L. (1975). *Molecular Reactions and Photochemistry* (II Edition). New Delhi: Prentice-Hall of India Private Limited.

4. Coxon, J. M., & Halton, B. (1987). Organic Photochemistry (II Edition). London: Cambridge University Press.
5. Nicholass, J. T., Scaiano J. C., & Ramamurthy, V. (2010). *Modern Molecular Photochemistry of Organic Molecules* (I Edition). United States: University Science Books.

Semester-II

16CHP202 INORGANIC CHEMISTRY- II 4H 4C

(CO-ORDINATION CHEMISTRY)

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the students

- To understand the theories of bonding in coordination compounds.
- To study the kinetics and mechanisms of reactions of complex compounds.
- To understand the magnetic properties of coordination compounds.
- To learn about the coordination compounds present in the biological systems and their functions.
- To remember the types of coordination compounds like metal carbonyls, carbocyclic pi complex in coordination compounds
- To evaluate the geometries of simple molecules.

Course Outcomes

On the completion of this course, students should have to

1. Learned how to name coordination compounds and to be able to draw the structure based on its name
2. Used Crystal Field Theory to understand the magnetic properties (and in simple terms the colour) of coordination compounds
3. Described the stability of metal complexes by the use of formation constants and to calculate thermodynamic parameters from them
4. Recognized the types of coordination compounds like metal carbonyls, carbocyclic pi complexes in coordination compounds
5. Familiar with some reactions and applications of coordination compounds
6. Predicted the geometries of simple molecules

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT-I

Coordination Chemistry: Nomenclature, isomerism and methods of preparation of coordination complexes- types of ligands.

Bonding: Valence bond theory- Crystal field theory – Crystal field effects in tetrahedral, octahedral and square planar symmetries. Crystal field stabilization energy - weak and strong fields- spectrochemical series. Molecular orbital theory: based on group theoretical approach. M.O. diagram of Oh. Td & square planar symmetries involving pi bonding- experimental evidence for the presence of pi bonding. Magnetic behaviour of the transition metal ions in crystal field and molecular orbital theories.

UNIT-II

Electronic spectra of complexes: Term symbols for d configuration. Characteristics of d-d transition and selection rules. Weak and strong field limits. Orgel and Tanabe -

Sugano diagrams. Jahn-Teller tetrahedral distortion and spin orbit couplings. Nephelauxetic effect - charge transfer spectra.

UNIT-III

Metal carbonyls: Methods of preparation, structure, bonding and reactions. Carbonylate ions. Carbonyl hydrides–Vaska's compound, complexes of molecular nitrogen and oxygen. Nitrosyl complexes, dinitrogen complexes. Complexes of unsaturated hydrocarbons- alkenes, allyl and pentadienyl complexes.

UNIT-IV

Carbocyclic pi complexes: Cyclopendienyl and related complexes synthesis, bonding, structure and reaction. Arene complexes-complexes of biochemical importance: Cytochromes, Haemoglobin, Myoglobin, Cyanocobalamine, Chlorophyll- structure and functions.

UNIT-V

Reaction of coordination compounds: Substitution reactions in square planar and octahedral complexes – Trans effect – mechanism of redox reactions.

Homogeneous catalysis by coordination compounds – hydroformylation –carboxylation of methanol – hydrogenation of unsaturated organic compounds.

SUGGESTED READINGS:

Text Books:

1. Huheey, J. E., Keitler, E. A., & Keitler, R. L. (2002). *Inorganic Chemistry-Principles of Structure and Reactivity* (IV Edition). Singapore: Pearson Education.
2. Madan, R. L., & Tuli, G. D. (2005). *Inorganic Chemistry Questions & Answers*. New Delhi: S. Chand and Co.
3. Sarn, K. (2005).*Co-ordination Chemistry*. New Delhi: Rajat Publications.
4. Catherine, E. H., & Alan G. S. (2012). *Inorganic Chemistry* (IV Edition). England: Pearson Education Limited, Harlow.
5. Cotton, F. A., Wilkinson, G., & Paul. L. (2002). Basic Inorganic Chemistry (III Edition). New York: John Wiley & Sons.

Reference Books:

1. Agarwal, R. C. (1998). *Some Recent Aspects of Inorganic Chemistry*. Allahabad: Kitab Mahal.
2. Chakraburty, D. K. (2003). *Inorganic Chemistry*. New Delhi: New Age International Publishing Pvt. Ltd.
3. Cotton, F. A., Wilkinson, G., Murillo, C. A., & Bochmann, M. (1999). *Advanced Inorganic Chemistry* (VI Edition). New York: John Wiley & Sons.
4. Drago, R. S. (1965). *Physical Methods in Inorganic Chemistry*. New York: Rein Gold Publishing Corporation.

Semester-II

16CHP203 PHYSICAL CHEMISTRY- II 4H 4C

(CHEMICAL KINETICS AND ELECTROCHEMISTRY)

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the students

- To provide knowledge on fundamental understanding of chemical kinetics and to establish a relationship between the rate of reaction and the concentration of the reactants (the rate law, or rate equation).
- To apply the chemical kinetics concept to study the enzyme mechanisms.
- To provide knowledge to the students about coulometric methods and its application.
- To investigate the adsorption, classification of adsorption and factors affecting of adsorption over corrosion application.
- To remember the basic polarography concepts.
- To understand the theories of catalysis and types of catalysis.

Course outcomes

On the completion of this course, student have to

1. Student understood theories of reaction rates, how reaction rates are measured and represented in rate laws.
2. Understood the applications of chemical kinetics in studying enzyme mechanisms
3. Provided the knowledge of coulometric methods and applications.
4. Evaluated the electrochemical principles involved in corrosion and energy storage.
5. Remembered the basic polarography techniques.
6. Understood the theories of catalysis and types of catalysis

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT-I

Theories of reaction rates: Arrhenius theory- hard - sphere collision theory of gas – phase reactions. Activated complex theory or Absolute reaction rate theory (ARRT) for ideal gas reactions (in terms of partition functions).

Reactions in solution: Comparison between gas-phase and solution reactions. The influence of the solvent on the reactions between ions. Influence of ionic strength on rates of reactions in solution - primary salt effect-influence of pressure on rates of reactions in solution -significance of volume and entropy of activations.

Study of fast reactions: Flow methods, pulse methods, relaxation methods, shock-tube method and nuclear magnetic resonance method.

UNIT-II

Homogeneous catalysis: Specific and general acid - base catalysis. Bronsted catalysis law- Hammett acidity functions. Enzyme catalysis (single substrate reaction only). Michaelis Menten law - Influence of pH and temperature on enzyme catalysis.
Surface phenomenon and heterogeneous catalysis: Adsorption and free energy relation at interfaces. Gibb's adsorption isotherm- physisorption and chemisorptions- Adsorption isotherms (Freundlich & Langmuir). Kinetics of heterogeneous catalysis- Langmuir - Hinshelwood and Langmuir - Rideal - Eley mechanisms.

UNIT-III
Inter ionic attraction theory: Debye – Huckel – Onsager equation - Falkenhagen effect- Wien effect. Activity and activity coefficient- ionic strength- Debye – Huckel limiting law and its applications.
Theories of double layer. Helmholtz – Perrin - Gouy chapmann – Stern theories**.**

UNIT – IV
Polarography: Current – voltage relationships-the dropping mercury electrode. Diffusion current- half – wave potentials. Applications of polarography- Amperometric titrations.
Fundamental principles of coulometric methods- constant current and controlled potential methods- simple applications.

UNIT – V
Kinetics of corrosion: Importance–graphical presentation of kinetic data-exchange current density- different types of polarization of electrodes. Activation polarization and Tafel plots-mixed potential theory-application of electrode kinetics to experimental observations-faradic impedance and corrosion.

SUGGESTED READINGS:
Text Books:

1. Bahl, A., Bahl, B. S., & Tuli, G. D, (2014). *Essentials of Physical Chemistry* (V Edition). New Delhi: S. Chand & Company.
2. Puri, B. R., Sharma, L.R., & Pathania, M .S. (2015). Elements of Physical Chemistry. Jalandhar: Vishal Publishing House.
3. Laidler, K. J. (2004). *Chemical Kinetics* (III Edition). New Delhi: Pearson Education Publishing. Indian branch.
4. Atkins, P., & De Paula, J. (2014). *Atkins Physical Chemistry* (X Edition). Oxford: Oxford University Press.
5. Glasstone, S. (2002). *An Introduction to Electrochemistry*. New Delhi: Litton Educational Publishing.

Reference Books:

1. Arora, M. G. (1996). *Polarographic Methods in Analytical Chemistry* (I Edition). New Delhi: Anmol Publications.
2. Raj Narayan, (1983). *An Introduction to Metallic Corrosion and Its Prevention* (I Edition). New Delhi: Oxford & IBH Publishing Company.

3. Moore, W. J. (1999). Physical Chemistry (V Edition). Orient Longman Ltd. Prentice Hall-Inc Delhi.
4. Rajaram, J., & Kuriakose, K. C. (1993). *Kinetics and Mechanisms of Chemical Transformations*. Chennai: MacMillan.

16CHP204 INDUSTRIAL CHEMICALS AND ENVIRONMENT 4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the students to

- Understand the industrial gases and inorganic chemicals which have an impact on the environment.
- Study about the general principles of metallurgy.
- Learn the environment and its segments.
- Discuss about the water pollution and water treatment.
- Explain the application of bio-catalysis in energy saving techniques.
- Apply this technique to design energy saving devices with eco-friendly method.

Course Outcomes

The course enables the students to

1. Understood the industrial gases and inorganic chemicals which have an impact on the environment.
2. Studied about the general principles of metallurgy.
3. Learned the environment and its segments.
4. Discussed about the water pollution and water treatment.
5. Explained the application of bio-catalysis in energy saving techniques.
6. Appling this technique to design energy saving devices with eco-friendly method.

Methodology

Blackboard teaching, Power point presentation and group discussion.

UNIT I

Industrial Gases and Inorganic Chemicals:

Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene.

Inorganic Chemicals: Manufacture, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate.

UNIT II

Industrial Metallurgy:

General Principles of Metallurgy:

Chief modes of occurrence of metals based on standard electrode potentials. Ellingham diagrams for reduction of metal oxides using carbon as reducing agent.

Hydrometallurgy, methods of purification of metals (Al, Pb, Ti, Fe, Cu, Ni, Zn): electrolytic, oxidative refining, Kroll process, Parting process, Van Arkel-de Boer process and Mond's process. Preparation of metals (ferrous and nonferrous) and ultrapure metals for semiconductor technology.

UNIT III

Environment and its segments:

Ecosystems. Biogeochemical cycles of carbon, nitrogen and sulphur.

Air Pollution: Major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature; Photochemical smog: its constituents and photochemistry. Environmental effects of ozone, Major sources of air pollution.

Pollution by SO_2, CO_2, CO, NOx, H_2S and other foul smelling gases. Methods of estimation of CO, NO_x, SO_x and control procedures. Effects of air pollution on living organisms and vegetation. Greenhouse effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and halogens, removal of sulphur from coal. Control of particulates.

Unit IV

Water Pollution:

Hydrological cycle, water resources, aquatic ecosystems, Sources and nature of water pollutants, techniques for measuring water pollution, Impacts of water pollution on hydrological and ecosystems.

Water purification methods. Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluents from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc. Sludge disposal.

Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water.

Unit V

Energy & Environment:

Sources of energy: Coal, petrol and natural gas. Nuclear fusion / fission, solar energy, hydrogen, geothermal, tidal and hydel, etc. Nuclear pollution: Disposal of nuclear waste, nuclear disaster and its management.

Biocatalysis:

Introduction to biocatalysis: Importance in "Green chemistry" and chemical industry.

SUGGESTED READINGS:

Text Books:

1. Stocchi, E. (1990). *Industrial Chemistry Vol-I*. UK: Ellis Horwood Ltd.
2. Felder, R. M., & Rousseau, R. W. (2010). *Elementary Principles of Chemical Processes*. (III Edition). New Delhi. Wiley India Pvt. Ltd
3. Kent, K. A. (1997). Riegel's Handbook of Industrial Chemistry (IX Edition). New Delhi: CBS Publishers and Distributors Private Limited.

Reference Books:

1. Umare, S. S. & Dara, S.S. (2014). *A Textbook of Engineering Chemistry* (V Edition). New Delhi: S. Chand & Company Ltd.
2. De, A. K. (2005). *Environmental Chemistry* (III Edition). New Delhi: New Age International Publishers (P) Ltd.
3. Khopkar, S. M. (1993). *Environmental Pollution Analysis*. New Delhi: Wiley Eastern Ltd.

	ELECTIVE-II	**Semester - II**
16CHP205A	**RESEARCH METHODOLOGY FOR CHEMISTRY**	**4H 4C**

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the students to

- Understand how to do literature survey about a particular scientific problem.
- Learn about the digital sources available for the literature collection.
- Study the methods of doing scientific research and how to write scientific papers.
- Discuss about the chemical safety and ethical handling of chemicals.
- Understand about the data analysis.
- Know about, how to handle the chemicals in safer way and how to analysis the data.

Course Outcomes

On the completion of this course, students to

1. Understood how to do literature survey about a particular scientific problem.
2. Learned about the digital sources available for the literature collection.
3. Studied the methods of doing scientific research and how to write scientific papers.
4. Discussed about the chemical safety and ethical handling of chemicals.
5. Understood about the data analysis.
6. Knew about, how to handle the chemicals in safer way and how to analysis the data.

Methodology

Blackboard teaching, Power point presentation and group discussion.

Unit I

Literature Survey:

Print: Sources of information: Primary, secondary, tertiary sources; Journals: Journal abbreviations, abstracts, current titles, reviews, monographs, dictionaries, text-books, current contents, introduction to chemical abstracts and beilstein, subject index, substance index, author index, formula index, and other indices with examples.

Unit II

Digital: Web resources, E-journals, journal access, TOC alerts, hot articles, citation index, impact factor, H-index, E-consortium, UGC infonet, E-books, internet discussion groups and communities, blogs, preprint servers, search engines, scirus, Google scholar, chemindustry, Wiki-databases, chemspider, science direct, scifinder, Scopus.

Information Technology and Library Resources: The Internet and World Wide Web. Internet resources for chemistry. Finding and citing published information.

Unit III

Methods of Scientific Research and Writing Scientific Papers:

Reporting practical and project work. Writing literature surveys and reviews. Organizing a poster display. Giving an oral presentation.

Writing scientific papers – justification for scientific contributions, bibliography, description of methods, conclusions, the need for illustration, style, publications of scientific work. Writing ethics. Avoiding plagiarism.

Unit IV

Chemical Safety and Ethical Handling of Chemicals:

Safe working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratory ventilation. Safe storage and use of hazardous chemicals, procedure for working with substances that pose hazards, flammable or explosive hazards, procedures for working with gases at pressures above or below atmospheric – safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory chemicals, procedure for laboratory disposal of explosives, identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewer system, incineration and transportation of hazardous chemicals.

Unit V

Data Analysis:

The Investigative Approach: Making and Recording Measurements. SI Units and their use. Scientific method and design of experiments.

Analysis and Presentation of Data: Descriptive statistics. Choosing and using statistical tests.

Chemometrics. Analysis of variance (ANOVA), Correlation and regression, Curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals, General polynomial fitting, linearizing transformations, exponential function fit, *r* and its abuse. Basic aspects of multiple linear regression analysis.

Electronics:

Basic fundamentals of electronic circuits and their components used in circuits of common instruments like spectrophotometers, typical circuits involving operational amplifiers for electrochemical instruments. Elementary aspects of digital electronics.

SUGGESTED READINGS:

Text Books:

1. Dean, J., Jones, A. M., Holmes, D., Reed, R., Jones, A., & Weyers, J. (2011). *Practical Skills in Chemistry* (II Edition). Harlow: Prentice-Hall.
2. Hibbert, D. B., & Gooding, J. J. (2006) *Data Analysis for Chemistry*. Oxford: Oxford University Press.
3. Topping, J. (1984) *Errors of Observation and Their Treatment* (IV Edition). London: Chapman Hall.

Reference Books:

1. Harris, D. C. (2007). *Quantitative Chemical Analysis* (VII Edition). New York: W. H. Freeman and Company.
2. Levie, R. D. (2001). *How to Use Excel in Analytical Chemistry and in General Scientific Data Analysis*. Cambridge: Cambridge University Press.

3. IUPAC–IPCS. (1992). *Chemical Safety Matters*. Cambridge: Cambridge University Press.

ELECTIVE-II Semester - II

16CHP205B ANALYTICAL CHEMISTRY 4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the students

- To learn about quantitative inorganic analysis.
- To understand the different colorimetric analysis.
- To learn about electrochemical methods of analysis.
- To learn different chromatographic techniques.
- To understand how to analyze the data obtained.
- To Explain about various analytical techniques for inorganic compounds.

Course Outcomes (CO’s)

On successful completion of the course the students should have to

1. Learned about quantitative inorganic analysis.
2. Understood the different colorimetric analysis.
3. Learned the electrochemical methods of analysis.
4. Understood the different chromatographic techniques.
5. Learned about how to analyze the data obtained.
6. Explained the various analytical techniques for inorganic compounds.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT-I

Quantitative Inorganic Analysis: Theoretical basis of quantitative inorganic analysis-common ion effect solubility product, effect of acid, temperature and solvent upon the solubility of a precipitate.

Supersaturation-Von Weimarn concept. Formation and treatment of precipitates-co-precipitation and post-precipitation. Precipitation from homogeneous solution. Specific and selective precipitants.

Principles of acid-base, oxidation-reduction, precipitation and complexometric titrations-indicators used in such titrations. Uses of organic reagents in inorganic quantitative and qualitative analysis.

UNIT-II

Data Analysis: Errors in chemical analysis-Defining terms: Mean median, accuracy and precision – classification of errors: Systematic errors and random errors. Improving accuracy of analysis – mean, standard deviation and Q-test. Comparison of results – Least square, ‘t‘-teat, ‘F‘-test and ‘Chi‘ square test.

UNIT-III

Techniques in Inorganic Chemistry: Colorimetry: Theoretical and practical aspects of colorimetric analysis. Flame emission and atomic absorption spectroscopy – types of atomic spectroscopy – emission methods – absorption methods – fluorescence methods –

source and atomizers for atomic spectroscopy – flame atomizers – eletrothermal atomizers – principle and applications of atomic absorption spectroscopy. Advantages of atomic absorption spectrometry over flame photometry.

UNIT-IV

Electrochemical Methods of Analysis: Cyclic votammetry, coulometry and amperometry-principle and applications.

Thermal characterization techniques: Principle and applications of differential thermal analysis (DTA), differentials scanning calorimetry (DSC) and thermogravimetric analysis (TGA) thermometric titration.

UNIT- V

Chromatographic Methods: Classification – techniques and applications in column, size-exclusion, ion exchange, paper and thin layer chromatography.
Gas chromatography and high performance liquid chromatography (HPLC)-principle, equipment design, sample injection system, columns, detectors and applications.

SUGGESTED READINGS:

Text Books:

1. Svehla, G. (2002). *Vogel's Qualitative Inorganic Analysis* (VII Edition). Singapore: Pearson Education.
2. Christian, G. D. (2007). *Analytical Chemistry* (VI Edition). United States: John Wiley & Sons.
3. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2014). *Fundamentals of Analytical Chemistry* (IX Edition). United States of America: Cengage Learning.

Reference Books:

1. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2007). *Principles of Instrumental Analysis* (VI Edition). United States of America: Thomson Brooks/Cole Publishers.

ELECTIVE-II **Semester - II**

16CHP205C **ORGANOMETALLIC CHEMISTRY** **4H 4C**

Instruction Hours/week:L: 4 T:0 P:0 **Marks: Internal:40 External: 60 Total:100**

Course objectives

This course enables the students

- To learn about nature of the bonding between organic ligands and metals.
- To understand about the metal alkyl complexes.
- To learn about the alkene and cyclopentadienyl complexes.
- To understand about the usage of organometallic compounds as catalysts
- To learn about the organometallic compound used as the catalyst in hydrogenation and hydroxylation of olefins.
- To study the concept of oxidation and polymerization of olefins.

Course Outcomes

On the completion of the course

1. Learned about the Alkyls and Arene complexes
2. Understood the bonding in olefin, acetylene and allyl systems
3. Known about the concepts of synthesis, structure and bonding in metallocenes
4. Understood the Organometallic reaction mechanisms and its applications
5. Learned about the Catalysis, hydrogenation of olefins and oxoprocess
6. Studied the concept of oxidation of olefins and polymerization

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT- I

Metal carbonyls: Definition of organometallic compound - 18 electron rule - effective atomic number rule classification of organometallic compounds - the metal carbon bond types - ionic bond - sigma covalent bond - electron deficient bond - delocalised bond - dative bond - metal carbonyl complexes - synthesis - structure and reactions of metal carbonyls - the nature of M- CO bonding - binding mode of CO and IR spectra of metal carbonyls - metal carbonyls- metal carbonyl anions - metal carbonyl hydrides - metal carbonyl halides - metal carbonyl clusters - Wades rule and isolobal relationship - metal nitrosyls - dinitrogen complexes - dioxygen complexes.

UNIT- II

Metal alkyl complexes: Stability and structure - synthesis by alkylation of metal halides - by oxidative addition - by nucleophilic attack on coordinated ligands - metal alkyl and 18 electron rule - reactivity of metal alkyls - M-C bond cleavage reactions - insertion of CO to M-C bonds - double carbonylation - insertions of alkenes and alkynes - insertions of metals with C-H bonds - alkylidene and alkylidyne complexes - synthesis of alkylidene complexes in low oxidation states and in high oxidation states - bonding in alkylidene complexes - synthesis and bonding in alkylidyne complexes - reactivity of alkylidene and alkylidyne complexes.

UNIT- III

Alkene complexes: Synthesis of alkene complexes by ligand substitutuion - by reduction and by metal atom synthesis - bonding of alkenes to transition metals - bonding in diene complexes - reactivity of alkene complexes - ligand substitution - reactions with nucleophiles - olefin hydrogenation - hydrosilation - Wacker process - C-H activation of alkenes - alkyne complexes - bonding in alkyne complexes - reactivity of alkynes - alkyne complexes in synthesis - cobalt catalysed alkyne cycloaddition.

UNIT- IV

Cyclopentadienyl complexes: Metallocenes - synthesis of metallocenes - bonding in metallocenes - reactions of metallocenes - Cp_2Fe/Cp_2Fe+ couples in biosensors - bent sandwich complexes - bonding in bent sandwich complexes - metallocene halides and hydrides - metallocene and stereospecific polymerisation of 1-alkenes - cyclopentadiene as a non-spectator ligand - monocyclopentadienyl (half-sandwich) complexes - synthesis and structures of allyl complexes - arene complexes - synthesis - structure and reactivity of arene complexes - multidecker complexes.

UNIT - V

Organometallic compounds in homogeneous catalytic reactions: Coordinative unsaturation - acid-base behaviour reaction - migration of atoms or groups from metal to ligand - insertion reaction - reactions of coordinated ligands - catalytic reactions of alkenes - isomerisation of alkenes - hydrogenation - hydroformylation and hydrosilation of alkenes - alkene polymerisation and oligomerisation - fluxional molecules.

SUGGESTED READINGS:

Text Books:

1. Huheey, J. E., Keitler, E. A., & Keitler, R. L. (2002). *Inorganic Chemistry-Principles of Structure and Reactivity* (IV Edition). Singapore: Pearson Education.
2. Haiduc, I., & Zuckerman, J. J. (2011). *Basic Organometallic Chemistry*. Brelin: Walter de Gruyter.

Reference Books:

1. Bockmann, M. (1996). *Organometallics 1- Complexes with transition metal-carbon-bonds*. UK: Oxford science publications.
2. Bockmann, M. (1996). *Organometallics 2- Complexes with transition metal-carbon bonds*. UK: Oxford science publications.
3. Cotton, F. A., & Wilkinson, G. (1978). *Basic Inorganic Chemistry*. Wiley Easter.

Semester - II

16CHP211 INORGANIC CHEMISTRY PRACTICAL–I 4H 2C
(QUALITATIVE ANALYSIS AND PREPARATIONS)

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the students should have

- To learn about the qualitative analysis by semi micro-qualitative analysis method.
- To learn the preparation of inorganic complexes.
- To describe the basic concept and advantages of semi- micro qualitative analysis.
- To understand the systematic separation d-block elements
- To study the step wise procedure to predict the anions along with metals
- To identify the d-block elements with their special tests.

Course Outcomes

Students have to,

1. Learned about the qualitative analysis by semi micro-qualitative analysis method.
2. Learned the preparation of inorganic complexes.
3. Described the basic concept and advantages of semi- micro qualitative analysis.
4. Understood the systematic separation d-block elements
5. Studied the step wise procedure to predict the anions along with metals
6. Identified the d-block elements with their special tests.

Methodology

Blackboard teaching and Demonstration.

Contents

Thallium, Tungsten, Selenium, Tellurium, Molybdenum, Cerium, Thorium, Titanium, Zirconium, Vanadium, Beryllium, Uranium and Lithium.

Note: Each student should analyze a minimum of six inorganic mixtures.

About ten preparations involving different techniques selected from the following:

Lead tetra acetate, dipyridinium hexaplumbate, hydroxylamine hydrochloride, ortho and para- hydroxy phenyl mercuric chloride, potassium cupric chloride, chrome alum, copperI chloride, tris(thio urea) copper(I) Chloride, potassium trioxalato- aluminato(III), potassium trioxalato-chromate(III), potassium trioxalato- ferrate(III), hexammine cobalt(III)chloride, chloropentammine chromium(III), chloro aquo pentammine chromium(III) nitrate, tetrammine copper(II) sulphate, ammonium hexa chloro stanate(IV).

Note: Each student should do a minimum of ten preparations.

SUGGESTED READINGS:

Text Books:

1. Ramanujam, V. V. (2004). *Inorganic Semi-micro Qualitative Analysis* (III Edition). Chennai: The National Publishing Company.
2. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A. R. (2004). *Basic Principles of Practical Chemistry* (II Edition). New Delhi: S. Chand Publications.
3. Siddhiqui, Z. N. (2002). *Practical Industrial Chemistry* (I Edition). New Delhi: Anmol Publications Pvt. Ltd.

Reference Books:

1. Mendham, J. R., Denney, C., Barnes, J. D., & Thomas, M. (2002). *Vogel's Textbook of Quantitative Chemical Analysis* (VI Edition). Singapore: Pearson Education Ltd.
2. Lepse, P. A., & Peter, L. B. (1986). *Lab Manual for Lingren's Essentials of Chemistry*. New Delhi: Prentice Hall.

Semester - II

16CHP212 INORGANIC CHEMISTRY PRACTICAL –II 4H 2C
(QUANTITATIVE ANALYSIS AND COMPLEX PREPARATIONS)

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

Course enables the students should have

- To learn about the basic principles about quantitative analyses.
- To study the concepts and systematic procedure in gravimetric analysis.
- To must know about the systematic procedure for estimation.
- To describe the synthesis method for in-organic co-ordination complexes
- To separate the molecules and identify its nature through chromatography technique.
- To apply this ideas and concepts to water treatment process, food science and forensic fields.

Course Outcomes

On successful completion of the course the students should have

1. Learned about the basic principles about quantitative analyses.
2. Studied the concepts and systematic procedure in gravimetric analysis.
3. Knew about the systematic procedure for estimation.
4. Described the synthesis method for in-organic co-ordination complexes
5. Known about separate the molecules and identify its nature through chromatography technique.
6. Applied this ideas and concepts to water treatment process, food science and forensic fields.

Methodology

Blackboard teaching and Demonstration.

Contents

- Analysis of mixture of ions – volumetry and gravimetry. Any four Complexometric titration- estimation of zinc, nickel, magnesium and calcium ions using Eriochrome black-T or muroxide indicator.
- Titrimetry: Oxidation using ceric and vanadium salts.
- Chromatography: Column, Paper and Thin layer chromatography.
- Titrations in non aqueous solvents.
- Preparation, analysis and study of co-ordination complexes (any 5).

SUGGESTED READINGS:

Text Books:

1. Lepse, P. A., & Peter, L. B. (1986). *Lab Manual for Lingren's Essentials of Chemistry*. New Delhi: Prentice Hall.
2. Mendham, J. R., Denney, C., Barnes, J. D., & Thomas, M. (2002). *Vogel's Textbook of Quantitative Chemical Analysis* (VI Edition). Singapore: Pearson Education Ltd.

3. Ramanujam, V. V. (2004). *Inorganic Semi-micro Qualitative Analysis* (III Edition). Chennai: The National Publishing Company.

Reference Books:

1. Siddhiqui, Z. N. (2002). *Practical Industrial Chemistry* (I Edition). New Delhi: Anmol Publications Pvt. Ltd.
2. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A. R. (2004). *Basic Principles of Practical Chemistry* (II Edition). New Delhi: S. Chand Publications.

Semester-III

16CHP301 ORGANIC CHEMISTRY- III (NATURAL PRODUCTS) 4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

On successful completion of the course the students should have,

- To Study about Isolation, classification and structure determination of simple terpenoids.
- To learn about Isolation, classification and structure determination of simple steroids and alkaloids
- To know the structure of proteins, enzymes and nucleic acids.
- To discuss about the biological application of DNA and RNA.
- To list the various reagents used in organic synthesis
- To apply this fundamentals to clarify the pharmacological and biological activity of organic molecules

Course outcomes

The students have

1. Studied about Isolation, classification and structure determination of simple terpenoids.
2. Learned about Isolation, classification and structure determination of simple steroids and alkaloids
3. Knew the structure of proteins, enzymes and nucleic acids.
4. Discussed about the biological application of DNA and RNA.
5. Remembered the various reagents used in organic synthesis
6. Applied this fundamentals to clarify the pharmacological and biological activity of organic molecules

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT-I

Terpenoids: Isolation and classification of terpenoids – general methods of determining structure of terpenoids –structural elucidation and synthesis of Zingiberene, Eudesmol, Abietic acid, Caryophyllene and Santonin-biosynthesis of monoterpenoids**.**

UNIT-II

Steroids: Introduction – structural elucidation and synthesis of Cholesterol (synthesis not necessary), Ergosterol, Vitamin D, Equilenin, Oestrone, Testosterone and Progesterone. Bile acids – biosynthesis of sterols.

UNIT-III

Alkaloids: Definition of an alkaloid-extraction of alkaloids-general properties - general methods of determining structure of alkaloids – structural elucidation and synthesis of Atropine, Morphine and Quinine -biosynthesis of quinoline alkaloids.

UNIT-IV

Proteins: General nature of proteins - classification of proteins – synthesis of peptides – oxytocin- insulin.

Enzymes: Nomenclature and classification - cofactors – specificity of enzyme action- mechanism of enzyme action. Nucleic acids- structures of RNA and DNA and their biological importance.

UNIT- V

Reagents in organic synthesis: Preparations and synthetic applications of DDQ, DBU, Dimethyl sulfoxide, trimethyl silyl iodide, Osmium tetroxide, Selenium dioxide, Dicyclohexylcarbodiimide (DCC), LDA, DIBAL-H and Mercuric acetate.

SUGGESTED READINGS:

Text Books:

1. Chatwal, G. R. (2011). *Organic Chemistry of Natural Products Vol. II*. New Delhi: Himalaya Publishing House.
2. Finar, I. L. (2000). *Organic Chemistry Vol. II: Stereochemistry and the Chemistry of Natural Products* (V Edition). New Delhi: Addison Wesley Longman (Singapore) Pvt. Ltd- Indian Branch.
3. Smith, M. B., & March, J. (2007). *March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure* (VI Edition). New Jersey: John Wiley & Sons, Inc., Hoboken.

Reference Books:

1. Chatwal, G. R. (2011). *Organic Chemistry of Natural Products. Vol. I*. New Delhi: Himalaya Publishing House.
2. Sanyal, S. N. (2006). *Reactions, Rearrangements and Reagents* (IV Edition). New Delhi: Bharathi Bhawan (Publishers and Distributors).
3. Tewari, N. (2011). *Advanced Organic Reaction Mechanism* (III Edition). Kolkata: Books and Allied (P) Ltd.
4. Agarwal, O. P. (2004). *Natural Product Chemistry Vol. II*. Meerut: Goel Publishing House.

Semester-III

16CHP302 PHYSICAL CHEMISTRY- III (THERMODYNAMICS) 4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the student to

- Understand about thermodynamics and Non-ideal systems
- Learn the third law of thermodynamics
- Study the classical Maxwell-Boltzman and quantum statistics
- Know about partition functions and determining thermodynamic properties
- Understand heat capacity of solids.
- Apply the thermodynamic factors in various organic synthesis processes (how the reaction condition and reaction rate various depend on the thermodynamic factors).

Course Outcomes

The students have to,

1. Understood about thermodynamics and Non-ideal systems
2. Learned the third law of thermodynamics
3. Studied the classical Maxwell-Boltzman and quantum statistics
4. Knew about partition functions and determining thermodynamic properties
5. Understood heat capacity of solids.
6. Applied the thermodynamic factors in various organic synthesis processes (how the reaction condition and reaction rate various depend on the thermodynamic factors).

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT – I

Themodynamics and Non-ideal systems: Chemical potential and the definition of fugacity. Determination of fugacity of gases by graphical method and from equations of state. Variation of fugacity with temperature. Fugacity and the standard states for non ideal gases.

Definition of activity. Activity coefficient. Temperature coefficient of activity. Standard states. Applications of activity concept to solutions. The rational and practical approaches. Measurement of activity of solvent from colligative properties. Determination of activity of solute.

UNIT – II

Third Law of Thermodynamics: Probability and third law. Need for third law. Nernst heat theorem and other forms stating third law. Thermodynamic quantities at absolute zero. Statistical meaning of third law and apparent exception.

Mathematical Introduction: Theories of permutation & combination, laws of probability. Distribution laws. Gaussian distribution.

UNIT – III

Classical Maxwell – Boltzmann Statistics: Maxwell distribution law for molecular velocities and molecular speeds in an ideal gas. Velocity and speed distribution functions. Experimental verification of Maxwell distribution law. Evaluation of average speed, root mean square speed and most probable speed from distribution law. Distribution function in terms of the kinetic energy of an ideal gas. The principle of equipartition of energy and the calculation of heat capacities of ideal gases. Limitations of the principle of equipartition of energy.

Quantum statistics: Maxwell-Boltzmann statistics. Thermodynamic probability. Thermodynamic probabilities of systems in equilibrium. Boltzmann expression for entropy. Stirling's approximation. State of maximum thermodynamics probability. Legrangian multipliers. Thermodynamic probabilities of systems involving energy levels. Maxwell-Boltzmann distribution law. Evaluation of alpha and beta in MB distribution law.

UNIT – IV

Partition function: Definition, justification of nomenclature, microcanonical and canonical ensembles. Molecular partition and canonical function. The relation between the total partition function of a molecule and the separate partition functions. Translational partition function, rotational partition function. Effect of molecular symmetry on rotational partition function. Ortho and para hydrogen. Vibrational partition function. Electronic partition function. Evaluation of thermodynamic properties E, H, S, A, G, C_v and C_p from monoatomic and diatomic ideal gas molecules partition functions. Thermodynamic properties of polyatomic ideal gases. Calculation of equilibrium constants of reaction involving ideal gases from partition functions.

UNIT – V

Heat capacities of solids: Einstein's and Debye's theories of heat capacities of solids. Bose-Einstein and Fermi-Dirac Statistics: Bose Einstein distribution law- Entropy of Bose Einstein gas. Planck distribution law of black body radiation. Fermi-Dirac distribution law. Entropy of a Fermi-Dirac gas. Heat capacities of the electron gas and the heat capacities of metals. Negative absolute temperature.

SUGGESTED READINGS:

Text Books:

1. Glasstone, S. (2002). *Thermodynamics for Chemists*. New York: Litton Edition Publishing.
2. Atkins, P., & De Paula, J. (2014). *Atkins Physical Chemistry* (X Edition). Oxford: Oxford University Press.
3. Kapoor, K. L. (2005). *Text Book Physical Chemistry Vol. V*. New Delhi: MacMillan India Ltd.

Reference Books:

1. Lavin, I. N. (2002). *Physical Chemistry* (V Edition). New Delhi: Tata-McGraw Hill Publishing Company.
2. Whittakar, A. G. (2001). *Physical Chemistry*. New Delhi: Mount & Heal Viva Books Pvt. Ltd.

Semester -III

16CHP303 PHYSICAL METHODS IN CHEMISTRY (INSTRUMENTATION) 4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course successfully enables the student,

- To understand different chromatographic methods.
- To discuss about electron spectroscopy and thermal analysis
- To learn Circular Dichroism and Optical Rotatory Dispersion
- To describe the Electron Spin Resonance spectroscopy
- To know about flame emission spectroscopy.
- To apply the chromatographic and spectroscopic concepts for separation and identification of mixture compounds/complex/metals.

Course outcomes

The students have to

1. Understood different chromatographic methods.
2. Discussed about electron spectroscopy and thermal analysis
3. Learned Circular Dichroism and Optical Rotatory Dispersion
4. Described the Electron Spin Resonance spectroscopy
5. Knew about flame emission spectroscopy.
6. Applied the chromatographic and spectroscopic concepts for separation and identification of mixture compounds/complex/metals.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT – I

Chromatography: Theory, instrumentation, basic principles & application in the chemical analysis of the following – columns, paper, thin layer and ion exchange-gel permeation-HPLC applications in chemical analysis-gas chromatography**.**

UNIT – II

Thermal analysis: Differential thermal analysis DTA and differential scanning calorimetry DSC - basic principles - thermo gravimetric analysis.

Electron spectroscopy: ESCA XPS: Principle, chemical shifts - description of ESCA spectrometer, X-ray sources, samples, analysis, detectors and recording devices-applications.

Auger electron spectroscopy AES and Ultra-Violet photo electron spectroscopy UPS/PES principles and applications.

UNIT – III

Circular Dichroism and Optical Rotatory Dispersion: Basic principles -cotton effects-octants rule –axial halo ketone rule-application of ORD and CD. Tyndal Scattering-turbidimetry and nephelometry-applications. Atomic absorption spectroscopy.

UNIT – IV

ESR spectroscopy: Theory - derivative curves - g shift - hyperfine splitting-isotropic and anisotropic systems-zero field splitting and Kramer degeneracy. Identification of free radicals – applications to copper complexes.

UNIT – V

Flame Emission Spectroscopy: Introduction, flames and flame spectra, flames temperature, chemical reaction in flame and flame background. Flame photometers, Flame spectrophotometers, photosensitive detectors, single beam and double beam instruments, calibration curve, errors in flame photometers, applications.

SUGGESTED READINGS:

Text Books:

1. Gopalan, V., Subramanian, P. S., & Rangarajan, K. (2003). *Elements of Analytical Chemistry*. New Delhi: S. Chand and Sons.
2. Usharani, S. (2002). *Analytical Chemistry*. Chennai: MacMillan India Ltd.
3. Sharma, B. K. (2005). *Instrumental Methods of Chemical Analysis* (24th Edition). Meerut: Krishna Prakashan Media (P) Ltd.
4. Ewing, G. W. (1988). *Instrumental Methods of Chemical Analysis* (III Edition). Singapore: McGraw Hill International Edition.

Reference Books:

1. Chatwal, G. R., & Anand, S. K. (2015). *Instrumental Methods of Chemical Analysis* (V Edition). New Delhi: Himalaya Publishing House.
2. Drago, R .S. (1965). *Physical Methods in Inorganic Chemistry*. New York: Reinhold Publishing Corporation.
3. Skoog, D. A., & West, D. M. (2004). *Fundamentals of Analytical Chemistry* (VIII Edition). Singapore: Thomson Book Store.
4. Svehla, G. (2002). *Vogel's Qualitative Inorganic Analysis* (VII Edition). Singapore. Pearson Education

Semester–III

16CHP304 NANOCHEMISTRY 4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the student

- To know the history and perspectives of Nanotechnology.
- To learn about the various types and significant of 1D, 2D and 3D nanoparticles
- To list the various types of nanoparticles and its application.
- To discuss about carbon based nanomaterials and its properties
- To explain the metal oxide based nano materials
- To motivate and lead the student in the field of nanotechnology.

Course Outcomes

The completion of this course, students

1. Knew about the history and perspectives of Nanotechnology.
2. Learned about the various types and significant of 1D, 2D and 3D nanoparticles
3. Remembered the various types of nanoparticles and its application.
4. Discussed about carbon based nanomaterials and its properties
5. Explained the metal oxide based nano materials
6. Motivated and lead them in the pathway of nanotechnology

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I: Introduction: History scope and perspectives of nano-chemistry

UNIT II: Synthesis and stabilization of nanoparticles, chemical reduction; reactions in micelles, emulsions, and dendrimers; photochemical and radiation chemical reduction; cryochemical synthesis: Physical methods, particles of various shapes and films.

UNIT III: Experimental techniques: Electron microscopy: Transmission electron microscopy: probe

Microscopy: Probe microscopy: diffraction techniques X-ray diffraction, neutron diffraction: Miscellaneous

Techniques, comparison of spectral techniques used for elemental analysis

UNIT IV: Size effects in nanochemistry: Models of reactions of metal atoms in matrices; properties;

Kinetic peculiarities of chemical processes on the surface of nanoparticles; Thermodynamic features of nanoparticles.

UNIT V: Applications of nanoparticle in various fundamental research, industries, medical field and environmental issue; toxicity, biosafety and ethical issue in application of nanoparticle

SUGGESTED READINGS:
Text Books:

1. Br’echignac, C., Houdy., & Lahmani, M. (2007). *Nanomaterials and Nanochemistry*. New York: Springer Berlin Heidelberg.
1. Hosokawa, M., Nogi, K., Naito, M., & Yokoyama, T. (2012). *Nanoparticle Technology Handbook* (II Edition). Elsevier.

Reference Books:

1. Theodore, L. (2006). *Nanotechnology: Basic Calculations for Engineers and Scientists*. Hoboken: John Wiley & Sons. Inc., Publication.

ELECTIVE-III **Semester-III**

16CHP305A **POLYMER CHEMISTRY** **4H 4C**

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the student

- To study about the basic concepts of polymerization.
- To explains the coordination polymerization and apply the Ziegler-natta catalyst in polymer synthesis.
- To understand the molecular weight determination methods of the polymer and apply it identifies the polymer properties.
- To discuss about the polymer processing and properties of commercial polymers
- To apply the polymer processing technique to prepare the polymer products
- To list out the commercial polymers and its application

Course outcomes

The students have

1. Studied about the basic concepts of polymerization.
2. Explained the coordination polymerization and apply the Ziegler-natta catalyst in polymer synthesis.
3. Understood the molecular weight determination methods of the polymer and apply it identifies the polymer properties.
4. Discussed about the polymer processing and properties of commercial polymers
5. Applied the polymer processing technique to prepare the polymer products
6. Remembered the commercial polymers and its application

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT – I

Polymer Basic Concepts: Monomers, repeat units, degree of polymerization, linear, branched and network polymers. Condensation polymerization: Mechanism of stepwise polymerization. Kinetics and statistics of linear stepwise polymerization. Addition polymerization: Free radical, cationic and anionic polymerization. Polymerization conditions. Polymerization in homogeneous and heterogeneous systems.

UNIT – II

Co-ordination Polymerization: Kinetics, mono and bimetallic mechanism of co-ordination polymers. Zeigler Natta catalyst, co-polymerization: Block and graft co-polymers, kinetics of copolymerization. Types of co-polymerization. Reactivity ratio.

UNIT–III

Molecular Weight and Properties: Polydispersion – average molecular weight concept, number, weight and viscosity average molecular weights. Measurement of molecular weights. Viscosity, light scattering, osmotic and ultracentrifugation methods. Polymer structure and physical properties – crystalline melting point T_m. The glass transition temperature. Determination of T_g. Relationship between T_m and T_g.

UNIT – IV

Polymer Processing: Plastics, elastomers and fibres. Compounding, processing techniques: calendering, die casting, rotational casting, film casting, injection moulding, blow moulding extrusion, moulding, thermoforming, foaming, reinforcing and fibre spinning.

UNIT – V

Properties of Commercial Polymers: Polyethylene, polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins and silicone polymers. Functional polymers, fire retarding polymers and electrically conducting polymers. Biomedical polymers – contact lens, dental polymers, artificial heart, kidney, skin and blood cells.

SUGGESTED READINGS:

Text Books:

1. Billmeyer, F. W. (2003). *Text Book of Polymer Science* (III Edition). New York: John Wiley.
2. Gowariker, V. R., Viswanathan, N. V., & Sreedhar, J. (2015). *Polymer Science* (II Edition). New Delhi: New Age International Private Ltd.
3. Alcock, H. R., Lampe, F. W., & Mark, J. E. (2003). *Contemporary Polymer Chemistry* (III Edition). NJ: Prentice Hall. Englewood Cliffs.

Reference Books:

1. Flory, P. J. (1953). *Principles of Polymer Chemistry*. New York: Cornell University Press.
2. Odian, G. (2004). *Principles of Polymerization* (IV Edition). New York: John Wiley & Sons.

ELECTIVE-III **Semester-III**

16CHP305B **TEXTILE CHEMISTRY** **4H 4C**

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the student

- To understand about the classification, Chemical structure, production, properties and uses of fibers.
- To learn about the dyeing process on fibers.
- To discuss the classification of dyes
- To learn the Pollution Control in Textile Industry.
- To explain the various finishing process of fibers.
- To apply this fundamentals to fabricate the material and its dying process.

Course outcomes

On the successful completion of this course, Students

1. Understood about the classification, Chemical structure, production, properties and uses of fibers.
2. Learned about the dyeing process on fibers.
3. Discussed the classification of dyes
4. Learned the Pollution Control in Textile Industry.
5. Explained the various finishing process of fibers.
6. Applied these fundamentals to fabricate the material and its dying process.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT- I

Fibres: General classification of fibres-chemical structure, production, properties and uses of the following natural fibres (a) natural cellulose fibres (cotton and jute) (b) natural protein fibre (wool and silk).

Chemical structure, production, properties and uses of the following synthetic fibres. (i) Man made cellulosic fibres (Rayon, modified cellulose fibres) (ii) Polyamide fibres (different types of nylons) (iii) Poly ester fibres.

UNIT- II

Dyeing Process: Impurities in raw cotton and grey cloth, wool and silk- general principles of the removal – scouring – bleaching – desizing – kierboiling- chemicking.

Dyeing - Dyeing of wool and silk –fastness properties of dyed materials – dyeing of nylon, terylene and other synthetic fibres.

UNIT- III

Finishing: Finishes given to fabrics- mechanical finishes on cotton, wool and silk, method used in process of mercerizing –anti-crease and anti-shrink finishes –water proofing.

UNIT-IV

Types of Dyes: Quinonoid dyes-examples and structure-Anthroquinone and Mordant dyes-synthesis and applications of Alizarin-Phthalocyanin dyes-Copper Phthalocyanin-synthesis and applications.

Diphenylmethane dyes- Auramine-Triphenylmethane dyes-Malachite green, Crystal violet, Pararosaniline-preparation and applications.

Indigo dyes-preparation and application-derivatives of Indigo- synthesis and uses of Indigosol and tetrahaloindigo.

Phthalein dyes-Phenolphthalein- preparation and applications.

Xanthene dyes-Rhodamine B, Fluorescein-Eosin- preparation and applications.

UNIT-V

Pollution Control in Textile Industry: Textile effluent-characteristics, effect of untreated effluent, degradability of wastes. Effluent treatment plants-aerated lagoon, photo oxidation process.

SUGGESTED READINGS:

Text Books:

1. Chatwal, R. (1995). *Synthetic Dyes*. Mumbai: Himalayan Publishing House.
2. Sadov, F., & Horchagin, M. (1978). *Chemical Technology of Fibrous Materials-A*. Matetshy. U.S.A: Mir Publishers Easton's Books. Inc. Mount Vernon.
3. Joseph, M. L., Hudson, P. B., Clapp, A. C., & Kness, D. (1993). *Joseph's Introductory Textile Science* (VI Edition). Fort Worth: Harcourt Brace Jovanovich College Publishers.
4. Luniak, B. (1953). *The Identification of Textile Fibres: The Identification of Textile Fibres: Qualitative and Quantitative Analysis of Fibre Blends*. London: Pitman Publisher.

Reference Books:

1. Sharma, B. K. (1997). Industrial *Chemistry*. New Delhi: Goel Publishing Co.
2. Prayag. R. S. (1989). *Dyeing of Wool, Silk and Manmade Fibres*. Dharwad: Noves Data Corporation.
3. Shenai. V. A. (1973). *Chemistry of Dyes and Principles of Dyeing*. Bombay: Sevak Publication.

ELECTIVE-III **Semester - II**

16CHP305C **INDUSTRIAL CHEMISTRY** **4H 4C**

(APPLIED BIOINORGANIC CHEMISTRY, INORGANIC DRUG TARGETS AND METALS IN MEDICINE)

Instruction Hours/week:L: 4 T:0 P:0 **Marks: Internal:40 External: 60 Total:100**

Course Objectives

This course enables the students

- To give the knowledge of the role of metals in human body
- To learn about the physical methods in bioinorganic chemistry, metal biomolecules interactions, complexes, and drug discovery.
- To give knowledge in Binding of Metal Ions and Complexes to Biomolecules
- To Learn about complexes and chelating agents
- To Provide fundamental knowledge in Drug Discovery and Design
- To apply these parameters to discover new pharmacokinetic molecules.

Course Outcomes

On the completion of this course, student should

1. Knew the knowledge of the role of metals in human body
2. Learned about the physical methods in bioinorganic chemistry, metal biomolecules interactions, complexes, and drug discovery.
3. Understood the knowledge in Binding of Metal Ions and Complexes to Biomolecules
4. Learned about complexes and chelating agents
5. Provided the fundamental knowledge in Drug Discovery and Design
6. Applied these parameters to discover new pharmacokinetic molecules.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT- I

Metals in the Human Body: General principles - the elements in the human body - biological significance, storage and transport of Fe, Zn, Cu, Mo, Co, Cr, V and Ni - metal functions in metalloproteins -metallo enzyme functions -supplying elements to the body - metals and human health.

UNIT- II

Physical Methods in Bioinorganic Chemistry: X-ray methods - magnetic resonance methods - mossbauer spectroscopy - magnetic measurements -other instrumental methods -atomic force microscopy - fast and time-resolved methods - stopped-flow kinetic methods - flash photolysis - time-resolved crystallography.

UNIT- III

Binding of Metal Ions and Complexes to Biomolecules: Nucleic acid structures - fundamental interactions with nucleic acids - binding interactions of tris(phenanthroline) metal complexes with DNA - techniques to monitor binding - applications of metal complexes that bind to nucleic acids -biopolymer promoted metal ligand interactions.

UNIT- IV

Complexes and Cheating Agents: Labile and inert complexes - metal-ligand selectivity-HSAB approach-chelate effect and Irving-William series -survey of metals used for diagnosis and chemotherapy-radiodiagnostic agents-Magnetic Resonance Imaging (MRI) - gold and other metal phosphines-main-group and transition metal compounds - miscellaneous metals in medicine-chelating agents and therapy - EDTA-evolution, chemical properties, *in vivo* chelation of radionuclides, dosage and toxicity .

UNIT-V

Drug Discovery and Design: Outline- therapeutic index, chemotherapeutic index, structure- activity relationship (SAR) and quantitative structure-activity relationship (QSAR)- Factors governing drug design- computer aided drug design-cancer chemotherapy-bioinorganic chemistry (DNA binding) of platinum anticancer drugs (cisplatin and carboplatin)-mechanism of action studies-clinical trials and their significance- production and quality control- patent protection.

SUGGESTED READINGS:

Text Books:

1. Taylor, D. M., & Williams, D. R. (1995). *Trace Element Medicine and Chelation Therapy* (I Edition). United Kingdom: The Royal Society of Chemistry.
2. Ashutosh Kar, (2000). *Medicinal Chemistry*. New Delhi: New Age International Publishers.
3. Gareth Thomas, (2000). *Medicinal Chemistry*. United Kingdom: John-Wiley & Sons Ltd.

Reference Books:

1. Bertini, I., Gray, H. B., Lippard, S. J., & Valentine, J. S. (1994). *Bioinorganic Chemistry*. California: University Science books.
2. Roat-Malone, R. M. (2002). *Bioinorganic Chemistry*. NJ: John Wiley & Sons. Inc.

Semester-III

16CHP311 PHYSICAL CHEMISTRY PRACTICAL -I 4H 2C

(MOLECULAR WEIGHT DETERMINATION AND CONDUCTOMETRIC TITRATIONS)

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the students should have

- To Learn about the heat of solution, determination of molecular weight and distribution coefficient
- To study about basic concepts of conductometric titrations.
- To understand the various laws in electrochemistry.
- To apply the conductometric method for the solutions and measure its conductivity
- To know about how to handle the conductivity meter, spectrophotometer.
- To may realize the how distribution co-efficient influence the solubility of various systems.

Course Outcomes

On the completion of this course, students

1. Learned about the heat of solution, determination of molecular weight and distribution coefficient
2. Studied about basic concepts of conductometric titrations.
3. Understood the various laws in electrochemistry.
4. Applied the conductometric method for the solutions and measure its conductivity
5. Knew about how to handle the conductivity meter, spectrophotometer.
6. Applied the knowledge to realize the how distribution co-efficient influence the solubility of various systems.

Methodology

Blackboard teaching and Demonstration.

Contents

Heat of solution from solubility.

Molecular weight determination by

i. Freezing point depression of solvents benzene and water by Beckmann method

ii. By Rast micro methods

Distribution of activity and activity co-efficient by freezing point method.

Distribution co-efficient and determination of equilibrium constant.

Conductivity experiments:

Determination of

i) Equivalent conductance of a strong electrolyte and verification of Debye-Huckel Onsager law.

ii) Verification of Ostwald dilution law and Kohlraush law for weak electrolytes.

Conductometric determination of pK_a of a weak acid.

Hydrolysis constant of aniline hydrochloride.

Determination of the solubility of a sparingly soluble salt.

Conductometric titrations:

Acid-base and precipitation titrations including mixture of halides.

SUGGESTED READINGS:

Text Books:

1. Lepse, P. A., & Lyle B. P., (1986). *Lab Manual for Lingren's Essentials of Chemistry*. New Delhi: Prentice Hall.
2. Pandey, O. P, Bajpai, D. N., & Giri, S. (2001). *Practical Chemistry* (VIII Edition). New Delhi: S. Chand Publications.
3. Santi Rajan Palit and Sadhan Kumar, (1971). *Practical Physical Chemistry* (I Edition). Calcutta: Joy Publishers.

Reference Books:

1. Siddhiqui, Z. N. (2002). *Practical Industrial Chemistry* (I Edition). New Delhi: Anmol Publications Pvt. Ltd.
2. Thomas, A.O, (2003). *Practical Chemistry*. Cannanore: Scientific Book Center.
3. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A. R. (2004). *Basic Principles of Practical Chemistry* (II Edition). New Delhi: S. Chand Publications.

Semester-III

16CHP312 PHYSICAL CHEMISTRY PRACTICAL- II 4H 2C

(CHEMICAL KINETICS AND POTENTIOMETRIC TITRATIONS)

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the students should have

- To learn about the principles of electrochemistry and determination EMF
- To understand about the basic needs of Chemical Kinetics and Potentiometric titrations.
- To study the principles about adsorption process.
- To know about how to handle the potentiometer, electrodes and spectrophotometer.
- To apply the knowledge of chemical kinetics in various preparation organic/inorganic compounds.
- To investigate the metal concentration in water samples using adsorption technique.

Course Outcomes

On the completion of this course, students to

1. Learned about the principles of electrochemistry and determination EMF
2. Understood about the basic needs of Chemical Kinetics and Potentiometric titrations.
3. Studied the principles about adsorption process.
4. Knew about how to handle the potentiometer, electrodes and spectrophotometers.
5. Appling the knowledge of chemical kinetics in various preparation organic/inorganic compounds.
6. Investigating the metal concentration in water samples using adsorption technique.

Objectives

On successful completion of the course the students should have

(i) Learnt about the Chemical Kinetics and Potenciometric titrations.

(ii) Learnt the Principles of Adsorption experiments.

Methodology

Blackboard teaching and Demonstration.

Contents

Electromotive force determination of standard potentials of Cu, Zn and Ag.

Determination of pH and pKa values using hydrogen and quinhydrone electrodes and glass electrode pH meter- potentiometric acid-base titrations.

Determination of formal redox potential of a redox system and redox titrations.

Determination of solubility product of a sparingly soluble salt concentration cell and chemical cell.

Determination of activity co-efficients from emf data.

Precipitation titration of a mixture of halides.

Chemical kinetics:

i . Evaluation of Arrhenius parameters using acid hydrolysis of an ester.
ii. Base catalysed hydrolysis of an ester conductometrically.
iii. Rate of reaction between persulphate and iodide ions study of salt over the persulphate- iodide reaction.

Evaluation of catalytic constants for weak acids and verification of Bronsted catalysis law.

Adsorption Experiments:

Adsorption of oxalic acid and acetic acid on activated charcoal-Fruendlich isotherm.

SUGGESTED READINGS:

Text Books:

1. Lepse, P. A., & Lyle B. P., (1986). *Lab Manual for Lingren's Essentials of Chemistry*. New Delhi: Prentice Hall.
2. Pandey, O. P, Bajpai, D. N., & Giri, S. (2001). *Practical Chemistry* (VIII Edition). New Delhi: S. Chand Publications.
3. Santi Rajan Palit and Sadhan Kumar, (1971). *Practical Physical Chemistry* (I Edition). Calcutta: Joy Publishers.

Reference Books:

1. Siddhiqui, Z. N. (2002). *Practical Industrial Chemistry* (I Edition). New Delhi: Anmol Publications Pvt. Ltd.
2. Thomas, A.O, (2003). *Practical Chemistry*. Cannanore: Scientific Book Center.
3. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A. R. (2004). *Basic Principles of Practical Chemistry* (II Edition). New Delhi: S. Chand Publications.

Semester-IV

16CHP491	**PROJECT WORK**	**30H 15C**

Instruction Hours/week: L:0 T:0 P:30 Marks: Internal: 40 External: 60 Total:100

BCOM
Bachelor of Commerce
CHOICE BASED CREDIT SYSTEM
(CBCS)

Syllabus
2016 – 2017

Enable | Enlighten | Enrich
KARPAGAM
ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)

DEPARTMENT OF COMMERCE
FACULTY OF ARTS, SCIENCE AND HUMANITIES

KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)
Pollachi Main Road, Eachanari (Post), Coimbatore – 641 021, Tamil Nadu, India
Phone: 0422- 2980011-2980015, Fax No: 0422 – 2980022 - 23
Email: info@karpagam.com, Web: www.kahedu.edu.in

KARPAGAM ACADEMY OF HIGHER EDUCATION,
(Deemed to be University)
(Established Under Section 3 of UGC Act 1956)
BACHELOR OF COMMERCE
B.Com
(For the Students admitted during the year 2016 – 2019 Batch onwards)

Scheme of Examination

Course Code	Name of the Course	Objectives and Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEOs	Pos	L	T	P		CIA	ESE	Total
								40	60	100
Semester 1										
16LAU101	Language - I	II	b,e,f,	6	-	-	6	40	60	100
16ENU101	English – I	I, IV	a,g,i	4	-	-	4	40	60	100
16CMU101	Financial Accounting	I, IV	a,g,i	5	-	-	5	40	60	100
16CMU102	Business organization and Management	I, IV	a,g,i	6	2	-	6	40	60	100
16CMU111	Financial Accounting (Practical)	II	b,e,f,	-	-	3	1	40	60	100
16AEC101	Business Communication	III	c,d,h	4	-	-	4	40	60	100
				25	2	3	**26**	240	360	600
Semester II										
16LAU201	Language – II	II	b,e,f,	6	-	-	6	40	60	100
16ENU201	English – II	I, IV	a,g,i	4	-	-	4	40	60	100
16CMU201	Business Law	III	c,d,h	5	-	-	5	40	60	100
16CMU202	Business Mathematics and Statistics	II	b,e,f,	6	2	-	6	40	60	100
16CMU211	Business Law (Practical)	III	c,d,h	-	-	3	1	40	60	100
16AEC 201	Environmental Studies	III	c,d,h	4	-	-	4	40	60	100
				25	2	3	**26**	**240**	**360**	**600**
Semester III										
16ENU301	English -III	I, IV	a,g,i	6	2	-	6	40	60	100
16CMU301	Company Law	III	c,d,h	6	2	-	6	40	60	100
16CMU302	Income Tax Law and Practice	II	b,e,f,	5	-	-	5	40	60	100
16CMU303 A	A. Financial Analysis and Reporting	I, IV	a,g,i	6	-	-	4	40	60	100
16CMU303 B	B. Stock Market Investment	II	b,e,f,	6	-	-				

16CMU311	Income Tax Law and Practice (Practical)	II	b,e,f,	-	-	3	1	40	60	100
				23	4	3	**22**	**200**	**300**	**500**
				Semester IV						
16ENU401	English - IV	I, IV	a,g,i	6	2	-	6	40	60	100
16CMU401	Corporate Accounting	III	c,d,h	5	-	-	5	40	60	100
16CMU402	Cost Accounting	III	c,d,h	6	2	-	6	40	60	100
16CMU403A	A. International Business	III	c,d,h	6	-	-	4	40	60	100
16CMU403B	B. E-Commerce	III	c,d,h	6	-	-				
16CMU411	Corporate Accounting (Practical)	III	c,d,h	-	-	3	**1**	**40**	**60**	**100**
				23	4	3	**22**	**200**	**300**	**500**
				Semester V						
16CMU501 A	A. Human Resource Management	I, IV	a,g,i	6	2	-	6	40	60	100
16CMU501B	B. Indirect tax Law	II	b,e,f,	6	2	-				
16CMU502A	A. Principles of Marketing	III	c,d,h	5	-	-	5	40	60	100
16CMU502B	B. Banking and Insurance	I, IV	a,g,i	5	-	-				
16CMU503A	A. Entrepreneurship	III	c,d,h	6	-	-	4	40	60	100
16CMU503B	B. Advertising	III	c,d,h	6	-	-				
16CMU504A	A. Principles of Micro Economics	III	c,d,h	6	2		6	40	60	100
16CMU504B	B. Business Ethics	III	c,d,h	6	2	-				
16CMU511A	A. Principles of Marketing (Practical)	III	c,d,h	-	-	3	1	40	60	100
16CMU511B	B. Banking and Insurance (Practical)	I, IV	a,g,i	-	-	3				
				23	4	3	**22**	**200**	**300**	**500**
				Semester VI						
16CMU601A	A. Management Accounting	III	c,d,h	5	-	-	5	40	60	100
16CMU601B	B. Computer Application in Business	II	b,e,f,	5	-	-				
16CMU602A	A. Office Management and Secretarial Practice	I, IV	a,g,i	6	2	-	6	40	60	100
16CMU602B	B. Fundamentals of Investment	II	b,e,f,	6	2	-				
16CMU603A	A. Personal Selling and Salesmanship	III	c,d,h	6	-	-	4	40	60	100
16CMU603B	B. Consumer Protection	III	c,d,h	6	-	-				
16CMU604A	A. Indian Economy	III	c,d,h	6	2	-	6	40	60	100
16CMU604B	B. Retail Management	III	c,d,h	6	2	-				
16CMU611A	A. Management Accounting (Practical)	III	c,d,h	-	-	3	1	40	60	100
16CMU611B	B. Computer Application in Business	II	b,e,f,	-	-	3	1	40	60	100

				23	4	3	22	**200**	**300**	**500**
ECA / NCC / NSS / Sports / General interest etc							**Good**			
							140	**1280**	**1920**	**3200**

PROGRAM OUTCOMES (PO)

a. Graduates will demonstrate solid foundation in bookkeeping, accounting and professional fundamentals required to record the business transaction ability.

b. Graduates will apply IT skills in Accounting, Taxation and business management for effective decision making.

c. Graduates will obtain the ability to analyse and solve the complex business problems using quantitative; qualitative tools and technologies.

d. Graduates will exhibit critical thinking skills in understanding the real-time business issues and advocate solutions.

e. Graduates will acquire and demonstrate the interpersonal and communication skills to convey and negotiate ideas for achieving the common goals.

f. Graduates will attain and exhibit skills to work as team to take effective decisions in achieving the common goals.

g. Graduates will demonstrate the leadership skills to initiate, lead and deliver the best performance together with the team members.

PROGRAM SPECIFIC OUTCOMES (PSO)

h. Graduates will gain lifelong learning practice by identifying, formulating, and analysing complex business problems to reach substantiated conclusions through research considering the changing environmental factors.

i. Graduate will demonstrate legal, ethical code and socially sustainable code of conduct in both personal and professional decision making process pertaining to their career.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

I. Graduates will acquire knowledge in accounting, taxation, finance and management concepts and apply it in business to become qualified professionals.

II. Graduates will possess the professional skills and competence to perform effectively in higher studies, jobs and entrepreneurial ventures.

III. Graduates will develop a lifelong learning by applying the gained knowledge and skills in research and practice.

IV. Graduates will demonstrate high standard of ethical conduct and become socially responsible citizens contributing to the sustainable growth of the career and the community.

Program Educational Objectives	**Program Outcomes**								
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**
Graduates will acquire knowledge in accounting, taxation, finance, management concepts and computer applications and apply it in business to become qualified professionals.	✓		√	√			✓	√	✓

Graduates will possess the professional skills, computer skills and competence in field related to accounting and commerce which will enable them to perform effectively in higher studies, KPO/BPO field of IT sector and entrepreneurial ventures.	√	✓			✓	✓ √			√
Graduates will continuously improve accounting and computer skills required to develop a life long learning through IT enabled research and practice.			✓	✓				✓	
Graduates will demonstrate high standard of ethical conduct in application of computer in accounting and finance and become socially responsible citizens contributing to the sustainable growth of profession and the community.	✓		√	√			✓	√	✓

Semester I

L	T	P	C
6	-	-	6

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016-2017)

பகுதி – I, **தமிழ்** **பருவம்** I

16LAU101 : **தமிழ் முதல் தாள்** 6-H,6-C **(இளநிலை கலையியல் பட்ட வகுப்புகளுக்குரியது)**

அலகு – I : இக்கால இலக்கியம்: (20 மணிநேரம்)

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

- இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, ' தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.

மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

கல்வி : மகாகவி பாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.

இன்றைய நிலை : கவிமணி தேசிய விநாயகம் -ஒற்றுமையே உயிர்நிலை

: கவிஞர் அப்துல்ரகுமான் - கால வழு

மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் – மலையாளக் காற்று

கவிஞர் தாமரை – மழைக்குறிப்பு

சூழலியல் : கவிஞர் வைதீஸ்வரன் -விரல் மீட்டிய மழை
பெண்ணியம் : கவிஞர் சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை
கவிஞர் வைரமுத்து – அம்மா
வாழ்க்கை : கவிஞர் தருமுசிவராம் – வாழ்வுப் பாடல்
இயற்கை : பாவேந்தர் பாரதிதாசன் – அழகின் சிரிப்பு – வான்.

அலகு – II : அற இலக்கியம்: (15 மணிநேரம்)

கொன்றை வேந்தன்: 1 - 50 பாடல்கள்
திருக்குறள்: பண்புடைமை, வினைத்திட்பம் -20 குறள்கள்
பழமொழி நானூறு: 5 பாடல்கள்
வேதநாயகம்பிள்ளை நீதிநூல்: 74 -78 பாடல்கள்
பெருவாயின் முள்ளியார் ஆசாரக்கோவை: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: (15 மணிநேரம்)

மூவருலா: 1-26 கண்ணிகள்
திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்
குற்றாலக்குறவஞ்சி: 5 பாடல்கள்
முக்கூடற்பள்ளு : 5 பாடல்கள்
கலிங்கத்துப் பரணி: போர்பாடியது- 9 பாடல்கள்

அலகு – IV : கட்டுரை: (10 மணிநேரம்)

1. உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்
2. கட்டிடக்கலை - அ.இராசமாணிக்கனார்
3. வாழ்க்கை -இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: (12 மணிநேரம்)

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. எழுத்து, சொல், பொருள் இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Semester I

L	**T**	**P**	**C**
4	**-**	**-**	**4**

16ENU101 **ENGLISH I**

Course Objectives:

1. To help students enhance their Language skills
2. To introduce different kinds of literary works
3. To familiarize different genres of Literature
4. To instruct moral values through literature.
5. To improvise their productive and receptive skills
6. To strengthen the basic knowledge about grammar

Course Outcome:

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed.
6. Betterment of language competence

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman – Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT V

Short Story: The Bird – Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. *Spring* 2013**.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala, V. *English for Communication*. 2006. Emerald Publishers: Chennai

Semester I

16CMU101	**FINANCIAL ACCOUNTING**	**L**	**T**	**P**	**C**
		5	**-**	**-**	**5**

COURSE OBJECTIVES:
To make the students

1. To make the students learn the basic concepts, conventions, nature of accounting and also to acquire Conceptual Knowledge in different accounting standards.
2. To know about the accounting process and preparation of final accounts
3. To understand about the Accommodation of bills, Average Due Date and Account Current.
4. To understand and apply the techniques for preparing accounts in different business organizations like consignment and joint venture.
5. To know about the Bank Reconciliation Statement process and Accounting Standards
6. To understand overall accounting standards to maintain financial accounting.

COURSE OUTCOMES:
Learners should be able to

1. Comprehend the accounting concepts, principles and to comply the accounting standards.
2. Acquire knowledge on accounting process and preparation of final accounts
3. To apply appropriate judgment derived from knowledge about bill of exchange
4. Recognize the accounting process of financial statement and critically think in preparing
5. Accounts, rectification of errors, Consignment and Joint Venture.
6. Recognize the Bank Reconciliation Statement process and Accounting Standards
7. To apply the correct accounting standards in their business.

Unit I
Theoretical Framework - Accounting information system: Users and their Needs. Characteristics of Accounting - Functions, Advantages and Limitations of Accounting. Branches of Accounting- Bases of Accounting: - Concepts and Conventions –Accounting Standards – Journal- Ledger – Subsidiary Books – Trial Balance

Unit II
Business Income – Revenue Recognition – Depreciation – methods – straight line method – Diminishing Balance Method – Change in method of depreciation – Final Accounts – preparation of final accounts for non- corporate business entities

Unit III
Accounting for Hire-Purchase and Installment System- Transactions - Journal Entries and ledger accounts including Default and Repossession.

Unit IV
Consignment - Features, Accounting treatment - Consignor and Consignee. **Joint Venture -** Accounting procedures: Joint Bank Account, Records Maintained by Co-venturer of (a) all transactions (b) only his own transactions. (Memorandum joint venture account).

Unit V

Accounting for Partnership - Valuation of Goodwill – Calculation of Profit-Sharing Ratio – Admission – Retirement of a Partner.

Note:

Distribution of marks - 20% theory and 80% problems

Suggested Readings

Text Book

1. Reddy T.S.& Moorthy.A. (2012), *Financial Accounting*, Chennai, Margham Publications.

Reference Books:

1. Shukla, M.C. Grewal T.S. & Gupta. S.C. (2013) Revised Edition, *Advanced Accounts*. New Delhi.Vol.-I. S. Chand & Co.,
2. Maheshwari, S.N. & Maheshwari S. K. (2013) *Financial Accounting*. New Delhi Vikas Publishing House.
3. Deepak Sehgal. (2014) *Financial Accounting*. New Delhi, Vikas Publishing House,
4. Tulsian, P.C. (2004) *Financial Accounting*, Pearson Education.
5. *Compendium of Statements and Standards of Accounting*.(2012) New Delhi, The Institute of Chartered Accountants of India,

Semester I

L	**T**	**P**	**C**
-	**-**	**3**	**1**

16CMU111 FINANCIAL ACCOUNTING - (PRACTICAL)

COURSE OBJECTIVES:

To make the students

1. To understand the accounts heads available to create a company in the accounting software
2. To know the mechanics of creating the vouchers and ledgers
3. To be aware of the inventory valuations methods available in the software
4. To understand various financial statements that are built in the software
5. To be aware of financial analysis tools available in the software
6. To understand the recent software application pages with its various functions.

COURSE OUTCOMES:

Learners should be able to

1. Understand the different accounting heads and its importance
2. Create vouchers and ledgers by understanding the reason for posting under different heads
3. Calculate valuation of assets using the software
4. Prepare the financial statements and analyze the financial statement using the option of ratio analysis
5. Exhibit communication skills to communicate the output derived from the program.
6. To know the Accounting software implementation with its functions.

TALLY – PRACTICAL LIST

1. Create a new company in integrate accounts mode and account with inventory mode

2. Create a primary and subgroups using single or multiple ledger mode.

3. Create minimum 10 ledgers using single or multiple ledger and alter and delete any 2 ledger.

4. Create a new company, ledger and record minimum 10 transactions with out adjustment.

5. Create a new company , ledger and record minimum 10 transactions with any five adjustments and display the relevant results.

6. Enter the following voucher

- Payment vouchers
- Receipt
- Purchases
- Sales
- Credit note
- Debit note
- Journals
- Memo

- Optional

7. Prepare trail balance for the company

8. Prepare profit and loss account and balance sheet (with minimum of any 5 adjustments)

Semester I

16CMU102 BUSINESS ORGANIZATION AND MANAGEMENT	L	T	P	C
	6	2	-	6

COURSE OBJECTIVES:
To make the students

1. To provide basic knowledge to the students about the foundation of Indian business and various types of manufacturing sectors.
2. To describe the concept, functions and levels of management and how the different schools of thoughts are integrated into management principles and practices.
3. To Specify how the managerial functions of planning, organizing and controlling are executed in a variety of circumstances
4. To Analyze the behaviour of individual and groups its influence organization\
5. To Resolve group dynamics, handle conflict and manage change.
6. Understand the importance of organization system including of motivation and leadership skills.

Course Outcomes (COs)
Learners should be able to

1. Providing the basic knowledge to the students about the foundation of Indian business and various types of manufacturing sectors.
2. Describing the concept, functions and levels of management and how the different schools of thoughts are integrated into management principles and practices.
3. Specifing how the managerial functions of planning, organizing and controlling are executed in a variety of circumstances
4. Analysing the behaviour of individual and groups its influence organization\
5. Resolving the group dynamics, handle conflict and manage change.
6. Understanding the importance of organization system including of motivation and leadership skills.

Unit I
Foundation of Indian Business: Manufacturing and Service Sectors- Small and Medium Enterprises- Problems and Government policy. India's Experience of Liberalization and Globalization. Make in India - Technological Innovations and Skill Development. Social Responsibility and Ethics Emerging opportunities in business- Franchising, Outsourcing, and E-commerce.

Unit II
Business Enterprises: Forms of Business Organisation- Sole Proprietorship- Joint Hindu Family Firm- Partnership firm- Joint Stock Company- Cooperative society- Limited Liability Partnership- Choice of Form of Organisation. Government - Business Interface; Rationale and Forms of Public Enterprises. International Business. Multinational Corporations.

Unit III
Management and Organisation: The Process of Management- Planning- Decision-making-

Strategy Formulation. Organizing Basic Considerations; Departmentation – Functional, Project, Matrix and Network; Delegation and Decentalisation of Authority; Groups and Teams.

Unit IV

Leadership, Motivation and Control: Leadership: Concept and Styles - Trait and Situational Theory of Leadership. Motivation - Concept and Importance- Maslow Need Hierarchy Theory- Herzberg Two Factors Theory- Communication- Process and Barriers- Control Concept and Process.

Unit V

Functional Areas of Management: Marketing Management- Marketing Concept- Marketing Mix- Product Life Cycle- Pricing Policies and Practices Financial Management: Concept and Objectives- Sources of Funds – Equity Shares, Debentures, Venture Capital and Lease Finance. Securities Market, Role of SEBI. Human Resource Management: Concept and Functions- Basic Dynamics of Employer - Employee Relations.

Suggested Readings

Text Book

1. Bhushan , Y.K. (2008), *Business Organization and Management*, 18th edition, New Delhi, Sultan chand & sons.

Reference books:

1. Kaul, V.K., (2013), *Business Organisation and Management*, New Delhi, Pearson Education,
2. Chhabra, T.N., (2009), *Business Organisation and Management*, New Delhi, Sun India Publications,
3. Gupta CB, (2014), *Modern Business Organisation*, New Delhi, Mayur Paperbacks.
4. Koontz & Weihrich, (2010), *Essentials of Management*, McGraw Hill Education.

Semester I

16AEC101	BUSINESS COMMUNICATION	L	T	P	C
		4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To understand the types of communication and barriers of communication.
2. To acquire knowledge on the different business correspondence used in organization
3. To be aware of the different types of reports prepared for the organization.
4. To understand the importance of vocabulary in business communication.
5. To be aware of the use of technology and the oral presentation techniques used in communication.
6. To use updated technology for various types of communication globally.

COURSE OUTCOMES:

Learners should be able to

1. Communicate effectively with the optimal mix of verbal and nonverbal communication mitigating the barriers.
2. Draft business correspondence for the organization requirement.
3. Prepare business reports for organization needs.
4. Use appropriate technology for business communication.
5. Draft the resume and develop the skills to face the interview
6. Use appropriate technology for business communication.

Unit I

Nature of Communication: Process of Communication, Types of Communication (Verbal & Non Verbal), - Importance of Communication- Different forms of Communication- Barriers to Communication Causes - Linguistic Barriers, Psychological Barriers, Interpersonal Barriers, Cultural Barriers, Physical Barriers, Organizational Barriers

Unit II

Business Correspondence: Letter Writing – Presentation - Inviting quotations- Sending Quotations- Placing orders- Inviting tenders - Sales letters- Claims and Adjustment Letters and Social Correspondence – Memorandum - Inter -office Memo – Notices- Agenda- Minutes.

Unit III

Report Writing: Business Reports- Types – Characteristics – Importance- Elements of Structure- Process of writing - Order of writing- Final draft, and check lists for Reports.

Unit IV

Application Letters : Preparation of Resume – Interview- Meaning – Objectives and Techniques of Various Types of Interviews – Public Speech – Characteristics of a Good speech- Business Report Presentations.

Unit V

Oral Presentation: Importance- Characteristics- Presentation Plan - Power Point Presentation- Visual Aids.

Suggested Readings

Text Book:

1. Rajendra Pal Korahill, (2008) "*Essentials of Business Communication*", New Delhi.Sultan Chand & Sonds.

Reference Books:

1. Bovee, & Thill, (2015),"*Business Communication Today"*, 13th Edition Pearson Education
2. Shirley Taylor, (2012).*Communication for Business*, Pearson Education – 7th Edition
3. Locker & Kaczmarek, (2013) *Business Communication: Building Critical Skills,* Tata McGraw Hill Education ,
4. .Leena Sen, *Communication Skills*, (2007) , New Delhi, PHI Learning- 2nd Edition

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)

பகுதி – I, **தமிழ்** **பருவம்** II **16LAU201 :**

தமிழ் இரண்டாம் தாள்

6-H,6-C

(இளநிலை கலையியல் பட்ட வகுப்புகளுக்குரியது)

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

- இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
- மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I : பக்தி இலக்கியம் (10 மணிநேரம்)

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு

1. **சைவம்** - பெரியபுராணம் - திருமூலநாயனார் புராணம்.
2. **வைணவம்** - பெரியாழ்வார் திருமொழி: 10 பாடல்கள்

அலகு – II : சங்க இலக்கியம் : (25 மணிநேரம்)

சங்க இலக்கியங்கள் அறிமுகம்

அ). **எட்டுத்தொகை**

நற்றிணை : 1. பிரசம் கலந்த – பாலை-110

2.தடமருப்பு எருமை- மருதம்-130

குறுந்தொகை : 1. கருங்கட்டாக் கலை – குறிஞ்சி- 69

2. உள்ளது சிதைப்போர்- பாலை-283

ஐங்குறுநூறு :1. நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

2. அன்னாய் வாழி வேண்டன்னை-203

பதிற்றுப்பத்து : 1. சிதைந்தது மன்ற-27

2. மீன்வயின் நிற்ப-90

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு:

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : 1.குறிஞ்சிக்கலி-சுடர்தொடீ -15

2. முல்லைக்கலி-தீம்பால் -11

அகநானூறு : 1.அன்னாய் வாழி வேண்டன்னை-குறிஞ்சி-17

புறநானூறு : 1. யாதும் ஊரே யாவருங் கேளிர்-பொதுவியல்-192

2.கெடுக சிந்தை கடிதிவள் துணிவே -279

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள்: சிறுதினை மலரொடு:218-275.

முருகன் அருள்புரிதல்: 286-295.

அலகு - III : காப்பியம் **(12 மணிநேரம்)**

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29) – கண்ணகியின் சிறப்பு: ‘நாகநீள் நகரொடு’ என்பதிலிருந்து தொடங்கி, ‘கண்ணகி என்பாண் மன்னோ’ என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234) - சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: ‘அருந்திறலரசர்’ என்பதிலிருந்து தொடங்கி, ‘மன்னவரேறென்’ என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485) - செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

சூளாமணி: மந்திர சாலைச் சருக்கம் (தேர்ந்தெடுக்கப்பெற்ற 25 பாடல்கள்)

அலகு – IV : சிறுகதை **(15 மணிநேரம்)**

1. குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்
2. **காட்டில் ஒரு மான் - அம்பை**
3. **நாற்காலி – கி.ராஜநாராயணன்**
4. நகரம் – சுஜாதா
5. எஸ்தர் – வண்ண நிலவன்
6. மரப்பாச்சி – உமா மகேஸ்வரி

அலகு- V : மொழிப்பயிற்சி **(10 மணிநேரம்)**

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை,கட்டுரை, உரைநடை)
மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

		Semester II
16ENU201	**ENGLISH II**	**L T P C**
		4 - - 4

Course Objectives:

- To enable the learners to acquire English language skills.
- To familiarize them with English literature.
- To attain basic knowledge on Grammar.
- To help learners imbibe cultural values.
- To gain knowledge of making correct sentences.
- To reflect originality on the application of soft skills and express in writing their views.

Course Outcome:

- Acquire to enjoy the ecstasy of literature.
- The select literary pieces will develop the confidence level of the learners.
- Develop the social values.
- Recognize the importance of communication
- Get sound knowledge in English
- Communicate well for business purpose.

UNIT I

Prose: The Unexpected- Robert Lynd
Poetry: The Village Schoolmaster – Oliver Goldsmith
Short Story: The Lion's Share – Arnold Bennett
Vocabulary: Homonyms
Grammar: Irregular Verb

UNIT II

Prose: Travel by Train – J. B. Priestley
Poetry: The Gift of India – Sarojini Naidu
Grammar: Sentence pattern

UNIT III

Prose: Women's Education is Almost More Important than the Education of Boys and Men – Indira Gandhi
Short Story: The Necklace – Guy De Maupassant
One-Act Play: The Referee – W.H. Andrews and Geoffrey Dearmer
Vocabulary: Similes
Grammar: Discourse Markers

UNIT IV

Poetry: Ozymandias – P.B. Shelley
One-Act Play: The Pot of Broth- W.B. Yeats
Vocabulary: Collective Noun

Grammar: Correction of Sentences

UNIT V

Short Story: The Silver Butterfly– Pearl S. Buck
One-Act Play: The Bear – Anton Chekov
Vocabulary: Acronym
Grammar: Question Tag

Prescribed Text:

Wings of Communication 2014. Board of Directors. Emerald Publishers: Chennai

Suggested Reading:

Syamala, V. *English for Communication*. 2006. Emerald Publishers: Chennai.

16CMU201 **BUSINESS LAW**

Semester II			
L	**T**	**P**	**C**
5	**-**	**-**	**5**

COURSE OBJECTIVES:

To make the students

1. To know the essential elements of contract and also the Indian Contract Act 1872.
2. To learn the fundamental regulation about the sale of goods act, 1930.
3. To impart basic knowledge of Partnership Law and Indian Partnership Act 1932.
4. To understand about the Limited Liability Partnership Act, 2008
5. To enhance knowledge in the Negotiable Instruments Act 1881.
6. To familiarize with the concepts in Indian Contract Act.

COURSE OUTCOMES:

Learners should be able to

1. Identify the basic legal principles behind contractual agreements.
2. Understand the relevance of business law in economic and social context.
3. Acquire problem solving techniques and will be able to present coherent, concise legal argument in partnership for achieving common goals.
4. Exhibit attributes in understanding various negotiable instruments, its features and utilization in real-time.
5. Obtain the capacity to do lifelong learning in modifications and revision done in the legal environment of business.
6. Prepare various agreements related to contract.

Unit I

The Indian Contract Act, 1872: General Principles of Contract- Contract – Meaning, Characteristics and Kinds- Essentials of a Valid Contract - Offer and Acceptance, Consideration, Contractual Capacity, Free Consent, Legality of Objects- Void Agreements- Discharge of a Contract – Modes of Discharge, Breach and Remedies against Breach of Contract- Contingent contracts- Quasi – Contracts.

Unit II

The Indian Contract Act, 1872: Specific Contracts - Contract of Indemnity and Guarantee- Contract of Bailment- Contract of Agency-**The Sale of Goods Act, 1930** - Contract of sale, Meaning and Difference Between Sale and Agreement to Sale - Conditions and Warranties- Transfer of Ownership in Goods including Sale by a Non-owner- Performance of Contract of sale- Unpaid Seller – Meaning, Rights of an Unpaid Seller against the Goods and the Buyer.

Unit III

The Partnership Act, 1932: Nature and Characteristics of Partnership- Registration of a Partnership Firms- Types of Partners- Rights and Duties of Partners- Implied Authority of a Partner- Incoming and outgoing Partners- Mode of Dissolution of Partnership.

Unit IV

The Limited Liability Partnership Act, 2008: Salient Features of LLP- Differences Between LLP and Partnership, LLP and Company- LLP Agreement - Partners and Designated Partners-Incorporation Document- Incorporation by Registration- Partners and their Relationship.

Unit V

The Negotiable Instruments Act 1881: Meaning, Characteristics, and Types of Negotiable Instruments: Promissory Note, Bill of Exchange, Cheque - Holder and Holder in Due Course, Privileges of Holder in Due Course. Negotiation - Types of Endorsements- Crossing of Cheque - Bouncing of Cheque

Suggested Readings

Text Book:

1. Kapoor N.D.(2006), *Elements of Mercantile Law*, New Delhi. S.Chand & Co,

Reference Books:

1. Kuchhal, M.C. & Vivek Kuchhal (2013), *Business Law*, Vikas Publishing House, New Delhi.
2. SN Maheshwari & SK Maheshwari (2011), *Business Law*, New Delhi. National Publishing House
3. Agarwal S K, (2005), *Business Law,* New Delhi , Galgotia Publishers Company,.
4. P C Tulsian & Bharat Tulsian (2000), *Business Law*, McGraw Hill Education
5. Sharma, J.P. & Sunaina Kanojia (2011), *Business Laws*, New Delhi, Ane Books Pvt. Ltd.,

		Semester II
16CMU211	**BUSINESS LAW – (PRACTICAL)**	**L T P C**
		- - 3 1

COURSE OBJECTIVES:
To make the students

1. To Prepare a presentation on offer and acceptance of Contract
2. To give a presentation about A Contract is void without Consideration
3. To Discuss in group on the following are unlawful agreements, Contractual Capacity, breach of contract and Remedies for Breach of Contract.
4. To Design Presentation slides like Registration of a Partnership firm, Rights and Duties of Partner and Implied Authority of partner
5. To enhance knowledge in the Negotiable Instruments Act 1881.
6. To familiarize with the concepts in Indian Contract Act.

COURSE OUTCOMES:
Learners should be able to

1. Preparing a presentation on offer and acceptance of Contract
2. Giving presentation about A Contract is void without Consideration
3. Discussion in group on the following are unlawful agreements, Contractual Capacity, breach of contract and Remedies for Breach of Contract.
4. Designing Presentation slides like Registration of a Partnership firm, Rights and Duties of Partner and Implied Authority of partner
5. Enhancing the knowledge in the Negotiable Instruments Act 1881.
6. Familiarizing with the concepts in Indian Contract Act.

List of Practical

1. Prepare a presentation on offer and acceptance of Contract
2. A Contract is void without Consideration – Give a Presentation
3. Discuss in group on the following
   a. unlawful agreements
   b. Contractual Capacity
   c. breach of contract
   d. Remedies for Breach of Contract
   e. Contract of sale
   f. Conditions and Warranties

4. Design Presentation slides on the following topics
   a. Registration of a Partnership firm
   b. Rights and Duties of Partner
   c. Implied Authority of partner
   d. Mode of dissolution of Partner
   e. Limited Liability partnership agreement
   f. Incorporation by Registration
   g. Incorporation Document

h. Partners and their relations

5. Design Slides on negotiable instruments

a. Essential requisites of Negotiable Instruments
b. Promissory Note
c. Bill of Exchange
d. Cheque
e. Holder in due course
f. Negotiation
g. Types of Endorsement
h. Crossing of Cheque

Note: Record note to be submitted and Viva-voce will be conducted.

Suggested Readings

Text Book:

1. Dr. M. R. Sreenivasan. (2013). *Business Law* [Fifth Revised and Enlarged Edition] Chennai, Margham Publications.
2. Kapoor N.D.(2014). *Elements of Mercantile Law*. New Delhi., S.Chand & Co,

Reference Books:

1. M.C. Kuchhal, and Vivek Kuchhal. (2013). *Business Law*, New Delhi, Vikas Publishing House.
2. SN Maheshwari and SK Maheshwari. (2011). *Business Law*. New Delhi, National Publishing House.
3. Agarwal, S K, (2005). *Business Law*. New Delhi, Galgotia Publishers Company.
4. P C Tulsian and Bharat Tulsian. (2000), *Business Law*, New Delhi, McGraw Hill Education
5. Sharma, J.P. and Sunaina Kanojia. (2011). *Business Laws*. New Delhi, Abe Books Pvt. Ltd.,.

		L	T	P	C
		Semester II			
16CMU202	**BUSINESS MATHEMATICS AND STATISTICS**	**L**	**T**	**P**	**C**
		6	**2**	**-**	**6**

COURSE OBJECTIVES
To make the students

1. To understand the concept of matrices
2. To acquire the knowledge of differential calculus
3. To know the concepts of central tendency and dispersion
4. To understand the correlation and regression concepts
5. To be aware of the index numbers and trend analysis
6. To be aware on of issues in the construction of index numbers

COURSE OUTCOMES:
Learners should be able to

1. Utilize the concept of matrices, differential calculus to solve business problems
2. Calculate and apply the measure of central tendency and dispersion in decision making.
3. Evaluate the relationship and association between variables to formulate the strategy in business.
4. Apply the concept of index numbers and trend analysis in business decisions.
5. Demonstrate capabilities as problem-solving, critical thinking, and communication skills related to the discipline of statistics.
6.Overcoming on issues in the construction of index numbers

Unit I: Matrices & Basic Mathematics of Finance

Definition of a matrix. Types of matrices; Algebra of matrices. Calculation of values of determinants up to third order; Adjoint of a matrix; Finding inverse of a matrix through ad joint; Applications of matrices to solution of simple business and economic problems- Simple and compound interest Rates of interest – nominal, effective and continuous – their interrelationships; Compounding and discounting of a sum using different types of rates

Unit II: Differential Calculus

Mathematical functions and their types – linear, quadratic, polynomial; Concepts of limit and continuity of a function; Concept of differentiation; Rules of differentiation – simple standard forms. Applications of differentiation – elasticity of demand and supply; Maxima and Minima of functions (involving second or third order derivatives) relating to cost, revenue and profit.

Unit III: Uni-variate Analysis

Measures of Central Tendency including arithmetic mean, geometric mean and harmonic mean: properties and applications; mode and median. Partition values - quartiles, deciles, and percentiles. Measures of Variation: absolute and relative. Range, quartile deviation and mean deviation; Variance and Standard deviation: calculation and properties.

Unit IV: Bi-variate Analysis

Simple Linear Correlation Analysis: Meaning, and measurement. Karl Pearson's co-efficient and

Spearman's rank correlation Simple Linear Regression Analysis: Regression equations and estimation. Relationship between correlation and regression coefficients

Unit V: Time-based Data: Index Numbers and Time-Series Analysis

Meaning and uses of index numbers; Construction of index numbers: Aggregative and average of relatives – simple and weighted, Tests of adequacy of index numbers, Construction of consumer price indices. Components of time series; additive and multiplicative models; Trend analysis: Finding trend by moving average method and Fitting of linear trend line using principle of least squares

Suggested Readings:

Text Books

1. N. D. Vohra.(2013) *Business Mathematics and Statistics*. [Reprint]. New Delhi, McGraw Hill Education (India) Pvt Ltd.

Reference Books

1. Mizrahi and John Sullivan. (2013). *Mathematics for Business and Social Sciences* [7th Edition] India, Wiley and Sons.
2. Budnick, P. (2011). *Applied Mathematics*.[4th Edition]. New Delhi, McGraw Hill Publishing Co.
3. J.K. Thukral. (2011). *Mathematics for Business Studies* [15th Edition]. Chennai, Mayur Publications
4. J. K. Singh. (2010). Business *Mathematics*. New Delhi, Himalaya Publishing House.
5. J. K. Sharma. (2013). *Business Statistics[*3rd Edition]. New Delhi, Pearson Education..
6. S.P. Gupta and Archana Gupta. (2013). *Elementary Statistics.* [7th Edition] New Delhi, Sultan Chand and Sons.
7. Richard Levin and David S. Rubin. (2015). *Statistics for Management*[7th Edition] New Delhi, Prentice Hall of India,.
8. M.R. Spiegel. (2013).*Theory and Problems of Statistics* [4th Edition] New Delhi,. McGraw Hill Publishing Co.

Semester II

16AEC201	ENVIRONMENTAL STUDIES	L	T	P	C
		4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To understand the ecosystem and its functions
2. To be aware of the difference between the renewable and non-renewable resources.
3. To know about biodiversity and the importance of conservation.
4. To be aware of the different pollution that affects the environment.
5. To know about the social issues prevailing in the environment.
6. To be familiar in Disaster Management.

COURSE OUTCOMES:

Learners should be able to

1. Understand the ecosystem and its impact on human beings.
2. Preserve the non – renewable energy and effectively utilize the renewable energy.
3. Avoid the threats to biodiversity habitat loses.
4. Prevent pollution in the environment
5. Apply the laws relevant to the environment conservation
6. Understand the causes of Disaster Management.

UNIT-I: Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

Unit II: Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources : Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fire works.

Unit III: Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV: Environmental Pollution - Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution , Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit V: Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

Suggested readings

T1: Tripathy.S.N. and Sunakar Panda. 2004. Fundamentals of Environmental Studies; 2nd Edition, Vrianda Publications Private Ltd., New Delhi.

T2: Arvind Kumar, 2004. A Textbook of Environmental Science; APH Publishing Corporation, New Delhi.

T3: P.S.Verma, V.K.Agarwal. 2001. Environmental Biology (Principles of Ecology); S.Chand and Company Ltd., New Delhi.

T4: Anubha Kaushik, C.P.Kaushik, 2004. Perspectives in Environmental Studies, New Age International Pvt. Ltd. Publications, New Delhi.

R1: Singh, M.P., B.S. Singh and Soma S. Dey, 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.

R2: Daniel B.Botkin and Edward A. Keller. 1995. Environmental Science, John Wiley and Sons, Inc., New York.

R3: Uberoi, N.K., 2005. Environmental Studies, Excel Books Publications, New Delhi, India.

Semester III

16ENU301	**ENGLISH III**	**L T P C**
		6 2 - 6

Course Objectives:

1. To develop confidence to respond in English during situations where the use of English is imperative.
2. To develop fluency in actual conversation in the English language.
3. To develop knowledge about business communication.
4. To develop knowledge about business writing.
5. To acquire knowledge on communication for different purpose.
6. To get knowledge to communicate in day to affairs.

Course Outcome:

1. Students learnt the basics and purposes of listening skill.
2. Students will know the importance of speaking.
3. Students developed the speaking skills on telephone, business and also in travel
4. Acquired knowledge on effective vocabulary learning strategies.
5. Students will able to communicate clearly and effectively and handle their day to day affairs well with their knowledge of language skills.
6. Students will know the importance of reading.

UNIT I: Listening

Listening and its types, Basic Listening Lessons, Critical Listening Lessons, Advanced Listening Lessons, and Note Taking

UNIT II: Speaking

Basics of speaking, Regular English, Business English, Interview English, and Travel English

UNIT III: Reading

Reading and its purposes, Types of Reading, Reading Techniques, Reading Comprehension, Note Making

UNIT IV: Writing

Writing defined, Types of Writing, Components of Writing, Writing Contexts, Language and Style with accordance to the contexts

UNIT V: Vocabulary Enrichment

Synonyms, Antonyms, Homonyms, Phrasal Verbs, Idioms and Phrases, One Word Substitutes, and Affixes

Suggested Reading:

Learning to Learn: Study Skills in English Cambridge, 2015
Advanced Skills; Simon Harenes – CUP. 2015

Business Results, Woodward, OUP. 2015
Function in English. Jonathan Middlemiss et al, OUP

Semester III

L	T	P	C
6	2	-	6

16CMU301 COMPANY LAW

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of laws related to constitution of company, finance structure, management team.
2. To comprehend on the laws pertaining to the need of audit, accounts, dividend and winding up of the company.
3. To analyse few real time cases relevant to company laws
4. To communicate orally and in written form and analyses cases in a team and exhibit leadership skills.
5. To be familiar with the standards and laws pertaining to the corporate and utilize for lifelong practical application.
6. To know the online registration and online filing process of documents.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of laws related to constitution of company, finance structure, management team.
2. Comprehend on the laws pertaining to the need of audit, accounts, dividend and winding up of the company.
3. Analyse few real time cases relevant to company laws
4. Communicate orally and in written form and analyse cases in a team and exhibit leadership skills.
5. Familiarize with the standards and laws pertaining to the corporate and utilize for lifelong practical application.
6. Online registration and online filing process of documents.

Unit I

Introduction: Administration of Company Law 2013 - National Company Law Appellate Tribunal (NCLAT), Special Courts- Characteristics of a Company- Lifting of Corporate Veil - Types of Companies Including One-Person Company, Small Company and Dormant Company - Association not for Profit- Illegal Association- Formation of Company- On-line Filing of Documents- Promoters- Legal Position, Pre-Incorporation Contract - On-line Registration of a Company.

Unit II

Documents : Memorandum of Association - Articles of Association- Doctrine of Constructive Notice and Indoor Management - Prospectus-shelf and Red Herring Prospectus- Misstatement in Prospectus- GDR- Book Building- Issue, Allotment and Forfeiture of Share- Transmission of Shares, Buyback and Provisions Regarding Buyback- Issue of Bonus Shares.

Unit III

Management: Classification of Directors -Women Directors- Independent Director- Small Shareholder's Director- Disqualifications- Director Identity Number (DIN)- Appointment- Legal Positions - Powers and Duties - Removal of Directors- Managing Director, Manager; Meetings of Shareholders and Board- Types of Meeting, Convening and Conduct of Meetings, Postal Ballot, Meeting Through Video Conferencing - e-Voting - Committees of Board of Directors - Audit Committee - Nomination and Remuneration Committee - Stakeholders Relationship Committee - Corporate Social Responsibility Committee.

Unit IV

Dividends, Accounts, Audit– Provisions Relating to Payment of Dividend - Provisions Relating to Books of Account- Provisions Relating to Audit - Auditors' Appointment- Rotation of Auditors - Auditors' Report- Secretarial Audit.

Unit V

Winding Up - Concept and Modes of Winding Up - Insider Trading - Whistle Blowing – Insider-Trading - Meaning and Legal Provisions- Whistle blowing- Concept and Mechanism.

Suggested Readings

Text Book:

1. MC Kuchhal, (2014), *Modern Indian Company Law*, Shri Mahaveer Book Depot (Publishers), Delhi.

Reference Books:

1. GK Kapoor & Sanjay Dhamija, *Company Law*, Delhi. Bharat Law House.
2. Anil Kumar, *Corporate Laws*, Delhi, Indian Book House.
3. Reena Chadha & Sumant Chadha, *Corporate Laws*, Delhi.Scholar Tech Press.
4. Gower and Davies, *Principles of Modern Company Law*, Sweet & Maxwell.
5. Sharma, J.P., *An Easy Approach to Corporate Laws*, Ane Books Pvt. Ltd., New Delhi.

Semester III

L	T	P	C
5	-	-	5

16CMU302 INCOME TAX LAW AND PRACTICE

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of assessment, assessee, Income heads and the Income Tax laws.
2. To learn the tools and techniques to compute the tax for the various income heads.
3. To select the best ways to compute the income tax based on the income heads for various assessee and to gain a lifelong learning for applying the IT calculation for various income heads based on each case of assessee.
4. To communicate orally and in written form the income tax concepts and computations.
5. To be familiar with the laws pertaining to the Income Tax and apply it lifelong.
6. To prepare a statement of income for a person.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend on the concepts related to assessment, assessee, Income heads and the Income Tax laws.
2. Compute Income Tax Returns.
3. Formulate the Income Tax calculations by critically analyzing the assessee's situation under various income heads and deductions and acquire a Lifelong practice for computation of Tax under various income heads and deductions for any assessee
4. Communicate orally and in written the Income tax computation under various income heads and deductions.
5. Familiar with the laws pertaining to the Income Tax and its apply it lifelong.
6. Prepare a statement of income for a person.

Unit I

Introduction: Basic concepts: Income, Agricultural Income, Person, Assessee, Assessment Year, Previous Year, Gross Total Income, Total Income, Maximum Marginal Rate of Tax-Permanent Account Number (PAN) - Residential status- Scope of Total Income on the basis of Residential Status - Exempted Income Under Section 10.

Unit II

Computation of Income under Different Heads-1: Income from Salaries- Income from house property

Unit III

Computation of Income under Different Heads-2: Profits and gains of business or profession-Capital gains- Income from other sources.

Unit IV

Computation of Total Income and Tax Liability: Income of other persons included in Assessee's Total income- Set-off and Carry Forward of Losses- Deductions from Gross Total Income.

Unit V

Computation of Total Income - Aggregation of Income - Assessment of Individuals - Total Income and Tax Liability of an Individual .

Suggested Readings

Text Book

1. Gaur and Narang (2016)," *Income Tax Law and Practice*", Kalyani Publisher Luthiana, 44th Edition.

References book:

1. Singhania, Vinod K. & Monica Singhania, (2016), *Students' Guide to Income Tax*, University Edition.Taxmann Publications Pvt. Ltd., New Delhi., 54th Edition,

2. Ahuja, Girish & Ravi Gupta, (2016), *Systematic Approach to Income Tax*. Bharat Law House, Delhi. 35thEdition.

Software

1. Vinod Kumar Singhania, e-filing of Income Tax Returns and Computation of Tax, Taxmann Publication Pvt. Ltd, New Delhi. Latest version
2. 'Excel Utility' available at incometaxindiaefiling.gov.in

Semester III

L	T	P	C
-	-	3	1

16CMU312 INCOME TAX LAW AND PRACTICE- (PRACTICAL)

COURSE OBJECTIVES:

To make the students

1. To enable the students to acquire the basic knowledge on the application of income tax law and practice
2. To make the students to learn the techniques and application of E-filling of income tax returns and calculation of TDS.
3. To prepare format and procedure of Provision and Procedures of VAT
4. To Prepare the procedure for valuation of Application for Getting PAN / TAN
5. To Prepare E- payment of tax on total income and tax calculator
6. To prepare ITR V Receipt Status
7.

COURSE OUTCOMES:

Learners should be able to

1. Enabling the students to acquire the basic knowledge on the application of income tax law and practice
2. Making the students to learn the techniques and application of E-filling of income tax returns and calculation of TDS.
3. Preparing the format and procedure of Provision and Procedures of VAT
4.Preparing the procedure for valuation of Application for Getting PAN / TAN
5.Preparing E- payment of tax on total income and tax calculator
6.Preparing the ITR V Receipt Status

The following are the list of programmes

1. Creation of login of e- filing

2. E- Filing of income tax returns,

2. Calculation of TDS

3. Provision and Procedures of VAT

4. Compulsory On-Line filing of returns for specified assesses.

5. Application for Getting PAN / TAN

6. E- payment of tax on total income and tax calculator

7. Submit returns or various forms

8. Rectification of Mistakes

9. ITR V Receipt Status

10. Outstanding tax demand and refund status

Semester III

16CMU303 A FINANCIAL ANALYSIS AND REPORTING

L	T	P	C
6	-	-	4

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of Financial reporting standards, difference between IFRS and IAS and the users of the financial statements for the decision making.
2. To understand and apply tools and techniques to analyse the financial statement analysis.
3. To critically evaluate the results of the tools applied, interpret the result.
4. To communicate orally and in written form the financial statement analysis, and results interpretation of the results.
5. To utilize the knowledge of financial statement analysis for lifelong practice.
6. To prepare Cash flow and fund flow statements.

COURSE OUTCOMES:
Learners should be able to

1. Comprehend the Concept of Financial reporting standards, difference between IFRS and IAS and the users of the financial statements for the decision making.
2. Understand and apply tools and techniques to analyse the financial statement analysis.
3. Critically evaluate the results of the tools applied, interpret the result.
4. Communicate orally and in written form the financial statement analysis, and results interpretation of the results.
5. Utilizing the knowledge of financial statement analysis for lifelong practice.
6. Preparation of statement of cash and fund flow.

Unit I
Basis of Financial Reporting : Purpose of Financial Reporting, Users of Financial Reports, Conceptual Framework for Financial Statements.

Unit II
Understanding Financial Statements Structure of Financial Statements: Introduction - Statement of Financial Position (Balance Sheet)- Statement of Earnings (Income Statement), - Cash Flow Statement - Additional Disclosure Statements Need for Additional Statements- Auditor’s Report - Director’s Report - Funds Flow Statement - Electronic Dissemination- Corporate Governance.

Unit III
Components of Financial Statements : Inventories – Receivables - Assets (Fixed Tangible, Intangible), Leases – Revenue - Income-Tax - Retained Earnings.

Unit IV

Analysis & Interpretation of Financial Statements : Ratio Analysis – Liquidity, Solvency, Activity & Profitability Analysis, Comparative & Common Size Analysis (Vertical & Horizontal Analysis) - Financial Statement Variation by Type of Industry.

Unit V

Expanded Analysis: Financial Ratios Used in Annual Reports, Management's Use of Analysis - Graphing Financial Information - Accounting Standards in India & IFRS Basic Framework.

Suggested Readings

Text Book

1. Grewal, T.S.,(2009) *Introduction to Accounting*, S. Chand and Co., New Delhi.

Reference Books

1. Lal, Jawahar, *Corporate Financial Reporting: Theory & Practice*, (2005), Taxmann Applied Services, 3rd edition, New Delhi.
2. Raiyani, J. R. and Lodha, G., *International Financial Reporting Standard (IFRS) and Indian Accounting Practices*, New Century Publications.
3. Singh, N. T. and Agarwal, P., *Corporate Financial Reporting in India*, Raj Publishing, Jaipur.
4. Hennie, V. G., *International Financial Reporting Standards: A practical guide*, Washington: World Bank.
5. Alexander, D., Britton, A. and A. Jorissen, *Global Financial Reporting and Analysis*, Cengage Learning, Indian edition.

		Semester III
16CMU303 B	**STOCK MARKET INVESTMENT**	**L T P C**
		6 - - 4

COURSE OBJECTIVES:

To make the students

1. To understand the concept and procedures of stock market investment
2. To provide basic skills to operate in stock market and the ways of investing in it.
3. To enable the student to take up investment in stock market independently.
4. To enable the students related to stock analysis and valuation.
5. To understand the process related to different types of ratios.
6. To know the concept of **share price indices**

COURSE OUTCOMES:

Learners should be able to

1. Understanding the concept and procedures of stock market investment
2. Provide basic skills to operate in stock market and the ways of investing in it.
3. Enabling the student to take up investment in stock market independently.
4. Eabling the students related to stock analysis and valuation.
5. Understand the process related to different types of ratios.
6. Knowing the concept of share price indices

Unit I

Investing Fundamentals: Types of Investment – Equity Shares, IPO/ FPO, Bonds - Indian Securities Market - The Market Participants - Trading of Securities - Security Market Indices- Sources of Financial Information - Stock Exchanges in India: BSE, NSE, MCX - Buying and Selling of Stocks - Using Brokerage and Analysts' Recommendations- Use of Limit Order and Market Order.

Unit II

Stock Analysis and Valuation: Online Trading of Stocks- Understanding Stock Quotations, Types and Placing of Order – Risk - Valuation and Mitigation - Analysis of the Company: Financial Characteristics (as explained by ratio analysis, future prospects of the company, assessing quality of management using financial and non-financial data, balance sheet and quarterly results, cash flows and capital structure).

Unit III

Comparative analysis of companies, Stock Valuations - Using Ratios like PE ratio, PEG ratio, and Price Revenue Ratio. Use of Historic Prices, Simple Moving Average, Basic and Advanced Interactive Charts - Examining the Shareholding Pattern of the Company - Pitfalls to Avoid while Investing - High P/E Stocks, Low Price Stocks, Stop Loss, Excess Averaging.

Unit IV

Investing in Mutual Funds: Background of Mutual Funds - Needs and Advantages of Investing in Mutual Funds - Net Asset Value, Types of Mutual funds - Open Ended, Closed Ended, Equity, Debt, Hybrid, Money Market, Load vs. No Load Funds, Factors Affecting Choice of Mutual funds. CRISIL - Mutual Fund Ranking and its Usage.

Unit V

Share Price Indices: Need, Importance, Compiling and their Interpretation - Derivative Trading - Meaning, Importance, Methods of trading- Types of Traders, Specification of Derivative Contracts and Derivative Market in India. Options: Types, Option Trading, Margin - Future- Futures Contracts- Future Market and Trading. Swaps: Mechanics and Valuation.

Suggested Readings

Text Book:

1. Chandra, Prasanna, (2008) "*Investment Analysis and Portfolio Management*", Tata McGraw Hill. 3rd Edition, 2008.

Reference Book:

1. Gitman & Joehnk, (2014), *Fundamentals of Investing*, Pearson. 12th Edition,
2. Madura, Jeff, (2014), *Personal Finance*, Pearson.5th Edition,
3. Damodaran, Aswath, (2012), *Investment Valuation: Tool and Techniques for Determining the Value of Any Asset*, Wiley Finance. 3rd Edition,
4. Bodie, Alex, Marcus & Mohanty,(2010), *Investments*, McGraw Hill Publishing Co. 9th Edition,
5. Hirt & Block, (2010), *Fundamentals of Investment Management*, McGraw Hill Publishing Co. 9th Edition,
6. Pandiyan, Punithavathy, (2009), *Security Analysis and Portfolio Management*, Vikas PublicationsEdition 1,

Semester IV

		L	T	P	C
16ENU401	**ENGLISH IV**	**6**	**2**	**-**	**6**

Course Objectives:

1. To train students in understanding the concepts of communication.
2. To be familiar with the four basic skills of English.
3. To train students in developing their written communication.
4. To train students in developing their presentation skills.
5. To acquire the skill of making grammatically correct sentences.
6. To reflect originality on the application of soft skill views and express in writing their views.

Course Outcome:

1. Students have acquired proficiency in communication.
2. Students have become adept in written communication and presentation skills.
3. Developed the skill of writing in English and that of public speaking.
4. Establish and maintain social relationships.
5. Develop communication skills in business environment.
6. Enhanced communication competency through LSRW skills.

UNIT I: Integrated Skills

Development of speaking, listening and grammar skills.

UNIT II: Advanced Reading Skills

Outcomes include improved reading speed, increased reading fluency and increased vocabulary.

UNIT III: Advanced Writing Skills

Planning and writing complex tasks

UNIT IV: News and World Affairs

Newspapers, magazines, the Internet, TV and radio are used to develop listening, reading and discussion skills.

UNIT V: Project Work

The class works together to write and produce a group project. This class is particularly useful for building confidence in using English and improving pronunciation.

Suggested Reading:

In Business; CUP
Oxford Handbook of Writing: St. Martins handbook of Writing
Sound Business. Julian Treasure OUP

		Semester IV
16CMU401	**CORPORATE ACCOUNTING**	**L T P C**
		5 - - 5

COURSE OBJECTIVES:

To make the students

1. To understand the accounting process for Share capital and debenture and its application
2. To prepare final accounts for corporate
3. To understand the accounting standard and its application in inter-holding companies
4. To solve problems relating to Holding Company Accounts,
5. To understand the process related to Liquidation of Companies.
6. To know accounting standard to Liquidation of Companies.

COURSE OUTCOMES:

Learners should be able to

1. Understand the accounting process for Share capital and debenture and its application
2. Preparing the final accounts for corporate
3. Understanding the accounting standard and its application in inter-holding companies
4. Solving the problems relating to Holding Company Accounts,
5. Understanding the process related to Liquidation of Companies.
6. Knowing the accounting standard to Liquidation of Companies

Unit I

Accounting for Share Capital and Debentures: Issue, Forfeiture and Reissue of Forfeited Shares - Concept & Process of Book Building - Issue of Rights and Bonus Shares - Buyback of Shares - Redemption of Preference Shares Issue and Redemption of Debentures

Unit II

Final Accounts: Preparation of Profit and Loss Account and Balance Sheet of Corporate Entities – Excluding Calculation of Managerial Remuneration - Disposal of Company Profits-Valuation of Goodwill and Valuation of Shares - Concepts and Calculation: Simple Problem only

Unit III

Amalgamation of Companies: Concepts and Accounting Treatment as per Accounting Standard: 14 (ICAI) (excluding inter- company holdings). Internal Reconstruction -Concepts and Accounting Treatment (excluding scheme of reconstruction)

Unit IV

Accounts of Holding Companies/Parent Companies : Preparation of Consolidated Balance Sheet with one Subsidiary Company - Relevant Provisions of Accounting Standard: 21 (ICAI).

Unit V

Accounts of Banking Companies: Difference Between Balance sheet of Banking and Non-banking Companies - Prudential Norms - Asset Structure of a Commercial Bank - Non-Performing Assets (NPA). Cash Flow Statement - Concept of Funds - Preparation of Cash Flow Statement as per Indian Accounting Standard (Ind- AS): 7.

Suggested Readings

Text Book:

1. Reddy & Moorthy (2012), "*Corporate Accounting*" Margham Publications, Chennai

Reference Books

1. M.C. Shukla, T.S. Grewal, and S.C. Gupta (2013) *Advanced Accounts*. Vol.-II. – Revised Edition S. Chand & Co., New Delhi.
2. S.N. Maheshwari, and S. K. Maheshwari.(2013) *Corporate Accounting*.- 5th Edition Vikas Publishing House, New Delhi.
3. V.K. Goyal and Ruchi Goyal,. (2007) *Corporate Accounting*. 3rd Edition PHI Learning.
4. Jain, S.P. and K.L. Narang. (2014) *Corporate Accounting*. Kalyani Publishers, Vol - II New Delhi.
5. P. C. Tulsian and Bharat Tulsian(2016), *Corporate Accounting*, S.Chand – 11th Edition

Semester IV

16CMU411 CORPORATE ACCOUNTING - (PRACTICAL)

L	T	P	C
-	-	3	1

COURSE OBJECTIVES:

To make the students

1. To enable the students to acquire the basic knowledge on the application of accounting standards for amalgamation
2.To make the students to learn the techniques and application of accounting standards in the preparation of financial statements
3.To prepare format and procedure of Amalgamation Companies as per Accounting
4.To Prepare the procedure for valuation of Goodwill of companies under Accounting Standard 36.
5.To Prepare final Accounts of Companies as per Accounting Standard
6.To prepare Accounting standard for Share and Accounting Standards for Debenture.

COURSE OUTCOMES:

Learners should be able to

1. Enabling the students to acquire the basic knowledge on the application of accounting standards for amalgamation
2.Making the students to learn the techniques and application of accounting standards in the preparation of financial statements
3.Preparing the format and procedure of Amalgamation Companies as per Accounting
4.Preparing the procedure for valuation of Goodwill of companies under Accounting Standard 36.
5.Preparing the final Accounts of Companies as per Accounting Standard
6.Preparing the Accounting standard for Share and Accounting Standards for Debenture

List of Practical

1. Prepare Format and Procedure of Amalgamation Companies as per Accounting
2. Prepare Format and Procedure of Accounting for Holding Companies and parent Companies as per Accounting Standard 21
3. Prepare the procedure for valuation of Goodwill of companies under Accounting Standard 36.
4. Financial Reporting Standard (FRS) 10 – Valuation of Goodwill
5. Prepare final Accounts of Companies as per Accounting Standard
6. Accounting standard for Share
7. Accounting Standards for Debenture

Suggested Readings:

Text Book:

1. Reddy & Moorthy. (2012) *Corporate Accounting.* [Vol. 1] Chennai , Margham Publications,

Reference Books

1. M.C. Shukla, T.S. Grewal, and S.C. Gupta. (2013) *Advanced Accounts*.[Vol.-II. – Revised Edition]. New Delhi, S. Chand & Co.
2. S.N. Maheshwari, and S. K. Maheshwari. (2013) *Corporate Accounting*[5th Edition] New Delhi, Vikas Publishing House.
3. V.K. Goyal and Ruchi Goyal. (2007) *Corporate Accounting*. [3rd Edition] New Delhi,. PHI Learning.
4. Jain, S.P. and K.L. Narang. (2014) *Corporate Accounting*.[Vol – II] New Delhi, Kalyani Publishers,.
5. P. C. Tulsian and Bharat Tulsian. (2016), *Corporate Accounting*. [11th Edition] New Delhi., S.Chand.

Semester IV

16CMU402	**COST ACCOUNTING**	**L**	**T**	**P**	**C**
		6	**2**	**-**	**6**

COURSE OBJECTIVES:

To make the students

1. To Understand the cost concepts, types of costing methods and book keeping for cost accounting
2. To learn the tools and techniques to calculate cost and solve the problems.
3. To select the best methods of costing and apply critically based on the situation
4. To communicate orally and in written form the cost accounting concepts, methods and book keeping procedure for cost accounting.
5. To gain a lifelong learning for applying the cost concepts in analyzing the business problems.
6. To know the reconciliation of the cost and financial accounting.

COURSE OUTCOMES:

Learners should be able to

1. Understand the cost concepts, types of costing methods and book keeping for cost accounting
2. Apply tools and techniques to calculate cost and solve the problems.
3. Select the best methods of costing by critically analyzing and apply the same to appropriate situation
4. Communicate orally and in written the cost concepts
5. Gain the lifelong learning of cost concepts and apply in the business environment.
6. Reconcile Cost and Financial Accounting.

Unit I

Introduction: Meaning- Objectives and Advantages of Cost Accounting- Difference Between Cost Accounting and Financial Accounting- Cost Concepts and Classifications- Elements of Cost- Installation of a Costing System - Role of a Cost Accountant in an Organization- Preparation of Cost Sheet

Unit II

Elements of Cost: Materials - Material/Inventory Control Techniques. Accounting and Control of Purchases, Storage and Issue of Materials. Methods of Pricing of Materials Issues — FIFO, LIFO, Simple Average, Weighted Average, Replacement, Standard Cost. Treatment of Material Losses. **Labour -**Accounting and Control of labour cost. Time Keeping and Time Booking. Concept and Treatment of Idle Time, Over Time, Labour Turnover and Fringe Benefits- Methods of Wage Payment and the Incentive Schemes- Halsey, Rowan, Taylor's Differential Piece Wage.

Unit III

Elements of Cost: Overheads - Classification, Allocation, Apportionment and Absorption of Overheads- Under and over-Absorption- Capacity Levels and Costs- Treatments of certain items in costing like Interest on Capital, Packing Expenses, Bad debts, Research and Development Expenses- Activity Based Cost Allocation.

Unit IV

Methods of Costing : Unit Costing- Job Costing - Contract Costing - Process Costing -Process Losses, Valuation of Work in Progress, Joint and By-products- Service Costing (only Transport).

Unit V

Book Keeping in Cost Accounting - Integral and Non-integral Systems- Reconciliation of Cost and Financial Accounts

Suggested Readings

Text Books

1. **S.P. Jain and KL. Narang**, (2013), "*Cost Accounting*", Kalyani Publishers, New Delhi.

Reference Books

1. Jawahar Lal, (2013), *Cost Accounting*. McGraw Hill Education, 5th Edition.
2. Arora, M.N. (2009), *Cost Accounting – Principles and Practice*. Vikas Publishing House, New Delhi., 10th Edition.
3. Maheshwari, S.N. and S.N. Mittal. (2013), *Cost Accounting: Theory and Problems*. Shri Mahavir Book Depot, New Delhi., 26th Edition,.
4. Iyengar, S.P.(2013), *Cost Accounting*. Sultan Chand & Sons, 10th edition.

Semester VI

16CMU403A	INTERNATIONAL BUSINESS	L	T	P	C
		6	-	-	4

COURSE OBJECTIVES:
To make the students

1. To understand the concepts of International business
2. To know the export procedure for production and shipment
3. To enhance the students' knowledge in EXIM policy
4. To have in-depth knowledge on different forms of Tarif and Non Tarif and its barriers.
5. To understand the recent International Financial Environment.
6. To know the recent organizational structure for International Business.

COURSE OUTCOMES:
Learners should be able to

1. To understand the concepts of International business
2. To know the export procedure for production and shipment
3. To enhance the students' knowledge in EXIM policy
4. Work and follow the procedure on different forms of Tarif and Non Tarif
5. Gather information to work on it and to manage the risk management.
6. Analyze the different organizational structure for International Business

Unit I

Introduction to International Business: Globalization - Importance in World Economy; Impact of Globalization - International Business vs. Domestic Business - Complexities of International Business; Modes of Entry into International Business.

International Business Environment: National and Foreign Environments - Components - Economic, Cultural and Political-Legal Environments

Unit II

Theories of International Trade –Classical Theories- Product Life Cycle theory- Theory of National Competitive Advantage- Commercial Policy Instruments - Tariff and Non-tariff Measures – Difference in Impact on Trade - Types of Tariff and Non Tariff Barriers - Balance of Payment Account and its Components.

International Organizations and Arrangements: WTO – Its Objectives - Principles, Organizational Structure and Functioning – UNCTAD- Commodity and other Trading Agreements (OPEC).

Unit III

a. Regional Economic Co-operation: Forms of Regional Groupings - Integration Efforts among Countries in Europe, North America and Asia (NAFTA, EU , ASEAN and SAARC) .

b. International Financial Environment: International financial system and institutions - IMF and World Bank – Objectives and Functions - Foreign Exchange Markets and Risk Management- Foreign Investments - Types and Flows - Foreign Investment in Indian Perspective

Unit IV

Organisational Structure for International Business Operations - International Business Negotiations. Developments and Issues in International Business - Outsourcing and its Potentials for India - Role of it in International Business - International Business and Ecological Considerations.

Unit V

Foreign Trade Promotion Measures and Organizations in India - Special Economic Zones (SEZs) and Export Oriented Units (EOUs) - Measures for Promoting Foreign Investments into and from India - Indian Joint Ventures and Acquisitions abroad - Financing of Foreign Trade and Payment Terms – Sources of Trade Finance (Banks, Factoring, Forfaiting, Banker's Acceptance and Corporate Guarantee) - Forms of Payment

Suggested Readings

Text Book

1. Charles W.L. Hill & Arun Kumar Jain, *International Business*. New Delhi: McGraw Hill Education

Reference Books

1. Daniels John, D. Lee H. Radenbaugh and David P. Sullivan. *International Business*. Pearson Education
2. Johnson, Derbe., and Colin Turner. *International Business* - Themes & Issues in the Modern Global Economy. London: Roultedge.
3. Sumati Varma, *International Business*, Pearson Education.
4. Cherunilam, Francis. *International Business: Text and Cases.* PHI Learning
5. Michael R. Czinkota. et al. *International Business.* Fortforth: The Dryden Press.
6. Bennett, Roger. *International Business*. Pearson Education.
7. Peng and Srivastav, *Global Business*, Cengage Learning

Semester IV

16CMU403B	E-COMMERCE	L T P C
		6 - - 4

COURSE OBJECTIVES:

To make the students

1. To enable the student to become familiar with the mechanism for conducting business transactions through electronic means.
2. To understand the concept of Security and Encryption.
3. Discuss need for IT Act 2000 and Cyber Crimes IT Act 2000
4. To understand the concept of Models and Methods of E–payments.
5. To understand the concept of Electronic Fund Transfer, Automated Clearing House, Automated Ledger Posting
6. To know the concept of On-line Business Transactions.

COURSE OUTCOMES:

Learners should be able to

1. Enabling the student to become familiar with the mechanism for conducting business transactions through electronic means.
2. Understanding the concept of Security and Encryption.
3. Discussing the need for IT Act 2000 and Cyber Crimes IT Act 2000
4. Understanding the concept of Models and Methods of E–payments.
5. Understanding the concept of Electronic Fund Transfer, Automated Clearing House, Automated Ledger Posting
6. Knowing the concept of On-line Business Transactions.

Unit I

Introduction: Meaning, Nature, Concepts, Advantages, Disadvantages and Reasons for Transacting Online, Types of E-Commerce, e-Commerce Business Models (introduction , key elements of a business model and categorizing major E -commerce business models), Forces Behind E-commerce Technology used in E-commerce: The Dynamics of World wide Web and Internet- Designing, Building and Launching E-commerce Website -A systematic Approach Involving Decisions Regarding Selection of Hardware, Software, Outsourcing vs. In-house Development of a Website

Unit II

Security and Encryption: Need and Concepts, The E-commerce Security Environment: - Dimension, Definition and Scope of E-security- Security Threats in the E-commerce Environment - Security Intrusions and Breaches, Attacking Methods like Hacking, Sniffing, Cyber-Vandalism etc.- Technology Solutions - Encryption, Security Channels of Communication, Protecting Networks and Protecting Servers and Clients

Unit III

IT Act 2000 and Cyber Crimes IT Act 2000: Definitions, Digital Signature, Electronic Governance, Attribution, Acknowledgement and Dispatch of Electronic Records, Regulation of

Certifying Authorities, Digital Signatures Certificates, Duties of Subscribers, Penalties and Adjudication, Appellate Tribunal, Offences and Cyber-Crimes

Unit IV

E-payment System: Models and Methods of E–payments - Debit Card, Credit Card, Smart Cards, E-money- Digital Signatures - Procedure, Working and Legal Position- Payment Gateways, Online Banking -Meaning, Concepts, Importance, Electronic Fund Transfer, Automated Clearing House, Automated Ledger Posting- Risks Involved in E-payments.

Unit V

On-line Business Transactions: Meaning, Purpose, Advantages and Disadvantages of Transacting Online, E-commerce Applications in Various Industries - Banking, Insurance, Payment of Utility Bills, Online Marketing, E-tailing - Popularity, Benefits, Problems and Features, Online Services - Financial, Travel and Career- Auctions, Online Portal, Online Learning, Publishing and Entertainment- Online Shopping (Amazon, Snapdeal, Alibaba, Flipkart,etc.)

Suggested Readings

Text Book

1. Ravi Kalakota & Andrew b.Whinston , (2006), "*Frontiers of Electronic Commerce*", Dorling Kindersley (India) Pvt.Ltd.

Reference Books:

1. Kenneth C. Laudon & Carlo Guercio Traver, (2014), *E-Commerce*, Pearson Education.10th edition.
2. David Whiteley, (2001), *E-commerce: Strategy, Technology and Applications,* McGraw Hill Education

3.Bharat Bhaskar, *Electronic Commerce: Framework*, *Technology and Application*, 4th Ed., McGraw Hill Education

	Semester V
	L T P C
16CMU501A HUMAN RESOURCE MANAGEMENT	**6 2 - 6**

COURSE OBJECTIVES:

To make the students

1. Describe nature and scope of Human Resources management
2. Evaluate human resource planning, recruitment process and selection methods in the organization
3. Discuss need for motivating employees in an organization.
4. Assess labour relations, industrial disputes and settlement in the organization
5. To know the concept of industrial relations.
6. To know the concept of Collective Bargaining and its significance to a company.

COURSE OUTCOMES:

Learners should be able to

1. Understand the HR environment in India and human resource functions within organizations
2. Plan human resources requirement and formulate HR policy of the organisation with regard to recruitment, selection, training and career planning.
3. Appraise the employee's performance and formulate compensation policy which helps to make organizational excellence.
4. Understand the importance of career planning, job evaluation and factors influencing compensation levels.
5. Analyse the ethical issues in HR management
6. To take decisions in a manner of Collective Bargaining.

Unit I

Introduction: Human Resource Management - Concept and Functions- Role - Status and Competencies of HR Manager - HR Policies - Evolution of HRM - HRM vs HRD. Emerging Challenges of Human Resource Management- Workforce Diversity - Empowerment; Downsizing – VRS - Human Resource Information System.

Unit II

Acquisition of Human Resource: Human Resource Planning-Quantitative and Qualitative dimensions - Job Analysis –Job Description and Job Specification - Recruitment –Concept and Sources - Selection –Concept and Process - Test and Interview - Placement and Induction

Unit III

Training and Development: Concept and Importance - Identifying Training and Development Needs - Designing Training Programmes - Role-Specific and Competency-Based Training - Evaluating Training Effectiveness - Training Process Outsourcing - Management Development - Career Development.

Unit IV

Performance Appraisal: Nature - Objectives and Importance - Modern Techniques of Performance Appraisal - Potential Appraisal and Employee Counseling - Job Changes - Transfers and Promotions – Compensation - Concept and Policies- Job Evaluation - Methods of Wage Payments and Incentive Plans - Fringe Benefits - Performance-Linked Compensation.

Unit V:

Maintenance : Employee Health and Safety - Employee Welfare - Social Security - Employer-Employee Relations-an Overview - Grievance Handling and Redressal - Industrial Disputes-Causes and Settlement Machinery.

Suggested Readings

Text Book

1. S.S.Khanka. (2000), *Human Resource Management*, New DelhiSultan Chand & Sons

Reference Books:

1. Gary Dessler. *A Framework for Human Resource Management*. (2013), 7th edition, Pearson Education.
2. DeCenzo, D.A. and S.P. Robbins, *Human Resource Management*, 11th edition, Pearson Education.
3. Bohlendar and Snell,(2010), *Principles of Human Resource Management*, 16th edition, Cengage Learning

Semester V

L	**T**	**P**	**C**
6	**2**	**-**	**6**

16CMU501B INDIRECT TAX LAW

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of indirect taxes emphasizing VAT and customs law.
2. To learn and compute the Taxation under the constitution.
3. To know how to register CST and apply the CST provisions.
4. To communicate orally and in written form the indirect taxations concepts and provisions.
5. To be familiar with the standards and laws pertaining to the CST and customs and utilize for lifelong practical application.
6. To demonstrate custom duties in India

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of indirect taxes emphasizing VAT and customs law.
2. Learn and compute the Taxation under the constitution.
3. Know how to register CST and apply the CST provisions.
4. Communicate orally and in written form the indirect taxations concepts and provisions.
5. Be familiar with the standards and laws pertaining to the CST and customs and utilize for lifelong practical application.
6. To have an understanding of custom duties

Unit I

Service Tax-I: Service tax –Concepts and General Principles - Charge of Service Tax and Taxable Services.

Unit II

Service Tax-II: Valuation of Taxable Services, Payment of Service Tax and Filing of Returns, Penalties, CENVAT Credit.

Unit III

VAT : Concepts and General Principles - Calculation of VAT Liability including Input Tax Credits - Small Dealers and Composition Scheme - VAT Procedures

Unit IV

Central Excise: Central Excise Law in Brief –Goods, Excisable Goods, Manufacture and Manufacturer, Valuation, CENVAT, Basic Procedures, Export, SSI, Job Work

Unit V

Customs laws: Basic Concepts of Customs Law, Territorial Waters, High Seas, Types of Custom Duties –Basic, Countervailing & Anti-Dumping Duty, Safeguard Duty, Valuation, Customs Procedures, Import and Export Procedures – Baggage -Exemptions.

Suggested Readings

Text Book

1. V.S.Datey, (2010) "*Indirect Taxes*", Taxmann Publications (P) Ltd., New Delhi

Reference Books

1. V.Balachandran (2006) *Indirect Taxation*, New Delhi . Sultan Chand &Sons,
2. P.RadhaKrishnan (2006) *Indirect Taxation*, New Delhi . Kalyan Publishers,
3. Sethurajan (2005) *Indirect Taxation including Wealth Tax,* Speed Publications
4. Singhania (2014), *Indirect Taxes*", New Delhi, Taxmann Publications (P) Ltd., 5. Grish Ahuja & Ravi Gupta, Indirect Taxes, Flair Publication Pvt. Ltd.
6. S. S. Gupta. *Service Tax -How to meet your obligation*, Taxmann Publications Pvt. Ltd., Delhi, Latest edition.

		Semester V
		L T P C
16CMU502A	**PRINCIPLES OF MARKETING**	5 - - 5

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of marketing, and 4Ps of Marketing
2. To communicate orally and in written form the concepts of marketing and 4 Ps of marketing
3. To apply the marketing concepts and skills lifelong.
4. To understand the recent trends in marketing strategies of a companies.
5. To understand the consumer behavior and to adopt the decision according to the consumer.
6. To know the promotion strategies followed by a company.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of marketing, and 4Ps of Marketing
2. Communicate orally and in written form the concepts of marketing and 4 Ps of marketing
3. Apply the marketing concepts and skills lifelong.
4. Apply the marketing strategies of a company's effectively.
5. To be familiar in behavior of consumer in related to market and to take decision effectively.
6. To implement the correct promotion strategies.

Unit I

Introduction: Nature - Scope - Importance of Marketing - Evolution of Marketing- Selling vs Marketing - Marketing Mix - Marketing Environment – Concept - Importance - Components (Economic, Demographic, Technological, Natural, Socio-Cultural and Legal).

Unit II

Consumer Behaviour: Nature and Importance - Consumer Buying Decision Process - Factors Influencing Consumer Buying Behaviour - Market segmentation – Concept - Importance and Bases- Target Market Selection- Positioning Concept- Importance and Bases- Product Differentiation vs. Market Segmentation.

Unit III

Product: Concept and Importance - Product Classifications-Concept of Product Mix – Branding - Packaging and Labeling – Product - Support Services - Product Life-Cycle - New Product Development Process - Consumer Adoption Process

Unit IV

Pricing: Significance- Factors Affecting Price of a Product- Pricing Policies and Strategies. Distribution Channels and Physical Distribution - Channels of Distribution - Meaning and Importance - Types of Distribution Channels - Functions of Middle Man - Factors Affecting

Choice of Distribution Channel - Wholesaling and Retailing- Types of Retailers - e-tailing- Physical Distribution.

Unit V

Promotion: Nature and Importance of Promotion - Communication Process - Types of Promotion – Advertising - Personal Selling - Public Relations & Sales Promotion, and their Distinctive Characteristics - Promotion Mix and Factors Affecting Promotion Mix Decisions - Recent Developments in Marketing - Social Marketing - Online Marketing - Direct Marketing, Services Marketing, Green Marketing - Rural Marketing - Consumerism.

Suggested Readings

Text Book

1. Philip Kotler. (2011). "*Marketing Management*". New Delhi, 18th edition, Prentice Hallof India Pvt. Ltd

Reference Books :

1. Michael, J. Etzel, Bruce J. Walker, William J Stanton and Ajay Pandit. *Principles of Marketing*.13th edition.
2. Neeru Kapoor, (2011). *Principles of Marketing.* New Delhi, PHI Learning Private limited
3. Rajendra Maheshwari. *Principles of Marketing*. New Delhi, International Book House Private limited.
4. CB Gupta and Dr. Rajan Nair (2014). *Marketing Management*. New Delhi, Sultan Chand & Sons.

16CMU502B	BANKING AND INSURANCE	Semester V L T P C 5 - - 5

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of banking operations, functions, risk associated with and law pertaining to banking functions,
2. To comprehend on the Indian banking system, its regulatory body and key macro indicators related to banks that affect the economy.
3. To communicate orally and in written form the understanding of banking operations, functions, risk associated with and law pertaining to banking functions and to apply the learning of the bank functions and operations lifelong.
4. To Understand the Concept of insurance, insurance products and services and the regulatory environment guiding the insurance function.
5. To comprehend on the risk mitigation concepts and usage of insurance products to mitigate risk and insurance contract in Indian market
6. To understand the recent trends in different forms of Internet Banking and with its benefit.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of banking operations, functions, risk associated with and law pertaining to banking functions,
2. Comprehend on the Indian banking system, its regulatory body and key macro indicators related to banks that affect the economy.
3. Communicate orally and in written form the understanding of banking operations, functions, risk associated with and law pertaining to banking functions
4. Understand the Concept of insurance, insurance products and services and the regulatory environment guiding the insurance function.
5. Comprehend on the risk mitigation concepts and usage of insurance products to mitigate risk and insurance contract in Indian market.
6. To be familiar in accessing different forms of Internet Banking globally and able to access its benefit.

Unit I

Introduction: Origin of Banking - Definition, Banker and Customer Relationship, General and Special Types of Customers - Types of Deposits - Origin and Growth of Commercial Banks in India - Financial Services Offered by Banks - Changing Role of Commercial Banks, Types of Banks

Unit II

Cheques and Paying Banker: Crossing and Endorsement - Meaning, Definitions, Types and Rules of Crossing- Duties, Statutory Protection in Due Course - Collecting Bankers - Duties, Statutory Protection for Holder in Due Course - Concept of Negligence.

Unit III

Banking Lending: Principles of Sound Lending - Secured vs. Unsecured Advances - Types of Advances - Advances Against Various Securities.

Unit IV

Internet Banking : Meaning - Benefits, - Home Banking - Mobile Banking -Virtual banking - E-payments - ATM Card/Biometric Card - Debit/Credit Card, Smart Card – NEFT – RTGS - ECS (credit/debit), E-money - Electronic Purse - Digital Cash.

Unit V

Insurance: Basic Concept of Risk - Types of Business Risk - Assessment and Transfer- Basic Principles of Utmost Good Faith – Indemnity - Economic Function- Proximate Cause, Subrogation and Contribution -Types of Insurance: Life and Non-life - Re-insurance - Risk and Return Relationship - Need for Coordination – Power - Functions and Role of IRDA - Online Insurance.

Suggested Readings

Text Books

1. Dr. P.K. Gupta (2015), *Insurance and Risk Managemen.* New Delhi, Himalaya Publishing House.
2. Varshney, P.N., (2014) *Banking Law and Practice*, New Delhi, Sultan Chand and Sons.

Reference Books:

1. Agarwal, O.P.,(2011), *Banking and Insurance*, Himalaya Publishing House, New Delhi.
2. Satyadevi, C.(2010), *Financial Services Banking and Insurance*, New Delhi.
3. S.Chand, Suneja, H.R., (2009) *Practical and Law of Banking*, New Delhi, Himalya Publishing House,.
4. Chabra, T.N., *Elements of Banking Law*, New Delhi. Dhanpat Rai and Sons,

Semester V

		L	T	P	C
16CMU512A	**PRINCIPLES OF MARKETING (PRACTICAL)**	-	-	3	1

COURSE OBJECTIVES:

To make the students

1. To helps the students to get in-depth knowledge on Marketing Segmentation
2. To helps to know about the proper Distribution channels
3.To helps to identify the media of Advertisement
4.To Prepare and Present the Development of Market Segmentation for any FMGC products
5.To Give a Presentation of the Selection of distribution channel for Baby Product
6.To Present in which media of Advertisement will you select for Cosmetic products

COURSE OUTCOMES:

Learners should be able to

1.Helping the students to get in-depth knowledge on Marketing Segmentation
2.Helping to know about the proper Distribution channels
3.Helping the students to identify the media of Advertisement
4.Preparing and Presenting the Development of Market Segmentation for any FMGC products
5.Giving a Presentation of the Selection of distribution channel for Baby Product
6.To Present in which media of Advertisement will you select for Cosmetic products

List of Practical

1. Prepare and Present the Development of Market Segmentation for any FMGC products
2. Give a Presentation of the Selection of distribution channel for Baby Product
3. Present in which media of Advertisement will you select for Cosmetic products
4. How to develop online marketing for apparels? Present and Defend
5. Give a Brief Account on Social Marketing
6. Give a Presentation on the following
   i. Green Marketing
   ii. Rural Marketing
   iii. Service Marketing
7. Design a presentation on Consumer Exploitation - Food Products
8. Discuss in Group – “The Consumer Movements in India”

Semester V

16CMU512B	BANKING AND INSURANCE- (PRACTICAL)	L	T	P	C
		-	-	3	1

COURSE OBJECTIVES:

To make the students

1. To impart knowledge about the basic principles of the banking and insurance
2.To prepare various types of accounts forms and deposits of commercial banks.
3.To prepare Application forms for opening accounts, Cheque Books, pass books, requisition slips for withdrawals and deposits, bank statements, format of Demand draft, Cheque, travel cheques etc.
4.To Collect the format of proposal form of different kinds of insurance and learn the process of filling them
5.To Visit any insurance office and collect the details of its Organizational Structure
6.To Collect the various types of the Proposal Forms of insurance.

COURSE OUTCOMES:

Learners should be able to

1.Imparting the knowledge about the basic principles of the banking and insurance
2.Preparing various types of accounts forms and deposits of commercial banks.
3.Preparing the Application forms for opening accounts, Cheque Books, pass books, requisition slips for withdrawals and deposits, bank statements, format of Demand draft, Cheque, travel cheques etc.
4.Collecting the format of proposal form of different kinds of insurance and learn the process of filling them
5.Visiting the any insurance office and collect the details of its Organizational Structure
6.Collecting the various types of the Proposal Forms of insurance.

List of Practicals

1. Draft chart of Banking system
2. Forms of various accounts and deposits of Commercial Banks.
3. Application forms for opening accounts, Cheque Books, pass books, requisition slips for withdrawals and deposits, bank statements, format of Demand draft, Cheque, travel cheques etc.
4. Working and operations of ATM, Credit cards, E-Banking.
5. Collect the format of proposal form of different kinds of insurance and learn the process of filling them.
6. Life insurance companies and identifying their features - Comparative analysis – Filling proposal form.

7. Map the general insurance market companies – familiarize with IRDA norms for agency license.
8. Visit any insurance office and collect the details of its Organizational Structure,
9. Collection of the Proposal Forms of insurance and filling the same,
10. Collecting and filling of Insurance Claim Forms,
11. Collect any one type of Policy Bond,
12. Life insurance companies and identifying their features - Comparative analysis – Filling proposal form.

Semester V

16CMU503A	**ENTREPRENEURSHIP**	**L**	**T**	**P**	**C**
		6	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
2. To communicate orally and in written form the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
3. To apply the understanding of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government in lifelong practice.
4. To Critically evaluate the appropriate alternatives available as entrepreneur and draw a solution.
5. To Work in team and exhibit leadership skills
6. To analyse the case studies and try to apply the theoretical learning into lifelong practice

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of entrepreneurship, entities of business, creating ideas, mobilizing funds and support from government.
2. Communicate orally and in written form the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
3. Apply the understanding of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government in lifelong practice.
4. Analyse the case studies and try to apply the theoretical learning into lifelong practice.
5. Critically evaluate the appropriate alternatives available as entrepreneur and draw a solution.
6. Work in team and exhibit leadership skills

Unit I

Introduction: Meaning- Elements, Determinants and Importance of Entrepreneurship and Creative Behavior- Entrepreneurship and Creative Response to the Society' Problems and at Work- Dimensions of Entrepreneurship – Intrapreneurship – Technopreneurship - Cultural Entrepreneurship - International Entrepreneurship – Netpreneurship - Ecopreneurship, and Social Entrepreneurship

Unit II

Entrepreneurship and Micro, Small and Medium Enterprises: Concept of Business Groups - Role of Business Houses and Family Business in India - Role of Entrepreneurship in Economic Development - Contemporary Role Models in Indian business - Values, Business Philosophy and Behavioural Orientations - Conflict in Family Business and its Resolution

Unit III

Public and Private System: Public and Private System of Stimulation, Support and Sustainability of Entrepreneurship – Requirement - availability -Access to Finance - Marketing Assistance – Technology - Industrial Accommodation - Role of Industries/Entrepreneur's Associations and Self-Help groups - The concept, Role and Functions of Business Incubators, Angel Investors, Venture Capital and Private Equity Fund.

Unit IV

Sources of business ideas and tests of feasibility: Significance of Writing the Business plan - Project Proposal - Contents Of Business Plan/ Project Proposal - Designing Business Processes – Location – Layout - Operation, Planning & Control - Preparation Of Project Report -Project Submission/ Presentation and Appraisal Thereof By External Agencies, Such As Financial/Non-Financial Institutions

Unit V

Mobilizing Resources : Mobilizing Resources for Start-up - Accommodation and Utilities-Preliminary Contracts with the Vendors- Suppliers- Bankers- Principal Customers- Contract Management- Basic start-up Problems

Suggested Readings

Text Books:

1. Vasant Desai. (2002) *Dynamics of Entrepreneurial Development and Management*. Mumbai, Himalaya Publishing House.

Reference Books:

1. Singh, Nagendra P. (2015) *Emerging Trends in Entrepreneurship Development*. New Delhi: ASEED
2. Khanka, SS (2001). *Entrepreneurial Development*, S. Chand & Co, Delhi.,
3. Ramachandran,K. (2008), *Entrepreneurship Development*, McGraw-Hill Education
4. SIDBI Reports on Small Scale Industries Sector., 2001
5. Gupta C.B & Srinivasan N.P.(2013). *Entrepreneurial Development*, 5th Edition.

		Semester V
16CMU503B	**ADVERTISING**	**L T P C**
		6 - - 4

COURSE OBJECTIVES:

To make the students

1. To know about the concepts of advertising.
2. To know about the various types of advertising
3. To understand the motivational aspects of salesmen
4. To understand the concept of sales force management
5. To know about the social effects of advertising
6. To know about the promotional strategy.

COURSE OUTCOMES:

Learners should be able to

1. Knowing the concepts of advertising.
2. Getting the details about the various types of advertising
3. Understanding the motivational aspects of salesmen
4. Understanding the concept of sales force management
5. Knowing about the social effects of advertising
6. Knowing about the promotional strategy.

Unit I

Introduction: Advertising-Meaning, Nature and Importance of Advertising - Types and Objectives - Audience Selection - Setting of Advertising Budget - Determinants and Major Methods.

Unit II

Media Decisions : Major Media Types - Their Merits and Demerits - Advertising Through Internet and Interactive Media-Issues and Considerations - Factors Influencing Media Choice - Media Selection, Media Scheduling.

Unit III

Message Development: Advertising Creativity - Advertising Appeals - Advertising Copy and Elements of Print Advertisement Creativity - Tactics for Print Advertisement.

Unit IV

Measuring Advertising Effectiveness: Arguments for and Against Measuring Effectiveness-Advertising Testing Process - Evaluating Communication and Sales Effects - Pre- and Post-Testing Techniques.

Unit V

Advertising Agency: Role, Types and Selection of Advertising Agency; Reasons for Evaluating Advertising Techniques. Social, Ethical and Legal Aspects of Advertising in India; Recent Developments and Issues in Advertisement.

Suggested Readings

Text Book:

1. Mahendra Mohan (2008) *Advertising Management*, Tata Mcgraw Hill Publishing

Reference Book

1. Belch and Belch, *Advertising and Promotion*, Tata McGraw Hill Co.
2. Sharma, Kavita, *Advertising: Planning and Decision Making*, Taxmann Publication Pvt. Ltd.
3. Mahajan, J.P., and Ramki, *Advertising and Brand Management*, Ane Books Pvt Ltd, New Delhi.
4. Burnett, Wells, and Moriatty, *Advertising: Principles and Practice*, Pearson Education
5. Terence A. Shimp, *Advertising and Promotion: An IMC Approach*, South Western, Cengage Learning.
6. O'Guinn, *Advertising and Promotion: An Integrated Brand Approach*, Cengage Learning. Note: Latest edition of text

Semester V

L	T	P	C
6	2	-	6

16CMU504A PRINCIPLES OF MICRO ECONOMICS

COURSE OBJECTIVES :

To make the students

1. To understand the demand, supply functions and its applicability.
2. To Formulate the pricing strategies based on the market structure
3. To gain knowledge on the market structure and price determination.
4. To understand the importance of macroeconomic indicators like National income, GDP, Inflation etc.
5. To understand the concepts of Monetary policy, Balance of payment and Money supply.
6. To understand the impact of monetary policy, money supply and Balance of payments on running a business.

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COURSE OUTCOMES:

Learners should be able to

1. Apply the demand and supply concept in managerial decisions
2. Formulate the pricing strategies based on the market structure
3. gain knowledge on the market structure and price determination
4. understand the importance of macroeconomic indicators like National income, GDP, Inflation etc.
5. Understand the concepts of Monetary policy, Balance of payment and Money supply
6. understand the impact of monetary policy, money supply and Balance of payments on running a business.

Unit I

Introduction : Demand and Supply: Determinants of Demand - Movements vs. Shift in Demand Curve, - Determinants of Supply - Movement along a Supply Curve vs. Shift in Supply Curve - Market Equilibrium and Price Determination - Elasticity of Demand and Supply - Application of Demand and Supply.

Unit II

Consumer Theory: Ordinal Utility theory: Indifference Curve Approach- Consumer's Preferences - Interference Curves - Budget line - Consumer's Equilibrium - Income and Substitution Effect - Price Consumption Curve and the Derivation of Demand Curve for a Commodity - Criticisms of the Law of Demand.

Unit III

Production and Cost: Production: Firm as an Agent of Production - Concepts of Production Function - Law of Variable Proportions – Isoquants - Return to Scale - Economics and Diseconomies of Scale - **Costs**: Costs in the Short Run. Costs in the Long Run, Profit Maximization and Cost Minimization - Equilibrium of the Firm, Technological Change - Very Long Run.

Unit IV

Market Structure : Perfect Competition: Assumption; Theory of a Firm Under Perfect Competition- Equilibrium of the Firm in the Short Run and Long Run - **Monopoly:** Short-run and Long-run Equilibrium of Monopoly Firm- Price Discrimination - **Imperfect Competition:** Difference Between Perfect Competitions, Monopoly and Imperfect Competition - **Monopolistic Competition:** Assumption; Short – Run Equilibrium - Long run Equilibrium -. **Oligopoly:** Causes for the Existence of Oligopolistic Firms in the Market rather than Perfect Competition

Unit V

Income Distribution and Factor Pricing: Demand for Factors. Supply of factor - Backward Bending Supply Curve for Labor Concepts of Economic Rent- Functional Distribution of Income.

Suggested Readings

Text Book

1. Sankaran. 2013."*Business Economics*" Margham publications Ltd . Chennai

Reference Books:

1. Case and Fair, *Principles of Micro Economics*, Pearson Education
2. Paul A Samuelson, William D Nordhaus, *Microeconomics*, McGraw-Hill Education.
3. P.N.Reddy & H.R.Appanaiah. 1995." *Principles of Business Economics*." New Delhi..S.Chand & Company Ltd.
4. Ferguson & R.Rothschild. 1993. "*Business Economics*" Hong Kong. Macmillan Press Ltd.
5. H.S.Agarwal. 1995. "*Business Economics*" Ratan Prakashan Mandir.
6. K.P.Sundaram and E.Sundaram 1997. *Business Economics*. New Delhi: Sultan Chand & Sons

		Semester V
		L T P C
16CMU504B	**BUSINESS ETHICS**	**6 2 - 6**

COURSE OBJECTIVES :
To make the students

1. To make the concept, process and importance of Business ethics.
2. To gain knowledge on Ethical Issues in Human Resource Management
3. To improve the ethical behaviour of business, Ethical Issues in Marketing Strategy
4. To give the basics of communication reports, tenders and various correspondence of a company.
5. To understand the concept of Ethical Issues in Finance
6. To impart the students with enhanced Corporate Social Responsibility (CSR)

COURSE OUTCOMES:
Learners should be able to

1. Making the concept, process and importance of Business ethics.
2. Gaining the knowledge on Ethical Issues in Human Resource Management
3. Improving the ethical behaviour of business, Ethical Issues in Marketing Strategy
4. Giving the basics of communication reports, tenders and various correspondence of a company.
5. Understanging the concept of Ethical Issues in Finance
6. Imparting the students with enhanced Corporate Social Responsibility (CSR)

Unit I

Introduction to Business Ethics : Definition – Meaning – Nature and Objectives of Ethics, Factors Affecting business ethics – Ethical Organization – Characteristics of an Ethical Organisation - Corporate Moral Excellence –Corporate Citizenship, Theories of Ethics – Utilitarian, Separatist and Integrative view of Ethics; Stages of Ethical Consciousness in Business - Relationship between Law and Moral Standards.

Unit II

Ethical Issues in Human Resource Management: The Principle of Ethical Hiring – Equality of Opportunity – Ethics and Remuneration – Ethics in Retirement - Ethical Issues in Operation and Purchase Management –Quality Control - Ethical Problems and Dilemmas in Operations Management - Role of Purchase Manager – Code of Ethics for Purchases - Ethical Issues in Global buyer – Supplier Relationships.

Unit III

Ethical Issues in Marketing Strategy: Ethical Issues in Marketing Mix – Product – Price – Promotion – Place – Process – People – Physical Evidence - Ethical Issues and Consumerism – Consumer Protection- Consumer Welfare – Consumer Delight – Consumer Rights.

UNIT IV

Ethical Issues in Finance: Ethical issues in Mergers and Acquisitions – Hostile Takeovers – Insider Trading – Money Laundering; Ethical Issues in Accounting Professional Conduct of

Accountants; Ethics and Financial Statements – Fictitious Revenues – Fraudulent Timing – Differences – Concealed Liabilities and Expenses – Fraudulent Disclosures and Omissions – Fraudulent Valuation of Assets – Ethical Auditing

UNIT V

Corporate Social Responsibility (CSR) : Meaning – Definition – Methods – Evaluation – Internal Stakeholders – Share holders – Employees – Management; External Stakeholders – Consumer – Suppliers – Creditors – Competitors – Community; Global and Local issues in Management – Black Money – Poverty – Child Labour – Gender equality and so on. Ethical issues in MNCs; Environmental Ethics – Environmental issues in India – Greening and Green initiatives – Sustainable development – Waste Management

Suggested Readings:

Text Book:

1. Business Ethics and Corporate Governance, 2003, ICFAI Centre for Management Research, Hyderabad

Reference Books

1. Fernando, A.C. (2009), " *Business Ethics – An Indian Perspective*", Pearson Education, New Delhi
2. John R Boatright (2009), *Ethics and the conduct of Business*, Delhi, Pearson Education (Singapore) Pvt. Ltd. Indian Branch,
3. Cyriac K. (2000), " *Managerial Ethics and Social Issues – Reading and Cases*", Reading Material for Business Ethics, XLRJ Jamshedpur
4. Fr. Mcgrarth, (2008), *Basic Managerial Skills for all*, New Delhi. Prentice Hall of India,
5. Davis Keith and Blomstrom, (1987), *Business, Society and Environment*, Tata Mcgraw Hill Ltd, New Delhi.

Semester VI

	L	T	P	C
16CMU601A **MANAGEMENT ACCOUNTING**	5	-	-	5

COURSE OBJECTIVES:

To make the students

1. To understand the objectives of management accounting and Difference between Financial Accounting, Cost accounting and Management Accounting
2. To recognize the concept of Budget and Budgetary control.
3. To identify the Standard Costing and Variance Analysis
4. To understand the concept of marginal costing and Relevant Costs and Benefits
5. To know the operations of fund flow and cash flow statement.
6. To have in-depth knowledge in Accounting Standard.

COURSE OUTCOMES:

Learners should be able to

1. Explain nature and scope of management accounting
2. Evaluate Costing systems, cost management systems, budgeting systems and performance measurement systems
3. Extend Classification of ratios, capital structure and leverage.
4. Analysis performance evaluation applications of management accounting.
5. Prepare management reports by using funds flow and cash flow statement.
6. Prepare the Financial Statement under the defined Accounting standard.

Unit I

Introduction : Meaning – Objectives - Nature and Scope of Management Accounting - Difference between Cost Accounting and Management Accounting - Cost Control - Cost Reduction - Cost Management

Unit II

Budgetary Control: Budgeting and Budgetary Control -Concept of Budget, Budgeting and Budgetary Control –Objectives – Merits- Limitations - Budget Administration - Functional Budgets - Fixed and Flexible Budgets. Zero Base Budgeting. Programme and Performance Budgeting.

Unit III

Standard Costing: Standard Costing and Variance Analysis - Meaning of Standard Cost and Standard Costing – Advantages - Limitations and Applications - Variance Analysis – Material, Labour - Overheads and Sales Variances - Disposition of Variances - Control Ratios.

Unit IV

Marginal Costing: Absorption versus Variable Costing - Distinctive Features and Income Determination - Cost-Volume-Profit Analysis - Profit / Volume ratio - Break-even Analysis-Algebraic and Graphic Methods - Angle of Incidence - Margin of Safety - Key Factor, Determination of Cost Indifference Point - Responsibility Accounting - Concept, Significance, Different Responsibility Centres - Divisional Performance Measurement - Financial and Non-Financial Measures - Transfer Pricing.

Unit V

Decision Making :Steps in Decision Making Process - Concept of Relevant Costs and Benefits - Various short term Decision Making Situations – Profitable Product Mix - Acceptance or Rejection of special/ export offers - Make or Buy, Addition or Elimination of a Product Line, Sell or Process Further, Operate or Shut Down. Pricing Decisions - Major Factors Influencing Pricing Decisions, Various Methods of Pricing

Suggested Readings

Text Book

1. Jain and Narang,. (2007) *Cost and Management Accounting*. Ludhiana Kalyani Publishers.

Reference Books:

1. Goel, Rajiv, *Management Accounting*. International Book House,
2. Arora, M.N. Management Accounting . Vikas Publishing House, New Delhi.
3. Maheshwari, S.N. & S.N. Mittal. *Management Accounting*. Shree Mahavir Book Depot, New Delhi.
4. Khan, M.Y. and Jain, P.K. *Management Accounting*. McGraw Hill Education

Semester V

L	T	P	C
5	-	-	5

16CMU601B COMPUTER APPLICATION IN BUSINESS

COURSE OBJECTIVES:

To make the students

1. To study the basics of Computer Networks.
2. To provide computer skills and knowledge for commerce students and to enhance the Student understands of usefulness of information technology tools for business operations.
3.To learn about concept of **Word Processing and** Printing Documents.
4. To prepare the **Presentations with** Creating Business Presentations using above facilities
5. To understand the principles of creating **Spreadsheet and its Business Applications**
6. To develop skills in analyzing the usability of a website.

COURSE OUTCOMES:

Learners should be able to

1. Studying the basics of Computer Networks.
2. Providing computer skills and knowledge for commerce students and to enhance the Student understands of usefulness of information technology tools for business operations.
3.Learning the concept of **Word Processing and** Printing Documents.
4. Preparing the **Presentations with** Creating Business Presentations using above facilities
5. Understanding the principles of creating **Spreadsheet and its Business Applications**
6. Developing the skills in analyzing the usability of a website.

Unit – I

Introduction to Computers: Definition - Characteristics and Limitations of Computers – Components of Computer System – Elements of Computers – Hardware – Software – Input and Output Devices – Storage Devices.

Unit 1I

Word Processing: Introduction to Word Processing - Word Processing Concepts - Use of Templates - Working with Word Document - Editing text, Find and replace text, Formatting, spell check, Autocorrect, Autotext; Bullets and numbering, Tabs, Paragraph Formatting, Indent, Page Formatting, Header and footer, Tables - Inserting, filling and formatting a table - Inserting Pictures and Video - Mail Merge - Including linking with Database - Printing Documents Creating Business Documents

Unit III

Preparing Presentations: Basics of Presentations – Slide - Fonts – Drawing – Editing - Inserting Tables, Images, texts, Symbols, Media - Design – Transition – Animation – Slideshow - Creating Business Presentations using above facilities

Unit IV

Spreadsheet and its Business Applications: Spreadsheet Concepts - Managing worksheets- Formatting - Entering data – Editing and Printing a Worksheet; Handling Operators in Formula, Project Involving Multiple Spreadsheets - Organizing Charts and Graphs Generally used

Spreadsheet Functions - Mathematical, Statistical, Financial, Logical, Date and Time, Lookup and reference, Database, and Text functions.

Unit V

Creating Business Spreadsheet: Creating Spreadsheet in the Area of Loan and Lease statement- Ratio Analysis - Payroll Statements Capital Budgeting- Depreciation Accounting- Graphical Representation of Data- Frequency Distribution and its Statistical Parameters- Correlation and Regression.

Suggested Readings

Text Book

1. .R.K.Taxali. (1999) *P.C.Software Made Simple*. New Delhi Tata McGraw-Hill Publishing Company Ltd

Semester VI

L	T	P	C
-	-	3	1

16CMU611A MANAGEMENT ACCOUNTING (PRACTICAL)

COURSE OBJECTIVES:
To make the students

1.To prepare inventory statements
2.To prepare bank reconciliation statement
3.To prepare various types of ratio analysis
4.To prepare Cash flow statement and Fund flow statement
5.To Create stock group and stock items and enter the vouchers
6.To prepare the various types of reports

COURSE OUTCOMES:
Learners should be able to

1. Preparing various types of inventory statements
2. Preparing the bank reconciliation statement
3. Preparing the various types of ratio analysis
4. Preparing the Cash flow statement and Fund flow statement
5. Creating the stock group and stock items and enter the vouchers
6. Preparing the various types of reports

The following are the list of practicals

1 Prepare inventory statements using (calculate inventory using all methods)
   - FIFO
   - LIFO
   - Simple Average Method
   - Weighted Average Method
2. Prepare bank reconciliation statement
3. Prepare the following ratio analysis
   - Financial ratio
   - Operating ratio
   - Investment ratio
4. Prepare the following
   - Cash flow statement
   - Fund flow statement
5. Create stock and stock groups

6. Create stock group and stock items and enter the vouchers
7. Preparation of reports for the following
    - Profit & loss a/c
    - Balance sheet
    - Bank reconciliation statement
    - Ledgers
    - Ratio analysis
8. Back up and restore the company information

Semester VI

L	T	P	C
-	-	3	1

16CMU611B COMPUTER APPLICATION IN BUSINESS (PRACTICAL)

Course Objectives:

To make the students

1. To know the MS-word usage and its commands
2. To be familiar with MS-Excel and its function
3. To be aware of the MS-power point
4. To know about the usage of MS-Access.
5. To be prepare documents and reports for the organization
6. To prepare presentation for business meetings.

Course Outcomes:

Learners should be able to

1. Knowing the MS-word usage and its commands
2. Familiar with MS-Excel and its function
3. Aware of the MS-power point
4. Knowing about the usage of MS-Access.
5. Preparing documents and reports for the organization
6. Preparing presentation for business meetings.

The following are the list of programmes,

MS WORD

1. Type chairman's speech/Auditor's report/Minutes/Agenda and perform the following operations:

   Bold. Underline. Font size. Style. Background color. Text color. Line spacing. Spell check. Alignment. Header & Footer. Inserting pages and page numbers. Find and Replace.

2. Prepare shareholders meeting letter for 10 members' using mail merge operation.
3. Prepare Bio-Data by using Wizard/Template.

MS EXCEL

1. Prepare a mark list of your class (minimum of 5 subjects) and perform the following operation:

   Data entry. Total. Average. Result and Ranking by using arithmetic and logical functions and sorting.

2. Draw the different type of charts (line. Pie. Bar) to illustrate year wise performance of sales. purchase. profit etc. of a company by using chart wizard.

3. Prepare a statement of Bank customer's account showing simple and compound interest calculations for 10 different customers' using mathematical and logical functions.

MS POWERPOINT

1. Design presentation slides for a product of your choice. The slide must include name. brand name. type of product. characteristics. special features. price. special offer etc.
2. Design presentation slides for organization details for 5 levels of hierarchy of a company by using organization chart.

MS ACCESS

1. Prepare a payroll for employee database of an organization with the following details:

   Employee ID. Employee name. Date of Birth. Department and Designation. Date of appointment. Basic pay. Dearness Allowance. House rent Allowance and other deduction if any. Perform queries for different categories.

2. Create mailings labels for student database which should include atleast three tables and each table must have atleast two fields with the following details:

   Roll Number. Name. Course. Year. College Name. University. Address and Phone number.

		Semester VI
16CMU602A	**OFFICE MANAGEMENT AND SECRETARIAL PRACTICE**	**L T P C** **6 2 - 6**

COURSE OBJECTIVES:
To make the students

1. To understand the concept office and office management.
2. To know the different finance sources of business and location of the business.
3. To familiarizes the students with the activities in a modern office
4. To impart the students about the working environment, the tools and equipment's used in office.
5. To understand the concept and procedure about banking facilities.
6. To demonstrate the importance and functions of Modern Office Equipments**.**

COURSE OUTCOMES:
Learners should be able to

1. Understanding the concept office and office management.
2. Knowing the different finance sources of business and location of the business.
3. Familiarizing the students with the activities in a modern office
4. Imparting the students about the working environment, the tools and equipment's used in office.
5. Understanding the concept and procedure about banking facilities.
6. demonstrating the importance and functions of Modern Office Equipments**.**

Unit I

Office and Office Management: Meaning of office - Functions of Office – Primary and Administrative Management Functions - Importance of Office - Duties of the Office Manager - - Qualities - Qualifications. Filing and Indexing: Filing and Indexing –Meaning and Importance - Essentials of Good Filing - Centralized vs. Decentralized Filing - Weeding of old records - Meaning and Need for Indexing - Types

Unit II

Mail and Mailing Procedures: Mailing Procedures – Meaning - Importance - Centralization of - Advantages - Room Equipment and Accessories - Sorting Tables and Rack, Letter Opener, Time and Date Stamps - Inward and Outward Mail – Distributing, Maintenance of Peon Book, Dispatching, Courier Services - Forms and Stationery **-** Office Forms –Meaning - Importance - Advantages - Disadvantages - Type - Factors Affecting Forms Design - Principles of Form Design - Form control. Stationery - Types of - importance - Selection of Stationery - Standardization of stationery.

Unit III

Modern Office Equipments: Modern Office Equipment – Meaning and Importance of Office Automation - Objectives– Advantages and Disadvantages - Factors Determining Office mechanization - Kind of office machines Personal computers – Photocopier – Fax – Telephone - Dictating machines - Audio Visual Aids. Budget: Budget - Annual, revised and estimated -.

Audit: Audit process- Vouching - verification and valuation - Consumables/ Stock register and Asset register - Procedure for disposal of records and assets.

Unit IV

Banking facilities: Types of accounts - Passbook and Cheque book - Other forms used in banks - ATM and money transfer - Abbreviations/Terms used in Offices: Explanation of abbreviations/terms used in offices in day-to-day work. Modes of Payment**: T**ypes of payments handled such as postal orders - Cheque (crossed/uncrossed) - post-dated and pre-dated Cheques - stale Cheque - dishonored Cheque.

UNIT V

Role of Secretary: Definition – Appointment - Duties and Responsibilities of a Personal Secretary - Qualifications for appointment as Personal Secretary - Modern technology and office communication – E - mail - Voice mail – Internet – Multimedia – Scanner - Video-conferencing - Web-casting - Agenda and Minutes of Meeting - Drafting, Fax-messages – E – mail - Maintenance of appointment diary.

Suggested Readings

Text Book

1. Duggal, B, *Office Management and Commercial Correspondence*, Kitab Mahal.

Reference Books:

1. Bhatia, R.C. *Principles of Office Management*, Lotus Press, New Delhi..
2. Leffingwell and Robbinson: *Text book of Office Management*, Tata McGraw-Hill.
3. Terry, George R: *Office Management and Control*.

Semester VI

L	T	P	C
6	2	-	6

16CMU602B FUNDAMENTALS OF INVESTMENT

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept and procedures of fundamentals of investment.
2. To familiarize the students with different investment alternatives, introduce them to the framework of their analysis and valuation and highlight the role of investor protection.
3. To know the concept of various types of bonds/
4. To Critically evaluate the appropriate alternatives techniques for Portfolio Analysis and Financial Derivatives
5. To Communicate in oral and written form of Technical Analysis and Efficient Market
6. To understand the concept and Role of SEBI and Stock Exchanges in Investor Protection

COURSE OUTCOMES:

Learners should be able to

1. Understanding the Concept and procedures of fundamentals of investment.
2. Familiarizing the students with different investment alternatives, introduce them to the framework of their analysis and valuation and highlight the role of investor protection.
3. Knowing the concept of various types of bonds/
4. Evaluate the appropriate alternatives techniques for Portfolio Analysis and Financial Derivatives
5. Communicate in oral and written form of Technical Analysis and Efficient Market
6. Understand the concept and Role of SEBI and Stock Exchanges in Investor Protection

Unit I

The Investment Environment: The Investment Decision Process -Types of Investments – Commodities, Real Estate and Financial Assets - The Indian Securities Market, the Market Participants and Trading of Securities, Security Market Indices, Sources of Financial Information, Concept of Return and Risk, Impact of Taxes and Inflation on return.

Unit II

Fixed Income Securities: Bond Features, Types of Bonds, Estimating Bond Yields, Bond Valuation Types of Bond Risks, Default Risk and Credit Rating.

Unit III

Approaches to Equity Analysis: Introduction to Fundamental Analysis, Technical Analysis and Efficient Market - Hypothesis, Dividend Capitalization Models, and Price-Earnings Multiple Approach to Equity Valuation.

Unit IV

Portfolio Analysis and Financial Derivatives : Portfolio and Diversification - Portfolio Risk and Return - Mutual Funds - Introduction to Financial Derivatives - Financial Derivatives Markets in India

Unit V

Investor Protection : Role of SEBI and Stock Exchanges in Investor Protection - Investor Grievances and their Redressal System, Insider Trading, Investors' Awareness and Activism

Suggested Readings

Text book

1. Prasanna Chandra, *Investment Analysis and Portfolio Management*, McGraw Hill Education

Reference Books

1. C.P. Jones, *Investments Analysis and Management*, Wiley, 8th edition.
2. Prasanna Chandra, *Investment Analysis and Portfolio Management*, McGraw Hill Education
3. R.P. Rustogi, *Fundamentals of Investment*, New Delhi. Sultan Chand & Sons,
4. N.D. Vohra &B.R. Bagri, *Futures and Options*, McGraw Hill Education
5. Mayo, *An Introduction to Investment*, Cengage Learning.

Semester VI

16CMU603A PERSONAL SELLING AND SALESMANSHIP

L	T	P	C
6	-	-	4

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of personal selling, theories of personal selling, motives of buying, selling process, sales planning and control.
2. To communicate orally and in written form the understanding of personal selling, theories of personal selling, motives of buying, selling process, sales planning and control.
3. To apply the understanding of personal selling, theories of personal selling, motives of buying, selling process, sales planning and controlling lifelong practice.
4. To Critically evaluate the appropriate alternatives techniques for closing deal and select the best technique suiting the situation.
5. To Communicate in oral and written form and prepare report
6. To Work in team and exhibit leadership skills

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of personal selling, theories of personal selling, motives of buying, selling process, sales planning and control.
2. Communicate orally and in written form the understanding of personal selling, theories of personal selling, motives of buying, selling process, sales planning and control.
3. Apply the understanding of personal selling, theories of personal selling, motives of buying, selling process, sales planning and controlling lifelong practice.
4. Critically evaluate the appropriate alternatives techniques for closing deal and select the best technique suiting the situation.
5. Communicate in oral and written form and prepare report
6. Work in team and exhibit leadership skills

Unit I

Introduction to Personal Selling: Nature and Importance of Personal Selling, Myths of Selling, Difference Between Personal Selling, Salesmanship and Sales Management - Characteristics of a Good Salesman - Types of Selling Situations - Types of Salespersons - Career Opportunities in Selling - Measures for Making Selling an Attractive Career.

Unit- II

Personal Selling- Preparation and Process: Introduction - Buying Decision Process - Buying Situations - Effective Communication Sales Knowledge and Sales Related Marketing Policies - The Sales Process - Transactional and Relationship Selling.

Unit- III

Buying Motives: Concept of motivation - Maslow's Theory of Need Hierarchy; Dynamic Nature of Motivation -Buying Motives and their uses in Personal Selling

Unit- IV

Selling Process: Prospecting and Qualifying; Pre-Approach – Approach - Presentation and Demonstration- Handling of Objections - Closing the Sale - Post Sales Activities.

Unit- V

Sales Reports: Reports and Documents - Sales Manual - Order Book - Cash Memo - Tour Diary - Daily and Periodical Reports - Ethical aspects of Selling

Suggested Readings

Text Books

1. Kapoor Neeru, *Advertising and personal Selling*, Pinnacle, New Delhi.

Reference Books

1. Spiro, Stanton, and Rich, *Management of the Sales force*, McGraw Hill.
2. Rusell, F. A. Beach and Richard H. Buskirk, *Selling: Principles and Practices*, McGraw Hill
3. Futrell, Charles, *Sales Management: Behaviour, Practices and Cases*, The Dryden Press.
4. Still, Richard R., Edward W. Cundiff & Norman A. P. Govoni, *Sales Management: Decision Strategies and Cases*, New Delhi, Prentice Hall of India Ltd.
5. Pedesson, Charles A. Wright, Milburn d. And Weitz, Barton A., *Selling: Principles and Methods*, Richard, Irvin

Semester VI

16CMU603B	**CONSUMER PROTECTION**	**L**	**T**	**P**	**C**
		6	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To familiarize the students with of their rights as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights
2. To comprehend the business firms' interface with consumers and the consumer related regulatory and business environment.
3. To understanding The Consumer Protection Act, 1986 (CPA)and their Objectives and Basic Concepts
4. To understanding the concept of Grievance Redress Mechanism under the Consumer Protection Act, 1986
5. To familiarize the students with the concept of Grievance Redress Mechanism under the Consumer Protection Act, 1986
6. To understand the concept of Industry Regulators and Consumer Complaint Redress Mechanism

COURSE OUTCOMES:

Learners should be able to

1. Familiarizing the students with of their rights as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights .
2. Comprehending the business firms' interface with consumers and the consumer related regulatory and business environment.
3. Understanding the Consumer Protection Act, 1986 (CPA)and their Objectives and Basic Concepts.
4. Understanding the concept of Grievance Redress Mechanism under the Consumer Protection Act, 1986.
5. Familiarizing the students with the concept of Grievance Redress Mechanism under the Consumer Protection Act, 1986.
6. Understanding the concept of Industry Regulators and Consumer Complaint Redress Mechanism.

Unit 1

Conceptual Framework Consumer and Markets: Concept of Consumer- Nature of Markets- Concept of Price in Retail and Wholesale - Maximum Retail Price (MRP) and Local Taxes - Fair Price - labeling and Packaging - Experiencing and Voicing Dissatisfaction: Consumer Satisfaction/dissatisfaction-Grievances –Complaint - Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers - Internal and External Complaint handling: Corporate Redress Systems and Public Redress Systems

Unit II

The Consumer Protection Act, 1986 (CPA): Objectives and Basic Concepts: Consumer, Goods, Service, Defect in Goods, Deficiency in Service, Spurious Goods and Services, Unfair Trade Practice, Restrictive Trade Practice. Organizational Set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels, Basic Consumer Rights - Adjudicatory Bodies: District Forums, State Commissions - National Commission: National Commission Composition, Powers, and Jurisdiction (Pecuniary and Territorial)- Role of Supreme Court under the CPA

Unit III

Grievance Redress Mechanism under the Consumer Protection Act, 1986: Who can file a complaint? Grounds of Filing a Complaint - Limitation Period - Procedure for Filing and Hearing of a Complaint - Disposal of Cases, Relief/Remedy to be Provided- Temporary Injunction - Enforcement of Order, Appeal, Frivolous and Vexatious Complaints - Offences and Penalties.

Unit IV

Consumerism in India: Evolution of Consumer Movement in India - Formation of Consumer Organizations and Consumer Organisation role in Consumer Protection-Recent Developments in Consumer Protection in India - National Consumer Helpline- Citizens Charter - Product testing. **Quality and Standardization**: Voluntary and Mandatory standards - Role of BIS - Indian Standards Mark (ISI) - Ag-mark, Hallmarking, Licensing and Surveillance; ISO: An overview

Unit V

Industry Regulators and Consumer Complaint Redress Mechanism

i. .Banking: RBI and Banking Ombudsman

ii. Insurance: IRDA and Insurance Ombudsman

iii. Telecommunication: TRAI

iv. Food Products: FSSAI (an overview)

v. Electricity Supply: Electricity Regulatory Commission

vi. Advertising: ASCI

Suggested Readings

Text Book

1. Aggarwal, V. K. (2003*). Consumer Protection: Law and Practice*. Delhi, 5th ed. Bharat Law House, or latest edition.

Reference Books:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. *Consumer Affairs*" (2007) Delhi University Publication.

2. Nader, Ralph (1973). *The Consumer and Corporate Accountability*. USA, Harcourt Brace Jovanovich, Inc.

3. Sharma, Deepa (2011).*Consumer Protection and Grievance-Redress in India: A Study of Insurance Industry* (LAP LAMBERT Academic Publishing GmbH & Co.KG, Saarbrucken, Germany.
4. Rajyalaxmi Rao, *Consumer is King*, Universal Law Publishing Company
5. Empowering Consumers e-book, www.consumeraffairs.nic.in
6. The Consumer Protection Act, 1986

Semester VI

16CMU604A	INDIAN ECONOMY	L	T	P	C
		6	2	-	6

COURSE OBJECTIVES:

To make the students

1. To enable the student to grasp the major economic problems in India and their solutions.
2. To provide an understanding of modern tools of macro-economic analysis and policy framework
3. To enlighten the students knowledge in Basic Issues and features of Indian Economy.
4. To communicate orally and in written form Concept of Sectoral Trends and Issues.
5. To have in-depth knowledge on Policies for restructuring agrarian relations and for regulating concentration of economic power.
6. To understand the importance of Inflation, Unemployment and Labour market

COURSE OUTCOMES:

Learners should be able to

1. Enabling the student to grasp the major economic problems in India and their solutions.
2. Providing an understanding of modern tools of macro-economic analysis and policy framework
3. Enlightening the students knowledge in Basic Issues and features of Indian Economy.
4. Communicating orally and in written form Concept of Sectoral Trends and Issues.
5. Having in-depth knowledge on Policies for restructuring agrarian relations and for regulating concentration of economic power.
6. Understanding the importance of Inflation, Unemployment and Labour market.

Unit I

Basic Issues and features of Indian Economy - Concept and Measures of Development and Underdevelopment; Human Development**;** Composition of national income and occupational structure

Unit II

Policy Regimes - The evolution of planning and import substituting industrialization - Economic Reforms since 1991 -Monetary and Fiscal policies with their implications on economy

Unit III

Growth, Development and Structural Change - The experience of Growth, Development and Structural Change in different phases of growth and policy regimes across sectors and regions - The Institutional Framework: Patterns of assets ownership in agriculture and industry - Policies for restructuring agrarian relations and for regulating concentration of economic power - Growth and Distribution - Unemployment and Poverty; Human Development - Environmental concerns - Demographic Constraints: Interaction between population change and economic development.

Unit IV

Sectoral Trends and Issues - Agriculture Sector**:** Agrarian growth and performance in different phases of policy regimes i.e. pre green revolution and the two phases of green revolution; Factors influencing productivity and growth; the role of technology and institutions - Industry and Services Sector: Phases of Industrialisation – Public sector – its role, performance and reforms; The small scale sector; Role of Foreign capital - Financial Sector: Structure, Performance and Reforms. Foreign Trade and balance of Payments: Structural Changes and Performance of India's Foreign Trade and Balance of Payments; Trade Policy Debate; Export policies and performance

Unit V

Inflation, Unemployment and Labour market – Inflation - Causes of Rising and Falling Inflation, Inflation and Interest Rates, Social Costs of Inflation - Unemployment – Natural Rate of Unemployment, Frictional and Wait Unemployment. Labour Market and its Interaction with Production System - Phillips curve, the trade-off between inflation and unemployment, sacrifice ratio, role of expectations adaptive and rational.

Suggested Readings

Text book

1. Mishra and Puri, *Indian Economy*, Himalaya Publishing House
2. IC Dhingra, *Indian Economy*, Sultan Chand & Sons

Reference Books:

1. Gaurav Dutt and KPM Sundarum, *Indian Economy*, S. Chand & Company.
2. Uma Kapila (ed), "*Indian Economy since Independence*", Relevant articles.
3. Bhagwati, J.& Desai, P. *India: Planning for industrialization*

Semester VI

L	T	P	C
6	2	-	6

16CMU604B RETAIL MANAGEMENT

COURSE OBJECTIVES:

To make the students

1. To make the students understand the features of Retailing.
2. To enhance the students knowledge in the theories of Retail Development
3. To enlighten the students knowledge in global Retail Markets.
4. To communicate orally and in written form Concept of management in retail business.
5. To Implement the right retail strategies to make success the retail business.
6. To understand the importance of Servicing the Retail Customer

COURSE OUTCOMES:

Learners should be able to

1. Understand the features of Retailing.
2. Knowledge in the theories of Retail Development
3. Knowledge in global Retail Markets.
4. Communicate orally and in written form Concept of management in retail business.
5. Implement the right retail strategies to make success the retail business.
6. Follow and take decisions related to Servicing the Retail Customer

Unit 1

Introduction To Retail Business : Retail Functions – Rise of Retailing – Consumerism – challenges – Consumer Proximity – Technology – Rise of Retailing in India – Key Markets – FDI in retail – Challenges in India – New Entrants – Emerging Sectors – Suppliers and buyers Rivalry

Unit II

Evaluation Of Retailing : Theories – Retail lifecycle – Business Models – Ownership – Merchandise offered , Franchise, Non Store, Direct Marketing – Tele, Vending Machines, Kiosks, Cash and Carry Global Experience – Brand Management.

Unit III

Retail Operations : Factors influencing location of Store - Market area analysis – Trade area analysis – Rating Plan Method - Site evaluation. Retail Operations: Stores Layout and visual merchandising, Stores designing, Space planning, Inventory management, Merchandise Management, Category Management.

Unit IV

Retail Marketing Mix : Introduction -Product: Decisions Related to Selection of Goods (– Decisions related to Delivery of Service. Pricing : Influencing Factors – Approaches to Pricing – Price Sensitivity - Value Pricing – Markdown Pricing. Place : Supply Channel – SCM Principles – Retail Logistics – Computerized Replenishment System – Corporate Replenishment Policies.

Promotion : Setting Objectives – Communication Effects - Promotional Mix. Human Resource Management in Retailing – Manpower Planning – Recruitment and Training – Compensation – Performance Appraisal Methods.

Unit V

Impact of Information Technology in Retailing - Non store retailing (e-retailing) - The Impact of Inforation Technology in Retailing – Integrated Systems and Networking – EDI – Bar coding – Electronic Article Surveillance – Electronic Shelf Labels – Customer Database Management System. Legal Aspects in Retailing, Social Issues in Retailing, Ethical issues in Retailing.

Suggested Readings:

Text Book:

1. Pradhan Swapna. (2013). *Retail Management: Text and Cases* [4th Edition]. New Delhi, Tata Mcgraw Hill Education
2. J.N. Jain & P.P. Singh, " Modern Retail Management" , Deep & Deep Publications, New Delhi

REFERENCE BOOKS

1. Suja Nair; (2 06) Retail Management, HPH- I st Edition
2. Karthic –(2006) Retail Management, HPH
3. Barry Bermans and Joel Evans: "Retail Management – A Strategic Approach", 8th edition, PHI/02
6. A.J.Lamba, "The Art of Retailing", 1st edition, Tata Mc GrawHill, New Delhi, 2003.
7. Swapna Pradhan : Retailing Management, 2/e, 2007 & 2008, TMH
8. Levy & Weitz : Retail Management -TMH 5th Edition 2002

KARPAGAM ACADEMY OF HIGHER EDUCATION
DEPARTMENT OF COMMERCE
B.COM (Business Process Services)
(For the students admitted during the year 2016-2019 Batch onwards)
Scheme of Examination

Course Code	Name of the Course	Objectives and Outcomes		Instruction Hours/Week			Credit	Maximum Marks		
		PEOs	POs	L	T	P		CIA	ESE	TOTAL
								40	60	100
				SEMESTER-I						
16LAU101	Language-I	I, II, III	a,b,c,d,e, f,g,h,i	6	0	0	6	40	60	100
16ENU101	English-I	II,IV	b,c,d,e,f, g,h,i	4	0	0	4	40	60	100
16BPU101	Financial Accounting	I,II	a,b,c,d,e, f,g,h,i	5	0	0	5	40	60	100
16BPU111	Financial Accounting (Practical)	I,II	a,b,c,d,e, f,g,h,i	0	0	3	1	40	60	100
16BPU102	Business Organization and Management	III,IV	b,c,d,e,f, g,h,i	6	2	0	6	40	60	100
16AEC101	Business Communication	II,IV	d,e,f,h	4	0	0	4	40	60	100
	Semester Total			25	2	3	26	240	360	600
Semester -II										
16LAU201	Language-II	I, II, III	a,b,c,d,e, f,g,h,i	6	0	0	6	40	60	100
16ENU201	English-II	II,IV	e,g,h	4	0	0	4	40	60	100
16BPU201	Business Law	I,II,IV	a,b,c,d,e, f,g,h,i	5	0	0	5	40	60	100
16BPU211	Ms- Office and Automation (Practical)	I,II,III	a,b,c,d,e, f,g,h,i	0	0	3	1	40	60	100
16BPU202	Business Mathematics and Statistics	I,II,III	a,b,c,d,e, f,g,h,i	6	2	0	6	40	60	100
16AEC201	Environmental Studies	III,IV	b,c,i	4	0	0	4	40	60	100
	Semester Total			25	2	3	26	240	360	600

SEMESTER-III										
16ENU301	English-III	II,IV	b,c,d,e,f, g,h,i	**6**	**2**	**0**	**6**	**40**	**60**	**100**
16BPU301	Business process services in Finance and Accounting	II,III	b,c,d,e,f, g,h,i	**6**	**2**	**0**	**6**	**40**	**60**	**100**
16BPU302	Corporate Law	II,IV	b,c,d,e,f, g,h,i	**5**	**0**	**0**	**5**	**40**	**60**	**100**
16BPU311	Corporate Law (Practical)	II,IV	b,c,d,e,f, g,h,i	**0**	**0**	**3**	**1**	**40**	**60**	**100**
16BPU303A	Business Process Services in Insurance	I,II,III	a,b,c,d,e, f,g,h,i	**6**	**0**	**0**	**4**	**40**	**60**	**100**
16BPU303B	Financial Analysis and Reporting	I,III	a,b,c,d,e, ,h,i	**6**	**0**	**0**	**4**			
	Semester Total			**23**	**4**	**3**	**22**	**200**	**300**	**500**
SEMESTER-IV										
16ENU401	English-IV	II,IV	e,g,h	**6**	**2**	**0**	**6**	**40**	**60**	**100**
16BPU401	Corporate Accounting	I,II,IV	a,b,c,d,e, f,g,h,i	**5**	**0**	**0**	**5**	**40**	**60**	**100**
16BPU411	Corporate Accounting (Practical)	I,II,IV	a,b,c,d,e, f,g,h,i	**0**	**0**	**3**	**1**	**40**	**60**	**100**
16BPU402	Business process services in Banking	I,II,III	a,b,c,d,e, f,g,h,i	**6**	**2**	**0**	**6**	**40**	**60**	**100**
16BPU403 A	Retail Environment and Market Research	I,II,III	a,b,c,d,e, f,g,h,i	**6**	**0**	**0**	**4**	**40**	**60**	**100**
16BPU403 B	E-commerce	I,III	a,b,c,d,e, h,i	**6**	**0**	**0**	**4**			
	Semester Total			**23**	**4**	**3**	**22**	**200**	**300**	**500**
SEMESTER-V										
16BPU501A	Business Process Service in Capital Market	I,II,III	a,b,c,d,e, f,g,h,i	**6**	**2**	**0**	**6**	**40**	**60**	**100**
16BPU501 B	Entrepreneurship	I,IV	b,c,d,e,f, h,i	**6**	**2**	**0**	**6**			
16BPU502A	Taxation	I,II,IV	a,b,c,d,e, f,g,h,i	**5**	**0**	**0**	**5**	**40**	**60**	**100**
16BPU502B	Auditing	I,III,IV	a,b,c,d,e, f,g,h,i	**5**	**0**	**0**	**5**			
16BPU511A	Taxation (Practical)	I,II,IV	a,b,c,d,e,	**0**	**0**	**3**	**1**	**40**	**60**	**100**

			f,g,h,i							
16BPU511B	Auditing (Practical)	I,III,IV	a,b,c,d,e, f,g,h,i	**0**	**0**	**3**	**1**			
16BPU503A	Managing Business Processes-I	I,II,IV	a,b,c,d,e, f,g,h,i	**6**	**0**	**0**	**4**	**40**	**60**	**100**
16BPU503B	Advertising	I,II,III	a,b,c,d,e, f,g,h,i	**6**	**0**	**0**	**4**			
16BPU504 A	Campus to Corporate Transition	II,III,IV	a,b,c,d,e, f,g,h,i	**6**	**2**	**0**	**6**	**100**	**0**	**100**
16BPU504B	Business Ethics	II,IV	b,c,d,e,f, g,h,i	**6**	**2**	**0**	**6**	**40**	**60**	**100**
	Semester Total			**23**	**4**	**6**	**27**	**260/200**	**240/300**	**500**
SEMESTER-VI										
16BPU601A	Financial Management	I,III	a,b,c,d,e, h,	**5**	**0**	**0**	**5**	**40**	**60**	**100**
16BPU601B	Human Resource Management	I,III	a,b,c,d,e, h,	**5**	**0**	**0**	**5**			
16BPU611A	Financial Management (Practical)	I,III	a,b,c,d,e, ,h,i	**0**	**0**	**3**	**1**	**40**	**60**	**100**
16BPU611B	Human Resource Management (Practical)	I,III	a,b,c,d,e, h,i	**0**	**0**	**3**	**1**			
16BPU602A	Cost and Management Accounting	I,II	a,b,c,d,e, f,g,h,i	**6**	**2**	**0**	**6**	**40**	**60**	**100**
16BPU602B	Office Management and Secretarial Practice	I,III,IV	a,b,c,d,e, f,h,i	**6**	**2**	**0**	**6**			
16BPU603A	Managing Business Processes-II	I,II,IV	a,b,c,d,e, f,g,h,i	**6**	**0**	**0**	**4**	**40**	**60**	**100**
16BPU603B	Personal Selling and Salesmanship	II,III,IV	b,c,d,e,f, g,h,i	**6**	**0**	**0**	**4**			
16BPU604A	Managerial Economics	I,III,IV	a,b,c,d,e, f,h,i	**6**	**2**	**0**	**6**	**40**	**60**	**100**
16BPU604B	Retail Management	I,II,III	a,b,c,d,e, f,g,h,i	**6**	**2**	**0**	**6**			
ECA/NCC/NSS/Sports/ General interest etc										**Good**
	Semester Total							**200**	**300**	**500**
	Grand total							**1280**	**1920**	**3200**

Program Educational Objective (PEO)

I. Graduate will familiarize oneself with knowledge and application skills in the domain of accounting, finance, insurance, taxation, and business process service

II. Graduates will acquire skills which would equip one to face the modern-day challenges and become job ready in various sectors and in particular to ITeS and BPS industry.

III. Graduates will develop a progressive learning approach in various domains of commerce and BPS industry and continue to excel in their career.

IV. Graduates will develop and exhibit a high standard of moral conduct and grow into socially responsible citizens contributing to the growth of the profession and the society.

Program Outcomes (PO)

a. Graduates will have a strong understanding of basic and advanced levels of commerce, accounting, and business process services.

b. Graduates will acquire skill in the BPS specific domains in accounting, insurance, retail management and improve decision-making skills to solve problems in day to day business activities for sustainable development.

c. Graduates will develop the ability to examine and apply in-depth domain knowledge to analyze and solve complex business problems analytically and technologically.

d. Graduates will understand the day to day issues in the business process domain and solve problems by exhibiting critical thinking skills.

e. Graduates will acquire effective and interactive communication skills to attain goals as a team by exchanging ideas.

f. Graduates will be able to integrate the skills and knowledge to provide innovative solutions.

g. Graduates will exhibit leadership to empower business organizations by working together with the team members.

PROGRAM SPECIFIC OUTCOMES (PSO)

h. Graduates will be able to do understand and learn changes in the fields relating to all domains specific to ITeS and BPS sector.

i. Graduates will be able to understand and apply the attained thoughts in securing employment in various levels and or start up a business in the field of ITeS and BPS

Program Educational Objectives	Program Outcomes								
	a	b	c	d	e	f	g	h	I
Graduate will familiarize oneself with knowledge and application skills in the domain of accounting, finance, insurance, taxation, and business process service	✓	✓	✓		✓			✓	
Graduates will acquire skills which would equip one to face the modern-day challenges and become job ready in various sectors and in particular to ITeS and BPS industry.		✓	✓	✓	✓	✓	✓	✓	✓
Graduates will develop a progressive learning approach in various domains of commerce and BPS industry and continue to excel in their career.		✓	✓	✓				✓	
Graduates will develop and exhibit a high standard of moral conduct and grow into socially responsible citizens contributing to the growth of the profession and the society.			✓	✓	✓	✓		✓	✓

Semester I

L	T	P	C
6	-	-	6

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016-2017)

பகுதி - I, தமிழ் **பருவம் I**

16LAU101 : தமிழ் முதல் தாள்

(இளநிலை கலையியல் பட்ட வகுப்புகளுக்குரியது)

COURSE OBJECTIVES

To make the students

1. Learning way of thinking and expressive ability.
2. Improving the scope of research.
3. Realizing the subtle parts of life that literature conveys.
4. Realizing the role that literature plays in the maturation of the human mind.
5. Awareness raising on awareness, culture etc. in the growing community.
6. Preparing students for government exams.

COURSE OUTCOMES

Learners should be able to

1. Complete introduction to 'History of Tamil Literature', which is an optional subject in competitive examinations such as Indian Citizenship.
2. Access to literature with a research-oriented approach to inscriptional, manuscript, and archaeological research.
3. 'Scientific Tamil', the field of development of Tamil; Development of multi-pronged research thinking on 'Internet Tamil'.
4. Having creative self-improvement and creativity development for employment.
5. An attitude of seeking literature in support of social and biological values.
6. Skill development for translation based employment.

அலகு - I : இக்கால இலக்கியம்: **(20 மணிநேரம்)**

கல்வி : மகாகவி பாரதியார் - சுயசரிதை - ஆங்கிலக் கல்வி.

இன்றைய நிலை : கவிமணி தேசிய விநாயகம் -ஒற்றுமையே உயிர்நிலை

: கவிஞர் அப்துல்ரகுமான் - கால வழு

மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் - மலையாளக் காற்று

கவிஞர் தாமரை - மழைக்குறிப்பு

சூழலியல் : கவிஞர் வைதீஸ்வரன் -விரல் மீட்டிய மழை

பெண்ணியம் : கவிஞர் சுகந்தி சுப்பிரமணியம் - புதையுண்ட வாழ்க்கை

கவிஞர் வைரமுத்து - அம்மா

வாழ்க்கை : கவிஞர் தருமுசிவராம் - வாழ்வுப் பாடல்
இயற்கை : பாவேந்தர் பாரதிதாசன் - அழகின் சிரிப்பு - வான்.

அலகு - II : அற இலக்கியம்: **(15 மணிநேரம்)**

கொன்றை வேந்தன்: 1 - 50 பாடல்கள்
திருக்குறள்: பண்புடைமை, வினைத்திட்பம் -20 குறள்கள்
பழமொழி நானூறு: 5 பாடல்கள்
வேதநாயகம்பிள்ளை நீதிநூல்: 74 -78 பாடல்கள்
பெருவாயின் முள்ளியார் ஆசாரக்கோவை: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: **(15 மணிநேரம்)**

மூவருலா: 1-26 கண்ணிகள்
திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்
குற்றாலக்குறவஞ்சி: 5 பாடல்கள்
முக்கூடற்பள்ளு : 5 பாடல்கள்
கலிங்கத்துப் பரணி: போர்பாடியது- 9 பாடல்கள்

அலகு - IV : கட்டுரை: **(10 மணிநேரம்)**

1. உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்
2. கட்டிடக்கலை - அ.இராசமாணிக்கனார்
3. வாழ்க்கை -இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: **(12 மணிநேரம்)**

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. எழுத்து, சொல், பொருள் இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை - தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Semester I

	L	T	P	C
16ENU101 **ENGLISH I**	4	-	-	4

COURSE OBJECTIVES:
To make the students

1. To train students to acquire proficiency in English.
2. To explore different genres of literature and learning grammar.
3. To provide aesthetic pleasure through literature.
4. To inculcate moral values through literature.
5. To develop ethical values.
6. To give basic grammar knowledge.

COURSE OUTCOMES:
Learners should be able to

1. Develop the knowledge of interpersonal skills.
2. Establish and maintain social relationships.
3. Genres of literature will give moral values of life.
4. Develop communication skills in business environment
5. Communication skills will get developed.
6. Develop to have language competence.

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman – Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT V

Short Story: The Bird – Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. *Spring* 2013**.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala, V. *English for Communication*. 2006. Emerald Publishers: Chennai

Semester I

L	T	P	C
5	-	-	5

16BPU101 FINANCIAL ACCOUNTING

COURSE OBJECTIVES:

To make the students

1. To learn the basic concepts and conventions of accounting and basic accounting framework.
2. To give insight into the business income and preparation of final accounts.
3. To learn accounting for hire purchase and installment system.
4. To learn the consignment feature and joint venture.
5. To study the partnership accounting and goodwill.
6. To apply the accounting procedures in practical.

COURSE OUTCOMES:

Learners should be able to

1. To understand the bookkeeping and purpose and functions of accounting
2. To know the depreciation and preparation of final accounts.
3. Describe the accounting for hire-purchase and installment system.
4. To identify the consigner and consignee & joint venture.
5. To know the accounting for partnership and calculation of profit-sharing ratio.
6. Apply the accounting procedures for partnership firm.

Unit I

Theoretical Framework: Accounting information system: Users and their Needs. Characteristics of Accounting - Functions, Advantages and Limitations of Accounting. Branches of Accounting- Bases of Accounting: - Concepts and Conventions –Accounting Standards – Journal- Ledger – Subsidiary Books – Trial Balance

Unit II

Business Income : Revenue Recognition – Depreciation – methods – straight line method – Diminishing Balance Method – Change in method of depreciation – Final Accounts – preparation of final accounts for non- corporate business entities

Unit III

Accounting for Hire-Purchase and Installment System : Transactions - Journal Entries and ledger accounts including Default and Repossession.

Unit IV

Consignment: Features, Accounting treatment - Consignor and Consignee. **Joint Venture:** Accounting procedures: Joint Bank Account, Records Maintained by Co-venturer of (a) all transactions (b) only his own transactions. (Memorandum joint venture account).

Unit V

Accounting for Partnership: Valuation of Goodwill – Calculation of Profit Sharing Ratio – Admission – Retirement of a Partner.

Note:

Distribution of marks - 20% theory and 80% problems

Suggested Readings

Text Book

1. Reddy T.S.& Moorthy.A. (2012), *Financial Accounting*, Chennai, Margham Publications.

Reference Books:

1. Shukla, M.C. Grewal T.S. & Gupta. S.C. (2013) Revised Edition, *Advanced Accounts*. New Delhi.Vol.-I. S. Chand & Co.,
2. Maheshwari, S.N. & Maheshwari S. K. (2013) Financial *Accounting*. New Delhi Vikas Publishing House.
3. Deepak Sehgal. (2014) *Financial Accounting*. New Delhi, Vikas Publishing House,
4. Tulsian, P.C. (2004) *Financial Accounting*, Pearson Education.
5. *Compendium of Statements and Standards of Accounting*.(2012) New Delhi, The Institute of Chartered Accountants of India,

Semester I

16BPU111	FINANCIAL ACCOUNTING (PRACTICAL)	L	T	P	C
		-	-	3	1

COURSE OBJECTIVES:

To make the students

1. To learn the basic concepts and conventions of accounting and basic accounting framework.
2. To give insight into the business income and preparation of final accounts through tally.
3. To prepare the books of accounts through tally.
4. To know about the accounting process and preparation of final accounts and inventory valuation.
5. To know the accounting for partnership and calculation of profit-sharing ratio.
6. To create stock items and groups

COURSE OUTCOMES:

Learners should be able to

1. To understand the bookkeeping and purpose and functions of accounting
2. To know preparation of final accounts.
3. Apply practical knowledge on accounting practices
4. Prepare accounting for partnership and calculation of profit-sharing ratio.
5. Prepare the final accounts and compute inventory valuation.
6. Creation of stock items and groups

List of Practical:

1. Creating a Company
2. Configure and features settings
3. Creating accounting ledgers and groups
4. Creating stock items and groups
5. Voucher entry
6. Generating reports –
   - Cash book
   - Ledger accounts
   - Trial balance
   - Profit and loss account
   - Balance sheet
   - Fund flow statement
   - Cash flow statement
   - Selecting and shutting a company;

- Backup and Restore data of a company

Suggested Readings

Reference Books :

1. Shraddha Singh. Navneet Mehra (2010). *Tally ERP 9: Power of Simplicity*. New Delhi, PBP Publication.
2. Nadhani. (2013). *Tally9.2*. New Delhi: PBP Publication.
3. Rita Bhargava.(2011). *Tally 9.2*. New Delhi, Cyber Publication

	Semester I	L	T	P	C
		6	2	-	6

16BPU102 BUSINESS ORGANIZATION AND MANAGEMENT

COURSE OBJECTIVES:
To make the students

1. To provide basic knowledge of foundation of Indian business, skill development and Skill development.
2. To learn the business enterprise, include the sole property, JHF, partnership and multinational corporations.
3. To learn the process of management, departmentation and group and teams.
4. To study the leadership, motivation, concepts and style.
5. To provide the functional areas of management
6. To know the product life cycle of products

COURSE OUTCOMES
Learners should be able to

1. Able to understand the foundation of Indian business and problems of government policy, Indian experience to liberalization and globalization.
2. To understand the business enterprise, include the organization, partnership business and international business.
3. To help the students develop their process of management.
4. To help the students to develop their leadership, motivation and control.
5. Make the marketing management concepts and HRM basic concepts, employee relations etc.
6. Analysis of product life cycle

Unit I

Foundation of Indian Business: Manufacturing and Service Sectors- Small and Medium Enterprises- Problems and Government policy, India's Experience of Liberalization and Globalization. Technological Innovations and Skill Development, make in India, Social Responsibility and Ethics Emerging opportunities in business- Franchising, Outsourcing needs and Domain Mix - E-commerce.

Unit II

Business Enterprises: Forms of Business Organisation- Sole Proprietorship- Joint Hindu Family Firm- Partnership firm- Joint Stock Company- Cooperative society- Limited Liability Partnership- Choice of Form of Organisation. Government - Business Interface; Rationale and Forms of Public Enterprises, International Business, Multinational Corporations.

Unit III

Management and Organisation: The Process of Management- Planning- Decision-making- Strategy Formulation. Organizing Basic Considerations; Departmentation – Functional. Project. Matrix and Network; Delegation and Decentalisation of Authority; Groups and Teams.

Unit IV

Leadership, Motivation and Control: Leadership: Concept and Styles; Trait and Situational Theory of Leadership. Motivation - Concept and Importance- Maslow Need Hierarchy Theory-

Herzberg Two Factors Theory- Communication- Process and Barriers- Control Concept and Process.

Unit V

Functional Areas of Management: Marketing Management- Marketing Concept- Marketing Mix- Product Life Cycle- Pricing Policies and Practices Financial Management: Concept and Objectives- Sources of Funds – Equity Shares, Debentures, Venture Capital and Lease Finance, Securities Market, Role of SEBI. Human Resource Management: Concept and Functions- Basic Dynamics of Employer - Employee Relations.

Suggested Readings

Text Book

1. Y.K.Bhushan (2012).Business Organization and Management. New Delhi: Sultanchand & sons

Reference books:

1. Kaul, V.K., (2013), *Business Organisation and Management*, New Delhi, Pearson Education,
2. Chhabra, T.N., (2009), *Business Organisation and Management*, New Delhi, Sun India Publications,
3. Gupta CB, (2014), *Modern Business Organisation*, New Delhi, Mayur Paperbacks.
4. Koontz & Weihrich, (2010), *Essentials of Management*, McGraw Hill Education.

Semester I

L	T	P	C
4	-	-	4

16AEC101 BUSINESS COMMUNICATION

COURSE OBJECTIVES:
To make the students

1. To provide an overview of Prerequisites to Business Communication & effective Organizational Communication.
2. To impart the correct practices of the strategies of Effective Business writing
3. To put in use the basic mechanics of business reports
4. To provide an outline to preparation of resume, interview and business report presentations.
5. To underline the presentation, include that the PPT, visual aids.
6. To use updated technology for various types of communication globally.

COURSE OUTCOMES
Learners should be able to

1. To effectiveness of management communication and different forms of communication and barriers.
2. To understand the practices of effective business writing.
3. To evaluate the write the report writing, structure of writing.
4. Able to understand the preparation of resume and interview and group discussion.
5. To understood the presentation and visual aids.
6. Use appropriate technology for business communication.

Unit I

Nature of Communication: Process of Communication, Types of Communication (verbal & Non-Verbal). Importance of Communication, Different forms of Communication; Barriers to Communication Causes, Linguistic Barriers, Psychological Barriers, Interpersonal Barriers. Cultural Barriers, Physical Barriers, Organizational Barriers

Unit II

Business Correspondence: Letter Writing, presentation, Inviting quotations, Sending quotations, Placing orders, Inviting tenders, Sales letters, claim & adjustment letters and social correspondence, Memorandum, Inter -office Memo, Notices, Agenda, Minutes.

Unit III

Report Writing: Business reports. Types, Characteristics, Importance, Elements of structure. Process of writing, Order of writing the final draft and check lists for reports.

Unit IV

Application Letters: Preparation of Resume – Interview: Meaning – Objectives and Techniques of various types of interviews – public speech – Characteristics of a good Speech- Business Report Presentations.

Unit V

Oral Presentation: Importance, Characteristics, Presentation Plan, Power Point Presentation. Visual aids.

Suggested Readings

Text Book:

1.Rajendra Pal Korahill. (2013).*Essentials of Business Communication.* New Delhi: Sultan Chand & Sons.

Reference Books:

1. Bovee, & Thill, (2015),"*Business Communication Today"*, [13th Edition] Pearson Education
2. Shirley Taylor, (2012).*Communication for Business,* Pearson Education [7th Edition]
3. Locker & Kaczmarek, (2013) *Business Communication: Building Critical Skills,* Tata McGraw Hill Education ,
4. Leena Sen, *Communication Skills,* (2007) , New Delhi, PHI Learning [2nd Edition]

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)

பகுதி - I, **தமிழ்** **பருவம்** II **16LAU201**

தமிழ் இரண்டாம் தாள் 6-H,6-C

(இளநிலை கலையியல் பட்ட வகுப்புகளுக்குரியது)

COURSE OBJECTIVES

To make the students

1. Learning way of thinking and expressive ability.
2. Improving the scope of research.
3. Realizing the subtle parts of life that literature conveys.
4. Realizing the role that literature plays in the maturation of the human mind.
5. Awareness raising on awareness, culture etc. in the growing community.
6. Preparing students for government exams.

COURSE OUTCOMES

Learners should be able to

1. Complete introduction to 'History of Tamil Literature', which is an optional subject in competitive examinations such as Indian Citizenship.
2. Access to literature with a research-oriented approach to inscriptional, manuscript, and archaeological research.
3. 'Scientific Tamil', the field of development of Tamil; Development of multi-pronged research thinking on 'Internet Tamil'.
4. Having creative self-improvement and creativity development for employment.
5. An attitude of seeking literature in support of social and biological values.
6. Skill development for translation based employment.

அலகு - I : பக்தி இலக்கியம் **(10 மணிநேரம்)**

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு

1. **சைவம் -** பெரியபுராணம் - திருமூலநாயனார் புராணம்.
2. **வைணவம் -** பெரியாழ்வார் திருமொழி: 10 பாடல்கள்

அலகு - II : சங்க இலக்கியம் : **(25 மணிநேரம்)**

சங்க இலக்கியங்கள் அறிமுகம்

அ). **எட்டுத்தொகை**

நற்றிணை : 1. பிரசம் கலந்த - பாலை-110

2.தடமருப்பு எருமை- மருதம்-130

குறுந்தொகை : 1. கருங்கட்டாக் கலை - குறிஞ்சி- 69

2. உள்ளது சிதைப்போர்- பாலை-283

ஐங்குறுநூறு :1. நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

2. அன்னாய் வாழி வேண்டன்னை-203

பதிற்றுப்பத்து : 1. சிதைந்தது மன்ற-27

2. மீன்வயின் நிற்ப-90

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு:

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : 1.குறிஞ்சிக்கலி-சுடர்தொடீ -15

2. முல்லைக்கலி-தீம்பால் -11

அகநானூறு : 1.அன்னாய் வாழி வேண்டன்னை-குறிஞ்சி-17

புறநானூறு : 1. யாதும் ஊரே யாவருங் கேளிர்-பொதுவியல்-192

2.கெடுக சிந்தை கடிதிவள் துணிவே -279

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள்: சிறுதினை மலரொடு:218-275.

முருகன் அருள்புரிதல்: 286-295.

அலகு - III : காப்பியம் **(12 மணிநேரம்)**

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29) - கண்ணகியின் சிறப்பு: 'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி, 'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234) - சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485) - செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

சூளாமணி: மந்திர சாலைச் சருக்கம் (தேர்ந்தெடுக்கப்பெற்ற 25 பாடல்கள்)

அலகு - IV : சிறுகதை **(15 மணிநேரம்)**

1. **குளத்தங்கரை அரசமரம் - வ.வே.சு.ஐயர்**
2. **காட்டில் ஒரு மான் - அம்பை**
3. **நாற்காலி - கி.ராஜநாராயணன்**
4. **நகரம் - சுஜாதா**
5. **எஸ்தர் - வண்ண நிலவன்**
6. **மரப்பாச்சி - உமா மகேஸ்வரி**

அலகு- V : மொழிப்பயிற்சி **(10 மணிநேரம்)**

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை,கட்டுரை, உரைநடை)

மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை - தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

		Semester II
		L T P C
16ENU201	**ENGLISH II**	**4 - - 4**

COURSE OBJECTIVES:
To make the students

1. To enable the learners to acquire English language skills.
2. To familiarize them with English literature.
3. To acquire Grammar.
4. To help learners imbibe cultural values.
5. To acquire skill of making correct sentences.
6. To reflect originality on the application of soft skills and express in writing their views.

COURSE OUTCOMES:
Learners should be able to

1. Learn to enjoy the ecstasy of literature.
2. The select literary pieces will develop the confidence level of the learners.
3. To get the social values.
4. To know the importance of communication
5. Get sound knowledge in English
6. Trained to communicate well for business purpose.

UNIT I

Prose: The Unexpected- Robert Lynd
Poetry: The Village Schoolmaster – Oliver Goldsmith
Short Story: The Lion's Share – Arnold Bennett
Vocabulary: Homonyms
Grammar: Irregular Verb

UNIT II

Prose: Travel by Train – J. B. Priestley
Poetry: The Gift of India – Sarojini Naidu
Grammar: Sentence pattern

UNIT III

Prose: Women's Education is Almost More Important than the Education of Boys and Men – Indira Gandhi
Short Story: The Necklace – Guy De Maupassant

One-Act Play: The Referee – W.H. Andrews and Geoffrey Dearmer
Vocabulary: Similes
Grammar: Discourse Markers

UNIT IV

Poetry: Ozymandias – P.B. Shelley
One-Act Play: The Pot of Broth- W.B. Yeats
Vocabulary: Collective Noun
Grammar: Correction of Sentences

UNIT V

Short Story: The Silver Butterfly– Pearl S. Buck
One-Act Play: The Bear – Anton Chekov
Vocabulary: Acronym
Grammar: Question Tag

Prescribed Text:

Wings of Communication 2014. Board of Directors. Emerald Publishers: Chennai

Suggested Reading:

Syamala, V. *English for Communication*. 2006. Emerald Publishers: Chennai.

Semester II

5 - - 5

16BPU201 BUSINESS LAW

COURSE OBJECTIVES:

To make the students

1. To know the legal framework of governing the business world.
2. To understand the framework of different modes of contract
3. To provide the student with knowledge of Indian partnership.
4. To understand the sale of goods and sale of agreement.
5. To study the fundamentals of law, negotiable instrument Act, RTI, IPL procedure and process.
6. To familiarize with the concepts in Indian Contract Act.

COURSE OUTCOMES

Learners should be able to

1. Identify the fundamental legal principles behind contractual agreements.
2. To understood the contract, guarantee and kinds of agency
3. Acquire problem solving techniques and to be able to present coherent, concise legal argument
4. Able understood the sale of goods and sale of agreement.
5. To understood the fundamentals of law, negotiable instrument act, RTI, IPL procedure and process.
6. Prepare various agreements related to contract

Unit I

Indian Contract Act 1872: Contract – Definition – Obligation and Agreement – Nature of Contract and Classification – Components of Valid Contract – Offer and Acceptance – Consideration - Capacity – Free Consent – Unlawful Agreements – Quasi Contracts.

Unit II

Different Modes of Discharge of Contract: Remedies for Breach of Contract – Contract of Indemnity and Guarantee – Rights of Surety – Discharge of Surety- Pawn or Pledge – Rights of Payee – Rights and Liabilities of Finder of Lost Goods - Law of Agency – Kinds of Agency – Ex-Post Facto Agency Requirements – Rights and Liabilities of Principals and Agents.

Unit III

Indian Partnership Act 1932: Definition and Tests of Partnership – Implied Authority of Partners – Limitations – Firms Debts and Private Debts – Priority in Discharge – Rights and Liabilities of Partners – Dissolution of Partnership Firm.

Unit IV

Sale of Goods Act 1930: Definition of Sale and Distinction between Sale and Related Transaction Resembling Sale – Sale and Agreement to Sell – Rules Regarding Passing of Property in Goods – Condition and Warranties – Actual and Implied- Principle of Caveat Emptor - Limitations - Rights of Unpaid Vendor.

Unit V

Common Carriers: Definition - Rights and Duties of Common Carriers – Contract of Carriage of Goods by Sea – Bill of Lading and Charter Party – Distinction- **RTI Act**- Features- Procedures. **Negotiable Instrument Act**: Features- Presumption- Types- Promissory Notes- Bills of Exchange-Cheques- Holder in Due Course - Liability of Parties- Rights of Parties- **Intellectual Property Legislations:** Meaning and scope of Intellectual Properties – Patent Act of 1970 – Patentee – True and first inventor – Procedure for grant of Process and Product Patents – TRIPS.

Suggested Readings

Text Book

1. N.D. Kapoor. (2013). *Elements of Mercantile Law***.** New Delhi: S.Chand & Co. Ltd..

Reference Books:

1. Kuchhal, M.C. & Vivek Kuchhal (2013), *Business Law*, Vikas Publishing House, New Delhi.
2. SN Maheshwari & SK Maheshwari (2011), *Business Law*, New Delhi. National Publishing House
3. Agarwal S K, (2011), *Business Law*, [3rd edition] New Delhi, Galgotia Publishers Company,.
4. P C Tulsian & Bharat Tulsian (2001), *Business Law*, [2rd edition] McGraw Hill Education
5. Sharma, J.P. & Sunaina Kanojia (2011), *Business Laws*, New Delhi, Ane Books Pvt. Ltd.,

Semester II

		L	**T**	**P**	**C**
16BPU211	**MS-OFFICE AND AUTOMATION-PRACTICAL**	**-**	**-**	**3**	**1**

COURSE OBJECTIVES:
To make the students

1. To impart the knowledge on elements of computers, in all spears of business life.
2. To provide knowledge on Business software for document and presentation
3. To apply the arithmetic and logical functions in excel in business context
4. To prepare business presentation through power point
5. To Understand and apply the knowledge of database creation through Access.
6. To utilize the expertise of the Excel features and functions as a lifelong practice.

COURSE OUTCOMES:
Learners should be able to

1. To prepare business documents / letters
2. Apply the arithmetic and logical functions in excel in business context
3. Able to prepare business presentation through power point
4. Understand and apply the knowledge of database creation through Access.
5. Utilize the expertise of the Excel features and functions as a lifelong practice.
6. Understand the features of Spreadsheet applications and functions.

List of Practical
MS WORD

1. Type chairman’s speech/Auditor’s report/Minutes/Agenda and perform the following operations:

    Bold. Underline. Font size. Style. Background color. Text color. Line spacing. Spell check. Alignment. Header & Footer. Inserting pages and page numbers. Find and Replace.

2. Prepare shareholders meeting letter for 10 members’ using mail merge operation.
3. Prepare Bio-Data by using Wizard/Template.

MS EXCEL

1. Prepare a mark list of your class (minimum of 5 subjects) and perform the following operation:

   Data entry. Total. Average. Result and Ranking by using arithmetic and logical functions and sorting.

2. Draw the different type of charts (line. Pie. Bar) to illustrate year wise performance of sales. purchase. profit etc. of a company by using chart wizard.
3. Prepare a statement of Bank customer’s account showing simple and compound interest calculations for 10 different customers’ using mathematical and logical functions.

MS POWERPOINT

1. Design presentation slides for a product of your choice. The slide must include name, brand name, type of product, Characteristics, Special features, Price, special offer etc.
2. Design presentation slides for organization details for 5 levels of hierarchy of a company by using organization chart.

MS ACCESS

1. Prepare a payroll for employee database of an organization with the following details:

   Employee ID, Employee name, Date of Birth, Department and Designation, Date of appointment, Basic pay, Dearness Allowance, House rent Allowance and other deduction if any perform queries for different categories.

2. Create mailings labels for student database which should include atleast three tables and each table must have at least two fields with the following details: Roll Number. Name. Course. Year. College Name. University. Address and Phone number.

Suggested Readings

Text Book

1. R.K.Taxali. (1999) *P.C.Software Made Simple*. New Delhi Tata McGraw-Hill Publishing Company Ltd

Semester II

16BPU202 BUSINESS MATHEMATICS AND STATISTICS

L	T	P	C
6	2	-	6

COURSE OBJECTIVES

To make the students

1. To understand the concept of matrices
2. To acquire the knowledge of differential calculus
3. To know the concepts of central tendency and dispersion
4. To understand the correlation and regression concepts
5. To be aware of the index numbers and trend analysis
6. To be aware on of issues in the construction of index numbers

COURSE OUTCOMES:

Learners should be able to

1. Utilize the concept of matrices, differential calculus to solve business problems
2. Calculate and apply the measure of central tendency and dispersion in decision making.
3. Evaluate the relationship and association between variables to formulate the strategy in business.
4. Apply the concept of index numbers and trend analysis in business decisions.
5. Demonstrate capabilities as problem-solving, critical thinking, and communication skills related to the discipline of statistics.
6. To overcome on issues in the construction of index numbers

Unit I

Matrices & Basic Mathematics of Finance: Definition of a matrix. Types of matrices; Algebra of matrices. Calculation of values of determinants up to third order; Adjoint of a matrix; Finding inverse of a matrix through ad joint; Applications of matrices to solution of simple business and economic problems- Simple and compound interest Rates of interest – nominal, effective and continuous – their interrelationships; Compounding and discounting of a sum using different types of rates

Unit II

Differential Calculus: Mathematical functions and their types – linear, quadratic, polynomial; Concepts of limit and continuity of a function; Concept of differentiation; Rules of differentiation – simple standard forms. Applications of differentiation – elasticity of demand and supply; Maxima and Minima of functions (involving second or third order derivatives) relating to cost, revenue and profit.

Unit III

Uni-variate Analysis: Measures of Central Tendency including arithmetic mean, geometric mean and harmonic mean: properties and applications; mode and median. Partition values - quartiles, deciles, and percentiles. Measures of Variation: absolute and relative. Range, quartile deviation and mean deviation; Variance and Standard deviation: calculation and properties.

Unit IV

Bi-variate Analysis: Simple Linear Correlation Analysis: Meaning, and measurement. Karl Pearson's co-efficient and Spearman's rank correlation Simple Linear Regression Analysis: Regression equations and estimation. Relationship between correlation and regression coefficients

Unit V

Time-based Data: Index Numbers and Time-Series Analysis: Meaning and uses of index numbers; Construction of index numbers: Aggregative and average of relatives – simple and weighted, Tests of adequacy of index numbers, Construction of consumer price indices. Components of time series; additive and multiplicative models; Trend analysis: Finding trend by moving average method and Fitting of linear trend line using principle of least squares

Suggested Readings:

Text Books

1. N. D. Vohra.(2013) *Business Mathematics and Statistics*. [Reprint]. New Delhi, McGraw Hill Education (India) Pvt Ltd.

Reference Books

1. Mizrahi and John Sullivan. (2013). *Mathematics for Business and Social Sciences* [7th Edition] India, Wiley and Sons.
2. Budnick, P. (2011). *Applied Mathematics*.[4th Edition]. New Delhi, McGraw Hill Publishing Co.
3. J.K. Thukral. (2011). *Mathematics for Business Studies* [15th Edition]. Chennai, Mayur Publications
4. J. K. Singh. (2010). Business *Mathematics*. New Delhi, Himalaya Publishing House.
5. J. K. Sharma. (2013). *Business Statistics[*3rd Edition]. New Delhi, Pearson Education..
6. S.P. Gupta and Archana Gupta. (2013). *Elementary Statistics*. [7th Edition] New Delhi, Sultan Chand and Sons.
7. Richard Levin and David S. Rubin. (2015). *Statistics for Management*[7th Edition] New Delhi, Prentice Hall of India,.
8. M.R. Spiegel. (2013).*Theory and Problems of Statistics* [4th Edition] New Delhi,. McGraw Hill Publishing Co.

Semester II

16AEC201	**ENVIRONMENTAL STUDIES**	**L**	**T**	**P**	**C**
		4	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To understand the basic concepts of environment and ecosystem
2. To create the awareness the environmental problems among people.
3. To developing an attitude of concern for the environment and biodiversity and its conservation.
4. To know the environmental pollution, causes, effects and control measures of urban and industrial waste.
5. To study the special issue and the environment from unsustainable to sustainable development.
6. To be aware on environmental legislation.

Course Outcomes

Learners should be able to

1. Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
2. Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
5. To understood the environment ethics for climate change, global warming, acid rain and ozone layer depletion.
6. Identify the issues in Public awareness, Population growth, variation among nations

Unit-I

Introduction: Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

Unit II

Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources: Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fire works.

Unit III

Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV

Environmental Pollution: Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit V

Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

Suggested readings

T1**:** Tripathy.S.N. and Sunakar Panda. (2004). Fundamentals of Environmental Studies; 2nd Edition, Vrianda Publications Private Ltd., New Delhi.

T2: Arvind Kumar,(2004). A Textbook of Environmental Science; APH Publishing Corporation, New Delhi.

T3: P.S.Verma, V.K.Agarwal.(2001). Environmental Biology (Principles of Ecology); S.Chand and Company Ltd., New Delhi.

T4: Anubha Kaushik, C.P.Kaushik, (2004). Perspectives in Environmental Studies, New Age International Pvt. Ltd. Publications, New Delhi.

R1: Singh, M.P., B.S. Singh and Soma S. Dey, (2004). Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.

R2: Daniel B.Botkin and Edward A. Keller. (1995). Environmental Science, John Wiley and Sons, Inc., New York.

R3: Uberoi, N.K., (2005). Environmental Studies, Excel Books Publications, New Delhi, India.

Semester III

16ENU301	**ENGLISH III**	**L T P C**
		6 2 - 6

COURSE OBJECTIVES:

To make the students

1. To develop confidence to respond in English during situations where the use of English is imperative.
2. To develop fluency in actual conversation in the English language.
3. To develop knowledge about business communication.
4. To develop knowledge about business writing.
5. To acquire knowledge on communication for different purpose.
6. To get knowledge to communicate in day to affairs.

COURSE OUTCOMES:

Learners should be able to

1. Students learnt the basics and purposes of listening skill.
2. Students will know the importance of speaking.
3. Students developed the speaking skills on telephone, business and also in travel
4. Learnt some effective vocabulary learning strategies.
5. Students will able to communicate clearly and effectively and handle their day to day affairs well with their knowledge of language skills.
6. Students will have honed the skills of communication which is needed for business purpose.

UNIT I: Listening

Listening and its types, Basic Listening Lessons, Critical Listening Lessons, Advanced Listening Lessons, and Note Taking

UNIT II: Speaking

Basics of speaking, Regular English, Business English, Interview English, and Travel English

UNIT III: Reading

Reading and its purposes, Types of Reading, Reading Techniques, Reading Comprehension, Note Making

UNIT IV: Writing

Writing defined, Types of Writing, Components of Writing, Writing Contexts, Language and Style with accordance to the contexts

UNIT V: Vocabulary Enrichment

Synonyms, Antonyms, Homonyms, Phrasal Verbs, Idioms and Phrases, One Word Substitutes, and Affixes

Suggested Reading:

Learning to Learn: Study Skills in English Cambridge, 2015

Advanced Skills; Simon Harenes – CUP. 2015

Business Results, Woodward, OUP. 2015
Function in English. Jonathan Middlemiss et al, OUP

Semester III

16BPU301	**BUSINESS PROCESS SERVICES IN FINANCE AND ACCOUNTING**	**L T P C** **6 2 - 6**

COURSE OBJECTIVES:

To make the students

1. To understand the basic concepts business process organization and outsourcing.
2. To learn the process of regarding purchase management and distribution strategies.
3. To have an insight about receivable management.
4. To understand the concept of budgeting and ratio analysis.
5. To understand the various accounting standards applicable for BPO.
6. To understand the accounting procedure of BPO

COURSE OUTCOMES

Learners should be able to

1. The students will be familiarized with basic accounting principles for BPO.
2. The students will be capable of formulating and executing purchase order, distribution strategies and payment method.
3. The students will have in-depth knowledge on receivable management.
4. The students will be able to perform ratio analysis and will be capable of doing capital budget.
5. The exposure on basic accounting standards for BPO.
6. Apply accounting procedure in BPO

Unit I

Introduction: Basic Accounting Principles, Concept, Convention - Systems of Book Keeping - Recording, Classifying and Summarizing of Transaction - Final Accounts - Types of Business Organizations - Business Partnerships - Types of BPOs - Merits and De-Merits on various BPO options - Accounting Business Process Cycle - Evolving of Outsourcing - Need for outsourcing Horizontal Services - Current Trend in F&A Outsourcing.

Unit II

Purchase Management: Activities before Purchasing, Quotations, Negotiation, Costs associated with Purchases etc - How a Purchase Order is raised, types of Purchase Orders, Contracts etc., Warehouse Receipt procedures, Returns, Issues and various Documents - Accounting Impact -Inventory Control - Types of discount offered by Vendors - Basics of Distribution Strategies, Integration of Strategic Partnering, Outsourcing and Procurement Strategies Freight Negotiation, FTL, Payments, Conditions etc., Various Activities in Accounts Payable and Accounting Impact - Types of Invoice Matching and resolving issues - Invoice Payment, Procedures and Mode of payment - Employee Payment (T&E and Various Cards) - Debit Balance, Write back, Discount adjustments and various actions - Help desk and support Activities -Vendor Account Reconciliation - Latest developments (Vendor Portal, EDI, E-Invoicing, Tools etc.,) - Effective management of AP leads to working Capital improvement.

Unit III

Receivable Management: Various Activities in Accounts Receivable and Accounting Impact - Background check for Customers (D&B Report, Credit Rating) Credit Limit, Customer Contract / Order - Management) - Mode of receiving Payment, Actions for non-receipt, Netting off - Revenue Recognition - Collection - Cash Applications - Adjustment of Discounts, Rebate, QPS discount, Write off etc., - Disputes Handling procedures - Customer Help desk and support Activities - Customer Account Reconciliation - Latest Developments (Customer Portal, E-Invoicing, Tools etc.,) - Effective management of AR leads to working Capital improvement. Activities in General Ledger - What is Subsidiary and Control Accounts - Chart of Accounts and maintenance, Cost Centre, Profit Centre, - Adjustment journals - Cost Allocation etc. - Bank Reconciliation - Fixed Asset Maintenance - Inter Company - Accounting and Reconciliation - Tax Accounting - Transactional Element - Generation of Final Accounts - Various Reports (Statutory Reports, Schedules, Variance Analysis).

Unit IV

Budgeting and Ratio Analysis: Budgeting and Budgetary Controls - Capital Budgeting - Ratio Analysis - Process of Decison Making - Analysis of Financial Statements and Variances - Management Reporting - Modules and usage of ERPs - Basic Screens required to be understood for F&A process - 3. Report generation - XBRL, Platform, Counting, Data Privacy Law etc.

Unit V

Basics of Accounting Standard - Differences between various GAAPs (US, UK, Indian and IFRS) - COSO, Internal Controls & Audit, ISO Standards (applicable to BPO) / CMMI Certification.etc., - PCI Data Security Standard / Security Audit / Data Privacy and Protection SOX - Compliance / SSAE 16 /ISAE 3402 - SOD, Access, Incident Management, BCP etc., - How the various transaction flows are happening - BPO Terminologies - Importance of Process Documents Service Level Measurements Contractual elements - Governance model - Internal Reporting - Delivery Excellence - Integration of support functions - Future and Challenges

Note: This syllabus has 100% theory

Suggested Readings

Text Book

TCS BPS study material

16BPU302	**CORPORATE LAW**	**Semester III** **L T P C** **6 - - 4**

COURSE OBJECTIVES:
To make the students

1. To learn the basic concepts about the company formation and commencement.
2. To understand the legal documents like MOA.
3. To study the capital raising methods through shares and debentures.
4. To study the corporate structure and conducting general meetings and resolution.
5. To understand the process of winding up a company
6. To know the powers and duties of the company management.

COURSE OUTCOMES
Learners should be able to

1. The students will have the understanding about the company formation, incorporation and commencement.
2. The students will be able to draft MOA.
3. The students will be well-versed in issue of share and debentures.
4. The students will be able to appoint board of directors organize and conduct general meetings.
5. The students will be able to execute the process of winding up a company.
6. Manage the legal process of Documentation

UNIT I
Introduction to Company: Company – Definition – Characteristics – Types – Lifting of corporate veil - Formation of a company – Procedure – Certificate of Incorporation – Effects of Registration – Promoters – Pre-incorporation Contracts – Certificate of Commencement.

UNIT II
Company Documents: Memorandum of association – Contents – Alteration - Articles of Association – Contents – Alteration – Doctrine of Ultra Virus – Legal effect of Memorandum and Articles - Constructive Notice of Memorandum and Articles - Doctrine of Indoor Management

UNIT III
Shares and Debentures: Prospectus – Definition – Abridged Prospectus – Statement in Lieu of Prospectus – Information Memorandum – Contents – Misstatement in Prospectus – Issue of Shares – Types – Application and Allotment of Shares, Share Certificate, Share Warrant - Transfer and Transmission of Shares – Buyback of Shares – Debentures – Meaning and Types – Procedure for Declaration of Dividends.

UNIT-IV
Company Management: Company Management – Board of Directors – Managing Director – Qualification, Appointment, Vacation of Office – Position – Powers, Duties and Liabilities – Board of Director's Meetings – General Meetings – Kinds of Meetings and Resolutions –

Procedure relating to Convening and Proceedings in General Meetings.

UNIT-V

Company Winding up: Winding up – Meaning Modes of Winding up – Compulsory Winding up by the Court – Voluntary Winding up – Types of Voluntary Winding up – Members Voluntary Winding up – Creditors Voluntary Winding up – Winding up subject to Supervision of the Court – Consequences of Winding up (general).Liquidator – Powers and Duties. Limited liability Partnership-Definition- Features- Registration - E-filing.

Suggested Readings

Text Book

1. Kapoor N.D(2013), "Elements of Company Law", Sultan Chand and Sons, New Delhi.

References

1. Chawla R.C.and Garg K.C(2014),"Commercial and Company Law", Kalyani Publishers, New Delhi.
2. Kapoor N.D(2013) ,"Company Law and Secretarial Practice", Sultan Chand and Sons, New Delhi.
3. Ramaiya A(1998), "Guide to the Companies Act", Wadhwa and Co, Nagpur.

Semester III

		L	T	P	C
16BPU303A	**BUSINESS PROCESS SERVICES IN INSURANCE**	**6**	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To understand the concept of Risk, contract and insurance.
2. To understand the fundamental principles of life insurance.
3. To learn the non -life insurance concepts.
4. To learn to the nuances of health insurance.
5. To study the retirement plans and procedures at global level.
6. To know the life cycle of participants in a plan.

COURSE OUTCOMES

Learners should be able to

1. The students will be able to chart out the risk management in insurance.
2. The students will have theoretical base of life insurance.
3. The students will have an in-depth knowledge about non-life insurance.
4. The students will be able to understand health insurance concepts.
5. The students will have thorough knowledge about retirement plans.
6. Knowledge on various policies in insurance.

Unit I

Concept of Risk: Risk Management - Basic concepts (Hazards, Perils, Assets, etc.) - Fundamentals of Insurance - Characteristics of a valid contract - Insurance contract - Principles & Practices of Insurance Contract - Important terminologies & parties in insurance contract - Types of Insurance (Personal, Commercial, Health, Life, etc. - History of Insurance - Types of Insurance companies - Business units in an Insurance company - Overview of Insurance Life Cycle (Underwriting, Policy Servicing, Claims, etc.) - Reinsurance concept.

Unit II

Life Insurance : Important terminologies in a Life Insurance policy - Parties in a Life Insurance policy - Individual Life Insurance plans - Supplementary Benefits - Policy Provisions - Ownership rights - Life Insurance policy life cycle (New business & Underwriting, Policy servicing, Claims, etc.) - Concept of Annuity - Types of Annuity - Annuity contract provisions - Annuity : USA – Fixed Annuity, Fixed Index Annuity, Variable Annuity - Qualified & Non-Qualified Annuity - Principles of Group Insurance - Group Life Insurance - Group Retirement Plans

Unit III

Non – Life Insurance: concepts : Hazards, Perils, Catastrophe, Property Damage & Business Interruption, Policy exclusions, Indemnity, Deductibles, Retention, Premiums, Limits, Salvage, Subrogation, etc. - Insurance Providers – Co-Insurance, Reinsurance, Captive Insurance - Underwriting process - Policy Servicing process - Claims process – Reinsurance.

Unit IV

Health Insurance: Concept of Healthcare Insurance - How Healthcare Insurance works - Key Challenges of Healthcare Industry - Healthcare Eco System - Healthcare regulations & Standards ; HIPAA – Medicare – Medicaid – Mediclaim - Individual Health Insurance policies - Group Health Insurance policies - Managed Care – Eye Care – Micro Insurance Schemes

Unit V

Retirement Plans: Concept of Retirement Services - Retirement Planning - Asset Allocation & Asset Classes - Life stages of an Investor - Defined Benefit & Defined Contribution - Individual Retirement Arrangement in USA - Third Party Administrator for Retirement Services in USA - Life cycle of Participants in a plan (enrollment, contribution,etc.) - Categories of Pension in UK - DWP & TPR - Annuity & Income Drawdown Plan.

Suggested Readings

Text Book

TCS BPS study material

Semester III

		L	T	P	C
16BPU303 B	**FINANCIAL ANALYSIS AND REPORTING**	**6**	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To understand the basis of financial reporting
2. To understanding various financial statements and structure
3. To study the concepts of components of financial statements.
4. To impart analytical thinking for students to analyses and interpret financial statements.
5. To understand the analyses of annual report and study accounting standards.
6. To prepare Cash flow and fund flow statements.

COURSE OUTCOMES

Learners should be able to

1. The students will have the basic knowledge about financial reporting.
2. The students will have a complete the knowledge on preparation of financial statement.
3. The students thorough understanding about various components of financial statements.
4. The students will be able to critically analyze and interpret financial statements.
5. The students will have knowledge about accounting standards.
6. Preparation of statement of cash and fund flow.

Unit I

Basis of Financial Reporting: Purpose of Financial Reporting, Users of Financial Reports, Conceptual Framework for Financial Statements.

Unit II

Understanding Financial Statements Structure of Financial Statements: Introduction - Statement of Financial Position (Balance Sheet) - Statement of Earnings (Income Statement), - Cash Flow Statement - Additional Disclosure Statements Need for Additional Statements- Auditor’s Report - Director’s Report - Funds Flow Statement - Electronic Dissemination- Corporate Governance.

Unit III

Components of Financial Statements: Inventories – Receivables - Assets (Fixed Tangible, Intangible), Leases – Revenue - Income-Tax - Retained Earnings.

Unit IV

Analysis & Interpretation of Financial Statements: Ratio Analysis – Liquidity, Solvency, Activity & Profitability Analysis, Comparative & Common Size Analysis (Vertical & Horizontal Analysis) - Financial Statement Variation by Type of Industry.

Unit V

Expanded Analysis: Financial Ratios Used in Annual Reports, Management's Use of Analysis - Graphing Financial Information - Accounting Standards in India & IFRS Basic Framework.

Suggested Readings

Text Book

1. Grewal, T.S., (2013) *Introduction to Accounting*, S. Chand and Co., New Delhi.

Reference Books

1. Lal, Jawahar, *Corporate Financial Reporting: Theory & Practice*, (2012), Taxmann Applied Services, [3rd edition], New Delhi.
2. Raiyani, J. R. and Lodha, G., *(2012), International Financial Reporting Standard (IFRS) and Indian Accounting Practices*, New Century Publications.
3. Singh, N. T. and Agarwal, P., *(2010)*, *Corporate Financial Reporting in India*, Raj Publishing, Jaipur.
4. Hennie, V. G., (2009). *International Financial Reporting Standards: A practical guide*, [5th edition], Washington: World Bank.
5. Alexander, D., Britton, A. and A. Jorissen,(2011), *Global Financial Reporting and Analysis*,[3rd edition] Cengage Learning, Indian edition.

		Semester IV
		L T P C
16ENU401	**ENGLISH IV**	6 2 - 6

COURSE OBJECTIVES:

To make the students

1. To train students in understanding the concepts of communication.
2. To be familiar with the four basic skills of English.
3. To train students in developing their written communication.
4. To train students in developing their presentation skills.
5. To acquire the skill of making grammatically correct sentences.
6. To reflect originality on the application of soft skill views and express in writing their views.

COURSE OUTCOMES:

Learners should be able to

1. Students have acquired proficiency in communication.
2. Students have become adept in written communication and presentation skills.
3. Practice the skill of writing in English and that of public speaking.
4. Establish and maintain social relationships.
5. Develop communication skills in business environment.
6. Refine communication competency through LSRW skills.

UNIT I: Integrated Skills

Development of speaking, listening and grammar skills.

UNIT II: Advanced Reading Skills

Outcomes include improved reading speed, increased reading fluency and increased vocabulary.

UNIT III: Advanced Writing Skills

Planning and writing complex tasks

UNIT IV: News and World Affairs

Newspapers, magazines, the Internet, TV and radio are used to develop listening, reading and discussion skills.

UNIT V: Project Work

The class works together to write and produce a group project. This class is particularly useful for building confidence in using English and improving pronunciation.

Suggested Reading:

In Business; CUP

Oxford Handbook of Writing: St. Martins handbook of Writing

Sound Business. Julian Treasure OUP

Semester IV

L	T	P	C
5	-	-	5

16BPU401 CORPORATE ACCOUNTING

COURSE OBJECTIVES:
To make the students

1. To make the students learn the techniques of issue of shares and debentures.
2. To enable the students to prepare profit and loss a/c and balance sheet.
3. To understand amalgamation of companies.
4. To understand the concepts of corporate accounting.
5. To understand the different between banking and non-banking accounting system.
6. To prepare final accounts for corporates

COURSE OUTCOMES
Learners should be able to

1. The students will be able to raise capital through shares and debentures.
2. The students will be proficient in final accounts.
3. The students will have knowledge about amalgamation of companies.
4. The students will be able to prepare consolidated balance sheet by incorporating accounting standards.
5. The students will have knowledge on the different between banking and non- banking accounting system.
6. Enhance the problem-solving skills and analytical skills in the accounting context.

UNIT-I
Accounting for Share Capital and Debentures: Issue, forfeiture and reissue of forfeited shares - concept & process of book building - Issue of rights and bonus shares - Buyback of shares - Redemption of Preference shares Issue and Redemption of Debentures

UNIT-II
Final Accounts: Preparation of Profit and Loss Account and Balance Sheet of corporate entities – excluding calculation of Managerial Remuneration - Disposal of company profits.
Valuation of Goodwill and Valuation of Shares: Concepts and calculation: simple problem only

UNIT- III
Amalgamation of Companies: Concepts and Accounting treatment as per Accounting Standard: 14 (ICAI) (excluding inter- company holdings). Internal Reconstruction - Concepts and Accounting treatment excluding scheme of reconstruction

UNIT- IV
Accounts of Holding Companies/Parent Companies: Preparation of consolidated balance sheet with one subsidiary company - Relevant provisions of Accounting Standard: 21 (ICAI).

UNIT-V

Accounts of Banking Companies: Difference between balance sheet of banking and non-banking companies - Prudential norms - Asset structure of a commercial bank - Non-performing assets (NPA).

Suggested Readings:

Text Book:

1. Reddy & Moorthy. (2012) Corporate Accounting. [Vol. 1] Chennai , Margham Publications.

Reference Books

1.M.C. Shukla, T.S. Grewal, and S.C. Gupta. (2013) Advanced Accounts.[Vol.-II. – Revised Edition]. New Delhi, S. Chand & Co.

2.S.N. Maheshwari, and S. K. Maheshwari. (2013) Corporate Accounting [5th Edition] New Delhi, Vikas Publishing House.

3.V.K. Goyal and Ruchi Goyal. (2012) Corporate Accounting. [3rd Edition] New Delhi,. PHI Learning. Pvt Ltd.

4..Jain, S.P. and K.L. Narang. (2014) Corporate Accounting.[Vol – II] New Delhi, Kalyani Publishers,.

5.P. C. Tulsian and Bharat Tulsian. (2016), Corporate Accounting. [11th Edition] New Delhi, S.Chand.

Semester IV

L	T	P	C
3	-	-	1

16BPU411 CORPORATE ACCOUNTING (PRACTICAL)

COURSE OBJECTIVES:
To make the students

1. To make the students learn the techniques of issue of shares and debentures.
2. To enable the students to prepare profit and loss a/c and balance sheet.
3. To understand amalgamation of companies.
4. To understand the concepts of corporate accounting.
5. To understand the different between banking and non-banking accounting system.
6. To prepare final accounts for corporates

COURSE OUTCOMES:
Learner should be able to

1. The students will be able to raise capital through shares and debentures.
2. The students will be proficient in final accounts.
3. The students will have practical knowledge about amalgamation of companies.
4. The students will be able to prepare consolidated balance sheet by incorporating accounting standards.
5. The students will have practical knowledge on the different between banking and non-banking accounting system.
6. Enhance the problem-solving skills and analytical skills in the accounting context.

<u>LIST OF PRACTICAL</u>

1. Prepare Format and Procedure of Amalgamation Companies as per Accounting
2. Prepare Format and Procedure of Accounting for Holding Companies and parent Companies as per Accounting Standard 21
3. Prepare the procedure for valuation of Goodwill of companies under Accounting Standard 36.
4. Financial Reporting Standard (FRS) 10 – Valuation of Goodwill
5. Prepare final Accounts of Companies as per Accounting Standard
6. Accounting standard for Share
7. Accounting Standards for Debenture

Note: Record note to be submitted and Viva-voce will be conducted.
Suggested Readings:
Text Book:

1. Reddy & Moorthy. (2012) Corporate Accounting.[Vol.1] Chennai , Margham Publications,

Reference Books

1.M.C. Shukla, T.S. Grewal, and S.C. Gupta. (2013) Advanced Accounts.[Vol.-II. – Revised Edition]. New Delhi, S. Chand & Co.
2.S.N. Maheshwari, and S. K. Maheshwari. (2013) Corporate Accounting [5th Edition] New Delhi, Vikas Publishing House.
3.V.K. Goyal and Ruchi Goyal. (2012) Corporate Accounting. [3rd Edition] New Delhi,. PHI Learning. Pvt Ltd.
4..Jain, S.P. and K.L. Narang. (2014) Corporate Accounting.[Vol – II] New Delhi, Kalyani Publishers,.
5.P. C. Tulsian and Bharat Tulsian. (2016), Corporate Accounting. [11th Edition] New Delhi, S.Chand.

Semester IV

		L	T	P	C
16BPU402	**BUSINESS PROCESS SERVICES IN BANKING**	**6**	**2**	**-**	**6**

COURSE OBJECTIVES:
To make the students

1. To provide good understanding of overview of banking.
2. To enable the students to learn the basic of cards.
3. To make the students understand the basic knowledge of banking procedures.
4. To understand the process of cash management.
5. To understand various trade practices and banking operation.
6. To Critically evaluate the appropriate alternative products and services suitable for customer needs and draw a solution.

COURSE OUTCOMES
Learners should be able to

1. The students will be able to execute the banking operations.
2. The students will in depth knowledge about cards and its transactions procedure.
3. The students will have an acquittance of the banking procedure.
4. The students will be able to handle cash management and fund transfer.
5. The students will have basic knowledge of banking trade practices.
6. Comprehend and apply the laws related to banking.

Unit I
Overview of Banking: Functions and Products of a Bank - Liabilities—Deposits Assets-Loans and Advances – Payments - Risk Management - Financial Accounting - Customer Service Data&Voice, covering maintenance, disputes and complaints - Metrics management productivity, quality SLA Tracking and monitoring - Pricing methodologies available - Commonly available Certifications ISO-COPC-CMMI-PCI etc - Risks and Controls-AML-KYC-Info security etc. - Account Originations - Account Servicing - Issuer of Cheque Books/Cards Pins - AML/KYC Checks - Account Conversions and Closures - Customer Correspondence - ATM Management - Time Deposits – Placements – Maintenance – Breakage - Booking and Top up - Roll Over - Payment Processing - Retail Wealth Management - Mutual Fund processing – Equities – Bonds - Structured Notes - Corporate actions – Reconciliation - Risk -Control and Information Security.

Unit II
Basics of Cards: Types of Cards, transaction overview, components of Cards - Entities involved,

overview on associations – Originations - Policy, Account opening,dispatch,delivery,Card Maintenance - Payments - Concepts, applications, investigations, Statement validations - Products on Cards - Rewards programs, merchandising offers - Authorization and Risk reviews - Settlement lifecycle,authorisations,settlement and reconciliation - Accounting and Interchange settlement, settlements to associations - Parameter Design - Referral authorization - Financial Accounting - Bank A/c and payment Reconciliations - GL and ATM Reconciliations - Customer Relationship Management - Dispute Processing and Fraud Investigations - Collections including Data Review, Field Collections and A/c maintenances and Collection Audit.

Unit III

Procedures: Lead Generation - Regulation Requirements - Mortgage Originations - Sales/ New Application Management - Support and Settlement Services - Pre Underwriting, Underwriting - Verification and Closing - Quality Control and Repurchase - Mortgage Servicing - Customer Service - A/c Maintenance - Payment Processing - A/c Closure – Collection - Default Management - Front End Activities - Foreclosure and Loss Mitigation – Bankruptcy - Support functions - Quality Assurance - Domain Learning and Development - Regulatory Agencies.

Unit IV

Cash Management Overview: Cash Management Product Suite A Glance and Brief on all – products - Payments Life Cycle - Payments Originations and various products in Originations – phase - Introduction to Funds Transfer - Various types of Funds transfer(Clearing, Treasury Payments, Bills receivables, Collections, lockbox, loans/deposits - Bulk Remittances etc - Pre Funds Transfer - A/c Opening and Maintenance - Workflow Management - Funds Transfer – Payments - Instruction Acceptance - Payment Security - Call Back and Other Controls - Routing and Accounting Entries - Settlement and Payment Structuring - Various Clearing Systems –Overview - Post Funds Transfer - Nostro Reconciliations - Proofing - Investigations - Financial Messaging - Tracking - MIS and Treasury Reporting - Amendments and Collections - Risk management around payments- few case studies.STP Analysis and Improvements.

Unit V

Introduction to Trade : Parties & Terminology used in International Trade, Risks Associated & its mitigants, Role of banks & Documents in International Trade - Letter of Credit (L/C) – Parties to L/C & Types of L/C – Issuance, Advising, Amendment, Confirmation, Document Checking, Acceptance & Payment - Collection - Parties to Collection & Types of Collection - Document Checking, Acceptance & Payment - Method of Payment – Advance, Open Account, Documentary Collection & Documentary Credit - Guarantee / SBLC – Types of Guarantee – Issuance, Amendment, Claim / Settlement & Cancellation - Reimbursement – Authorization, Claim / Payment, Clean Payment, Irrevocable Undertaking, FI Advance - Loans & Finances - Syndicated Loans, Corporate Advances, Receivable Finance, Supplier Finance, Commodity Finance, Channel Finance & Bill Finance / Discounting - Basics and outline of UCP 600, ISBP, URC 522, URR 725, URDG and ISP98 - Value Added Services - After Service– Customer Service (Voice / Non-voice), Investigation, Reconciliation, Proofing & Reporting - Trade Compliance - Trade Advisory / Customer Owner - Overview on specialized training course for CDCS certification.

Suggested Readings

Text Book

TCS BPS study material

	Semester IV
	L T P C
16BPU403A RETAIL ENVIRONMENT FOR MARKET RESEARCH	**6 - - 4**

COURSE OBJECTIVES:
To make the students

1. To enable the students to understand the basic of market research.
2. To make the students understand the concepts of retail and segmentation.
3. To make the students understand various types of research and the concepts of marketing.
4. To impart the concept of product planning and consumer research the students.
5. To enable the students to understand the concepts of retail research.
6. To prepare retail and media research report.

COURSE OUTCOMES
Learners should be able to

1. The students will have the understanding of the importance of market research.
2. The students will have broader understanding of retailing.
3. The students will be able to decided on the type of research.
4. The students will be able to conduct consumer research and do product planning.
5. The students will able to design and conduct retail research.
6. Preparation of retail and media research report

Unit I
Introduction about Market Research: Market - Research - Market Research - Need for Market Research - Type of goods – CPG - Why CPG industry is different? Global CPG manufacturers - Consumer Behavior – Influencers.

Unit II
Retailing: Characteristics of Retailing - Retail formats - Overview to Retail functions - Global Retailers – Segmentation – Need for segmentation - Segmentation criteria - Types of Segmentation.

Unit III

Types of Research and Introduction to Marketing: Primary Research - Secondary Research - Custom Study - Syndicated Study - Quantitative Research Methodology - Qualitative Research Methodology - Research Types - Introduction to 4 Ps of Marketing - Optional Ps – Product – Price – Place - Promotion - Market Research and 4Ps

Unit IV

Product Planning and Consumer research: Product Planning - Product Mix - New Product Development - Product Life Cycle. - Branding - Brand Types - Private Labels - Brand association - Brand extension. - Advertising - Need for Advertising - Types of Media - Media Mix and Planning - What is Consumer Research? - Why research consumers? - Consumer Research Cycle - Consumer Research for new product launches - Consumer Research for existing products

Unit V

Retail Research: Need for Retail Research - Retail Data - Importance of Retail Data Validation - Retail Research reports. - Media Research – Importance of media research - Media Data - Importance of Media Data Validation - Media Research reports. - Consumer Panel - Importance of Consumer Panel - Consumer Panel Data - Panel Research reports.

Suggested Readings

Text Book

TCS BPS study material

Semester IV

		L	**T**	**P**	**C**
16BPU403B	**E-COMMERCE**	**6**	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To understand the basic concepts of e-commerce.
2. To understand be security process in e-commerce.
3. To enable the students the become familiar with IT Act and Cyber Crimes.
4. To enable the students to understand the e-payment system.
5. To learn to do online business transactions in e-commerce.
6. To gain knowledge on online portal and online learnings.

COURSE OUTCOMES

Learners should be able to

1. The students will have the understanding the basic of e-commerce
2. The students will be able to secure and encrypt e-commerce
3. The students will understand IT Act and Cyber Crimes.
4. The students will have the knowledge of e-payment system.
5. The students familiar with the mechanism of online business transaction through electronic means.
7. The students will have the knowledge online portal and online learnings.

Unit I

Introduction: Meaning, Nature, Concepts, Advantages, Disadvantages and Reasons for Transacting Online, Types of E-Commerce, e-Commerce Business Models (introduction , key elements of a business model and categorizing major E -commerce business models), Forces

Behind E-commerce Technology used in E-commerce: The Dynamics of World wide Web and Internet- Designing, Building and Launching E-commerce Website -A systematic Approach Involving Decisions Regarding Selection of Hardware, Software, Outsourcing vs. In-house Development of a Website

Unit II

Security and Encryption: Need and Concepts, The E-commerce Security Environment: - Dimension, Definition and Scope of E-security- Security Threats in the E-commerce Environment - Security Intrusions and Breaches, Attacking Methods like Hacking, Sniffing, Cyber-Vandalism etc.- Technology Solutions - Encryption, Security Channels of Communication, Protecting Networks and Protecting Servers and Clients

Unit III

IT Act 2000 and Cyber Crimes IT Act 2000: Definitions, Digital Signature, Electronic Governance, Attribution, Acknowledgement and Dispatch of Electronic Records, Regulation of Certifying Authorities, Digital Signatures Certificates, Duties of Subscribers, Penalties and Adjudication, Appellate Tribunal, Offences and Cyber-Crimes.

Unit IV

E-payment System: Models and Methods of E–payments - Debit Card, Credit Card, Smart Cards, E-money- Digital Signatures - Procedure, Working and Legal Position- Payment Gateways, Online Banking -Meaning, Concepts, Importance, Electronic Fund Transfer, Automated Clearing House, Automated Ledger Posting- Risks Involved in E-payments.

Unit V

On-line Business Transactions: Meaning, Purpose, Advantages and Disadvantages of Transacting Online, E-commerce Applications in Various Industries - Banking, Insurance, Payment of Utility Bills, Online Marketing, E-tailing - Popularity, Benefits, Problems and Features, Online Services - Financial, Travel and Career- Auctions, Online Portal, Online Learning, Publishing and Entertainment- Online Shopping (Amazon, Snapdeal, Alibaba, Flipkart,etc.)

Suggested Readings

Text Book

1. Kenneth C. Laudon & Carlo Guercio Traver, (2014), *E-Commerce*, Pearson Education.10th edition.

Reference Books:

1. Ravi Kalakota & Andrew b.Whinston , (2006), "*Frontiers of Electronic Commerce*", Dorling Kindersley (India) Pvt.Ltd.
2. David Whiteley, (2001), *E-commerce: Strategy, Technology and Applications*, McGraw Hill Education
3. Bharat Bhaskar, (2006), *Electronic Commerce: Framework, Technology and*

Application, [4th edition] McGraw Hill Education

Semester V

16BPU501A BUSINESS PROCESS SERVICES IN CAPITAL MARKETS	L	T	P	C
	6	2	-	6

COURSE OBJECTIVES:
To make the students

1. To acquaint the students with security markets
2. To familiars the students in understanding the concepts of investment.
3. To make them understand mutual fund and hedging.
4. To familiarize the students in understanding the concept of private equity.
5. To make the students know the basic of risk Management.
6. To participate in security market trading.

COURSE OUTCOMES
Learners should be able to

1. The students will be understanding the security market concepts.
2. The students will have understood the investments banking.
3. The students will have the knowledge of mutual fund and hedging.
4. The students will be acquainted with private equity.
5. The students will be able to handle the risk in investment.
6. Participate in security market trading.

Unit I
Securities: Types of Securities - Equities - Fixed Income & Govt. Securities - Derivatives - OTC Products - Participants in a Trade & Global Financial Markets - Financial Markets – Exchange - OTC Products and Financial Markets - Participants in a Trade - Overview of regulators & important regulations

Unit II
Investment Banking: Basics of Investment Banking-Trade Life Cycle - Clearing and Settlement - Securities Lending - Prime Brokerage - Collateral Management - Corporate Actions - Mandatory & Voluntary - Corporate Actions: How they affect securities.

Unit III
Mutual funds and Hedging: Mutual Funds - Transactions in Mutual Funds - Fund Expenses - Transfer Agency - Hedge Funds - Understanding Hedge Funds - Hedge Fund strategies.

Unit IV
Private Equity: Private Equity - Understanding Private Equity Operations - Fund Accounting & NAV calculations - Performance reporting - Reconciliations in Asset Management

Unit V
Risk Management: Counterparty Credit Risk Management - Market Risk Management

Suggested Readings

Text Book

Semester V

	L	T	P	C
16BPU501B ENTREPRENEURSHIP	6	2	-	6

COURSE OBJECTIVES:
To make the students
1. To learn to basic concept of entrepreneurship, netpreneurship and Eco-Preneurship.
2. To understand the MSME enterprises of business groups.
3. To make the students know the intuitional service to entrepreneurship.
4. To learn to sources of business ideas and test of feasibility.
5. To study the students in incentives and subsidies.
6. To Critically evaluate the appropriate alternatives available as entrepreneur and draw a solution.

COURSE OUTCOMES
Learners should be able to
1. The students will be understand the basic concepts of entrepreneurship, netpreneurship and ecopreneurs hip.
2. The students will have understood the MSME business groups.
3. The students will have the knowledge of intuitional services.
4. The students will have institutional finance to entrepreneurs.
5. The students will be able to handle the taxation benefits to SSI role of Entrepreneur.
6. Critically evaluate the appropriate alternatives available as entrepreneur and draw a solution.

Unit I
Introduction: Meaning, Elements, Determinants and Importance of Entrepreneurship and Creative behavior; Entrepreneurship and creative response to the society' Problems and at work; Dimensions of Entrepreneurship: Intrapreneurship, Technopreneurship, Cultural Entrepreneurship, International Entrepreneurship, Netpreneurship, Ecopreneurship, and Social Entrepreneurship.

Unit II
Entrepreneurship and Micro, Small and Medium Enterprises: Concept of business groups and role of business houses and family business in India; Role of Entrepreneurship in Economic Development; the contemporary role models in Indian business: their values, business philosophy and behavioural orientations; Conflict in family business and its resolution.

Unit III
Institutional services to entrepreneurship - DIC, SIDO, NSIC, SISI, SSIC, SIDCO – ITCOT, IIC, KUIC and Commercial bank.

Unit IV

Sources of Business ideas and tests of Feasibility: Institutional finance to entrepreneurs : IFCI, SFC, IDBI, ICICI, TIIC, SIDCS, LIC and GIC, UTI, SIPCOT – SIDBI, Commercial bank venture capital.

Unit V

Incentives and Subsidies – Subsidized services – subsidy for market. Transport – seed capital assistance - Taxation benefit to SSI role of entrepreneur in export promotion and import substitution

Text Books:

1. Vasant Desai. (2009). *Dynamics of Entrepreneurial Development and Management*, Mumbai, Himalaya Publishing House.

Reference Books:

1. Singh, Nagendra P.(2015). *Emerging Trends in Entrepreneurship Development*, New Delhi: ASEED.
2. Khanka. SS,(2007). *Entrepreneurial Development*, 4th Edition, S. Chand & Co, Delhi.
3. Ramachandran K,(2008). *Entrepreneurship Development*, New Delhi, McGraw-Hill Education
4. C.B.Gupta and N.P.Srinivasan,(2008). *Entrepreneurial Development,* 5th Edition, Sultan & Sons, Delhi.

Semester III

	L	T	P	C
16BPU502A **TAXATION**	5	-	-	5

COURSE OBJECTIVES:

To make the students

1. To learn to basic concept of taxation.
2. To understand the computation of income from salary.
3. To make the students know the different heads of incomes.
4. To study the students in GST concepts.
5. To provide basic knowledge and equip students with application of principles and provisions of customs law.
6. To be familiar with the laws pertaining to the Income Tax and apply it lifelong

COURSE OUTCOMES

Learners should be able to

1. The students will be understanding the basic concepts of income.
2. The students will have understood the income from salary.
3. The students will have the knowledge of the different heads of income.
4. The students understood the GST concepts.
5. The students will be understood the basic knowledge and equip students with application of principles and provisions of customs law.
6. Familiar with the laws pertaining to the Income Tax and its apply it lifelong

Unit I

Introduction: Basic Concepts - Income, Agricultural Income, Person, Assessee, Assessment Year, Previous Year, Gross Total Income, Total Income, Maximum Marginal Rate of Tax- Permanent Account Number (PAN) - Residential status- Scope of Total Income on the basis of Residential Status - Exempted Income Under Section 10.

Unit II

Computation of Income under Different Heads-1: Income from Salaries- Income from House Property.

Unit III

Computation of Income under Different Heads-2: Profits and Gains of Business or Profession- Capital Gains- Income from Other Sources.

Unit IV

Service Tax: Service tax –Concepts and General Principles - Charge of Service Tax and Taxable Services- Valuation of Taxable Services, Payment of Service Tax and Filing of Returns, Penalties, CENVAT Credit.

Unit V

Central Excise and Customs laws: Central Excise Law in Brief –Goods, Excisable Goods, Manufacture and Manufacturer, Valuation, CENVAT, Basic Procedures, Export, SSI, Job Work - Basic Concepts of Customs Law, Territorial Waters, High Seas, Types of Custom Duties – Basic, Countervailing & Anti-Dumping Duty, Safeguard Duty, Valuation, Customs Procedures, Import and Export Procedures – Baggage -Exemptions.

Suggested Readings

Text Book

1. Gaur and Narang (2016), *Income Tax Law and Practice*, Kalyani Publisher Luthiana, 4th Edition.

2. V.S.Datey, (2016) , *Indirect Taxes*, New Delhi, Taxman Publications (P) Ltd.,

References Books:

1. Singhania, Vinod K. & Monica Singhania, (2016), *Students' Guide to Income Tax*, University Edition.Taxmann Publications Pvt. Ltd., New Delhi., 54th Edition,

2. Ahuja, Girish & Ravi Gupta, (2016), *Systematic Approach to Income Tax*. Bharat Law House, Delhi. 35thEdition.
3. Sanjeev Kumar (2013) *Systematic Approach to Indirect Taxes* [10th Edition]. New Delhi, Bharat Law House Pvt. Ltd.
4. S. S. Gupta. Service Tax (2016)-*How to meet your obligation.* NewDelhi, Taxmann Publications Pvt. Ltd.,
5. Grish Ahuja and Ravi Gupta (2015), Indirect Taxes, [32nd Edition]. New Delhi, Flair Publication Pvt. Ltd.

Semester V

L	T	P	C
5	-	-	5

16BPU502B AUDITING

COURSE OBJECTIVES:

To make the students

1. To imparting knowledge about auditing principles.
2. To know the methods of auditing.
3. To understand the vouching of cash transactions.
4. To study the depreciation, reserves and provisions.
5. To learn the company audit and appointment and removal of auditor.
6. To know about the valuation of assets and liabilities.

COURSE OUTCOMES

Learners should be able to

1. The students will be understanding the about auditing principles.
2. The students will have methods of auditing.
3. The students will be understood the vouching of cash transactions.
4. The students will have the regarding depreciation, reserves and provisions.
5. The students will be understanding the company audit and appointment and removal of auditor.
6. The students will be able to evaluate the assets and liabilities.

UNIT I

Introduction to Auditing: Definition – General Objectives of Auditing – Advantages and Limitations of Auditing – Auditing and Investigation – Qualification of an Auditor.

UNIT II

Types of Audit: Continuous Audit – Final Audit - Interim Audit – Balance Sheet Audit – Merits and Demerits – Audit Procedure – Planning of Audit – Audit Programme – Audit Note Book – Audit Working Papers – Internal Control – Internal Check – Internal Checks as Regards Cash, Wages, Sales etc, – Position of External Auditors to Internal Audit - Revenue Audit and Concurrent Audit.

UNIT III

Vouching: Vouching of Cash Transactions – Trading Transactions – Impersonal Ledger – Definition, Nature and Scope of Internal Auditing- Auditor Position – Auditors Duty Regarding Depreciation, Reserves and Provisions.

UNIT IV

Verification and Valuation of Assets and Liabilities: – Auditor Position – Auditors Duty Regarding Depreciation, Reserves and Provisions.

UNIT V

Company Audit: Appointment and Removal of Auditor– Rights and Duties of Company Auditors - Liabilities – Audit of Share Capital and Share Transfer.

Suggested Readings

Text Book

1. B.N.Tandon. (2014) *Practical Auditing*. New Delhi: S.Chand & Company.

References

1. Saxena. R.G. Kuriakose. K.K. Venugopal. S. (2010).*Auditing Theory and Practicals*. Mumbai :Himalaya Publishing House.
2. Saxena (2011) *Principles and practices of Auditing*. Mumbai: Himalaya Publishing House.
3. Kamal Gupta. (2012) *Contemporary Auditing.* New Delhi : Tata McGraw-Hill Publishing Company Ltd.
4. M.S Ramasawamy. (2011).*Principles and Practices of Auditing*. New Delhi: Vikas Publishing House Pvt Ltd.

Semester V

	L	T	P	C
16BPU512A **TAXATION (PRACTICAL)**	-	-	3	1

COURSE OBJECTIVES:

To make the students

1. To imparting knowledge about auditing principles.
2. To understand the vouching of cash transactions.
3. To learn the company tax filing
4. To study the students in GST concepts.
5. To know the process of GST registration
6. To understand the filing of GST return

COURSE OUTCOMES

Learner should be able to

1. The students will be understood the calculation of TDS and E- filing
2. The students will be able to create login for e filing
3. The students will be understanding the tax return and ratifications of mistakes.
4. The students understood the GST concepts
5. The students will be able to register GST
6. The students will be able to filing of GST return

LIST OF PRACTICAL

1. Creation of login of e- filing

2. E- Filing of income tax returns,

2. Calculation of TDS

3. Provision and Procedures of VAT

4. Compulsory On-Line filing of returns for specified assesses.

5. Application for Getting PAN / TAN

6. E- payment of tax on total income and tax calculator

7. Submit returns or various forms

8. Rectification of Mistakes

9. ITR V Receipt Status

10. Outstanding tax demand and refund status

Suggested Readings

Text Book

1. Gaur and Narang (2016),“ *Income Tax Law and Practice*”, Kalyani Publisher Luthiana, 44th Edition.

References book:

1. Singhania, Vinod K. & Monica Singhania, (2016), *Students' Guide to Income Tax*, University Edition.Taxmann Publications Pvt. Ltd., New Delhi., 54th Edition,

2. Ahuja, Girish & Ravi Gupta, (2016), *Systematic Approach to Income Tax*. Bharat Law House, Delhi. 35thEdition.

Software

1. Vinod Kumar Singhania, e-filing of Income Tax Returns and Computation of Tax, Taxmann Publication Pvt. Ltd, New Delhi. Latest version
2. 'Excel Utility' available at incometaxindiaefiling.gov.in

Semester V

L	**T**	**P**	**C**
-	**-**	**3**	**1**

16BPU512B **AUDITING (PRACTICAL)**

COURSE OBJECTIVES:

To make the students

1. To understand and Analyse the Auditing standards and standards for the audit evidence
2. To classify and apply vouching, verification and valuation technique to appropriate situation
3. To study the depreciation, reserves and provisions.
4. To Preparation of internal check on trading transactions.
5. To know about the valuation of assets and liabilities.
6. To know the information related to audit reporting.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend and Analyse the Auditing standards and standards for the audit evidence.
2. Classify and apply vouching, verification and valuation technique to appropriate situation
3. The students will have the regarding depreciation, reserves and provisions.
4. Preparation of internal check on trading transactions.
5. The students will be able to valuate the assets and liabilities.
6. Reminiscence with statistics on audit reporting.

LIST OF PRACTICAL

1. Preparation of audit report
2. Preparation of procedure for vouching of cash transactions.
3. Preparation of vouching of impersonal leaders.
4. Auditor’s duty regarding deprecation, reserve and provisions.
5. Valuation of assets and liabilities.
6. Qualification of an auditor.
7. Preparation of company audit report.
8. Preparation of procedure for audit of share capital and share transfer.
9. Preparation of internal check on trading transactions.
10. Assume a company; prepare internal and external audit report.

Suggested Readings

Text Book

1. B.N.Tandon. (2014) *Practical Auditing*. New Delhi: S.Chand & Company.

References

2. Saxena. R.G. Kuriakose. K.K. Venugopal. S. (2010).*Auditing Theory and Practicals*. Mumbai :Himalaya Publishing House.
3. Saxena (2011) *Principles and practices of Auditing*. Mumbai: Himalaya Publishing House.
4. Kamal Gupta. (2012) *Contemporary Auditing.* New Delhi : Tata McGraw-Hill Publishing Company Ltd.

Semester V

16BPU503A	**MANAGING BUSINESS PROCESSES – I**	**L**	**T**	**P**	**C**
		6	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To equip the students with the knowledge of business processes in BPS industry.
2. To understand different methods used for mapping a process.
3. To understand different metrics used in BPS.
4. To understand quality management Techniques used in BPS.
5. To learn the defects management.
6. To know the basics and types of risks.

COURSE OUTCOMES

Learners should be able to

1. Students will understand the different process levels and working of BPS industry.
2. Students will learn to map the processes using different mapping tools.
3. Students will understand the different metrics used to measure the performance of project in BPS.
4. Students will be able to recognize different quality management techniques used in BPS.
5. Students will be able to defects management.
6. Students will be able to manage the risks.

Unit I

Introduction to Process Management: Process Definition - Recognition of Business Processes - Core Processes Vs Support Processes - Components of Process Management - Understanding Internal customer Vs End User

Unit II

BPO: BPO Overview - Outsourcing Environment - Need for Outsourcing - Business Processes outsourced to India - . BPS Life Cycle - Sales/Solutioning - Transition - Steady State - Value Creation.

Unit III

Overview of Metrics Management: Metrics Management - Service Level Agreements - Business Metrics Vs Operations Metrics - Target Setting

Unit IV

Mapping: Process Mapping Techniques - Process Levels - Process Mapping – Symbols, SIPOC - Kano Model - SIPOC Fundamentals - Customer Expectations in Business Process Outsourcing.

Unit V:

Introduction to Risk: Risk - Risk Types - Operational Risk - Information Security Risk - Financial Risk - Strategic Risk - Risk Mitigation Plans

Suggested Readings

Text Book

TCS study material

		Semester V
		L T P C
16BPU503B	**ADVERTISING**	6 - - 4

COURSE OBJECTIVES:

To make the students

1. To equip the students with the knowledge of basic concepts of advertising.
2. To learn the students of media decisions through advertising.
3. To know how to set the advertisement budget.
4. To understand the message development through creativity of advertisement.
5. To study the effectiveness of advertising process and techniques.
6. To learn the advertising agency and legal aspects of advertising.

COURSE OUTCOMES

Learners should be able to

1. Students will be understanding the knowledge of advertising.
2. Students will be having understood the media decisions through advertising.
3. Students will be able to set the advertisement budget.
4. Students will be able to development through creativity of advertisement.
5. Students will be able to the effectiveness of advertising process and techniques.
6. Able to understand the advertising agency and legal aspects of advertising.

Unit I

Introduction: Advertising-Meaning, Nature and Importance of Advertising - Types and Objectives - Audience Selection - Setting of Advertising Budget - Determinants and Major Methods.

Unit II

Media Decisions: Major Media Types - Their Merits and Demerits - Advertising Through Internet and Interactive Media-Issues and Considerations - Factors Influencing Media Choice - Media Selection, Media Scheduling.

Unit III

Message Development: Advertising Creativity - Advertising Appeals - Advertising Copy and Elements of Print Advertisement Creativity - Tactics for Print Advertisement.

Unit IV

Measuring Advertising Effectiveness: Arguments for and Against Measuring Effectiveness-Advertising Testing Process - Evaluating Communication and Sales Effects - Pre- and Post-Testing Techniques.

Unit V

Advertising Agency: Role, Types and Selection of Advertising Agency; Reasons for Evaluating Advertising Techniques. Social, Ethical and Legal Aspects of Advertising in India; Recent Developments and Issues in Advertisement.

Suggested Readings

Text Book:

1. Mahendra Mohan (2014). *Advertising Management*, [7th edition] Tata Mcgraw Hill Publishing

Reference Book

1. Belch and Belch, (2012). *Advertising and Promotion*, [9th edition], Tata McGraw Hill Co.
2. Sharma, Kavita, (2014). *Advertising: Planning and Decision Making*, Taxmann Publication Pvt. Ltd.
3. Burnett, Wells, and Moriatty, (2005). *Advertising: Principles and Practice*, [7th edition] Prentice Hall of India.
4. Terence A. Shimp, (2013). *Advertising and Promotion: An IMC Approach*, [9th edition] South Western, Cengage Learning.
5. O'Guinn, (2012). *Advertising and Promotion: [6th edition] An Integrated Brand Approach*, Cengage Learning. Note: Latest edition of text.

Semester V

16BPU504A	**CAMPUS TO CORPORATE TRANSITION**	**L T P C**
		6 2 - 6

COURSE OBJECTIVES:

To make the students

1. To equip students with the basic concepts of BPO industry.
2. To learn the students of differentiate campus and corporate.
3. To understand the corporate etiquettes.
4. To study the basic concepts of communication.
5. To learn the tips of interview skill and group discussion.
6. To know the difference between campus and corporate culture.

COURSE OUTCOMES

Learner should be able to

1. Students will be understanding the knowledge of BOP industry.
2. Students will be having understood the differentiate campus and corporate.
3. Students will be able to corporate etiquettes.
4. Students will be understood the communication.
5. Students will be the tips for interview and group discussion.
6. Students will be able to differentiate the campus and corporate culture

Unit 1

Introduction: Corporate Readiness - Overview of Corporate - History of Corporate –Overview of BPO Industry - History of BPO - Benefits of BPO - BPO Industry in World - BPO Industry in India - TCS BPO.

Unit II

Campus vs. Corporate: Difference between campus and corporate – Change management - Learn the Culture - Impact of your attitude and behavior - Consider the language – Establish and maintain relationship – Respect others - Be Confident - Keep on learning - Consider the body language.

Unit III

Corporate Etiquettes: Dressing and grooming skills - Workplace etiquette - Business etiquette - E-Mail etiquette - Telephone etiquette - Meeting etiquette - Presentation Skills - Professional Competencies - Analytical Thinking - Listening Skills - Time management - Team Skills – Assertiveness - Stress Management - Participating in Group Discussion - Interview facing – Ownership - Attention to Detail.

Unit IV

Introduction to Communication: Communication – Grammar – Phonetics – One on one basic conversation skill practice - Reading Comprehension - Listening Comprehension - Improving Vocabulary - Improving Writing Skills - Comprehension while interacting face to face.

Unit V

Tips for Interview: Recitation of short stories - Interview Skills - Group Discussion - Social Conversation Skills – Presentation - One Act Plays.

Suggested Readings

Text Book

TCS study material

Semester V

16BPU504B	**BUSINESS ETHICS**	**L**	**T**	**P**	**C**
		6	**2**	**-**	**6**

COURSE OBJECTIVES:
To make the students

1. To help to understand the importance of ethics in business.
2. To make students understand the ethical issues in HRM.
3. To provide good knowledge about the ethical issue in marketing strategy.
4. To acquaint a student with ethical issues in finance.
5. To inculcate the behavioural understanding of CSR.
6. To Critically evaluate the appropriate Marketing Strategy, Finance and provide suitable solution.

COURSE OUTCOMES
Learners should be able to

1. Students will be familiarized the concept of business ethics.
2. Students will be prepared to handled ethical issues in HRM.
3. Students will be prepared to handled ethical issues in marketing strategy.
4. Students will have understanding of ethical issues in finance.
5. The exposure given to them deal with CSR.
6. Critically evaluate the appropriate Marketing Strategy, Finance and provide suitable solution.

Unit I
Introduction to Business Ethics : Definition – Meaning – Nature and Objectives of Ethics, Factors Affecting business ethics – Ethical Organization – Characteristics of an Ethical Organisation - Corporate Moral Excellence –Corporate Citizenship, Theories of Ethics – Utilitarian, Separatist and Integrative view of Ethics; Stages of Ethical Consciousness in Business - Relationship between Law and Moral Standards.

Unit II
Ethical Issues in Human Resource Management: The Principle of Ethical Hiring – Equality of Opportunity – Ethics and Remuneration – Ethics in Retirement - Ethical Issues in Operation and Purchase Management –Quality Control - Ethical Problems and Dilemmas in Operations Management - Role of Purchase Manager – Code of Ethics for Purchases - Ethical Issues in Global buyer – Supplier Relationships.

Unit III
Ethical Issues in Marketing Strategy: Ethical Issues in Marketing Mix – Product – Price – Promotion – Place – Process – People – Physical Evidence - Ethical Issues and Consumerism – Consumer Protection- Consumer Welfare – Consumer Delight – Consumer Rights.

UNIT IV

Ethical Issues in Finance: Ethical issues in Mergers and Acquisitions – Hostile Takeovers – Insider Trading – Money Laundering; Ethical Issues in Accounting Professional Conduct of Accountants; Ethics and Financial Statements – Fictitious Revenues – Fraudulent Timing – Differences – Concealed Liabilities and Expenses – Fraudulent Disclosures and Omissions – Fraudulent Valuation of Assets – Ethical Auditing

UNIT V

Corporate Social Responsibility (CSR) : Meaning – Definition – Methods – Evaluation – Internal Stakeholders – Share holders – Employees – Management; External Stakeholders – Consumer – Suppliers – Creditors – Competitors – Community; Global and Local issues in Management – Black Money – Poverty – Child Labour – Gender equality and so on. Ethical issues in MNCs; Environmental Ethics – Environmental issues in India – Greening and Green initiatives – Sustainable development – Waste Management

Suggested Readings:

Text Book:

1. *Business Ethics and Corporate Governance*. (2003). Hyderabad, ICFAI Centre for Management Research,
2. A.C. Fernando, (2009). "Business Ethics – An Indian Perspective", Pearson Education, New Delhi.

Reference Books

1. John R Boatright (2009). *Ethics and the conduct of Business*, Pearson Education (Singapore) Pvt. Ltd. Indian Branch, Delhi.
2. Cyriac K. (2000), *Managerial Ethics and Social Issues – Reading and Cases*, Reading Material for Business Ethics, XLRJ Jamshedpur.
3. Fr. Mcgrarth, (2008), *SJ Basic Managerial Skills for all*, Prentice Hall of India, New Delhi.

Semester VI

L	T	P	C
5	-	-	5

16BPU601 A FINANCIAL MANAGEMENT

COURSE OBJECTIVES:

To make the students

1. To make the students understand principles of financial management
2. To enable the students to take investment decisions.
3. To help the students to make financial decisions.
4. To provide the students with the basic knowledge of Dividend decisions.
5. To impart knowledge of working capital and cash management.
6. To analyse cases in a team and exhibit leadership skills.

COURSE OUTCOMES

Learners should be able to

1. Students will be familiarized with basic concepts of financial management.
2. Students will know the technicalities of making investment decisions.
3. Students will be capable of making financing decisions.
4. Students will be familiarized with concepts of dividend decisions.
5. Students will be capable of making working capitalization and cash management.
6. Analyse cases in a team and exhibit leadership skills

UNIT- I

Introduction: Nature, scope and objective of Financial Management, Time value of money, Risk and return (including Capital Asset Pricing Model), Valuation of securities –Bonds and Equities.

UNIT- II

Investment Decision: The Capital Budgeting Process, Cash flow Estimation, Payback Period Method, Accounting Rate of Return, Net Present Value (NPV), Net Terminal Value, Internal Rate of Return (IRR), Profitability Index, Capital budgeting under Risk –Certainty Equivalent Approach and Risk-Adjusted Discount Rate.

UNIT-III

Financing Decision: Cost of Capital and Financing Decision: Sources of long-term financing Estimation of components of cost of capital. Methods for Calculating cost of Equity capital, Cost of Retained Earnings, Cost of Debt and Cost of Preference Capital, Weighted Average Cost of Capital (WACC) and Marginal cost of capital. Capital structure –Theories of Capital Structure (Net Income, Net Operating Income, MM Hypothesis, Traditional Approach). Operating and Financial Leverage. Determinants of Capital Structure.

UNIT-IV

Dividend Decisions: Theories for Relevance and Irrelevance of Dividend Decision for Corporate valuation; Cash and Stock Dividends; Dividend policies in practice

Unit V

Working Capital Decisions: Concepts of Working Capital - Risk-return trade off - Sources of short-term finance - Working Capital Estimation - Cash Management - Receivables Management - Inventory Management and Payables Management.

Suggested Readings:

Text Book:

1. S.N.Maheswari.(2014). *Financial Management- Principles and practices*, [14th Edition], New Delhi: Sultan Chand & Sons.

Reference Books:

1. James C. Van Horne and Sanjay Dhamija. (2012). *Financial Management and Policy* [12th Ed], New Delhi, Pearson Education.
2. Levy H. and M. Sarnat (2004). *Principles of Financial Management*, New Delhi, Pearson Education.
3. Joy, O.M.(2007). *Introduction to Financial Management*, New Delhi, TataMc Graw Hill Education
4. Singh, J.K .*Financial Management-text and Problems*, [2nd Ed] New Delhi, Dhanpat Rai and Company.
5. Rustagi, R.P. *Fundamentals of Financial Management*. New Delhi, Taxmann Publication Pvt. Ltd.
6. Pandey, I.M. *Financial Management.* [9th Edition]. New Delhi, Vikas Publications.

Semester VI

	L	T	P	C
16BPU601B HUMAN RESOURCE MANAGEMENT	5	-	-	5

COURSE OBJECTIVES:

To make the students

1. To make students understand the basic concept of human resource management.
2. To enable the students to understand the process of acquisition of Human Resource.
3. To make them understand to the importance and process of training and development.
4. To acquaint the students with knowledge of performance of appraisal.
5. To make the students understand the importance of employee welfare and grievance handling.
6. To know the methods of incentives and Wage payments.

COURSE OUTCOMES

Learners should be able to

1. Students will be familiarized with basic concept of HRM.
2. Students will be capable of acquiring human resource.
3. Students will be capable of organizing and conducting training and development programmes.
4. Students will have the sound knowledge of performance of appraisal system.
5. Students will be capable of handling grievances of employees and industrial disputes.
6. Students will have the sound knowledge of incentives and Wage payments.

Unit I

Introduction: Human Resource Management - Concept and Functions- Role - Status and Competencies of HR Manager - HR Policies - Evolution of HRM - HRM vs HRD. Emerging Challenges of Human Resource Management- Workforce Diversity - Empowerment; Downsizing – VRS - Human Resource Information System.

Unit II

Acquisition of Human Resource: Human Resource Planning-Quantitative and Qualitative dimensions - Job Analysis –Job Description and Job Specification - Recruitment –Concept and Sources - Selection –Concept and Process - Test and Interview - Placement and Induction

Unit III

Training and Development: Concept and Importance - Identifying Training and Development Needs - Designing Training Programmes - Role-Specific and Competency-Based Training - Evaluating Training Effectiveness - Training Process Outsourcing - Management Development - Career Development.

Unit IV

Performance Appraisal: Nature - Objectives and Importance - Modern Techniques of Performance Appraisal - Potential Appraisal and Employee Counseling - Job Changes - Transfers and Promotions – Compensation - Concept and Policies- Job Evaluation - Methods of Wage Payments and Incentive Plans - Fringe Benefits - Performance-Linked Compensation.

Unit V:

Maintenance : Employee Health and Safety - Employee Welfare - Social Security - Employer-Employee Relations-an Overview - Grievance Handling and Redressal - Industrial Disputes-Causes and Settlement Machinery.

Suggested Readings

Text Book

1. S.S.Khanka. (2014). *Human Resource Management*, New Delhi, Sultan Chand & Sons

Reference Books:

1. Gary Dessler. (2013). *A Framework for Human Resource Management*. 7th edition, Pearson Education.
2. DeCenzo, D.A. and S.P. Robbins. (2013). *Human Resource Management*, 11th edition, Pearson Education.
3. Bohlendar and Snell,(2010). *Principles of Human Resource Management*, 16th edition, Cengage Learning.

Semester VI

16BPU611A FINANCIAL MANAGEMENT (PRACTICAL)

L	T	P	C
-	-	3	1

COURSE OBJECTIVES:

To make the students

1. To make the students understand principles of financial management
2. To enable the students to take investment decisions by analyzing the risk return.
3. To help the students to make financial decisions.
4. To provide the students with the basic knowledge of Dividend decisions.
5. To impart knowledge of working capital and cash management.
6. To analyse cases in a team and exhibit leadership skills.

COURSE OUTCOMES:

Learners should be able to

1. Students will be familiarized with basic concepts of financial management.
2. Students will know the technicalities of making investment decisions.
3. Students will be capable of making financing decisions.
4. Students will be familiarized with concepts of dividend decisions.
5. Students will be capable of making working capitalization and cash management.
6. Analyse cases in a team and exhibit leadership skills.

LIST OF PRACTICAL

1. Preparation of capital budgeting process in an industry.
2. Evaluation of risk-return analysis of a company.
3. Estimation of components of cost of Capital of a new started business.
4. Evaluate theories of capital structure with an analysis of a company.
5. Comparison of IRR and NPV techniques of an organization.
6. Preparation of dividend policy in current corporate practice of a company.
7. Collection of difference source of long term and short term financing of a business unit.

8. Preparation of the principal yardsticks for measuring financial characteristics of investment proposal.
9. Evaluation of different methods used for ranking of investment proposal.
10. Choose any MNC and analyze the cost of capital and leverages.
11. Collection of the source of working capital of a new starting business.
12. Choose any company, Evaluate working capital management and give suitable suggestions.

Suggested Readings:

Text Book:

1. S.N.Maheswari.(2014). *Financial Management- Principles and practices*, [14th Edition], New Delhi: Sultan Chand & Sons.

Reference Books:

2. James C. Van Horne and Sanjay Dhamija. (2012). *Financial Management and Policy* [12th Ed], New Delhi, Pearson Education.
3. Pandey, I.M. *Financial Management.* [9th Edition]. New Delhi, Vikas Publications.

Semester VI

	L	T	P	C
16BPU611B HUMAN RESOURCE MANAGEMENT (PRACTICAL)	-	-	3	1

COURSE OBJECTIVES:

To make the students

1. To make students understand the basic concept of human resource management.
2. To enable the students to understand the process of acquisition of Human Resource.
3. To make them understand the to importance and process of training and development.
4. To acquaint the students with knowledge of performance of appraisal.
5. To make the students understand the importance of employee welfare and grievance handling.
6. To Evaluate effectiveness of Training Programme in Corporate Sector

COURSE OUTCOMES:

Learners should be able to

1. Students will be familiarized with basic concept of HRM.
2. Students will be capable of acquiring human resource.
3. Students will be capable of organizing and conducting training and development programmes.
4. Students will have the sound knowledge of performance of appraisal system.
5. Students will be capable of handling grievances of employees and industrial disputes.
6. Evaluate effectiveness of Training Programme in Corporate Sector

LIST OF PRACTICAL

1. Prepare a statement on Human Resource Policies in Service Sector
4. Prepare a Chart showing the functions of HRM and a brief explanation on the need for each function.
5. How do education institutions to prepare Human Resource Planning?
6. Preparation of a chart of job specification and job description.

7. Prepare an advertisement for recruitment / selection of candidates for any organization of your choice.
8. Collection of information about new recruitment sources.
9. Choose any MNC and present your observations on training programme.
10. Collect the information about how training is given to workers and managers
11. Evaluate effectiveness of Training Programme in Corporate Sector
12. Give different methods of incentive plans followed by any organization of your choice
13. Give observation report of industrial safety practices followed by any organization of your choice

Suggested Readings

Text Book

1. S.S.Khanka. (2014). *Human Resource Management*, New Delhi, Sultan Chand & Sons

Reference Books:

2. Gary Dessler. (2013). *A Framework for Human Resource Management*. 7th edition, Pearson Education.
3. DeCenzo, D.A. and S.P. Robbins. (2013). *Human Resource Management*, 11th edition, Pearson Education.
4. Bohlendar and Snell,(2010). *Principles of Human Resource Management*, 16th edition, Cengage Learning.

Semester VI

		L	T	P	C
16BPU602A	**COST AND MANAGEMENT ACCOUNTING**	**6**	**2**	**-**	**6**

COURSE OBJECTIVES:

To make the students

1. To acquaint the students with basic concepts used in cost accounting and material management.
2. To make the students understand the various cost involved the respect to labour and overheads.
3. To make the students analysis and interpret financial statement using ratio analysis.
4. To enable the students practice the preparation of cash flow and fund flow statement.
5. To provide the students knowledge about marginal costing and budgeting.
6. To gain a lifelong learning for applying the cost and management concepts in analyzing the business problems.

COURSE OUTCOMES

Learners should be able to

1. Students will have the knowledge about cost accounting and book keeping system.
2. Students will be capable of calculating wages and ascertaining overhead cost.
3. Students will have expertise in analyzing and interpreting financial statement.
4. Students will be capable of preparing cash flow and fund flow statements.
5. Students will have the understanding above marginal costing and budgeting.
6. Gain the lifelong learning of cost concepts and apply in the business environment.

Unit I

Cost Accounting: Definition, Meaning and objectives - Distinction between Cost and Financial Accounting. Elements of cost and preparation of cost sheets and tender. Management

Accounting - Definition and objectives - Distinction between management and financial accounting.
Materials: Stores Records - Purchase Order - Goods Received. Note - Bin Card - Stores Ledger - Purchase, Receipt and Inspection - Inventory Control. ABC Analysis - Economic Ordering Quantity - Maximum, Minimum and Reordering levels - Methods of Pricing Issued

Unit II
Labour: Importance of Labour Cost Control - Various Methods of Wage Payment - Calculation of wages - Methods of Incentive for Schemes.
Overheads: Factory, Administration, Selling and Distribution of overheads - Classification - Allocation and Apportionment-Redistribution (Secondary Distribution) - Absorption of Overheads including 'Machine Hour Rate'.

Unit III
Analysis and Interpretation of Financial Statements- Meaning – types of financial analysis – comparative statements – common size statements, - trend analysis. **Ratio Analysis:** Meaning, Objective, Limitation, Classification, Computation and Interpretation, Liquidity, Leverage Activity and Profitability Ratios. Return on Capital employed Computation and uses.

Unit IV
Funds Flow and Cash Flow Statement: Schedule of changes in working capital - Preparation of 'funds flow statement'-Preparation of 'Cash Flow Statement' - Importance of funds flow and cash flow Analysis - Difference between funds flow and cash flow - Ratio Analysis-Utility and limitations of Accounting.

Unit V
Marginal Costing: The Concept - Break Even Analysis - Break - Even Chart - Importance and assumptions - Application of Profit Volumes Ratio - Different types of problems (with special emphasis on decision making problems). Budget and Budgetary Control: Procedure and Utility - Preparation of different types of Budget including Flexible Budget.

Suggested Readings
Text Book

1. Jain and Narang, (2015) *Cost and Management Accounting*. [15th edition] Ludhiana Kalyani Publishers.

Reference Books:

1. Goel, Rajiv, (2012) *Management Accounting*. International Book House,
2. Arora, M.N. (2013), Management Accounting. [10th edition] Vikas Publishing House, New Delhi.
3. Maheshwari, S.N. & S.N. Mittal. (2013), *Management Accounting*. Shree Mahavir Book Depot, New Delhi.
4. Khan, M.Y. and Jain,P.K. (2008) *Management Accounting*. [3rd edition] McGraw Hill Education

Semester VI

		L	T	P	C
16BPU602B	**OFFICE MANAGEMENT AND SECRETARIAL PRACTICE**	**6**	**2**	**-**	**6**

COURSE OBJECTIVES:

To make the students

1. To make students understand the activities in office.
2. To acquaint students the communication procedures.
3. To understand the importance and uses of modern office equipment and audit process.
4. To acquire the knowledge of banking facilities.
5. To know the types of payment handled in office.
6. To make the students familiar with role and responsibility of secretary.

COURSE OUTCOMES

Learners should be able to

1. Students will be able to execute the activities involved in an office.
2. Students will be able to efficiently handle mail and mailing procedures.
3. The students will be capable of handling different office equipment.
4. Students will understand banking facilities.
5. Students will understand payment procedures.
6. Students will have an in-depth understanding about the roles and responsibilities of secretary.

Unit I

Office and Office Management: Meaning of office - Functions of Office – Primary and

Administrative Management Functions - Importance of Office - Duties of the Office Manager - - Qualities - Qualifications. Filing and Indexing: Filing and Indexing –Meaning and Importance - Essentials of Good Filing - Centralized vs. Decentralized Filing - Weeding of old records - Meaning and Need for Indexing - Types

Unit II

Mail and Mailing Procedures: Mailing Procedures – Meaning - Importance - Centralization of - Advantages - Room Equipment and Accessories - Sorting Tables and Rack, Letter Opener, Time and Date Stamps - Inward and Outward Mail – Distributing, Maintenance of Peon Book, Dispatching, Courier Services - Forms and Stationery **-** Office Forms –Meaning - Importance - Advantages - Disadvantages - Type - Factors Affecting Forms Design - Principles of Form Design - Form control. Stationery - Types of - importance - Selection of Stationery - Standardization of stationery.

Unit III

Modern Office Equipments: Modern Office Equipment – Meaning and Importance of Office Automation - Objectives– Advantages and Disadvantages - Factors Determining Office mechanization - Kind of office machines Personal computers – Photocopier – Fax – Telephone - Dictating machines - Audio Visual Aids. Budget: Budget - Annual, revised and estimated -. Audit: Audit process- Vouching - verification and valuation - Consumables/ Stock register and Asset register - Procedure for disposal of records and assets.

Unit IV

Banking Facilities: Types of accounts - Passbook and Cheque book - Other forms used in banks - ATM and money transfer - Abbreviations/Terms used in Offices: Explanation of abbreviations/terms used in offices in day-to-day work. Modes of Payment**: T**ypes of payments handled such as postal orders - Cheque (crossed/uncrossed) - post-dated and pre-dated Cheques - stale Cheque - dishonored Cheque.

UNIT V

Role of Secretary: Definition – Appointment - Duties and Responsibilities of a Personal Secretary - Qualifications for appointment as Personal Secretary - Modern technology and office communication – E - mail - Voice mail – Internet – Multimedia – Scanner - Video-conferencing - Web-casting - Agenda and Minutes of Meeting - Drafting, Fax-messages – E – mail - Maintenance of appointment diary.

Suggested Readings:

Text Book:

1. N.D. Kapoor (2014) *Company Law*. New Delhi, Sultan Chand and Sons

Reference Books

1. Bhatia, R.C. (2005) *Principles of Office Management* [1st Edition] New Delhi, Lotus Press.
2. Leffingwell and Robbinson (2003) *Text book of Office Management*. New Delhi, Tata

McGraw-Hill.

Semester VI

L	T	P	C
6	-	-	4

16BPU603A MANAGING BUSINESS PROCESSES – II

COURSE OBJECTIVES:

To make the students

1. To equip the students with the knowledge of business processes in BPS industry.
2. To understand different problem-solving techniques.
3. To understand different process improvement techniques.
4. To understand Six Sigma and its procedures.
5. To understand various risk in BPS industry.
6. To know the defect management.

COURSE OUTCOMES

Learners should be able to

1. Students will understand the different process levels and working of BPS industry.
2. Students will be able to understand different problem analyzing and solving techniques.
3. Students will be able to understand different techniques used to improve the business process.
4. Students will be introduced to Six Sigma quality improvement techniques and its role in sustaining quality.
5. Students will understand the different risk and ways of mitigating them in the BPS industry.
6. Students will be able to understand the defect management.

Unit I

Quality Management: Introduction to Quality Management - Quality Definition - Quality Control Vs Quality Assurance - International Quality Standards

Unit II

Transaction Monitoring: Transaction monitoring Process - Sampling inspection - Transaction monitoring cycle – Inspection – Feedback – RCA- Assurance

Unit III

Overview of Defects Management: Defects Management - Defect vs Defective - Opportunity - Definition,DPU/DPMO calculations - FPY & COQ - Value Stream Mapping - Standard Operating Procedures.

Unit IV

Problem Solving: Systematic Problem solving basics (P D C A) - Problem Solving Tolls – Brainstorming - Basic 7QC Tools - Why Why Analysis - FMEA(Process Failure Mode Effects Analysis).

Unit V

Process Improvement: Need for Process Improvement - Kaizen - Introduction to Lean Methodology - Introduction to Six Sigma methodology

Suggested Readings

Text Book
TCS study material

Semester VI

16BPU603B	**PERSONAL SELLING AND SALESMANSHIP**	**L**	**T**	**P**	**C**
		6	**-**	**-**	**4**

COURSE OBJECTIVES:
To make the students
1. To familiarize students with the fundamentals of personal selling.
2. To understand the process of buying and selling.
3. To make the students understanding concepts of motivation and the buying motives in personal selling.
4. To understand the process of selling.
5. To make the familiar with preparation of sales reports and documentation.
6. To Work in team and exhibit leadership skills

COURSE OUTCOMES
Learners should be able to
1. Students will have clarity in choosing sales as career option.
2. Students will have thorough knowledge about personal selling process.
3. Students will have understanding above motivation and buying motives.
4. Students will have a concrete knowledge on selling process.
5. Students will be able to prepare sales reports and documentation.
6. Work in team and exhibit leadership skills

Unit I
Introduction to Personal Selling: Nature and Importance of Personal Selling, Myths of Selling, Difference Between Personal Selling, Salesmanship and Sales Management - Characteristics of a Good Salesman - Types of Selling Situations - Types of Salespersons - Career Opportunities in Selling - Measures for Making Selling an Attractive Career.

Unit- II
Personal Selling- Preparation and Process: Introduction - Buying Decision Process - Buying Situations - Effective Communication Sales Knowledge and Sales Related Marketing Policies - The Sales Process - Transactional and Relationship Selling.

Unit- III
Buying Motives: Concept of motivation - Maslow's Theory of Need Hierarchy; Dynamic Nature of Motivation -Buying Motives and their uses in Personal Selling

Unit- IV
Selling Process: Prospecting and Qualifying; Pre-Approach – Approach - Presentation and Demonstration- Handling of Objections - Closing the Sale - Post Sales Activities.

Unit- V

Sales Reports: Reports and Documents - Sales Manual - Order Book - Cash Memo - Tour Diary - Daily and Periodical Reports - Ethical aspects of Selling

Suggested Readings

Text Books

1. Kapoor Neeru, (2012) *Advertising and personal Selling, [2nd edition]* Pinnacle, New Delhi.

Reference Books

1. Spiro, Stanton and Rich, (2012) *Management of the Sales force*, [12th edition] McGraw Hill.
2. Rusell, F. A. Beach and Richard H. Buskirk,(2013) *Selling: Principles and Practices*, McGraw Hill
3. Futrell, Charles, *Sales Management: Behaviour, Practices and Cases*, The Dryden Press.
4. Still, Richard R., Edward W. Cundiff & Norman A. P. Govoni,(2001) *Sales Management: Decision Strategies and Cases*, [5th edition] New Delhi, Prentice Hall of India Ltd.

Semester VI

L	**T**	**P**	**C**
6	**2**	**-**	**6**

16BPU604A MANAGERIAL ECONOMICS

COURSE OBJECTIVES:

To make the students

1. To enable the students to understand nature and scope of economics.
2. To make the students understand the production function and economics of scale.
3. To impart knowledge about the competition and its types.
4. To Understand the Concept of macroeconomic factors and its application in business.
5. To apply the macroeconomic factors that is applied for the lifelong decision related to individual and business.
6. To familiarized the concepts of monetary policy.

COURSE OUTCOMES

Learners should be able to

1. Students will have understanding about basic concept in economics.
2. Students will be able to ascertain the economics of scale.
3. Students will be familiarized with different competition.
4. Understand the Concept of macroeconomic factors and its application in business.
5. Apply the macroeconomic factors that is applied for the lifelong decision related to individual and business.
6. Students will have the knowledge of monetary policy.

Unit I

Introduction: Economics – Definition – Nature – Scope - Objectives of Firm – Social responsibilities of firm – Utility Analysis – Law of Diminishing Marginal Utility – Law of Equi-Marginal Utility. Demand – Meaning - Types- Demand Analysis --Indifference Curve Analysis – Elasticity of Demand – Consumer's Surplus.

Unit II

Production: Production – Factors of production – Production Function – Least Cost Combination – Laws of Returns – Law of Variable Proportions – Returns to Scale – Economies of Scale – Cost and Revenue concepts and curves.

Unit III

Types of Competition: Market – Meaning – Types – Equilibrium of the firm – Industry – Pricing under Perfect Competition –Monopoly – Price Discrimination – Pricing under Monopolistic Competition – Pricing under Oligopoly and duopoly.

Unit IV

Introduction to Macroeconomics: Definition- Basic issues studied in macroeconomics-National Income-concepts and measurement, Inflation-types- causes and controlling methods, Trade cycle-phases of trade cycle- Balance of Payments- Disequilibrium and correction.

Unit V

Monetary Policy: Money Functions of Money - Quantity Theory of Money - Determination of Money Supply and Demand- Credit Creation - Tools of Monetary Policy.

Suggested Readings:

Text Book

1. Sankaran (2013). *Indian Economy* Chennai, Margham Publication**.,**

Reference Books

1. Kaveri, Sudha Nayak, Girija and Meenakshi (2010)**,** Micro Economic Theory. New Delhi, Sultan Chand & Sons
2. Varshini and Maheswari (2013). Managerial Economics. New Delhi, S. Chand & Company.
3. M.L.Jhingan (2014). Microeconomic Theory, Vrinda Publications (P) Ltd

Semester VI

	L	T	P	C
16BPU604B **RETAIL MANAGEMENT**	6	2	-	6

COURSE OBJECTIVES:

To make the students

1. To introduce the concepts of retail business.
2. To make the students understand the evaluation of retailing.
3. To expose the students to the operation of retail business.
4. To provide exposure to pricing and promotion in retail.
5. To enable the students to understand the impact of information technology in retailing.
6. To know the social issues in retailing.

COURSE OUTCOMES

Learners should be able to

1. Students will be familiarized with retail business management.
2. Students will have knowledge about evaluation of retailing.
3. Students will be able to carryout the different operation in retail.
4. Students will be able to frame policy in promotion and manpower strategies.
5. Students will have and exposure on impact of information technology in retailing.
6. Students will be able to handle the social issues in retailing.

Unit I

Introduction To Retail Business : Retail Functions – Rise of Retailing – Consumerism – challenges – Consumer Proximity – Technology – Rise of Retailing in India – Key Markets – FDI in retail – Challenges in India – New Entrants – Emerging Sectors – Suppliers and buyers Rivalry.

Unit II

Evaluation Of Retailing : Theories – Retail lifecycle – Business Models – Ownership – Merchandise offered , Franchise, Non Store, Direct Marketing – Tele, Vending Machines, Kiosks, Cash and Carry Global Experience – Brand Management.

Unit III

Retail Operations: Factors influencing location of Store - Market area analysis – Trade area analysis – Rating Plan Method - Site evaluation. Retail Operations: Stores Layout and visual merchandising, Stores designing, Space planning, Inventory management, Merchandise Management, Category Management.

Unit IV

Retail Marketing Mix: Introduction -Product: Decisions Related to Selection of Goods (– Decisions related to Delivery of Service. Pricing: Influencing Factors – Approaches to Pricing –

Price Sensitivity - Value Pricing – Markdown Pricing. Place: Supply Channel – SCM Principles – Retail Logistics – Computerized Replenishment System – Corporate Replenishment Policies. Promotion: Setting Objectives – Communication Effects - Promotional Mix. Human Resource Management in Retailing – Manpower Planning – Recruitment and Training – Compensation – Performance Appraisal Methods

Unit V

Impact Of Information Technology in Retailing : Non store retailing (e-retailing) - The Impact of Information Technology in Retailing – Integrated Systems and Networking – EDI – Bar coding – Electronic Article Surveillance – Electronic Shelf Labels – Customer Database Management System. Legal Aspects in Retailing, Social Issues in Retailing, Ethical issues in Retailing.

Suggested Readings:

Text Book:

1.Pradhan Swapna. (2013). *Retail Management: Text and Cases* [4th Edition]. New Delhi, Tata Mcgraw Hill Education

2. J.N. Jain & P.P. Singh (2016), *Modern Retail Management*. New Delhi, Deep & Deep Publications.

REFERENCE BOOKS

1. Suja Nair.(2012) *Retail Management*. [First Edition]. New Delhi, Himalaya Publishing House

2. Barry Bermans and Joel Evans.(2012) *Retail Management – A Strategic Approach.* [8th edition] New Delhi, Prentice Hall of India.

3. A.J.Lamba, (2003.) *The Art of Retailing*[1st Edition]. New Delhi, Tata McGraw Hill.

4. Levy & Weitz (2013). *Retail Management* [9th Ed] New Delhi, Tata McGraw Hill

KARPAGAM ACADEMY OF HIGHER EDUCATION
DEPARTMENT OF COMMERCE
Candidates Admitted for the Batch 2016 – 2019 & Onwards
UG Degree-B.Com CA

Course code	Name of the course	Hrs / week	Marks			Exam (h)	Credit
			CIA	ESE	Total		
SEMESTER – I							
16LAU101	Language - I	06	40	60	100	3	6
16ENU101	English – I	04	40	60	100	3	4
16CCU101	Financial Accounting	05	40	60	100	3	5
16CCU111	Financial Accounting (Practical)	03	40	60	100	3	1
16CCU102	Introduction to Information Technology	05	40	60	100	3	5
16CCU112	Introduction to Information Technology (Practical)	03	40	60	100	3	1
16AEC101	Business Communication	04	40	60	100	3	4
	Semester total	**30**	**280**	**420**	**700**		**26**
SEMESTER – II							
16LAU201	Language - II	06	40	60	100	3	6
16ENU201	English - II	04	40	60	100	3	4
16CCU201	Business Law	04	40	60	100	3	4
16CCU211	Business Law (Practical)	04	40	60	100	3	2
16CCU202	Business Mathematics and Statistics	08	40	60	100	3	6
16AEC 201	Environmental Studies	04	40	60	100	3	4
	Semester total	**30**	**240**	**360**	**600**	**-**	**26**
SEMESTER – III							
16ENU301	English -III	08	40	60	100	3	6
16CCU301	Corporate Accounting	05	40	60	100	3	5
16CCU311	Corporate Accounting (Practical)	03	40	60	100	3	1
16CCU302	Object Orientated Programming with C++	04	40	60	100	3	4
16CCU312	Object Oriented Programming with C++ (Practical)	04	40	60	100	3	2
16CCU303A	A. Company Law	06	40	60	100	3	4
16CCU303B	B. Retail Management						
	Semester total	**30**	**240**	**360**	**600**	**-**	**22**
SEMESTER – IV							
16ENU401	English -IV	08	40	60	100	3	6
16CCU401	Cost Accounting	05	40	60	100	3	5
16CCU411	Cost Accounting (Practical)	03	40	60	100	3	1
16CCU402	Database Management System	04	40	60	100	3	4
16CCU412	Database Management System (Practical)	04	40	60	100	3	2
16CCU403A	A. Income Tax	06	40	60	100	3	4
16CCU403B	B. Stock Market Investments						
	Semester total	**30**	**240**	**360**	**600**		**22**

	SEMESTER – V						
16CCU501 A	A. Software Development with Visual Basic	04	40	60	100	3	4
16CCU501B	B. Principles of Marketing						
16CCU511A	A. Software Development with Visual Basic (Practical)	04	40	60	100	3	2
16CCU511 B	B. Principles of Marketing (Practical)						
16CCU 502A	A. Management Accounting	08	40	60	100	3	6
16CCU502 B	B. Indirect Tax Law						
16CCU 503A	A. Entrepreneurship	06	40	60	100	3	4
16CCU 503B	B. Advertising						
16CCU 504 A	A. Principles of Micro Economics	08	40	60	100	3	6
16CCU 504B	B. Business Ethics						
	Semester total	**30**	**200**	**300**	**500**	**-**	**22**
	SEMESTER – VI						
16CCU601A	A. Internet and Web designing	05	40	60	100	3	5
16CCU601B	B. International Business						
16CCU611A	A. Internet and Web Design (Practical)	03	40	60	100	3	1
16CCU611B	B. International Business (Practical)						
16CCU602 A	A. Office Management and Secretarial Practice	08	40	60	100	3	6
16CCU602B	B. Banking and Insurance						
16CCU603A	A. Fundamentals of Financial Management	06	40	60	100	3	4
16CCU603B	B. Personal Selling and Salesmanship						
16CCU604 A	A Indian Economy	08	40	60	100	3	6
16CCU604 B	B. Cyber Crimes and Laws						
	ECA / NCC / NSS / Sports / General interest etc						**Good**
	Semester total	**30**	**200**	**300**	**500**	**-**	**22**
	G. Total	**-**	**1400**	**2100**	**3500**		**140**

AECC: Ability enhancement compulsory course GE: Generic elective course; SEC: Skill enhancement course; DEC: Discipline specific elective

SKILL ENHANCEMENT COURSE

Semester	Subject Code	Skill Enhancement Course	Semester	Subject Code	Skill Enhancement Course
III	16CCU303A	Company Law	IV	16CCU403A	Income Tax
	16CCU303B	Retail Management		16CCU403B	Stock Market Investments

Semester	Subject Code	Skill Enhancement Course	Semester	Subject Code	Skill Enhancement Course
V	16CCU503A	Entrepreneurship	VI	16CCU603A	Fundamentals of Financial Management
	16CCU503B	Advertising		16CCU603B	Personal Selling and Salesmanship

DISCIPLINE SPECIFIC ELECTIVE

Semester	Subject Code	Discipline Specific Elective	Semester	Subject Code	Discipline Specific Elective
V	16CCU501A	Software Development with Visual Basic	VI	16CCU601 A	Internet and Web designing
	16CCU511 A	Software Development with Visual Basic Practical		16CCU611 A	Internet and Web designing - Practical
	16CCU501B	Principles of Marketing		16CCU601 B	International Business
	16CCU511 B	Principles of Marketing Practical		16CCU611 B	International Business Practical
	16CCU502A	Management Accounting		16CCU602 A	Office Management and Secretarial Practice
	16CCU502B	Indirect Tax Law		16CCU602 B	Banking and Insurance

GENERIC ELECTIVE

Semester	Subject Code	Generic Elective	Semester	Subject Code	Generic Elective
V	16CCU503A	Principles of Micro Economics	IV	16CCU604A	Indian Economy
	16CCU303B	Business Ethics		16CCU604B	Cyber Crimes and Laws

KARPAGAM ACADEMY OF HIGHER EDUCATION
COIMBATORE
SYLLABUS – B.COM (CA)
CANDIDATES ADMITTED FOR THE ACADEMIC YEAR 2016-2017 & ONWARDS

Semester I

பருவம் I

L	T	P	C
6	-	-	6

பகுதி - I, தமிழ்

16LAU101 : தமிழ் முதல் தாள்
(இளநிலை கலையியல் பட்ட வகுப்புகளுக்குரியது)

பாடத்திட்டப் பொதுநோக்கம்

1. கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
2. ஆய்வுநோக்கை மேம்படுத்துதல்.
3. இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
4. மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
5. வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
6. அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு - I : இக்கால இலக்கியம்: (20 மணிநேரம்)

கல்வி : மகாகவி பாரதியார் - சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணி தேசிய விநாயகம் -ஒற்றுமையே உயிர்நிலை
: கவிஞர் அப்துல்ரகுமான் - கால வழு
மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் - மலையாளக் காற்று கவிஞர் தாமரை -
மழைக்குறிப்பு
சூழலியல் : கவிஞர் வைதீஸ்வரன் -விரல் மீட்டிய மழை
பெண்ணியம் : கவிஞர் சுகந்தி சுப்பிரமணியம் - புதையுண்ட வாழ்க்கை கவிஞர் வைரமுத்து -
அம்மா
வாழ்க்கை : கவிஞர் தருமுசிவராம் - வாழ்வுப் பாடல்
இயற்கை : பாவேந்தர் பாரதிதாசன் - அழகின் சிரிப்பு - வான்.

அலகு - II : அற இலக்கியம்: **(15 மணிநேரம்)**

கொன்றை வேந்தன்: 1 - 50 பாடல்கள்

திருக்குறள்: பண்புடைமை, வினைத்திட்பம் -20 குறள்கள்

பழமொழி நானூறு: 5 பாடல்கள்

வேதநாயகம்பிள்ளை நீதிநூல்: 74 -78 பாடல்கள்

பெருவாயின் முள்ளியார் ஆசாரக்கோவை: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: **(15 மணிநேரம்)**

மூவருலா: 1-26 கண்ணிகள்

திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்

குற்றாலக்குறவஞ்சி: 5 பாடல்கள்

முக்கூடற்பள்ளு : 5 பாடல்கள்

கலிங்கத்துப் பரணி: போர்பாடியது- 9 பாடல்கள்

அலகு - IV : கட்டுரை: **(10 மணிநேரம்)**

1. உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்
2. கட்டிடக்கலை - அ.இராசமாணிக்கனார்
3. வாழ்க்கை -இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்

5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: (12 மணிநேரம்)

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. எழுத்து, சொல், பொருள் இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை - தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Semester I

L	T	P	C
4	-	-	4

16ENU101 **ENGLISH – 1**

(For all undergraduate students admitted from 2016 onwards)

COURSE OBJECTIVES:

1. To help students enhance their Language skills
2. To introduce different kinds of literary works
3. To familiarize different genres of Literature
4. To instruct moral values through literature.
5. To improvise their productive and receptive skills
6. To strengthen the basic knowledge about grammar

COURSE OUTCOMES:

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed.
6. Betterment of language competence

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT V

Short Story: The Bird – Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. *Spring* 2013**.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala, V. *English for Communication*. 2006. Emerald Publishers: Chenna

Semester I

		L	T	P	C
16CCU101	**FINANCIAL ACCOUNTING**	**5**	**-**	**-**	**5**

COURSE OBJECTIVES:

1. To provide theoretical knowledge on accounting practices
2. To develop the ability to use a basic accounting system to create (record, classify, and summarize)
3. To Develop the ability to use accounting concepts, principles for preparation of final accounts
4. To understand the concepts of accounting system for hire-Purchase and installment system
5. To understand and solve Accounts for Joint Venture-Consignment
6. To recognize Accounting concepts used in Partnership firms

COURSE OUTCOMES:

1. Attained the ability to use a basic accounting system
2. Able to use a basic accounting system
3. Achieved the ability to prepare of final accounts
4. Understood the concepts of accounting system for hire-Purchase and installment system
5. Understood the preparation of accounts for Joint Venture-Consignment
6. Recognized the accounting concepts for Goodwill and Calculation of Profit-Sharing Ratio

UNIT- I

Accounting information system: Users and their needs. Characteristics of accounting - Functions, Advantages and limitations of accounting. Branches of accounting. Bases of accounting: - Concepts and Conventions – Bases of Accounting – Accounting standards – Journal- Ledger – Subsidiary Books – Trial Balance.

UNIT- II

Business Income – Revenue Recognition – Depreciation – Methods – Straight line method – Diminishing Balance Method – Change in Method of Depreciation – Final Accounts – preparation of final accounts for non- corporate business entities

UNIT- III

Accounting for Hire-Purchase and installment system: Transactions, Journal entries and ledger accounts including Default and Repossession.

UNIT- IV

Accounting for Joint Venture-Consignment: Features, Accounting treatment in the books of the consignor and consignee. **Joint Venture:** Accounting procedures: Joint Bank Account, Records Maintained by Coventurer of (a) all transactions (b) only his own transactions. (Memorandum joint venture account).

UNIT- V

Accounting for Partnership: Valuation of Goodwill – Calculation of Profit Sharing Ratio – Admission - Retirement

Note: Distribution of marks - 20% theory and 80% problems

Suggested Readings:

Text Book

1. Reddy and Moorthy. (2013). *Financial Accounting* Chennai. Margham Publications.

Reference Book

1. M.C.Shukla, T.S. Grewal and S.C.Gupta. (2013).*Advanced Accounts*. [Vol.-I Revised Edition] New Delhi, S. Chand & Co.
2. S.N. Maheshwari, and. S. K. Maheshwari.(2012). *Financial Accounting*.[First Edition]. New Delhi, Vikas Publishing House.
3. Deepak Sehgal. (2014). *Financial Accounting*.[4th Ed]. New Delhi, Vikas Publishing House,
4. Tulsian, P.C. (2011). *Financial Accounting*, [4th Ed]. New Delhi, S.Chand Publishing
5. Compendium of Statements and Standards of Accounting. (2012). New Delhi, The Institute of Chartered Accountants of India.

Semester I

L	T	P	C
	-	4	2

16CCU111 FINANCIAL ACCOUNTING (PRACTICAL)

COURSE OBJECTIVES

1. To provide practical knowledge on accounting practices
2. To know the accounting through Tally
3. To learn and create company, single ledger and multiple ledger
4. To know and record vouchers
5. Learn how to prepare and maintain Trial Balance
6. Learn how to prepare and maintain the company's profit and loss account

COURSE OUTCOMES

1. Attained practical knowledge on accounting practices
2. Understood accounting through Tally
3. Learnt to create company, single ledger and multiple ledger
4. Understood how to create and record vouchers
5. Learnt to prepare and maintain Trial Balance
6. Learnt to prepare and maintain the company's profit and loss account

TALLY – PRACTICAL LIST

1. Create a new company in integrate accounts mode and account with inventory mode
2. Create a primary and subgroups using single or multiple ledger mode.
3. Create minimum 10 ledgers using single or multiple ledgers and alter and delete any 2 ledger.
4. Create a new company, ledger and record minimum 10 transactions with out adjustment.
5. Create a new company , ledger and record minimum 10 transactions with any five adjustments and display the relevant results.
6. Enter the following voucher
    - Payment vouchers
    - Receipt
    - Purchases
    - Sales
    - Credit note
    - Debit note
    - Journals
    - Memo
    - Optional
7. Prepare trail balance for the company
8. Prepare profit and loss account and balance sheet (with minimum of any 5 adjustments)

Suggested Readings:

Reference Books :

1. Shraddha Singh, Navneet Mehra**.** (2015) *Tally ERP 9: Power of Simplicity* [first edition]. New Delhi, V&S Publishers.
2. Nadhani. (2013). ***Tally9.2***. New Delhi, PBP Publication.
3. Rita Bhargava. (2011). ***Tally 9.2.*** New Delhi, Cyber media.

16CCU102	INTRODUCTION TO INFORMATION TECHNOLOGY	Semester I
		L T P C
		5 - - 5

COURSE OBJECTIVES:

1. To know about the various concepts of information technology
2. To enable the students to learn about the various operating system
3. To understand the various applications and information process using MS Word
4. To recognize and process MS Power point
5. To use and create various applications using MS Excel
6. To understand Internet and ECommerce

COURSE OUTCOMES:

1. Understood concepts of information technology
2. Learnt about the various operating system
3. Understood to use and process MS Word
4. Recognized to process MS Power point
5. Learnt to create various applications using MS Excel
6. Understood Internet and ECommerce

Unit I

Introduction to computers: definition, characteristics and limitations of computers – Components of Computer System – Elements of Computers – Hardware – Software – Input and Output devices – storage devices.

Unit II

Operating system: Operating systems – Meaning, Definition, Functions and Types of Operating Systems – Booting process – Disk Operating System: Internal and External Commands -wild card characters – Computer virus, Cryptology. Windows operating system – Desktop, Start menu, Control Panel, Windows Accessories.

Unit III

MS Office: Ms Word – Meaning – Word Processing – Meaning and Features of Word Processing – Advantages and Applications of Word Processing – Toolbars – Creating, Saving and Closing a document – Moving and copying text – Text and Paragraph formatting, Applying Bullets and Numbering.

Unit IV

Ms Excel: Meaning – Features of MS Excel – Insertion and Deletion of Worksheet – Entering and editing data in worksheet – Cell range – Formatting – Auto Fill – Formulas and its disadvantages.

MS Power Point: Meaning – Slides – Creation of Slides – Slide Sorter, Slide Show, Slide Number, Slide Design, Slide Layout, Slide Show – View Show Set up Show, Custom Animation, Slide Transition.

Unit V

Internet, E- Commerce and E-Mail: E-Commerce: Meaning, Advantages and limitations, Application of e-commerce – E-mail – Creation of e-mail Id – Group communication – Tele conferencing – Video Conferencing – File Exchange – Bandwidth – Modem – Network Topologies – Network Types LAN, MAN, WAN and their architecture – Dial Up access.

Suggested Readings:

Text Books:

1. Roger Hunt and John Shelley. (1988) *Computer and common sense-*, [4th Edition]. New Delhi, Prentice Hall of India.

Reference Books:

1. Rajaraman V. (2013). *Introduction to Information Technology*. [2nd Edition]. New Delhi, Prentice Hall of India.
2. ITL Education Solutions Ltd. (2007). *"Introduction to Information Technology"*[5th impression].New Delhi, Darling Kindersley India (p) Ltd
3. Deepak Bharihoke.(2012).*Fundamentals of Information Technology*. [Kindle Edition].New Delhi, Excel Books
4. Dr. Madhulika Jain. (2006). *Information Technology Concepts* New Delhi, BPB Publications, ,
5. Atul Kahate. (2007). *Information Technology*. [Third Edition]. New Delhi, Tata Mc Graw Hill Company
6. Turban Rainer Potter. (2006) *Introduction to Information Technology*. [Second Edition] Asia, Wiley

Semester I

16CCU112

INTRODUCTION TO INFORMATION TECHNOLOGY (PRACTICAL)

L	T	P	C
-	-	3	1

COURSE OBJECTIVES:

1. To provide basic training in MS Office
2. To gain the practical knowledge about MS word
3. To gain the practical knowledge about MS Excel
4. To create, add, delete slides using MS Power point
5. To insert the slides with animation effects
6. To manipulate the data base information

COURSE OUTCOMES:

1. Understood basic MS Office software
2. Gained practical knowledge about MS word
3. Gained practical knowledge about MS Excel
4. Learnt to create, add, delete slides using MS Power point
5. Learnt to create slides with animation effects
6. Recognized to manipulate the data base information

MS WORD

1. Type Chairman's Speech / Auditors report/ Minutes/ agenda and perform the following operations Bold, Underline, Font Size, Font Style, Background Color, text Color, Line Spacing, Spell Check, Alignment, Header and Footer, Inserting pages and page numbers, Find and replace.
2. Prepare an invitation for the College Function using Text boxes and Clip Arts
3. Design an invoice and Account Sales by using drawing tool bar, clip art, word art, symbols, borders and shading.
4. Prepare a class time table and perform the following operations
5. Inserting the table, data entry, alignment of rows and columns, inserting and deleting and change of table format.
6. Prepare a shareholders' meeting letter (notice) for 10 members using mail merge operation.
7. Prepare bio data by using wizard/ templates.

MS EXCEL

1. Prepare a mark list of your class (minimum 5 subjects) and perform the following operations
2. Data entry, total, average, result and ranking by using arithmetical, logical functions and sorting
3. Prepare final accounts (Trading Profit and Loss account and Balance Sheet) by using formula
4. Draw different types of charts (Line,. Pie, Bar) to illustrate yearwise performance of sales, purchase, profit of a company by using chart wizard.
5. Prepare a statement of Bank's customer account showing simple and compound interest calculations for 10 different customers using mathematical and logical functions
6. Prepare a product life cycle, which should contain the following stages
7. Introduction, growth, maturity, saturation and decline

MS POWERPOINT

1. Design Presentation slides for a product of your choice. The slides must include name, brand name, type of product, characteristics, special features, price, special offer etc, and Add voice if possible to explain the features of the product. The presentation should work in manual mode.
2. Design presentation slides for organisation details for five levels of hierarchy of a company using organisation chart
3. Design slides for the headline news of a popular TV channel. The presentation should contain the following transactions – Top down, Bottom up, Zoom in and Zoom out – The presentation should work in custom mode.
4. Design presentation slides about an organisation and perform frame movement by inserting clip arts to illustrate running of an image automatically
5. Design presentation slides for the seminar, lecture presentation using animation effect and perform the following operations: Creations of different slides, changing background color, font color, using word art.

MS ACCESS

1. Prepare a payroll for employee database of an organisation with the following details

1. Employee id, employee name, date of birth, department, designation, date of appointment, basic pay, dearness allowance, , House Rent allowance and other deductions if any. Perform quires for different categories
2. Create mailing labels for student database which should include atleast three table, must have atleast 2 fields with the following details :Roll no, name, course, year, college name, university, address, phone number
3. Gather price quantity and other descriptions for five products and enter in the access table and create an invoice in the form of design view.
4. Create forms for simple table ASSETS
5. Create report for the PRODUCT database.

Reference Books

1. June Jamrich Parsons.(2013)*Practcial Microsoft Office* 2013 [First Edition]. Boston, Cengage learning,
2. Dr. S. V. Srinivasa Vallabhan. (2011).*Computer Application in Business*[5th edition].New Delhi, Sultan Chand and Sons

Semester I

L	T	P	C
4	-	-	4

16AEC101 BUSINESS COMMUNICATION

COU

COURSE OBJECTIVES:

1. To provide an overview of Prerequisites to Business Communication.
2. To put in use the basic business letter writing concepts.
3. To understand business reports writing and its characteristics
4. To recognize resume preparation and details about interviews
5. Realize Speech. public speaking and business presentation
6. To impart knowledge about visual aids

COURSE OUTCOMES:

1. Learnt the Prerequisites of Business Communication.
2. Understood the basic business letter writing concepts.
3. Understood business reports writing and its characteristics
4. Recognize resume preparation and details about interviews and public speaking
5. Learnt about Speech and business presentation
6. Attained knowledge about visual aids

Unit I

Nature of Communication: Process of Communication, Types of Communication (Verbal & Non Verbal), Importance of Communication, Different forms of Communication; Barriers to Communication Causes, Linguistic Barriers, Psychological Barriers, Interpersonal Barriers, Cultural Barriers, Physical Barriers, Organizational Barriers

Unit II

Business Correspondence: Letter Writing, presentation, Inviting quotations, Sending quotations, Placing orders, Inviting tenders, Sales letters, Claim & Adjustment Letters and Social Correspondence, Memorandum, Inter -office Memo, Notices, Agenda, Minutes,

Unit III

Report Writing: Business Reports, Types, Characteristics, Importance, Elements of Structure, Process of Writing, Order of Writing, the Final Draft, and Check lists for Reports.

Unit IV

Application Letters – Preparation of Resume – Interview: Meaning – Objectives and Techniques of various types of Interviews – Public speech – Characteristics of a good Speech- Business Report Presentations.

Unit V

Oral Presentation: Importance, Characteristics, Presentation Plan, Power point presentation, Visual aids.

Suggested Readings:

Text Book:

1. Rajendra Pal Korahill, (2013). *Essentials of Business Communication* [11th Ed]. New Delhi, Sultan Chand & Sons.

Reference Books:

1. Bovee, and Thill. (2015). *Business Communication Today*.[13th Edition]. New Delhi, Pearson Education Publishing.
2. Shirley Taylor. (2012). *Communication for Business*. 7th Edition].New Delhi, Pearson Education Publishing.
3. Locker and Kaczmarek. (2013). *Business Communication Building Critical Skills*. [6th Ed]. New Delhi,TMH
4. Leena Sen. (2007). *Communication Skills*. [2nd Edition]. New Delhi, PHI Learning

Semester II

L	T	P	C
6	-	-	6

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)

பகுதி - I, தமிழ்

பருவம் II

16LAU201 : தமிழ் இரண்டாம் தாள்

(இளநிலை கலையியல் பட்ட வகுப்புகளுக்குரியது)

பாடத்திட்டப் பொதுநோக்கம்

1. கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
2. ஆய்வுநோக்கை மேம்படுத்துதல்.
3. இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
4. மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
5. வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
6. அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு - I : பக்தி இலக்கியம் **(10 மணிநேரம்)**

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு

1. **சைவம் -** பெரியபுராணம் - திருமூலநாயனார் புராணம்.
2. **வைணவம் -** பெரியாழ்வார் திருமொழி: 10 பாடல்கள்

அலகு - II : சங்க இலக்கியம் : **(25 மணிநேரம்)**

சங்க இலக்கியங்கள் அறிமுகம்

அ). **எட்டுத்தொகை**

நற்றிணை : 1. பிரசம் கலந்த - பாலை-110

2.தடமருப்பு எருமை- மருதம்-130

குறுந்தொகை :1. கருங்கட்டாக் கலை - குறிஞ்சி- 69

2. உள்ளது சிதைப்போர்- பாலை-283

ஐங்குறுநூறு : 1. நெய்தல்-தொண்டிப்பத்து: திரைஇமிழ் இன்னிசை-171

2. அன்னாய் வாழி வேண்டன்னை-203

பதிற்றுப்பத்து : 1. சிதைந்தது மன்ற-27

2. மீன்வயின் நிற்ப-90

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு:

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : 1.குறிஞ்சிக்கலி-சுடர்தொடீ -15

2. முல்லைக்கலி-தீம்பால் -11

அகநானூறு : 1.அன்னாய் வாழி வேண்டன்னை-குறிஞ்சி-17

புறநானூறு : 1. யாதும் ஊரே யாவருங் கேளிர்-பொதுவியல்-192

2.கெடுக சிந்தை கடிதிவள் துணிவே -279

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள்: சிறுதினை மலரொடு:218-275.

முருகன் அருள்புரிதல்: 286-295.

அலகு - III : காப்பியம் **(12 மணிநேரம்)**

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29) - கண்ணகியின் சிறப்பு: 'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி, 'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234) - சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485) - செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

சூளாமணி: மந்திர சாலைச் சருக்கம்

(தேர்ந்தெடுக்கப்பெற்ற 25 பாடல்கள்)

அலகு - IV : சிறுகதை **(15 மணிநேரம்)**

1. குளத்தங்கரை அரசமரம் -வ.வே.சு.ஐயர்
2. காட்டில் ஒரு மான் - அம்பை
3. நாற்காலி - கி.ராஜநாராயணன்
4. நகரம் - சுஜாதா
5. எஸ்தர் - வண்ண நிலவன்
6. மரப்பாச்சி - உமா மகேஸ்வரி

அலகு- V : மொழிப்பயிற்சி **(10 மணிநேரம்)**

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)

மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை - தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

SEMESTER II

L	T	P	C
4	-	-	4

16ENU201- Part II - English II
(For all undergraduate students admitted from 2016 onwards)

COURSE OBJECTIVES:

1. To enable the learners to acquire English language skills.
2. To familiarize them with English literature.
3. To attain basic knowledge on Grammar.
4. To help learners imbibe cultural values.
5. To gain knowledge of making correct sentences.
6. To reflect originality on the application of soft skills and express in writing their views.

COURSE OUTCOMES:

1. Acquire to enjoy the ecstasy of literature.
2. The select literary pieces will develop the confidence level of the learners.
3. Develop the social values.
4. Recognize the importance of communication
5. Get sound knowledge in English
6. Communicate well for business purpose.

UNIT I

Prose: The Unexpected- Robert Lynd
Poetry: The Village Schoolmaster – Oliver Goldsmith
Short Story: The Lion's Share – Arnold Bennett
Vocabulary: Homonyms
Grammar: Irregular Verb

UNIT II

Prose: Travel by Train – J. B. Priestley
Poetry: The Gift of India – Sarojini Naidu
Grammar: Sentence pattern

UNIT III

Prose: Women's Education is Almost More Important than the Education of Boys and Men – Indira Gandhi
Short Story: The Necklace – Guy De Maupassant
One-Act Play: The Referee – W.H. Andrews and Geoffrey Dearmer
Vocabulary: Similes
Grammar: Discourse Markers

UNIT IV

Poetry: Ozymandias – P.B. Shelley
One-Act Play: The Pot of Broth- W.B. Yeats
Vocabulary: Collective Noun
Grammar: Correction of Sentences

UNIT V

Short Story: The Silver Butterfly– Pearl S. Buck
One-Act Play: The Bear – Anton Chekov
Vocabulary: Acronym
Grammar: Question Tag

Prescribed Text:

Wings of Communication 2014. Board of Directors. Emerald Publishers: Chennai

Suggested Reading:

Syamala, V. *English for Communication*. 2006. Emerald Publishers: Chennai.

Semester II

L T P C

5 - - 5

16CCU201 BUSINESS LAW

COURSE OBJECTIVES:

1. To understand General principles of Indian Contract Act, 1872
2. To understand Specific contracts and Sale of goods act Indian Contract Act, 1872
3. To Understand Partnership Act, 1932
4. To Understand Limited Liability Partnership Act, 2008
5. TO impart Negotiable Instruments Act 1881
6. To know the Types of Negotiable Instruments

COURSE OUTCOMES:

1. Understood the General principles of Indian Contract Act, 1872
2. Understood Specific contracts and Sale of goods act Indian Contract Act, 1872
3. Understood Partnership Act, 1932
4. Understood Limited Liability Partnership Act, 2008
5. Attained Negotiable Instruments Act 1881
6. Realized Types of Negotiable Instruments

Unit I

The Indian Contract Act, 1872: General Principles of Contract- Contract – Meaning, Characteristics and Kinds- Essentials of a Valid Contract - Offer and Acceptance, Consideration, Contractual capacity, Free Consent, Legality of objects- Void Agreements- Discharge of a Contract – Modes of discharge, Breach and Remedies against breach of Contract- Contingent contracts- Quasi – Contracts.

Unit II

The Indian Contract Act, 1872: Specific Contracts - Contract of Indemnity and Guarantee- Contract of Bailment- Contract of Agency-The Sale of Goods Act, 1930 - Contract of sale, Meaning and difference between sale and agreement to sell-Conditions and warranties- Transfer of ownership in goods including sale by a non-owner- Performance of contract of sale- Unpaid seller – Meaning, Rights of an unpaid seller against the goods and the buyer.

Unit III

Partnership Laws: The Partnership Act, 1932- Nature and Characteristics of Partnership- Registration of a Partnership Firms- Types of Partners- Rights and Duties of Partners- Implied Authority of a Partner- Incoming and outgoing Partners- Mode of Dissolution of Partnership.

Unit IV

The Limited Liability Partnership Act, 2008: Salient Features of LLP- Differences between LLP and Partnership, LLP and Company- LLP Agreement,- Partners and Designated Partners- Incorporation Document- Incorporation by Registration- Partners and their Relationship.

Unit V

The Negotiable Instruments Act 1881: Meaning, Characteristics, and Types of Negotiable Instruments: Promissory Note, Bill of Exchange, Cheque-Holder and Holder in Due Course, Privileges of Holder in Due Course. Negotiation: Types of Endorsements- Crossing of Cheque-Bouncing of Cheque

Suggested Readings:

Text Book:

1. Kapoor N.D.2014). *Elements of Mercantile Law*. New Delhi, S.Chand & Co,

Reference Books:

1. M.C. Kuchhal, and Vivek Kuchhal. (2013). *Business Law*, New Delhi, Vikas Publishing House.
2. SN Maheshwari and SK Maheshwari. (2011). *Business Law*. New Delhi, National Publishing House.
3. Agarwal, S K, (2005). *Business Law*. New Delhi, Galgotia Publishers Company.
4. P C Tulsian and Bharat Tulsian. (2000), *Business Law*, New Delhi, McGraw Hill Education
5. Sharma, J.P. and Sunaina Kanojia. (2011). *Business Laws*. New Delhi, Abe Books Pvt. Ltd.,.

16CCU211 **BUSINESS LAW (PRACTICAL)** **L T P C**

3 - - 1

COURSE OBJECTIVES:

1. Helps to acquire in depth knowledge in Indian Contract Act
2. Helps to acquire in depth knowledge of agreements Indian Contract Act
3. To demonstrate unlawful agreements, contracts
4. Helps the students to get more knowledge on basics of Partnership Act
5. To let know the partnership features
6. Helps to provide enough knowledge on Negotiable Instrument Act

COURSE OUTCOMES:

1. Helps to acquire in depth knowledge in Indian Contract Act
2. Helps to acquire in depth knowledge of agreements Indian Contract Act
3. To demonstrate unlawful agreements, contracts
4. Helps the students to get more knowledge on basics of Partnership Act
5. To let know the partnership features
6. Helps to provide enough knowledge on Negotiable Instrument Act

List of Practical

1. Prepare a presentation on offer and acceptance of Contract
2. A Contract is void without Consideration – Give a Presentation
3. Discuss in group on the following
   a. unlawful agreements
   b. Contractual Capacity
   c. Breach of contract
   d. Remedies for Breach of Contract
   e. Contract of sale
   f. Conditions and Warranties

4. Design Presentation slides on the following topics
   a. Registration of a Partnership firm
   b. Rights and Duties of Partner
   c. Implied Authority of partner
   d. Mode of dissolution of Partner
   e. Limited Liability partnership agreement
   f. Incorporation by Registration
   g. Incorporation Document

h. Partners and their relations

5. Design Slides on negotiable instruments

a. Essential requisites of Negotiable Instruments
b. Promissory Note
c. Bill of Exchange
d. Cheque
e. Holder in due course
f. Negotiation
g. Types of Endorsement
h. Crossing of Cheque

Note: Record note to be submitted and Viva-voce will be conducted.

Suggested Readings:

Text Book:

1. Dr. M. R. Sreenivasan. (2013). *Business Law* [Fifth Revised and Enlarged Edition] Chennai, Margham Publications.

2. Kapoor N.D.(2014). *Elements of Mercantile Law*. New Delhi., S.Chand & Co,

Reference Books:

1 .M.C. Kuchhal, and Vivek Kuchhal. (2013). *Business Law*, New Delhi, Vikas Publishing House.

2. SN Maheshwari and SK Maheshwari. (2011). *Business Law*. New Delhi, National Publishing House.

3. Agarwal, S K, (2005). *Business Law*. New Delhi, Galgotia Publishers Company.

4. P C Tulsian and Bharat Tulsian. (2000), *Business Law*, New Delhi, McGraw Hill Education

Semester II

16CCU202 **BUSINESS MATHEMATICS AND STATISTICS**

L	T	P	C
6	2	-	6

COURSE OBJECTIVES :

To make the students

1. To understand the concept of matrices
2. To acquire the knowledge of differential calculus
3. To know the concepts of central tendency and dispersion
4. To understand the correlation and regression concepts
5. To be aware of the index numbers and trend analysis
6. To Demonstrate capabilities as problem-solving, critical thinking, and communication skills related to the discipline of statistics.

COURSE OUTCOMES:

Learners should be able to

1. Utilize the concept of matrices, differential calculus to solve business problems
2. Calculate and apply the measure of central tendency and dispersion in decision making.
3. Evaluate the relationship and association between variables to formulate the strategy in business.
4. Apply the concept of index numbers and trend analysis in business decisions.
5. Demonstrate capabilities as problem-solving, critical thinking, and communication skills related to the discipline of statistics.
6. Analyze problems in economics, business, and accounting to determine appropriate methods for solving them using business math concepts and applications.

UNIT- I: Matrices & Basic Mathematics of Finance

Definition of a matrix. Types of matrices; Algebra of matrices. Calculation of values of determinants up to third order; Adjoint of a matrix; Finding inverse of a matrix through ad joint; Applications of Matrices to solution of simple business and economic problems- Simple and compound interest Rates of interest – Nominal, effective and continuous – their interrelationships; Compounding and discounting of a sum using different types of rates

UNIT-II: Differential Calculus

Mathematical functions and their types – linear, quadratic, polynomial; Concepts of limit and continuity of a function; Concept of differentiation; Rules of differentiation – simple standard forms. Applications of differentiation – elasticity of demand and supply; Maxima and Minima of functions (involving second or third order derivatives) relating to cost, revenue and profit.

UNIT-III: Uni-variate Analysis

Measures of Central Tendency including arithmetic mean, geometric mean and harmonic mean:

properties and applications; mode and median. Partition values - quartiles, deciles, and percentiles. Measures of Variation: absolute and relative. Range, quartile deviation and mean deviation; Variance and Standard deviation: calculation and properties.

UNIT-IV: Bi-variate Analysis

Simple Linear Correlation Analysis: Meaning, and measurement. Karl Pearson's co-efficient and Spearman's rank correlation Simple Linear Regression Analysis: Regression equations and estimation. Relationship between correlation and regression coefficients

Unit V: Time-based Data: Index Numbers and Time-Series Analysis

Meaning and uses of index numbers; Construction of index numbers: Aggregative and average of relatives – simple and weighted, Tests of adequacy of index numbers, Construction of consumer price indices. Components of time series; additive and multiplicative models; Trend analysis: Finding trend by moving average method and Fitting of linear trend line using principle of least squares

Suggested Readings:

Text Books

1. N. D. Vohra.(2013) *Business Mathematics and Statistics*. [Reprint]. New Delhi, McGraw Hill Education (India) Pvt Ltd.

Reference Books

1**.** Mizrahi and John Sullivan. (2013). *Mathematics for Business and Social Sciences* [7th Edition] India, Wiley and Sons.

2. Budnick, P. (2011). *Applied Mathematics*.[4th Edition]. New Delhi, McGraw Hill Publishing Co.

3.. J.K. Thukral. (2011). *Mathematics for Business Studies* [15th Edition]. Chennai, Mayur Publications

4..J. K. Singh. (2010). Business *Mathematics*. New Delhi, Himalaya Publishing House.

5. J. K. Sharma. (2013). *Business Statistics[*3rd Edition]. New Delhi, Pearson Education..

6. S.P. Gupta and Archana Gupta. (2013). *Elementary Statistics.* [7th Edition] New Delhi, Sultan Chand and Sons.

7. Richard Levin and David S. Rubin. (2015). *Statistics for Management*[7th Edition] New Delhi, Prentice Hall of India,.

8. M.R. Spiegel. (2013).*Theory and Problems of Statistics* [4th Edition] New Delhi,. McGraw Hill Publishing Co.

Semester II

16AEC201 ENVIRONMENTAL STUDIES

L	T	P	C
4	-	-	4

COURSE OBJECTIVES

1. To know the importance of environmental studies and methods of conservation of natural resources.
2. To describe the structure and function of an ecosystem and explain the values and Conservation of bio-diversity.
3. To explain the sources, environmental effects and control measures of various types of pollutions.
4. To select the appropriate methods for waste management.
5. To recall social issues and legal provision and describe the necessities for environmental act.
6. To recognize Population explosion

COURSE OUTCOMES

1. At the end of the course, students would be able to Know the importance of environmental studies and methods of conservation of natural resources.
2. Describe the structure and function of an ecosystem and explain the values and Conservation of bio-diversity.
3. Explain the sources, environmental effects and control measures of various types of pollutions.
4. Select the appropriate methods for waste management.
5. Recall social issues and legal provision and describe the necessities for environmental act
6. Recognized Population explosion

UNIT I:

Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

UNIT II

Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources : Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fire works.

UNIT III

Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV

Environmental Pollution - Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution , Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

UNIT V:

Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

SUGGESTED READINGS

T1: Tripathy.S.N. and Sunakar Panda. 2004. Fundamentals of Environmental Studies; 2nd Edition, Vrianda Publications Private Ltd., New Delhi.

T2: Arvind Kumar, 2004. A Textbook of Environmental Science; APH Publishing Corporation, New Delhi.

T3: P.S.Verma, V.K.Agarwal. 2001. Environmental Biology (Principles of Ecology); S.Chand and Company Ltd., New Delhi.

T4: Anubha Kaushik, C.P.Kaushik, 2004. Perspectives in Environmental Studies, New Age International Pvt. Ltd. Publications, New Delhi.

R1: Singh, M.P., B.S. Singh and Soma S. Dey, 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.

R2: Daniel B.Botkin and Edward A. Keller. 1995. Environmental Science, John Wiley and Sons, Inc., New York.

R3: Uberoi, N.K., 2005. Environmental Studies, Excel Books Publications, New Delhi, India.

16ENU301 **ENGLISH III**

Semester - III

(For all undergraduate students admitted from 2016 onwards)

L	T	P	C
6	2	-	6

COURSE OBJECTIVES:

1. To develop confidence to respond in English during situations where the use of English is imperative.
2. To develop fluency in actual conversation in the English language.
3. To develop knowledge about business communication.
4. To develop knowledge about business writing.
5. To acquire knowledge on communication for different purpose.
6. To get knowledge to communicate in day to affairs.

COURSE OUTCOMES:

1. Students learnt the basics and purposes of listening skill.
2. Students will know the importance of speaking.
3. Students developed the speaking skills on telephone, business and also in travel
4. Acquired knowledge on effective vocabulary learning strategies.
5. Students will able to communicate clearly and effectively and handle their day to day affairs well with their knowledge of language skills.
6. Students will develop knowledge about business writing.

UNIT I: Listening

Listening and its types, Basic Listening Lessons, Critical Listening Lessons, Advanced Listening Lessons, and Note Taking

UNIT II: Speaking

Basics of speaking, Regular English, Business English, Interview English, and Travel English

UNIT III: Reading

Reading and its purposes, Types of Reading, Reading Techniques, Reading Comprehension, Note Making

UNIT IV: Writing

Writing defined, Types of Writing, Components of Writing, Writing Contexts, Language and Style with accordance to the contexts

UNIT V: Vocabulary Enrichment

Synonyms, Antonyms, Homonyms, Phrasal Verbs, Idioms and Phrases, One Word Substitutes, and Affixes

Suggested Reading:

Learning to Learn: Study Skills in English Cambridge, 2015

Advanced Skills; Simon Harenes – CUP. 2015

Business Results, Woodward, OUP. 2015

Function in English. Jonathan Middlemiss et al, OUP

Semester III

L	T	P	C
5	-	-	5

16CCU301 **CORPORATE ACCOUNTING**

COURSE OBJECTIVES:

1. To enable the students to acquire the basic knowledge of the corporate accounting
2. To provide the knowledge on issue of shares
3. To teach the students about under writing and redemption of sharb debentures
4. To know the accounting treatment for profit prior to incorporation
5. To gain the amalgamation and absorption procedures of acompany
6. To understand the concepts of liquidation

COURSE OUTCOMES

1. Attained the knowledge on corporate accounting
2. Secured the knowledge on issue of shares
3. Secured knowledge about under wring and redemption of preference shares & debentures
4. Understood the accounting treatment for profit prior to incorporation
5. Gained the concepts of amalgamation and absorption procedures of a company
6. Understood the concept of Liquidation

UNIT-I

Accounting for Share Capital and Debentures: Issue, forfeiture and reissue of forfeited shares - concept & process of book building - Issue of rights and bonus shares - Buyback of shares - Redemption of preference shares Issue and Redemption of Debentures

UNIT-II

Final Accounts: Preparation of profit and loss account and balance sheet of corporate entities – excluding calculation of managerial remuneration - Disposal of company profits. **Valuation of Goodwill and Valuation of Shares:** Concepts and calculation: simple problem only

UNIT- III

Amalgamation of Companies: Concepts and accounting treatment as per Accounting Standard: 14 (ICAI) (excluding inter- company holdings). Internal reconstruction - concepts and accounting treatment (excluding scheme of reconstruction)

UNIT- IV

Accounts of Holding Companies/Parent Companies: Preparation of consolidated balance sheet with one subsidiary company - Relevant provisions of Accounting Standard: 21 (ICAI).

UNIT-V

Accounts of Banking Companies: Difference between balance sheet of banking and non-banking companies - Prudential norms - Asset structure of a commercial bank - Non-performing assets (NPA).

Suggested Readings:

Text Book:

1. Reddy & Moorthy. (2012) *Corporate Accounting*. [Vol. 1] Chennai , Margham Publications,

Reference Books

1. M.C. Shukla, T.S. Grewal, and S.C. Gupta. (2013) *Advanced Accounts*.[Vol.-II. – Revised Edition]. New Delhi, S. Chand & Co.

2. S.N. Maheshwari, and S. K. Maheshwari. (2013) *Corporate Accounting*[5th Edition] New Delhi, Vikas Publishing House.
3. V.K. Goyal and Ruchi Goyal. (2007) *Corporate Accounting*. [3rd Edition] New Delhi,. PHI Learning.
4. Jain, S.P. and K.L. Narang. (2014) *Corporate Accounting*.[Vol – II] New Delhi, Kalyani Publishers,.
5. P. C. Tulsian and Bharat Tulsian. (2016), *Corporate Accounting*. [11th Edition] New Delhi, S.Chand.

Semester III

L	T	P	C
3	-	-	1

16CCU311 CORPORATE ACCOUNTING (PRACTICAL)

COURSE OBJECTIVES:

1. To enable the students to acquire the basic knowledge on the application of accounting standards for amalgamation
2. To make the students to learn the techniques and application of accounting standards in the preparation of financial statements
3. To make the students understand the procedure of Goodwill of companies
4. To make the students well versed about Final account preparation
5. To generate knowledge about accounting standard for share trading
6. To generate knowledge about Accounting Standards for Debenture

COURSE OUTCOMES:

1. To enable the students to acquire the basic knowledge on the application of accounting standards for amalgamation
2. To make the students to learn the techniques and application of accounting standards in the preparation of financial statements
3. To make the students understand the procedure of Goodwill of companies
4. To make the students well versed about Final account preparation
5. To generate knowledge about accounting standard for share trading
6. To generate knowledge about Accounting Standards for Debenture

List of Practical

1. Prepare Format and Procedure of Amalgamation Companies as per Accounting
2. Prepare Format and Procedure of Accounting for Holding Companies and parent Companies as per Accounting Standard 21
3. Prepare the procedure for valuation of Goodwill of companies under Accounting Standard 36.
4. Financial Reporting Standard (FRS) 10 – Valuation of Goodwill
5. Prepare final Accounts of Companies as per Accounting Standard
6. Accounting standard for Share
7. Accounting Standards for Debenture

Note: Record note to be submitted and Viva-voce will be conducted.

Suggested Readings:

Text Book:

1. Reddy & Moorthy. (2012) *Corporate Accounting*. [Vol. 1] Chennai , Margham Publications,

Reference Books

1. M.C. Shukla, T.S. Grewal, and S.C. Gupta. (2013) *Advanced Accounts*.[Vol.-II. – Revised Edition]. New Delhi, S. Chand & Co.

2. S.N. Maheshwari, and S. K. Maheshwari. (2013) *Corporate Accounting*[5th Edition] New Delhi, Vikas Publishing House.

3. V.K. Goyal and Ruchi Goyal. (2007) *Corporate Accounting*. [3rd Edition] New Delhi,. PHI Learning.
4. Jain, S.P. and K.L. Narang. (2014) *Corporate Accounting*.[Vol – II] New Delhi, Kalyani Publishers,.
5. P. C. Tulsian and Bharat Tulsian. (2016), *Corporate Accounting*. [11th Edition] New Delhi., S.Chand.

Semester III

L	T	P	C
4	-	-	4

16CCU302 OBJECT ORIENTED PROGRAMMING WITH C++

COURSE OBJECTIVES

1. To familiarize the students with the fundamental conceptsof C++
2. To enhance the knowledge about loops and arrays in C++.
3. To obtain an execution pattern of control functions andstructure and unions in C++.
4. To gain the knowledge about Pointers in C++
5. To gain the knowledge about Arrays in C++
6. To obtain the knowledge about file processing in C++.

COURSE OUTCOMES

1. Recognized the fundamental concepts of C++.
2. Understood the execution pattern of loops and arraysin C++.
3. Enhance the knowledge about control functions and structure and unions in C++.
4. Obtained the knowledge about Pointers in C++
5. Obtained the knowledge about Pointers in C++
6. Developed the knowledge about file processing in C++.

UNIT I

Principles of Object- Oriented Programming – A Look at Procedure and Object - Oriented Paradigm – Basic Concepts of Object – Oriented Programming – Benefits of Oop – Object-Oriented Languages – Applications of Oop . Beginning with C++ - What is C++? – Applications of C++ - C++ Statements – Structure of C++ Program.

UNIT II

Tokens, Expressions and Control Structures – Tokens – Keywords – Identifiers – Basic & User – Defined Data Types – Operators in C++ - Operator Over Loading – Operator Precedence – Control Structures – Functions in C++ - The Main Function – Function Prototyping – Call By Reference – Return By Reference – In Line Functions – Function Over Loading – Friend and Virtual Functions.

UNIT III

Classes and Objects – Introduction – Specifying a Class – Defining Member Function – Nesting of Member Functions – Private Member Functions – Arrays within a Class- Static Data Members – Static Member Functions – Array of Objects – Objects as Function Arguments – Friendly Functions – Pointers to Members. Constructors & Destructors – Constructors – Copy Constructors – Dynamic Constructors – Construction Two- Dimensional Arrays – Destructors.

UNIT IV

Operator Over Loading -Type Conversion – Introduction – Defining Operator Over Loading – Over Loading Unary & Binary Operators – Over Loading Binary Operators using Friends – Manipulation of String Using Operators – Rules for Over Loading Operators – Types – Conversions – Inheritance – Extending Classes – Defining Derived Classes – Single, Multi Level Multiple, Hierarchical & Hybrid Inheritance – Virtual Base Classes – Abstract Classes.

UNIT V

Pointers, Virtual Functions & Polymorphism – Pointers to Object - Pointers to Derived Classes – Virtual Functions .Working with Files – Classes for File Stream Operations – Opening and Closing a File – File Pointers & their Manipulations - Sequential I/O Operations.

Suggested Readings:

Text Book:

1. E.Balagurusamy (2013) *Object Oriented Programming With C++* [6th Edition] New Delhi, Tata Mcgraw Hill Publishing Company Ltd, ,

Reference Books :

1. K.R Venu Gopal, Raj Kumar, T.Ravishankar (1998). *Master In C++”*. New Delhi, Tata Mcgraw Hill Publishing Company Ltd
2. D.Ravichandran. (2010) Programming *with C++* [3rd Edition]. New Delhi, Tata Mcgraw Hill Publishing Company Ltd,2010,.

Semester III

	L	T	P	C
16CCU312 OBJECT ORIENTED PROGRAMMING WITH C++ (PRACTICAL)	-	-	4	2

COURSE OBJECTIVES

1. To familiarize the students with the programming concepts of C++
2. To famialrize the creation of Objects and Classes
3. To uderstand the concept of overloading
4. To know the concept of ineritance
5. To uderstand the concept of console Input/Output
6. To identify the concept of file in CPP

COURSE OUTCOMES

1. Understood the programming concepts of C++
2. Famialrized creation of Objects and Classes
3. Uderstood the concept of overloading
4. Understood the concept of ineritance
5. Understood the concept of console Input/Output
6. Identified the concept of file in CPP

Object and Classes

1. Create an class to implement the data structure STACK . Write a constructor to initialize the top of the STACK to zero. Write a member function PUSH () to insert an element and a member function POP () to delete an element. Check for over flow and under flow conditions

2. Create a class ARITH which consists of FLOAT and an INTEGER variable. Write member function ADD () SUB (), MUL (), DIV () MOD () to perform addition, subtraction, mulplication, division and modulus respectively. Write member functions to get and display MAT () object values.

Operator Overloading

3. Create a class "MAT" as a 2D matrix and R, C represents rows and columns of the matrix. Overload the operators +-* t add, subtract, multiply 2 matrices. Write member functions to get and display MAT () object values.

4. Create a class STRING. Write member function to initalise to get and display strings. Overload the operator + to concatenate two strings, == to compare 2 string and a member function to find the length of the strings.

Inheritance

5. Create a class which consist of EMPLOYEE details like eno, ename, dept, basic salary and grade. Write member function to get and display them. Derive a class PAY from the above class and write member function to calculate DA, HRA, PF depending on the grade and display the payslip in a neat format using console I/O.

6. Create a class SHAPE whicb consist of two virtual functions CAL_Area () and CAL_Peri () to calculate area and perimeter of various figures . Derive 3 classes SQUARE, RECTANGLE, TRIANGLE from the class SHAPE and calculate area and perimeter of each separately and display the result.

7. Create two classes, which consist of two private variables, one integer and one float variable in each class. Write member functions to get and display them. Write FRIEND function common to both classes which takes the object of the above two classes as arguments and the integer and float values of both the objects separately and display the results.

Console I/O

8. Write a user defined function USERFUN () which has the formatting commands like setw(), showpos(), precision (). Write a programme which prints a multiplication table and uses userfun() for formatting.

Files

9. Write a program to perform insertion, deletion and updation using files

10. Write a program which takes a file as arguments and copies into anpother file with line numbers using Command Line Arguments.

Suggested Readings :

Reference Books :

1. E.Balagurusamy (2013) "*Object Oriented Programming With C++*"[6th Edition]. New Delhi, Tata Mcgraw Hill Publishing Company Ltd, ,
2. Ashok N. Kamthane. (2013).*Object oriented Programming with ANSI and Turbo C++*. New Delhi, Pearson Education.
3. Chandra B. (2013) . *OOPS using C++*[2nd Edition]. New Delhi, Narosa Publishing House
4. Yashavant Kanetkar.(2013) *Let Us C++* [2nd Edition]. New Delhi, BPB Publication
5. John R. Hubbard. (2006). Programming *with C++*[2nd Edition]. New Delhi, Tata Mcgraw Hill Publishers.

Semester III

L	T	P	C
6	-	-	4

16CCU303 A **COMPANY LAW**

COURSE OBJECTIVES:

1. The objective of the course is to impart basic knowledge of the provisions of the Companies Act 2013.
2. To impart Basic and broad knowledge in business laws in management.
3. Ability to apply concepts, principles and theories to understand simple business laws.
4. Awareness of the different business laws.
5. Awareness of the global business laws and its impacts on businesses.
6. Case studies involving issues in company law are required to be discussed.

COURSE OOUTCOMES:

1. Received basic knowledge of the provisions of the Companies Act 2013.
2. Understood Basic and broad knowledge in business laws in management.
3. Familiarized with the principles and theories of business laws.
4. Awareness accomplished about different business laws.
5. Understood the global business laws and its impacts on businesses.
6. Present Case studies involving issues in company law

UNIT I

Introduction – Administration of Company Law [including National Company Law Tribunal (NCLT), National Company Law Appellate Tribunal (NCLAT), Special Courts]; Characteristics of a company; lifting of corporate veil; types of companies-; formation of company-

UNIT II

Documents – Memorandum of association, Articles of association, Doctrine of constructive notice and indoor management prospectus-shelf and red herring prospectus, Misstatement in prospectus, GDR; Book building; Issue, allotment and forfeiture of share, Transmission of shares, Buyback and provisions regarding buyback; Issue of bonus shares.

UNIT III

Management: Classification of directors, women directors, independent director, small shareholder's director; Disqualifications, director identity number (DIN); Appointment; Legal positions, powers and duties; removal of directors; Key managerial personnel, managing director, manager; Meetings of shareholders and board; Types of meeting, conduct of meetings, Committees of Board of Directors - Audit Committee, Nomination and Remuneration Committee, Corporate Social Responsibility Committee.

UNIT IV

Dividends, Accounts, Audit– Provisions relating to payment of Dividend, Provisions relating to Books of Account, Provisions relating to Audit, Auditors' Appointment, Rotation of Auditors, Auditors' Report, Secretarial Audit.

UNIT V

Winding Up - Concept and modes of Winding Up. **Insider-Trading, Whistle-Blowing** – Insider-Trading; meaning and legal provisions; Whistleblowing: Concept and Mechanism.

Suggested Readings :

Text Book:

1. Kapoor N.D. (2009) *Elements of Mercantile Law*. [4th Edition] New Delhi, S.Chand & Co.

Reference Books:

1. M.C. Kuchhal, and Vivek Kuchhal,(2014) *Business Law*[4th Edition] New Delhi, Vikas Publishing House.
2. S.N. Maheshwari and SK Maheshwari (2011). *Business Law*, New Delhi, National Publishing House.
3. Aggarwal S K, (2005). *Business Law*. New Delhi, Galgotia Publishers Company.
4. P C Tulsian and Bharat Tulsian,(2000) *Business Law*. New Delhi, McGraw Hill Education
5. Sharma, J.P. and Sunaina Kanojia (2011) *Business Laws*. New Delhi, Ane Books Pvt. Ltd.

Semester III

16CCU303 B **RETAIL MANAGEMENT** **L T P C**

6 - - 4

COURSE OBJECTIVES:

1. Introduce retailing and its evaluation in the Indian and Global markets
2. To know about the retail functions and challenges in India.
3. To understand the Retailing and its evolution, in the Indian and Global Markets.
4. To give exposure to Customer Relationship Management and its Operations in Retailing.
5. To provide exposure and skills to establish service operations and
6. To give awareness a gain the knowledge about the role of agriculture and green revolution about the marketing channel systems.

COURSE OUTCOMES:

1. Understand retail markets Locally and Globally
2. Know the one of the fastest growing careers in the industry with the tremendous growth in the economy.
3. Get knowledge about the retail business models
4. Understanding the knowledge of Customer Relationship Management and its Operations in Retailing
5. strives to create a new generation of smart retail professional of international caliber
6. Insight into the operations of the marketing channel systems.

UNIT- 1: INTRODUCTION TO RETAIL BUSINESS

Retail Functions – Rise of Retailing – Consumerism – challenges – Consumer Proximity – Technology – Rise of Retailing in India – Key Markets – FDI in retail – Challenges in India – New Entrants – Emerging Sectors – Suppliers and buyers Rivalry

UNIT-2: EVALUATION OF RETAILING

Theories – Retail lifecycle – Business Models – Ownership – Merchandise offered , Franchise, Non Store, Direct Marketing – Tele, Vending Machines, Kiosks, Cash and Carry Global Experience – Brand Management.

UNIT- 3: RETAIL OPERATIONS

Factors influencing location of Store - Market area analysis – Trade area analysis – Rating Plan Method - Site evaluation. Retail Operations: Stores Layout and visual merchandising, Stores designing, Space planning, Inventory management, Merchandise Management, Category Management.

UNIT- 4: RETAIL MARKETING MIX

Introduction -Product: Decisions related to selection of goods (Merchandise Management revisited) – Decisions related to delivery of service. Pricing : Influencing factors – approaches to pricing – price sensitivity - Value pricing – Markdown pricing. Place : Supply channel – SCM principles – Retail logistics – computerized replenishment system – corporate replenishment policies. Promotion : Setting objectives – communication effects - promotional mix. Human Resource Management in Retailing – Manpower planning – recruitment and training – compensation – performance appraisal Methods.

UNIT-5: IMPACT OF INFORMATION TECHNOLOGYIN RETAILING.

Non store retailing (e-retailing) - The impact of Information Technology in retailing – Integrated systems and networking – EDI – Bar coding – Electronic article surveillance – Electronic shelf labels – customer database management system. Legal aspects in retailing, Social issues in retailing, Ethical issues in retailing.

Suggested Readings:

Text Book:

1. Pradhan Swapna. (2013). *Retail Management: Text and Cases* [4th Edition]. New Delhi, Tata Mcgraw Hill Education

2. J.N. Jain & P.P. Singh, *Modern Retail Management*. New Delhi, Deep & Deep Publications.

REFERENCE BOOKS

1. Suja Nair. (2006) *Retail Management*. [First Edition]. New Delhi, Himalaya Publishing House

2. Karthic. (2006). *Retail Management*, [First Edition]. New Delhi, Himalaya Publishing House

3. Barry Bermans and Joel Evans. *Retail Management – A Strategic Approach.* [8th edition] New Delhi, Prentice Hall of India.

6. A.J.Lamba, (2003.) *The Art of Retailing*[1st edition]. New Delhi, Tata McGraw Hill.

7. Swapna Pradhan. (2008) *Retailing Management*[2nd Ed]. New Delhi, Tata McGraw Hill

8. Levy & Weitz (2002). *Retail Management* [5th Ed] New Delhi, Tata McGraw Hill

Semester IV

		L	**T**	**P**	**C**
16ENU401	**ENGLISH IV (THEORY & PRACTICAL)**	**6**	**2**	**-**	**6**

(Communication Lab/BEC/IELT) EC-4

(For all undergraduate students admitted from 2016 onwards)

COURSE OBJECTIVES:

1. To train students in understanding the concepts of communication.
2. To be familiar with the four basic skills of English.
3. To train students in developing their written communication.
4. To train students in developing their presentation skills.
5. To acquire the skill of making grammatically correct sentences.
6. To reflect originality on the application of soft skill views and express in writing their views.

COURSE OUTCOMES:

1. Students have acquired proficiency in communication.
2. Students have become adept in written communication and presentation skills.
3. Developed the skill of writing in English and that of public speaking.
4. Establish and maintain social relationships.
5. Develop communication skills in business environment.
6. Enhanced communication competency through LSRW skills.

UNIT I: Integrated Skills

Development of speaking, listening and grammar skills.

UNIT II: Advanced Reading Skills

Outcomes include improved reading speed, increased reading fluency and increased vocabulary.

UNIT III: Advanced Writing Skills

Planning and writing complex tasks

UNIT IV: News and World Affairs

Newspapers, magazines, the Internet, TV and radio are used to develop listening, reading and discussion skills.

UNIT V: Project Work

The class works together to write and produce a group project. This class is particularly useful for building confidence in using English and improving pronunciation.

Suggested Reading:

In Business; CUP

Oxford Handbook of Writing: St. Martins handbook of Writing

Sound Business. Julian Treasure OUP

Semester IV

L	T	P	C
5	-	-	5

16CCU401 **COST ACCOUNTING**

COURSE OBJECTIVES:

1. To acquaint the students with basic concepts used in cost accounting, various methods involved in cost ascertainment and cost accounting book keeping systems.
2. To enable the students to learn the basic concepts of Cost Accounting and enable them to compute the cost of products and services.
3. To familiarize students with the knowledge of methods of valuation of material issues and calculation of labour turnover cost
4. To create cost consciousness of manufacturing sectors among the students.
5. To provide the knowledge about use of costing data for planning, controls and decision making.
6. To varying procedures for the collection of expenses give rise to the different systems of costing as Historical or Actual Costs, Estimated Costs, Standard Costs etc.

COURSE OUTCOMES:

1. Understand cost accounting book keeping systems
2. Understand the basic concepts of cost accounting and enable them to various elements of cost.
3. Familiar with the methods of valuation of material issues and calculation of labour turnover cost
4. Analyze the allocation and apportionment of overheads for the various department of the organization.
5. Aware and calculation of total cost for each process.
6. Gain the knowledge for the collection of expenses and give rise to the different methods of costing.

UNIT-I

Introduction: Meaning, objectives and advantages of cost accounting; Difference between cost accounting and financial accounting; Cost concepts and classifications; Elements of cost; Installation of a costing system; Role of a cost accountant in an organization- Preparation of Cost Sheet

UNIT- II

Elements of Cost: Materials: Material/inventory control techniques. Accounting and control of purchases, storage and issue of materials. Methods of pricing of materials issues — FIFO, LIFO, Simple Average, Weighted Average, Replacement, Standard Cost. Treatment of Material Losses.

UNIT-III

Labour: Accounting and Control of labour cost. Time keeping and time booking. Concept and treatment of idle time, over time, labour turnover and fringe benefits. Methods of wage payment and the Incentive schemes- Halsey, Rowan, Taylor's Differential piece wage.

UNIT- IV

Elements of Cost: Classification, allocation, apportionment and absorption of overheads; Under- and over-absorption; Capacity Levels and Costs; Treatments of certain items in costing like interest on capital, packing expenses, bad debts, research and development expenses; Activity based cost allocation.

UNIT- V

Methods of Costing: Unit costing, Job costing, Contract costing, Process costing (process losses, valuation of work in progress, joint and by-products), Service costing (only transport).

Suggested Readings:

Text Books

1. **S.P. Jain and KL. Narang**. (2013) *Cost Accounting* New Delhi, Kalyani Publishers.

Reference Books

1. Jawahar Lal (2013). *Cost Accounting* [5th Edition]. New Delhi, Tata McGraw Hill
2. Arora, M.N(2009). *Cost Accounting Principles and Practice* [10th Ed]. New Delhi, Vikas Publishing House.
3. Maheshwari, S.N. and S.N. Mittal. (2013). *Cost Accounting: Theory and Problems* [26th Edition]. New Delhi, Shri Mahavir Book Depot,., ,
4. Iyengar, S.P.(2013) *Cost Accounting*. [10th edition]. New Delhi, Sultan Chand & Sons

Semester IV

16 CCU411 COST ACCOUNTING (PRACTICAL)

L	T	P	C
-	-	3	1

COURSE OBJECTIVES:

1. To provide practical knowledge on accounting practices
2. To process bank reconciliation statement
3. To understand and generate ratio analysis
4. To analyses and create Cash/Fund flow statement
5. To create Stock and Stock group
6. To Process Final Account reports

COURSE OUTCOMES:

1. Practical knowledge achieved on accounting practices
2. Understood to create bank reconciliation statement
3. Understood to generate ratio analysis
4. Recognize Cash/Fund flow statement
5. Understood creation of Stock and Stock group
6. Ability to prepare Final Account reports

List of Programs

The following are the list of practical

1 Prepare inventory statements using (calculate inventory using all methods)
   - FIFO
   - LIFO
   - Simple Average Method
   - Weighted Average Method

2. Prepare bank reconciliation statement
3. Prepare the following ratio analysis
   - Financial ratio
   - Operating ratio
   - Investment ratio
4. Prepare the following
   - Cash flow statement
   - Fund flow statement
5. Create stock and stock groups
6. Create stock group and stock items and enter the vouchers
7. Preparation of reports for the following
   - Profit & loss a/c
   - Balance sheet
   - Bank reconciliation statement
   - Ledgers
   - Ratio analysis

8. Back up and restore the company information

Suggested Readings

Reference Books :

1. Shraddha Singh, Navneet Mehra (2010) “Tally ERP 9: Power of Simplicity”.
2. Nadhani. 2013. *Tally9.2*. New Delhi, PBP Publication.
3. Rita Bhargava. 2011. *Tally 9.2*. New Delhi. Cyber the Publication.

Semester IV

L T P C

4 - - 4

16CCU402 DATABASE MANAGEMENT SYSTEMS

COURSE OBJECTIVES:

1. To enable the students to learn the data base operations and process
2. Understand management and implementation issues pertinent to databases in public and private organizations
3. Understand the database development process and technology
4. To enable students to understand ER Model
5. Understand structured query languages (SQL)
6. Understand PL/SQL

COURSE OUTCOMES:

1. Learnt the data base operations and process
2. Understood management and implementation issues pertinent to databases in public and private organizations
3. Understood the database development process and technology
4. Recognized the importance of ER Model
5. Understood structured query languages (SQL)
6. Understood PL/SQL

UNIT-I

Purpose of Database - Overall System Structure - Entity Relationship Model -Mapping Constraints - Keys - E-R Diagrams.

UNIT- II

Relational Model - Structure - Formal Query Language - Relational Algebra - Tuple and Domain Relational Calculus.

UNIT- III

Structured Query Language - Basic Structure - Set Operations - Aggregate Functions - Date, Numeric, and Character Functions - Nested Sub queries -Modification Of Databases - Joined Relations-DDL - Embedded SQL.

UNIT- IV

Relational Database Design - Pitfalls - Normalisation Using Functional Dependencies - First Normal Form-Second Normal Form-Third Normal Form-Fourth Normal Form And BCNF.

UNIT- V

Oracle - Introduction - SQL (DDL,DML, DCL Commands) - Integrity Constraints - PL/SQL - PL/SQL Block - procedure, function - Cursor management - Triggers - Exception Handling.

Suggested Readings:

Text Book

1. Abraham Silber Sehatz, Henry F. Korth & S. Sudharasan. (2010) , *Database System Concepts*[6th Edition]. New Delhi, Tata McGraw Hill Mc Graw Hill Publication.

Reference Books

1. Singh. (2011) *Database systems: Concepts, Design & Applications*, [2nd Edition]. New Delhi, Pearson Education.
2. Gerald V.Post. (2011). *DBMS-Designing And Business Applications [*5th Edition] New Delhi, Tata McGraw Hill
3. Michael Abbey And Michael.J.Core.(2008). *Oracle- A Beginners guide* [4th Edition] New Delhi, Tata McGraw Hill.

Semester IV

L	T	P	C
-	-	4	2

16CCU412 DATABASE MANAGEMENT SYSTEM -PRACTICAL

COURSE OBJECTIVES

1. Acquire the skills in SQL
2. To enable the students to learn DDL
3. To enable the students to learn DML
4. Understand the database development process and technology
5. Understand structured query languages (SQL)
6. Understand PL/SQL

COURSE OUTCOMES

1. Acquired the necessary skills in SQL
2. Understood the concepts and execution of DDL
3. Understood the concepts and execution of DML
4. Understood the database development process and technology
5. Understood structured query languages (SQL) concepts and execution
6. Understood PL/SQL concepts and execution

1. Create Table Company with the following fields and insert the values for 10 employees

Field Name	**Field Type**	**Field size**
Company name	Character	15
Proprietor	Character	15
Address	Character	25
Supplier name	Character	15
Number of employees -	Character	4
GP Percent	number	6 decimal places

Queries

a) Display all the records of the company, which are in ascending order of GP percent

b) Display the name of the company whose GP percent is greater than 20 and order by GP percent

c) Display the details of the company having the employee ranging from 300 to 1000

d) Display the name of the company whose supplier's name is as the data's

2. Create table named Employee with the following fields and insert the values

Field name	**Field Type**	**Field Size**

Employee name	character	15
Employee Code	number	6
Address	Character	25
Designation	Character	15
Grade	Character	1
Date of joining	Date	-
Salary	number	10 with two decimal places

Queries:

a) Display the name of the employee whose salary is greater than Rs. 10000

b) Display the details of employee in ascending order according to employee code

c) Display the total salary of the employee whose grade is 'A'

d) Display the details of employees earning the highest salary

e) Display the name of the employee who earn more than 'Ravi'

3. Create table named student with the following fields and insert the values

Field name	**Field Type**	**Field Size**
Student name	character	15
Gender	Character	6
Roll No	Character	10
Department name	Character	15
Address	Character	25
Percent	number	4 with 2 decimal places

Queries

a) Calculate the average percentage of the students

b) Display the name of the student whose percentage is greater than 80

c) Display the detail of the students who got the highest percentage

d) Display the details of the student whose percentage is between 50 and 70

e) Display the details whose percentage is greater than the percentage of roll no = 12CA01

4. Create table named Product with the following fields and insert the values

Field name	Field Type	Field Size
Product number	number	6
Product name	Character	15
Unit of measure	Character	15
Quantity	number	6 decimal places
Total Amount	number	8 decimal places

Queries

a) Using update statement calculate the amount and then record

b) Select the records whose unit of measure is KG

c) Select the record whose quantity is greater than 10 and less than or equal to 20

d) Calculate the number of record whose unit price is greater than 50 with count operation

5. Create table payroll with the following fields and insert the values

Field name	Field Type	Field Size
Employee number	number	8
Employee name	Character	8
Department	Character	10
Basic Pay	number	8 with 2 decimal places
HRA	number	6 with 2 decimal places
DA	number	6 with 2 decimal places
PF	number	6 with 2 decimal places
NET PAY	number	8 with 2 decimal places

Queries

a) Update the record to calculate the net pay

b) Arrange the record of employee in ascending order to their net pay

c) Display the details of the employee whose department is sales

d) Select the details of employee whose HRA greater than or equal to 1000 and DA<= 900

e) Select the record in descending order

6. Create table Deposit and Loan with the following fields

Field name	Field Type	Field Size
Account	Varchar	6
Branch name	Varchar	15
Customer name	Varchar	20
Balance Amount	Varchar	10
Loan	Varchar	7
Loan Amount	Varchar	6

Queries

a) Find the number of loan with amount between 10000 and 50000

b) List in the alphabetical order the name of all customers who have a loan of the Coimbatore branch

c) Find the average account balance of the Coimbatore branch

d) Update deposit to add interest at 5% to the balance

e) Arrange the record in descending order of the loan amount

f) Find the maximum loan amount

g) Find the total amount of deposit in Erode branch

Reference:

1. Abbey Michael (2008), *Oracle 8* [4th Edition]. New Delhi, Tata Mc Graw Hill Publishing.
2. Kevin Loney (2008) Oracle 9i Complete Reference , First Edition Mc Graw Hill Publishing Company, New Delhi
3. Brown Bradley. (2000). *Oracle8i* [2nd Edition] New Delhi, Tata Mc Graw Hill Publishing
4. Dorsey Paul. (2006). Oracle *Designer 2006* [7th Edition]. New Delhi, Mc Graw Hill Publishing.

Semester IV

L T P C

16CCU403A **INCOME TAX** **6 - - 4**

COURSE OBJECTIVES

1. To provide the Basic and Residential status in Income tax
2. To provide working knowledge of framework of procedure for an assessment
3. To understand the assessment procedures of individuals and HUF income.
4. To enrich the knowledge of various concepts about assessment of partnership firm and partners.
5. To familiarize the ideas on Assessment of Companies and Assessment of Co-operative Societies.
6. To know about the Collection and Recovery of Taxes.

COURSE OUTCOMES: On completion of the course, the students will be able to

1. Provide working knowledge of Basic and Residential status in Income tax
2. Provide working knowledge of framework of procedure for an assessment
3. Understand the assessment procedures and calculate tax liability of an individuals and HUF income.
4. Enrich the knowledge of various concepts about assessment of partnership firm and partners.
5. Familiarize the ideas on Assessment of Companies and Assessment of Co-operative Societies.
6. Know about the Collection and Recovery of Taxes.

UNIT- I

UNIT- I

Introduction: Basic concepts: Income, agricultural income, person, assessee, assessment year, previous year, gross total income, total income, maximum marginal rate of tax; Permanent Account Number (PAN) **Residential status**; Scope of total income on the basis of residential status-Exempted income under section 10

UNIT- II

Computation of Income under different heads-1: Income from Salaries; Income from house property

UNIT-III

Computation of Income under different heads-2: Profits and gains of business or profession; Capital gains; Income from other sources

UNIT- IV

Computation of Total Income and Tax Liability: Income of other persons included in assessee's total income; Aggregation of income and set-off and carry forward of losses; Deductions from gross total income; Rebates and reliefs Computation of total income of individuals and firms; Tax liability of an individual and a firm; Five leading cases decided by the Supreme Court

UNIT-V

Preparation of Return of Income: Filing of returns: Manually, On-line filing of Returns of Income & TDS; Provision & Procedures of Compulsory On-Line filing of returns for specified assesses.

Suggested Readings :

Text Book

1. Gaur and Narag.(2016). *Income Tax Law and Pr*actice [44th Edition]. Luthiana, Kalyani Publisher.

References book:

1. Singhania, Vinod K. and Monica Singhania (2016). *Students' Guide to Income Tax*[54th Edition, University Edition]. New Delhi, Taxmann Publications Pvt. Ltd
2. Ahuja, Girish and Ravi Gupta (2016). *Systematic Approach to Income Ta*x [35thEdition]. New Delhi, Bharat Law House.

Semester IV

L	T	P	C
6	-	-	4

16CCU403 B STOCK MARKET INVESTMENTS

COURSE OBJECTIVE:

1. To impart basic introduction to stocks
2. To enable student to take up investment in stock market independently.
3. To provide basic skills to operate in stock market and the ways of investing in it.
4. To understand the process of Stock Analysis and Valuation
5. To understand about Mutual Funds and the factors that affect choice of Mutual Funds
6. To understand Derivative Trading

COURSE OUTCOMES:

1. Recognized the virtue of stocks
2. Understood about the mechanism of investment in stock market independently.
3. Acquired the basic skills to operate in stock market and the ways of investing in it.
4. Understood the process of Stock Analysis and Valuation
5. Understood Mutual Funds and the factors that affect choice of Mutual Funds
6. Recognized Derivative Trading

UNIT- I

Investing Fundamentals: Types of Investment – Equity Shares, IPO/ FPO, Bonds. Indian Securities Market: the Market participants, Trading of Securities, Security market Indices. Sources of Financial Information. Stock Exchanges in India: BSE, NSE, MCX. Buying and Selling of Stocks: Using brokerage and analysts' recommendations. Use of Limit order and Market order.

UNIT- II

Stock Analysis and Valuation: Online Trading of Stocks. Understanding Stock Quotations, Types and Placing of Order. Risk: its Valuation and Mitigation, Analysis of the company: financial characteristics (as explained by Ratio analysis, Future prospects of the company, Assessing quality of management using Financial and Non-Financial data, Balance Sheet and Quarterly results, Cash flows and Capital Structure).

UNIT- III

Comparative analysis of companies, Stock valuations: using ratios like PE ratio, PEG ratio, and Price Revenue ratio. Use of Historic prices, simple moving average, basic and advanced interactive charts. Examining the shareholding pattern of the company. Pitfalls to avoid while investing: high P/E stocks, low price stocks, stop loss, excess averaging,

UNIT- IV

Investing in Mutual Funds: Background of Mutual Funds: Needs and advantages of investing in Mutual Funds. Net Asset Value, Types of Mutual funds: Open ended, closed ended, equity, debt, hybrid, money market, Load vs. no load funds, Factors affecting choice of mutual funds. CRISIL Mutual Fund Ranking and its Usage.

UNIT- V:

Share price indices: need, importance, compiling and their interpretation. Derivative Trading: Meaning, importance, Methods of trading. Types of traders, specification of derivative contracts and Derivative market in India. Options: Types, option trading, margin. Future: Futures contracts, future market and trading. Swaps: mechanics and valuation.

Suggested Readings :

Text Book:

1. Chandra, Prasanna (2008). *Investment Analysis and Portfolio Management* [3rd Edition]. New Delhi, Tata McGraw Hill

Reference Book:

1. Gitman and Joehnk.(2014). *Fundamentals of Investing* [12th Edition]. New Delhi, Pearson Publications.
2. Madura, Jeff. (2014). *Personal Finance,* [5th Edition] New Delhi, Pearson Publications
3. Damodaran, Aswath (2012). *Investment Valuation: Tool and Techniques for Determining the Value of Any Asset* [3rd Edition]. India, Wiley Finance
4. Bodie, Alex, Marcus and Mohanty. (2010). *Investments* [9th Edition]. New Delhi, McGraw Hill.
5. Hirt and Block. (2010). *Fundamentals of Investment Management*. [9th Edition]. New Delhi, McGraw Hill
6. Pandiyan, Punithavathy (2009). *Security Analysis and Portfolio Management* [1st Ed]. New Delhi, Vikas Publications.

Semester V

L	T	P	C
4	-	-	4

16CCU501A SOFTWARE DEVELOPMENT WITH VISUAL BASIC

COURSE OBJECTIVES:

1. To understand the concepts and procedures of visual programming.
2. To enable the students to develop a front-end tool for customer interaction in business.
3. To learn event-driven models to design a software.
4. To educate various control tools for designing a form.
5. To make the student develop an application using Visual Basic.
6. To enable the students develop an application using Front end and Back end

COURSE OUTCOMES:

1. Understood the GUI programming interface and Procedures.
2. Able to develop a front end tool for business
3. Develop a relationship with database.
4. Acquire the knowledge to handle the errors.
5. Display the outcome through front end application.
6. Develop a complete tool with front end and back end software using visual basic

UNIT- I

Introduction to VB – steps in VB application – Project Explorer Window – Property Window – Form Layout – Code Window – Event driven programming – Working with Forms.

UNIT-II

Variables – Constants – Literals – Data Types – Operators – Sub routine and Functions Programme Flow Control – String function – Numeric function – Date function.

UNIT-III

Pointers – Label – Frame – Check Box – Compo Box – Scroll Bar – Timer – Shape and Line Control - Command Button – List Box - Image Box - Picture Box – text Box – SDI and MDI form – Data Grid - Flex Grid – Menus – Dialog Boxes.

UNIT-IV

DAO – Creating a Data base – Types of Record set – ActiveX Data Object (ADO).

UNIT- V

Data Report: Data Environment – Designer – Connection object – Command object – Data Report control – Sections of Report designer. Case Study: Automated system for student mark list – Automated system for Railway reservation.

Suggested Readings:

Text Book*:*

1. Gary Cornell. (2005). *Visual Basic 6 from the Ground up* [3rd Edition]. New Delhi: Tata McGraw Hill

Reference Books:

1. Content Development Group(2012). *Visual Basic 6 programming.* New Delhi: Tata McGraw Hill.

Semester V

16CCU501B	PRINCIPLES OF MARKETING	L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

1. To Know the concepts and Functions of Marketing
2. To familiarize the concepts of market segmentation
3. To recognize customer relationship Management.
4. To provide the knowledge about the Product Life Cycle.
5. To Understand the pricing Strategies of Marketing
6. To Know the Promotional Steps in Marketing

COURSE OUTCOMES:

1. Understood the concepts of Marketing.
2. Identify the various channels of distribution and sales promotion methods.
3. Recognized CRM concepts
4. Develop the new product policies and strategies.
5. Know the different methods of pricing methods.
6. Be conversant with the importance of promotional aspects.

UNIT-I

Introduction: Nature, Scope and Importance of Marketing; Evolution of Marketing; Selling vs Marketing; Marketing mix, Marketing Environment: Concept, Importance, and Components (Economic, Demographic, Technological, Natural, Socio- Cultural and Legal).

UNIT-II

Consumer Behaviour: Nature and Importance, Consumer Buying Decision Process; Factors influencing Consumer Buying Behaviour. **Market segmentation:** Concept, Importance and Bases; Target market selection; Positioning concept, Importance and Bases; Product differentiation vs. Market Segmentation.

UNIT-III

Product: Concept and importance, Product classifications; Concept of product mix; Branding, Packaging and Labeling; Product-Support Services; Product life -Cycle; New Product Development Process; Consumer adoption process

UNIT-IV

Pricing: Significance. Factors affecting price of a product. Pricing policies and strategies. **Distribution Channels and Physical Distribution:** Channels of distribution -meaning and importance; Types of distribution channels; Functions of middle man; Factors affecting choice of distribution channel; Wholesaling and retailing; Types of Retailers; e-tailing, Physical Distribution.

UNIT-V

Promotion: Nature and importance of promotion; Communication process; Types of promotion: advertising, personal selling, public relations & sales promotion, and their distinctive characteristics; Promotion mix and factors affecting promotion mix decisions;

Recent developments in marketing: Social Marketing, online marketing, direct marketing, services marketing, green marketing, Rural marketing; Consumerism

Suggested Readings:

Text Book:

1. Philip Kotler. (2003).*Marketing Management*. New Delhi: Prentice Hall of India Pvt. Ltd

Reference Books :

1. Michael, J. Etzel, Bruce J. Walker, William J Stanton and Ajay Pandit. *Principles of Marketin*g[13th edition]. New Delhi, Pearson Education.
2. CB Gupta and Dr. Rajan Nair (2014). *Marketing Management*. New Delhi, Sultan Chand & Sons.
3. William D. Perreault, and McCarthy, E. Jerome (2005), *Basic Marketing*. New Delhi, .Pearson Education
4. Neeru Kapoor (2005). *Principles of Marketing*. New Delhi: Prentice Hall of India Pvt. Ltd
5. Rajendra Maheshwari (2010) *Principles of Marketing* [2nd Edition]. New Delhi, International Book House.

Semester V

	L	T	P	C
16CCU511A SOFTWARE DEVELOPMENT WITH VISUAL BASIC (PRACTICAL)	-	-	4	2

COURSE OBJECTIVES:

1. To develop the front-end application using Visual Basic
2. To use the controls in the tool box and develop a Windows based application software
3. To develop modern software programs using the Visual Basic
4. To develop Logic solving mathematical problems
5. To recognize string operations
6. To understand database connectivity

COURSE OUTCOMES:

1. Understood to develop the front-end application using Visual Basic
2. Acquired the knowledge in using controls in the tool box and develop a Windows based application software
3. Able to develop modern software programs using the language Visual Basic
4. Able to develop Logic solving mathematical problems
5. Recognized string operations
6. Understood database connectivity

1. Write VB Program to perform the text manipulation using alignment and format function
2. Write VB Program to find the given is Prime or not
3. Write VB Program to calculate the simple interest and compound interest
4. Write VB Program to compute the total marks and display the results of a student in the exams
5. Write VB Program to calculate the Quadratic Equation
6. Write VB Program for performing String Operations
7. Write VB Program to implement the calculator
8. Write VB Program to perform Menu Operations
9. Write VB Program to implement flex grid
10. Write VB Program to present product details like purchase, sales, profit etc., by declaring array functions and present details in a Rich Text Book Box (RTF)
11. Write VB Program to implement Employee Details using ADO
12. Write VB Program to implement pay slip for an organization and create a database using SQL and ADO Control
13. Write VB Program to create a bank customer database by declaring simple array and multiple arrays using ADO Control
14. Write VB Program to display tree view and list view of folders and files from a directory of an organization
15. Write VB Program to implement the Animated Dice.

16CCU511B	PRINCIPLES OF MARKETING (PRACTICAL)	L	T	P	C
		-	-	4	2

COURSE OBJECTIVES:

1. Helps the students to get in-depth knowledge on Marketing Segmentation
2. Helps to know about the proper Distribution channels
3. Helps to identify the media of Advertisement
4. To provide the on-hand knowledge to the students on the current marketing scenario
5. To helps them to acquire the sufficient knowledge in the marketing field
6. To help them get good presentation skills

COURSE OUTCOMES:

1. Acquired in-depth knowledge on Marketing Segmentation
2. Understood the proper Distribution channels
3. Understood media concepts
4. Recognized on-hand knowledge on the current marketing scenario
5. Acquired the sufficient knowledge in the marketing field
6. Achieved good presentation skills

List of Practical

1. Prepare and Present the Development of Market Segmentation for any FMGC products
2. Give a Presentation of the Selection of distribution channel for Baby Product
3. Present in which media of Advertisement will you select for Cosmetic products
4. How to develop online marketing for apparels? Present and Defend
5. Give a Brief Account on Social Marketing
6. Give a Presentation on the following
    i. Green Marketing
    ii. Rural Marketing
    iii. Service Marketing
7. Design a presentation on Consumer Exploitation - Food Products
8. Discuss in Group – “The Consumer Movements in India”

Note: Record note to be submitted and Viva-voce will be conducted.

Suggested Readings:

Text Book:

1. Philip Kotler. (2003).*Marketing Management*. New Delhi: Prentice Hall of India Pvt. Ltd

Reference Books :

1.Michael, J. Etzel, Bruce J. Walker, William J Stanton and Ajay Pandit. *Principles of Marketin*g [13th edition]. New Delhi, Pearson Education.

2. CB Gupta and Dr. Rajan Nair (2014). *Marketing Management*. New Delhi, Sultan Chand & Sons.

3. William D. Perreault, and McCarthy, E. Jerome (2005), *Basic Marketing*. New Delhi, Pearson Education

4. Neeru Kapoor (2005). *Principles of Marketing*. New Delhi: Prentice Hall of India Pvt. Ltd

5. Rajendra Maheshwari (2010) *Principles of Marketing* [2nd Edition]. New Delhi, International Book House.

Semester V

L	T	P	C
6	2	-	6

16CCU502 A MANAGEMENT ACCOUNTING

COURSE OBJECTIVES:

1. To enable the students to understand the role of the management accounting in decision making.
2. To analysis and interpretation of Financial Statements
3. To know about the impact of ratio analysis
4. Helps the student to prepare management reports by using funds flow and cash flow statement.
5. To support management in planning decision-making in a variety of business contexts and marginal cost analysis.
6. To make clear understanding of various budgets and their importance.

COURSE OUTCOMES: On completion of the course, students will able to

1. Understand the role of the management accounting in decision making.
2. Able to analyze financial statements
3. Understood the impact of ratio analysis and construct the balance sheet using ratios
4. Identified the rules regarding to prepare fund flow statement and cash flow statement as per accounting standard.
5. Knew about the marginal cost analysis.
6. Understood various budgets and its importance.

UNIT-I

Introduction : Meaning, Objectives, Nature and Scope of management accounting, Difference between cost accounting and management accounting, Cost control and Cost reduction, Cost management

UNIT-II

Analysis and Interpretation of Financial Statements- Meaning – types of financial analysis – comparative statements – common size statements, - trend analysis. Ratio Analysis, meaning, objective, limitation, classification, computation and interpretation, liquidity, leverage activity and profitability raios. Return on Capital employed computation and uses.

UNIT- III

Fund flow and Cash Flow: Meaning – Definition – Uses and Limitations – Procedures for Preparing Fund Flow Statement. Cash Flow Analysis: Meaning – Objectives – Uses and significance of CFS – Comparison between Funds Flow and Cash Flow Statements – Preparation of Cash Flow Statement as per Accounting Standards

UNIT- IV

Marginal Costing: Absorption versus Variable Costing: Distinctive features and income determination. Cost-Volume-Profit Analysis, Profit / Volume ratio. Break-even analysis- Angle of incidence, margin of safety

UNIT- V

Budgetary Control: Budgeting and Budgetary Control: Concept of budget, budgeting and budgetary control, objectives, merits, and limitations. Budget administration. Functional budgets. Fixed and flexible budgets. Zero base budgeting. Programme and performance budgeting.

Suggested Readings:

Text Book:

1. Jain and Narang,. (2007) *Cost and Management Accounting*. Ludhiana, Kalyani Publishers.

Reference Books:

1. Goel Rajiv (2012) *Management Accounting*. Mumbai, International Book House.
2. Arora, M.N. (2013) *Management Accounting* [10th Edition]. New Delhi. Vikas Publishing House.
3. Maheshwari, S.N. and S.N. Mittal. *Management Accounting* [10th Edition]. New Delhi, Shree Mahavir Book Depot.
4. Khan, M.Y. and Jain, P.K. (2002). *Management Accounting*. New Delhi, McGraw Hill Education.

Semester V

16CCU502B **INDIRECT TAX LAWS**

L	T	P	C
6	2	-	6

COURSE OBJECTIVES

1. To study the scope of indirect tax system in India
2. To gain knowledge of various provisions of Excise Duty
3. To understand the different types of customs duties in India
4. To know about Central Sales Tax
5. To familiarize the knowledge on the VAT
6. To familiarize Central Excise, and Customs Laws

COURSE OUTCOMES: On completion of the course, the students will be able to

1. Understood the scope of indirect tax system in India
2. Gained knowledge of various provisions of Excise Duty
3. Awareness about Central Sales Tax
4. Acquired knowledge on levy and collection of indirect taxes.
5. Gives thorough knowledge about levy and collection of customs duty
6. Know about computation of Central Excise, and Customs Laws

UNIT I

Service Tax-I: Service tax –concepts and general principles, Charge of service tax and taxable services,

UNIT- II

Service Tax-II: Valuation of taxable services, Payment of service tax and filing of returns, Penalties, CENVAT Credit

UNIT- III

VAT : VAT –concepts and general principles, Calculation of VAT Liability including input Tax Credits, Small Dealers and Composition Scheme, VAT Procedures

UNIT- IV

Central Excise: Central Excise Law in brief –Goods, Excisable goods, Manufacture and Manufacturer, Valuation, CENVAT, Basic procedures, Export, SSI, Job Work

UNIT-V

Customs laws: Basic concepts of customs law, Territorial waters, high seas, Types of custom duties – Basic, Countervailing & Anti-Dumping Duty, Safeguard Duty, Valuation, Customs Procedures, Import and Export Procedures, Baggage, Exemptions

Suggested Readings:

Text Book:

1. V.S.Datey, (2016) *Indirect Taxes* New Delhi, Taxman Publications (P) Ltd.,

Reference Books:

1. Sanjeev Kumar (2013) *Systematic Approach to Indirect Taxes* [10th Edition]. New Delhi, Bharat Law House Pvt. Ltd.
2. S. S. Gupta. Service Tax (2016)-*How to meet your obligation.* NewDelhi, Taxmann Publications Pvt. Ltd.,
3. Grish Ahuja and Ravi Gupta (2015), Indirect Taxes, [32nd Edition]. New Delhi, Flair Publication Pvt. Ltd.

Semester V

L	T	P	C
6	-	-	4

16CCU503A **ENTREPRENEURSHIP**

COURSE OBJECTIVES:

1. To know the concepts of Entrepreneurship.
2. To bring an idea about the motivational aspects of the Entrepreneurship.
3. To identify and study about the start up process and formulation of projects.
4. To know about the various financial Institutions.
5. To learn about the institutional finance to entrepreneurs.
6. To learn about Incentives and subsidies

COURSE OUTCOMES : On completion of the course, the students will be able to

1. Understand the concepts of entrepreneur and Entrepreneurial Development Programs
2. bring an idea and know about the types of motivational aspects of the Entrepreneurship
3. Awareness for the projects formulation and study about the legal considerations for the startup industries.
4. Get an ideas and ways to identify the institutional finance to the budding entrepreneurs
5. Inculcate the role of SISI and legal procedures for setting up of a small-scale unit
6. Learnt about Incentives and subsidies

UNIT- I

Introduction: Meaning, Elements, Determinants and Importance of Entrepreneurship and Creative Behavior; Entrepreneurship and Creative response to the society' problems and at work; Dimensions of Entrepreneurship: Intrapreneurship, Technopreneurship, Cultural Entrepreneurship, International Entrepreneurship, Netpreneurship, Ecopreneurship, and Social Entrepreneurship

UNIT- II

Entrepreneurship and Micro, Small and Medium Enterprises: Concept of business groups and Role of Business Houses and Family Business in India; Role of Entrepreneurship in Economic Development; the Contemporary Role models in Indian business: their values, business philosophy and behavioural orientations; Conflict in family business and its resolution

UNIT-III

Institutional services to entrepreneurship - DIC, SIDO, NSIC, SISI, SSIC, SIDCO – ITCOT, IIC, KUIC and Commercial Bank.

UNIT- IV

Sources of business ideas and tests of feasibility: Institutional finance to Entrepreneurs: IFCI, SFC, IDBI, ICICI, TIIC, SIDCS, LIC and GIC, UTI, SIPCOT – SIDBI commercial bank venture capital.

UNIT- V

Incentives and subsidies – Subsidized services – subsidy for market. Transport – seed capital assistance - Taxation benefit to SSI role of entrepreneur in export promotion and import substitution

Suggested Readings :

Text Books:

1. Vasant Desai. (2002) *Dynamics of Entrepreneurial Development and Management*. Mumbai, Himalaya Publishing House.

Reference Books:

1. Singh, Nagendra P (2015) . *Emerging Trends in Entrepreneurship Development*. New Delhi: ASEED
2. SS Khanka. (2001). *Entrepreneurial Development*, New Delhi, S. Chand & Co
3. K Ramachandran.(2008). *Entrepreneurship Development*, New Delhi, McGraw-Hill Education.
4. C.B.Gupta and N.P.Srinivasan (2008). *Entrepreneurial Development* [5th Edition]. New Delhi, Sultan Chand and sons.

Semester V

L T P C

6 - - 4

16CCU503B ADVERTISING

COURSE OBJECTIVES:

1. To know about the forms of advertising.
2. To know about the various types of advertising
3. To create awareness about the process of advertising layout
4. To understand the motivational aspects of salesmen
5. To get an idea about the techniques and know the process of personal selling
6. To know the role of Advertising Agency

COURSE OUTCOMES: On completion of the course, the students will able to

1. Know about the different forms of advertising.
2. Study about the agencies of advertising and strategies of advertising
3. Understand the designs of layout and advertising campaign
4. Gain knowledge about the sales force management
5. Grasp the advertising as a tools of sales promotion .
6. Understood the role of Advertising Agency

UNIT- I

Introduction: Advertising-meaning, Nature and Importance of Advertising, Types and Objectives. Audience Selection; Setting of Advertising Budget: Determinants and Major methods.

UNIT-II

Media Decisions : Major Media Types - their Merits and Demerits; Advertising through internet and interactive media-Issues and Considerations; Factors influencing Media Choice; Media Selection, Media Scheduling.

UNIT- III

Message Development: Advertising Creativity; Advertising Appeals; Advertising Copy and Elements of Print Advertisement Creativity; Tactics for Print Advertisement.

UNIT-IV

Measuring Advertising Effectiveness: Arguments for and against measuring effectiveness; Advertising Testing Process; Evaluating Communication and Sales Effects; Pre- and Post-testing techniques.

UNIT-V

a) **Advertising Agency**: Role, Types and Selection of Advertising Agency; Reasons for Evaluating Advertising Techniques. b) Social, Ethical and Legal Aspects of Advertising in India; Recent developments and Issues in Advertisement.

Suggested Readings :

Text Book:

1. Mahendra Mohan. (2008). *Advertising Management* . New Delhi, Tata Mcgraw Hill

Reference Book

1. Belch and Belch.(2003). *Advertising and Promotion* [6th Edition]. New Delhi, Tata McGraw Hill.
2. Sharma, Kavita. (2011). *Advertising: Planning and Decision Making*, New Delhi, Taxmann Publication Pvt. Ltd.
3. Mahajan, J.P., and Ramki (2010). *Advertising and Brand Management*, New Delhi, Abe Books Pvt Ltd
4. Burnett, Wells, and Moriatty. (2006). *Advertising: Principles and Practice* [7th Edition]. New Delhi, Pearson Education.
5. Terence A. Shimp. (2013). *Advertising and Promotion: An IMC Approach* [9th Edition]. New Delhi, South Western, Cengage Learning.
6. O'Guinn. (2012). *Advertising and Promotion: An Integrated Brand Approach* [6th Edition] New Delhi, Cengage Learning.

Semester V

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16CCU504 A GE 1 – PRINCIPLES OF MICRO ECONOMICS

COURSE OBJECTIVES

1. This course seeks to enable the student to grasp the determinants of demand and supply.
2. It also provides knowledge of theories relating to consumer
3. It equip the students with the knowledge of concept of production and calculation of production cost
4. It enable them to understand the market structure for the product
5. It equip the students with the knowledge of income distribution and factor pricing.
6. To impart skills in computation of national income analysis

COURSE OUTCOMES: On successful completion of the course, the students will be able to

1. analyze the business economic concepts demand and supply
2. gain knowledge about demand and supply
3. Acquire skills on calculation of cost of production
4. compare the different pricing and market conditions
5. Understand the production and cost analysis and the pricing decisions
6. Measure the per capita income and National Income.

UNIT-I

Introduction :Demand and Supply: Determinants of Demand, Movements vs. Shift in Demand Curve, Determinants of Supply, Movement along a Supply Curve vs. Shift in Supply Curve; - Market Equilibrium and Price Determination -Elasticity of Demand and Supply -Application of Demand and Supply.

UNIT-II

Consumer Theory- Ordinal Utility theory: (Indifference curve approach): Consumer's preferences; Interference Curves; Budget line; Consumer's Equilibrium; Income and Substitution effect; Price Consumption Curve and the derivation of Demand Curve for a Commodity; Criticisms of the Law of Demand.

UNIT- III

Production and Cost- Production: Firm as an agent of production. Concepts of Production function. Law of variable proportions; Isoquants; Return to scale. Economics and Diseconomies of scale. **Costs**: Costs in the short run. Costs in the long run, Profit maximization and cost minimization. Equilibrium of the firm, Technological Change: the very long run.

UNIT-IV

Market Structure - Perfect Competition: Assumption; Theory of a firm under perfect competition; Demand and Revenue; Equilibrium of the firm in the short run and long run, The long run industry supply curve: increasing, decreasing and constant cost industry. Allocation efficiency under Perfect Competition, **Monopoly:** Short-run and long-run Equilibrium of Monopoly firm; Concept of Supply Curve under Monopoly; Allocation inefficiency and dead-weight loss Monopoly; Price discrimination. **Imperfect Competition:** Difference between Perfect Competitions, Monopoly and Imperfect Competition; **Monopolistic Competition:** Assumption; Short – run Equilibrium; Long run Equilibrium; Concepts of excess capacity; Empirical relevance. **Oligopoly:** Causes for the existence of oligopolistic firms in the market rather than Perfect Competition; Cooperative vs. Non cooperative Behaviour and dilemma of Oligopolistic firms.

UNIT- V

Income Distribution and Factor Pricing: Demand for factors. Supply of factor, backward bending Supply Curve for labor concepts of Economic Rent; Functional Distribution of Income.

Suggested Readings :

Text Book:

1. Sankaran. (2013). *Business Economics.* Chennai, Margham publications Ltd .

Reference Books:

1. Karl Case, Ray Fair (2013). *Principles of Micro Economics* [11th Edition]. New Delhi, Pearson Education.
2. Koutsiyannis. (2008) *Modern Micro Economic Theory* [2nd Edition].London; England. Macmillan Press Ltd.
3. Paul A Samuelson, William D Nordhaus (2009). *Micro Economics* [19th Edition]. New Delhi, McGraw-Hill.
4. P.N.Reddy & H.R.Appanaiah. (1995) *Principles of Business Economics*. New Delhi, S.Chand & Company Ltd.
5. Ferguson & R.Rothschild. (1993). *Business Economics*. Hong Kong, Macmillan Press Ltd.
6. H.S.Agarwal. (1995). *Business Economics* Ratan Prakashan Mandir.
7. K.P.Sundaram and E.Sundaram (1997). *Business Economics*. New Delhi: Sultan Chand & Sons

Semester V

L T P C

16CCU504 B BUSINESS ETHICS

COURSE OBJECTIVES:

1. To know the ethical issues in business and managerial decisions.
2. To gain the ethical issues in Human Resource Management
3. To understand the ethical issues in Marketing strategy
4. To learn the ethical issues in finance
5. To make students aware of the social responsibilities of business.
6. To impart concepts of Corporate Social Responsibility (CSR)

COURSE OUTCOMES: On completion of the course, the students will be able to

1. Obtained the knowledge on ethical issues in business and managerial decisions
2. Understood the various ethical issues in Human resource management
3. Acquired ethical issues in Marketing strategy
4. Got the knowledge about ethical issues in finance
5. Gathered the ethical practices of business
6. Understood the concepts of Corporate Social Responsibility (CSR)

UNIT- I

Introduction to Business Ethics : Definition – Meaning – Nature and Objectives of Ethics, Factors Affecting business ethics – Ethical organization – Characteristics of an Ethical Organisation; Corporate Moral Excellence –Corporate Citizenship, Theories of Ethics – Utilitarian, Separatist and Integrative view of Ethics; Stages of Ethical Consciousness in Business; Relationship between Law and Moral Standards.

UNIT- II

Ethical Issues in Human Resource Management: The Principle of Ethical Hiring – Equality of Opportunity – Ethics and Remuneration – Ethics in Retirement; Ethical Issues in Operation and Purchase Management –Quality Control; Ethical Problems and Dilemmas in Operations Management; Role of Purchase Manager – Code of Ethics for Purchases; Ethical Issues in Global buyer – Supplier Relationships.

UNIT-III

Ethical Issues in Marketing Strategy: Ethical Issues in Marketing Mix – Product – Price – Promotion – Place – Process – People – Physical Evidence ; Ethical Issues and Consumerism – Consumer Protection- Consumer Welfare – Consumer Delight – Consumer Rights.

UNIT- IV

Ethical Issues in Finance: Ethical issues in Mergers and Acquisitions – Hostile Takeovers – Insider Trading – Money Laundering; Ethical Issues in Accounting Professional Conduct of Accountants; Ethics and Financial Statements – Fictitious Revenues – Fraudulent Timing – Differences – Concealed Liabilities and Expenses – Fraudulent Disclosures and Omissions – Fraudulent Valuation of Assets – Ethical Auditing

UNIT- V

Corporate Social Responsibility (CSR) : Meaning – Definition – Methods – Evaluation – Internal Stakeholders – Share holders – Employees – Management; External Stakeholders – Consumer – Suppliers – Creditors – Competitors – Community; Global and Local issues in Management – Black

Money – Poverty – Child Labour – Gender equality and so on. Ethical issues in MNCs; Environmental Ethics – Environmental issues in India – Greening and Green initiatives – Sustainable development – Waste Management

Suggested Readings:

Text Book:

1. *Business Ethics and Corporate Governance*. (2003). Hyderabad,ICFAI Centre for Management Research,

Reference Books

1. A.C. Fernando, (2009), " Business Ethics – An Indian Perspective", Pearson Education, New Delhi
2. John R Boatright 2009, Ethics and the conduct of Business, Pearson Education (Singapore) Pvt. Ltd. Indian Branch, Delhi
3. Cyriac K. 2000, " Managerial Ethics and Social Issues – Reading and Cases", Reading Material for Business Ethics, XLRJ Jamshedpur
4. Fr. Mcgrarth, 2008, SJ Basic Managerial Skills for all, Prentice Hall of India, New Delhi.
5. Davis Keith and Blomstrom, 1987, Business, Society and Environment, Tata Mcgraw Hill Ltd, New Delhi.

Semester VI

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16CCU601A INTERNET AND WEB DESIGN

COUSE OBJECTIVES:

1. To know the working of Internet, uses of search engines and procedures to develop a web page.
2. To make the student expertise in creating web page.
3. To ensure that the student know the concepts of Internet and design a web page.
4. To know HTML Forms.
5. To make the students expertise in creating Web Page with JavaScript.
6. the skill in the application of scripting languages like HTML, Java script and ASP, Net

COUSE OUTCOMES:

1. Recognized the working of Internet, uses of search engines and procedures to develop a web page.
2. Grasped the needed techniques in creating web page.
3. Understood the concepts of Internet and design a web page.
4. Understood to create HTML Forms.
5. Understood to create Web Page with JavaScript.
6. Acquired the necessary skill in scripting languages like HTML, Java script and ASP.Net

UNIT- I

Introduction to Internet: Internet basics – World wide Web – browser portability – Features of Internet Explorer. Introduction to HTML ; Mark up languages – common Tags – Headers – text styling – Linking – Images – formatting text – special characters – Horizontal rules and Line text – unrecorded lists – nested unordered lists- basic HTML tables – Intermediate HTML tables.

UNIT- II

Formatting – Basic HTML forms – creating and using Image maps – meta tags – frameset – nested frameset. Introduction to DHTML: cascading Style Sheet – Inline style – creating style sheets with style elements – conflicting styles – Linking external style sheets – Position elements – Backgrounds – element dimension – text flow – Box models.

UNIT-III

Introduction to Java Script – Operators – Arithmetic Operators – Precedence of Operators – Relational Operators – Control Structures – Assignment Operators – Increment and Decrement Operators – For loops – Switch – Do While – Break – Continues – Arrays – Functions .

UNIT- IV

Active Server Page (ASP): Introduction – How ASP work – five objects of ASP – Client Side Scripting Vs Server Side Scripting – Server Side ActiveX component – Session Tracking and Cookies – file system objects.

UNIT-V

Introduction to XML : Introduction – The Syntax of XML – XML Document Structure – Document Type Definitions – Namespaces – XML Schemas – Displaying Raw XML Documents – Displaying XML Documents with CSS – XML Processors.

Suggested Readings :

Text Books

1. H.M.Deitel and T.R.Nieto, (2000). *Internet and World Wide Web How to Program*. New Delhi, Pearson education.
2. Ivan Bayross, (2000). *Web enables Commercial application development using HTML, DHTML,Java Script, Perl, CGI. New Delhi,* BPB Publications.

Reference Books

1. Robert .W.Sebesta, (2007). *Programming the World Wide Web* [3rd Edition]. New Delhi, Pearson Education.
2. Shelly Powers (2008) *Dynamic Web Publishing*. New Delhi, Techmedia.
3. Scot Johnson.(2010). *Using Active Server Pages*. New Delhi. Que Publications.
4. J. Jaworski (2000). *Mastering JavaScript* [2nd Edition]. New Delhi, BPB Publications.
5. Thomas Powell. (2002). *HTML Computer Reference*[4th Edition] New Delhi, Tata Mcgraw Hill

Semester VI

16CCU603A INTERNATIONAL BUSINESS

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COURSE OBJECTIVES:

1. To make the students aware about Globalization and its importance in world economy
2. To impart knowledge about the Theories of International Trade
3. To render knowledge about Regional Economic Co-operation
4. The objective of the course is to familiarize the students with the concepts, importance and dynamics of international business and India's involvement with global business.
5. The course also seeks to provide theoretical foundations of international business to the extent these are relevant to the global business operations and developments.
6. To keep the students aware about Foreign Trade Promotion Measures and Organizations in India

COURSE OUTCOMES:

1. Understood Globalization and its importance in world economy
2. Gained knowledge about the Theories of International Trade
3. Received information about Regional Economic Co-operation
4. Familiarized the concepts, importance and dynamics of international business and India's involvement with global business.
5. Received the theoretical foundations of international business.
6. Aware about Foreign Trade Promotion Measures and Organizations in India

UNIT-I

Introduction to International Business: Globalisation and its importance in world economy; Impact of globalization; International business vs. Domestic business: Complexities of International business; Modes of entry into international business.

International Business Environment: National and Foreign Environments and their components - economic, cultural and political-legal environments

UNIT- II

Theories of International Trade – an overview (Classical Theories, Product Life Cycle theory, Theory of National Competitive Advantage); Commercial Policy Instruments - tariff and nontariff measures – difference in Impact on trade, types of tariff and non tariff barriers (Subsidy, Quota and Embargo in detail) ; Balance of Payment account and its components.

International Organizations and Arrangements: WTO – Its objectives, principles, Organizational Structure and Functioning; An overview of other Organizations – UNCTAD,; Commodity and other Trading Agreements (OPEC).

UNIT-III

Regional Economic Co-operation: Forms of Regional Groupings; Integration efforts among Countries in Europe, North America and Asia (NAFTA, EU , ASEAN and SAARC) . **International Financial Environment:** International Financial System and Institutions (IMF and World Bank – Objectives and Functions); Foreign exchange Markets and Risk Management; Foreign Investments - Types and Flows; Foreign Investment in Indian Perspective

UNIT- IV

Organisational structure for international business operations; International Business Negotiations. **Developments and Issues in International Business:** Outsourcing and its potentials for India; Role of IT in international business; International business and ecological considerations.

UNIT- V

Foreign Trade Promotion Measures and Organizations in India; Special Economic Zones (SEZs) and Export Oriented Units (EOUs), ; Measures for Promoting Foreign investments into and from India; Indian Joint Ventures and Acquisitions Abroad. b. Financing of Foreign Trade and Payment terms – Sources of Trade Finance (Banks, factoring, forfeiting, Banker's Acceptance and Corporate Guarantee) and Forms of Payment (Cash in advance, Letter of Credit, Documentary Collection, Open Account)

Suggested Readings :

Text Book

1. Subba Rao,(2008) *International Business*. New Delhi, Himalaya Publishing House.

Reference Books:

1. Charles W.L. Hill and Arun Kumar Jain. (2008). *International Business*. New Delhi, McGraw Hill.

2.Daniels John, D. Lee H. Radenbaugh and David P. Sullivan. *International Business* [15th Edition]. New Delhi, Pearson Education,

3. Johnson, Derbe. and Colin Turner(2015). *International Business* - Themes & Issues in the Modern Global Economy. [2nd Edition] London: Roultedge

4. Cherunilam, Francis. *International Business: Text and Cases* [5th Edition]. New Delhi, PHI

5. Michael R. Czinkota. et al. *International Business* [9th Edition]. Fortforth, The Dryden Press

6. Bennett, Roger (2003). *International Business*. New Delhi, Pearson Education

7. Peng and Srivastav (2011). *Global Business*. New Delhi,Cengage Learning

8. SumatiVarma, *International Business* [2nd Edition] New Delhi, Pearson Education

Semester VI

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16CCU611A INTERNET AND WEB DESIGN (PRACTICAL)	-	-	3	1

COURSE OBJECTIVES:

To make the students

1. To familiar with graphic design principles that relate to web design and learn how to implement theories into practice.
2. To Develop skills in analyzing the usability of a web site.
3. To Understand how to plan and conduct user research related to web usability.
4. To Learn the language of the web: HTML and CSS grid layout and flexbox.
5. To Learn techniques of responsive web design, including media queries and digital imaging (Adobe Photoshop.)
6. Develop basic programming skills using Javascript and jQuery and embed social media content into web pages

COURSE OUTCOMES:

Learners should be able to

1. Students will develop an understanding of the formalistic (aesthetic) aspects of design and visual communication. [MM/MAC]
2. Students will demonstrate cross-platform (web, mobile, broadcast, print) storytelling skills. [MM/MAC: 4.2]
3. Students will become familiar with graphic design and/or game theory and be able to apply this theory to real world projects. [IM]
4. Analyze a web page and identify its elements and attributes.
5. Create web pages using XHTML and Cascading Style Sheets and Build dynamic web pages using JavaScript (Client side programming).
6. Create XML documents and Schemas. Create web pages for a business organization using HTML frames.

1. .Create web pages for a business organization using HTML frames
2. Create a program using HTML to display the ordered list and unordered list of a departmental store
3. Program to display image and text using HTML Tag for an advertisement of a company product
4. Create a table to list out products using HTML Tags
5. Create a document using formatting and alignment using JAVA script to display sales letter
6. Create a Resume using JAVA Script
7. Create a Website of your department with minimum five links using HTML
8. Create a document using Form to support local process of order form using JAVA script
9. Create a form of the customer survey of the user to enter general name and address information using JAVA Script

10. Create a frame to display multi form document using JAVA script

Suggested Readings:

1.Thomas Powell, 2002, 4th Edition, "HTML Computer Reference", New Delhi, Tata Mcgraw Hill

Semester VI

16CCU612B	INTERNATIONAL BUSINESS (PRACTICAL)	L	T	P	C
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COURSE OBJECTIVES:

To make the students

1. To enhance the students practical exposure in both Commerce and Computer oriented applications
2. To Knowledge the basic and broad knowledge in business laws in management.
3. To Ability to apply concepts, principles and theories to understand simple business laws.
4. To learn the global Perspective of Awareness of the different business law and its impacts on businesses.
5. To know for shares & allotment, letter of shares and transfer of shares.
6. To learn the students Tax liability, PAN, Filling form-16.

COURSE OUTCOMES:

Learners should be able to

On completion of this course, the students will be able to:

1. Understood the concepts in business laws with respect to foreign trade
2. Students will be able to global business laws to current business environment
3. Understood the principle of international business and strategies adopted by firms to expand globally
4. Integrate concept of business law with foreign trade.
5. Understood the Filling up application forms for admission to Co-operative Societies
6. Understood loan application forms and deposit Challan.

List of Practical

1. How to prepare the following documents
    a. Documents of origin
    b. Certificate of origin
2. How to fill up the following documents
    a. Commercial documents
    b. Proforma Invoice
    c. Invoice,
    d. Packing List/Packing specialization
3. How to prepare Transport documents.
    a. Shipping Bill
    b. ARE 1
    c. Master's Receipt
    d. Bill of Lading
    e. Airway Bill
4. Explain the Administrative documents.

5. Discuss in group the other documents required for import and export.
6. Prepare the procedure for
   - Documents needed for export to Brazil.
7. Prepare the Documentation for export of fish to Angola

Note: Record note to be submitted and Viva-voce will be conducted.

Suggested Readings:

Text Book

1. Subba Rao,(2008) *International Business*. New Delhi, Himalaya Publishing House.

Reference Books:

1. Charles W.L. Hill and Arun Kumar Jain. (2008). International *Business*. New Delhi, McGraw Hill.

2.Daniels John, D. Lee H. Radenbaugh and David P. Sullivan. *International Business* [15th Edition]. New Delhi, Pearson Education,

3. Johnson, Derbe, Colin Turner(2015). *International Business - Themes & Issues in the Modern Global Economy*. [2nd Edition] London: Roultedge

4. Cherunilam, Francis. *International Business: Text and Cases* [5th Edition]. New Delhi, PHI

5. Michael R. Czinkota. et al. International Business [9th Edition]. Fortforth, The Dryden Press

6. Bennett, Roger (2003). *International Business*. New Delhi, Pearson Education

7. Peng and Srivastav (2011). *Global Business*. New Delhi,Cengage Learning

8. SumatiVarma, *International Business* [2nd Edition] New Delhi, Pearson Education

Semester VI

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6	2	-	6

16CCU603B OFFICE MANAGEMENT AND SECRETARIAL PRACTICE

COURSE OBJECTIVES:

1. To familiarize the students with the activities in a modern office
2. To make the students familiar with Filing and Indexing
3. Make the students aware about Mail and Mailing Procedures
4. Understand Modern Office Equipment
5. Learn the Role of Secretary
6. To familiarize the students about the working environment, the tools and equipments. used in office.

COURSE OBJECTIVES:

1. Familiarized with the activities in a modern office
2. Familiar with Filing and Indexing
3. Awareness about Mail and Mailing Procedures
4. Understood Modern Office Equipment
5. Learnt the Role of Secretary
6. Understood the working environment, the tools and equipment used in office.

UNIT- I

Office and Office Management: Meaning of office - Functions of office – Primary and Administrative Management Functions - Importance of Office - Duties of the Office Manager - his qualities and essential qualifications.

Filing and Indexing: Filing and Indexing – Its meaning and importance - essentials of good filing - Centralized vs. Decentralized filing - System of Classification - Methods of Filing and Filing Equipment - Weeding of Old records - Meaning and Need for Indexing - Various Types of Indexing.

UNIT- II

Mail and Mailing Procedures: Mailing Procedures – Meaning and Importance of Mail - Centralization of Mail Handling Work - its Advantages - Room Equipment and Accessories - Sorting Tables and Rack, Letter Opener, Time and Date Stamps, Postal Franking Machine, Addressing Machine, Mailing Scales, Mailing through Post, Courier, Email, Appending Files with email. Inward and Outward mail – Receiving, Sorting, Opening, Recording, Making, Distributing, Folding of letters Sent, Maintenance of Peon Book, Dispatching, Courier Services, Central Receipt and Dispatch

Forms and Stationery: Office Forms – Introduction – Meaning - Importance of Forms - Advantages of using Forms - Disadvantages of using Forms - Type of Forms - Factors affecting Forms Design -

Principles of Form Design - Form Control. Stationery – Introduction - Types of Stationery used in offices - Importance of Managing Stationery - Selection of Stationery - Essential Requirements for a good system of dealing with Stationery - Purchasing Principles - Purchase Procedure - Standardization of Stationery.

UNIT- III

Modern Office Equipments: Modern Office Equipment – Introduction - meaning and Importance of office automation - objectives of office mechanization – advantages and disadvantages - factors determining office mechanization. **Kind of office machines**: Personal computers – Photocopier – Fax – Telephone - Telephone answering machine - Dictating machines - Audio Visual Aids.

UNIT-IV

Banking facilities: Types of accounts - Passbook and Cheque book - Other forms used in banks - ATM and money transfer - **Abbreviations/Terms used in Offices:** Explanation of Abbreviations/Terms used in offices in day-to-day work **Modes of Payment: T**ypes of payments handled such as postal orders - Cheque (crossed/uncrossed) - Post-Dated and Pre-Dated Cheques - stale Cheque - Dishonored Cheque.

UNIT-V

Role of Secretary: Definition – Appointment - Duties and Responsibilities of a Personal Secretary - Qualifications for appointment as Personal Secretary - Modern technology and Office Communication – E - mail - Voice mail – Internet – Multimedia – Scanner - Video-conferencing - Web-casting - Agenda and Minutes of Meeting - Drafting, Fax-messages – E – mail - Maintenance of Appointment Diary.

Suggested Readings :

Text Book:

1. N.D. Kapoor (2008) *Company Law*. New Delhi, Sultan Chand and Sons

Reference Books

1. Bhatia, R.C. *Principles of Office Management* [1st Edition] New Delhi, Lotus Press.
2. Leffingwell and Robbinson (2003) *Text book of Office Management*. New Delhi, Tata McGraw-Hill.

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Semester VI

L T P C

6 2 - 6

16CCU602B BANKING AND INSURANCE

COURSE OBJECTIVES:

To make the students

1. To enlighten the students' knowledge on Banking and Insurance regulation acts.
2. To gain an appreciation of the principles of insurance law and the particular operation of contract law in the insurance context.
3. To develop ability to analyze insurance problems and apply legal doctrine and policy considerations to them.
4. To acquire insight into the structure and substance of insurance policies;
5. To evaluate the effectiveness of legislation in controlling the insurance industry
6. To learn the protecting the interests of consumers of insurance products and insurers.

COURSE OUTCOMES:

Learners should be able to

1. Understand basic legal concepts and general principles of law;
2. Gain knowledge and understanding of the laws relevant to insurance;
3. Gain knowledge and understanding of the system which applies these laws; and
4. Develop an analytical approach to the application of knowledge and skills to simple problems.
5. Students will be able to insight into the structure and substance of insurance policies.
6. Understood the effectiveness of legislation in controlling the insurance industry.

UNIT- I

Introduction: Origin of banking: definition, banker and customer relationship, General and special types of customers, Types of deposits, Origin and growth of commercial banks in India. Financial Services offered by banks, changing role of commercial banks, types of banks

UNIT- II

Cheques and Paying Banker: Crossing and endorsement - meaning, definitions, types and rules of crossing. Duties, Statutory protection in due course, collecting bankers: duties, statutory protection for holder in due course, Concept of negligence.

UNIT- III

Banking Lending: Principles of sound lending, Secured vs. unsecured advances, Types of advances, Advances against various securities.

UNIT- IV

Internet Banking : Meaning, Benefits, Home banking, Mobile banking, Virtual banking, E-payments, ATM Card/Biometric card, Debit/Credit card, Smart card, NEFT, RTGS, ECS (credit/debit), E-money, Electronic purse, Digital cash.

UNIT- V

Insurance: Basic concept of risk, Types of business risk, Assessment and transfer, Basic principles of utmost good faith, Indemnity, Economic function, Proximate cause, Subrogation and contribution, Types of Insurance: Life and Non-life, Re-insurance, Risk and return relationship, Need for coordination. Power, functions and Role of IRDA, Online Insurance.

Suggested Readings:

Text Book:

1. Dr. P.K. Gupta (2015), *Insurance and Risk Management.* New Delhi, Himalaya Publishing House

2. Varshney, P.N (2014). *Banking Law and Practice*[20th edition]. New Delhi, Sultan Chand and Sons

Reference Books

1. Agarwal, O.P.(2011). *Banking and Insurance*. New Delhi, Himalaya Publishing House
2. Satyadevi, C(2009), *Financial Services Banking and Insurance* New Delhi, S.Chand & Co.
3. Suneja, H.R (2007). *Practical and Law of Banking.* New Delhi, Himalaya Publishing House.
4. Chabra, T.N.(2008). *Elements of Banking Law*, New Delhi, Dhanpat Rai and Sons,
5. Arthur, C. and C. William Jr., *Risk Management and Insurance*. [8th Edition]. Tata McGraw Hill.
6. Saxena, G.S. (2005). *Legal Aspects of Banking Operations*. New Delhi, Sultan Chand and Sons
7. Jyotsna Sethi and Nishwan Bhatia(2012). *Elements of Banking and Insurance*. New Delhi, PHI Learning.

Semester VI

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16CCU603 A FUNDAMENTALS OF FINANCIAL MANAGEMENT

COURSE OBJECTIVES:

To make the students

1. To equip the students with the understanding time value of money & use it for decision making.
2. To evaluate projects and investments is the basic objective of the course.
3. To enable the students to take investment decisions and financial decisions.
4. To acquaint the students about the various aspects of capital structure
5. To provide the students with the basic knowledge of Dividend decisions.
6. To impart knowledge of working capital and cash management.

COURSE OUTCOMES:

Learners should be able to

1. Students who complete this course will be able understand the use of finance for decision making
2. The students will able to describe time value of money, how a project is made and appraised.
3. Students will know the technicalities of making investment decisions.
4. Students of the course will able to differentiate between the various sources of finance and their pros & cons.
5. Students who complete this course will be able to outline capital requirements for starting a business & management of working capital.
6. Students of the course will able to recommend whether and why an investment should be accepted or rejected.

UNIT- I

Introduction: Nature, scope and objective of Financial Management, Time value of money, Risk and return (including Capital Asset Pricing Model), Valuation of securities –Bonds and Equities.

UNIT- II

Investment Decision: The Capital Budgeting Process, Cash flow Estimation, Payback Period Method, Accounting Rate of Return, Net Present Value (NPV), Net Terminal Value, Internal Rate of Return (IRR), Profitability Index, Capital budgeting under Risk –Certainty Equivalent Approach and Risk-Adjusted Discount Rate.

UNIT-III

Financing Decision: Cost of Capital and Financing Decision: Sources of long-term financing Estimation of components of cost of capital. Methods for Calculating cost of Equity capital, Cost of Retained Earnings, Cost of Debt and Cost of Preference Capital, Weighted Average Cost of Capital

(WACC) and Marginal cost of capital. Capital structure –Theories of Capital Structure (Net Income, Net Operating Income, MM Hypothesis, Traditional Approach). Operating and Financial Leverage. Determinants of Capital Structure.

UNIT-IV

Dividend Decisions: Theories for Relevance and Irrelevance of Dividend Decision for Corporate valuation; Cash and Stock Dividends; Dividend policies in practice

Unit V

Working Capital Decisions Concepts of working capital, the risk-return trade off, sources of short-term finance, working capital estimation, cash management, receivables management, inventory management and payables management.

Suggested Readings :

Text Book:

1. S.N.Maheswari.(2008). *Financial Management*, New Delhi: Sultan Chand & Sons.

Reference Books:

1. James C. Van Horne and Sanjay Dhamija. (2012). *Financial Management and Policy*[12th Ed], New Delhi, Pearson Education.
2. Levy H. and M. Sarnat (2004). *Principles of Financial Management* New Delhi, Pearson Education.
3. Joy, O.M.(2007). *Introduction to Financial Management*. New Delhi, TataMc Graw Hill Education
4. Singh, J.K .*Financial Management-text and Problems* [2nd Ed] New Delhi, Dhanpat Rai and Company.
5. Rustagi, R.P. *Fundamentals of Financial Management*. New Delhi, Taxmann Publication Pvt. Ltd.
6. Pandey, I.M. *Financial Management.* [9th Edition]. New Delhi, Vikas Publications.

Semester VI

L	T	P	C
6	-	-	4

16CCU603 B **PERSONAL SELLING AND SALESMANSHIP**

COURSE OBJECTIVES:
To make the students

1. To equip the students with the understanding of **buying motives**.
2. To equip the students with the understanding of **Personal Selling**
3. To enable the students to understand selling process.
4. To acquaint the students about Recruiting and Selection
5. To provide the students with the knowledge of reports and documents
6. To impart knowledge of management Ethical aspects of Selling

COURSE OUTCOMES:
Learners should be able to

1. Understood **buying motives**.
2. Equipped knowledge about **Personal Selling**
3. Understood selling process.
4. Got knowledge about Recruiting and Selection
5. Acquired sufficient knowledge about reports and documents
6. Understood Ethical aspects of Selling

UNIT- 1:

Introduction to Personal Selling: Nature and importance of personal selling, myths of selling, Difference between Personal Selling, Salesmanship and Sales Management, Characteristics of a good salesman, types of selling situations, types of salespersons, Career opportunities in selling, Measures for making selling an attractive career.

UNIT-II

Buying Motives: Concept of motivation, Maslow's theory of need hierarchy; Dynamic nature of motivation; Buying motives and their uses in personal selling

UNIT-III

Selling Process: Prospecting and qualifying; Pre-approach; Approach; Presentation and demonstration; handling of objections; Closing the sale; Post sales activities.

UNIT-IV

Sales Force Management – Job analysis – Jon Description – organization for Recruiting and Selection –Sources of Sales Force Recruits – The Recruiting Effort – Selecting Sales Personnel .Training, Motivation and Compensation of Sales Force : Building Sales Training Programs –Selecting Training Methods – Organization for Sales Training – Evaluating Sales Training Programs

UNIT-V

Sales Reports: reports and documents; sales manual, Order Book, Cash Memo; Tour Diary, Daily and Periodical Reports; Ethical aspects of Selling

Suggested Readings:

Text Books

1. Richard R. Still, Edward W.Cundiff & Norman A.P.Govoni (2001), *Sales Management*, New Delhi, Prentice Hall of India.

Reference Books

1. Spiro, Stanton, Rich *Management of the Sales force*[12th Edition].New Delhi, Tata McGraw Hill.
2. Rusell, F. A. Beach and Richard H. Buskirk (2013). *Selling: Principles and Practices*, New Delhi, Tata McGraw Hill
3. Futrell, Charles. (2013). *Sales Management: Behaviour, Practices and Cases*, New Delhi,The Dryden Press.
4. Still, Richard R., Edward W. Cundiff and Norman A. P. Govoni. (2013). *Sales Management: Decision Strategies and Cases.* New Delhi, Prentice Hall of India Ltd.
5. Johnson, Kurtz and Schueing (2010). *Sales Management*. New Delhi, Tata McGraw Hill.

Semester VI

L T P C

16CCU604A GE2 – INDIAN ECONOMY **6 2 - 6**

COURSE OBJECTIVES:

To make the students

1. To represents the concept of economic development of various fields and human resource.
2. To learn the basics of economic development of agriculture, industry, public finance and economic planning.
3. To understand how planning and infrastructure support can develop an economy.
4. To learn the environmental and resource economics, development economics and international trade.
5. To learn the Industrial Labour Organization and Industrial Policy.
6. To identify the Agricultural Productivity and Reforms.

COURSE OUTCOMES:

Learners should be able to

1. It will result in comprehensive understanding of Indian Economy
2. Understood the efficiency and equity implications of market interference, including government policy.
3. Understood of the students related to different sectors of Indian Economy.
4. Insight into special fields of your choice, like energy economic, competition policy, industrial economics, financial markets, environmental and resource economics, development economics and international trade.
5. Understood the Foreign Trade and Balance of Payments. GATT and WTO.
6. Understood the Agricultural Productivity and Reforms.

UNIT- I

Basic Issues and features of Indian Economy: Concept and Measures of Development and Underdevelopment- Human Development**-** Composition of national income and occupational structure

UNIT-II

Policy Regimes : The evolution of planning and import substituting industrialization-Economic Reforms since 1991- Monetary and Fiscal policies with their implications on economy

UNIT- III

Growth, Development and Structural Change: The experience of Growth- Development and Structural Change in different phases of growth and policy regimes across sectors and regions. The Institutional Framework: Patterns of assets ownership in agriculture and industry- Policies for restructuring agrarian relations and for regulating concentration of economic power- Changes in policy perspectives on the role of institutional framework after 1991. Growth and Distribution-

Unemployment and Poverty- Human Development; Environmental concerns.Demographic Constraints: Interaction between population change and economic development.

UNIT-IV

Sectoral Trends and Issues: Agriculture Sector: Agrarian growth and performance in different phases of policy regimes i.e. pre green revolution and the two phases of green revolution; Factors influencing productivityand growth; the role of technology and institutions; price policy, the public distribution system and food security. Industry and Services Sector: Phases of Industrialisation – the rate and pattern of industrial growth across alternative policy regimes; Public sector – its role, performance and reforms; The small scale sector; Role of Foreign capital.

Financial Sector: Structure, Performance and Reforms. Foreign Trade and balance of Payments: Structural Changes and Performance of India's Foreign Trade and Balance of Payments; Trade Policy Debate; Export policies and performance; Macro Economic Stabilisation and Structural Adjustment; India and the WTO, Role of FDI, Capital account convertibility,

UNIT- V

Inflation, Unemployment and Labour market : Inflation: Causes of rising and falling inflation, inflation and interest rates, social costs of inflation; Unemployment – natural rate of unemployment, frictional and wait unemployment. Labour market and its interaction with production system; Phillips curve, the trade-off between inflation and unemployment, sacrifice ratio, role of expectations adaptive and rational.

Suggested Readings :

Text Book

1. **Sankaran (2013). *Indian Economy* Chennai, Margham Publication.,**

Reference Books

1. Mishra and Puri(2014)**,** *Indian Economy*. New Delhi, Himalaya Publishing House.
2. IC Dhingra(2014), *Indian Economy*, New Delhi, Sultan Chand & Sons
3. Gaurav Dutt , KPM Sundarum (2013). *Indian Economy*. New Delhi, S. Chand & Company.
4. Uma Kapila (2015), *Indian Economy since Independence*,[19th Edition]. New Delhi, Academic Foundation.
5. Bhagwati, J, Desai, P. (2015). *Planning for industrialization*. Chennai; India.Oxford University Press.

Semester VI

16CCU604 B	CYBER CRIMES AND LAWS	L	T	P	C
		6	2	-	6

COURSE OBJECTIVES:
To make the students

1. To expose the students to the basics of cyber laws.
2. To enable students to learn laws and rules governing electronic commerce, contracts, IPRs etc.
3. To know rapid growth of the information technology
4. To understand Cyber Law prevents or reduces the damage from cybercriminal activities
5. To understanding the protecting information access, privacy, communications, intellectual property
6. To about the Internet, World Wide Web (WWW), email, computers

COURSE OUTCOMES:
Learners should be able to

1. Understood the Regulation and Cyber law
2. Understood copyright in digital media
3. Know the about Regulators under IT
4. Understand Software Development & Licensing Agreements
5. Understood Legal, Security & Technical Issues in Cyber Contracts
6. Understood Indian Penal Codes and Cyber Crimes.

UNIT- I

Cyber Crimes: Introduction- Computer crime and cyber crimes; Distinction between cyber crime and conventional crimes; cyber forensic; Kinds of cyber crimes- cyber stalking, cyber terrorism, forgery and fraud, crimes related to IPRs, computer vandalism; Privacy of online data; Cyber Jurisdiction; Copyright issues; and Domain name dispute etc.

UNIT-II

Definition and Terminology (Information Technology Act, 2000): Concept of Internet, Internet Governance, E-Contract, E-Forms, Encryption, Data Security. Access, Addressee, Adjudicating Officer, Affixing Digital Signatures, Appropriate Government, Certifying Authority, Certification Practice Statement,

UNIT-III

Computer: Computer Network, Computer Resource, Computer System, Cyber Appellate Tribunal, Data, Digital Signature, Electronic Form, Electronic Record, Information, Intermediary, Key Pair, Originator, Public Key, Secure System, Verify, and Subscriber as defined in the Information Technology Act, 2000.

UNIT-IV

Electronic Records : Authentication of Electronic Records; Legal Recognition of Electronic Records; Legal Recognition of Digital Signatures; Use of Electronic Records and Digital Signatures in Government and its Agencies; Retention of Electronic Records; Attribution, Acknowledgement and Dispatch of Electronic Records; Secure Electronic Records and Digital Signatures.

UNIT-V

Regulatory Framework: Regulation of Certifying Authorities; Appointment and Functions of Controller; License to issue Digital Signatures Certificate; Renewal of License; Controller's Powers; Procedure to be Followed by Certifying Authority; Issue, Suspension and Revocation of Digital Signatures Certificate, Duties of Subscribers; Penalties and Adjudication; Appellate Tribunal; Offences.

Suggested Readings:

Text Book :

1. Chaffey, Dave (2009). *E-business and E-commerce Management* [4th Edition]. New Delhi, Pearson Education.

Reference Books:

1. Efraim Turban, Jae Lee, King, David, and HM Chung. (2001). *Electronic Commerce-A managerial Perspective*. New Delhi, Pearson Education.
2. Joseph, P.T *E-Commerce-An Indian Perspective* [5th Edition]. New Delhi, Prentice Hall of India.
3. Painttal. D (2002). *Law of Information Technology*. New Delhi, Taxmann Publications Pvt. Ltd.
4. Dietel, Harvey M., Dietel, Paul J., and Kate Steinbuhler (2009). *E-business and E-commerce for managers*. New Delhi, Pearson Education.
5. Brian, Craig *Cyber Law: The Law of the Internet and Information Technology*. New Delhi, Pearson Educatio.
6. Sharma J. P, Sunaina Kanojia. (2012). *Cyber Laws* [1st Edition] New Delhi, Ane Books Pvt Ltd.

BACHELOR OF COMMERCE (PROFESSIONAL ACCOUNTING)

CHOICE BASED CREDIT SYSTEM (CBCS)

Curriculum

(2016 – 2019)

DEPARTMENT OF COMMERCE

FACULTY OF ARTS, SCIENCE AND HUMANITIES

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)

(Established Under Section 3 of UGC Act, 1956)

Pollachi Main Road, Eachanari (Post), Coimbatore- 641021, Tamil Nadu, India

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DEPARTMENT OF COMMERCE
FACULTY OF ARTS, SCIENCE AND HUMANITIES
UG PROGRAM (CBCS) – B.COM.(PA)
(2016–2017 Batch and onwards)

Course code	Name of the course	Objectives and outcomes		Instruction hours / week			Credit(s)	Maximum Marks		
		PEOs	POs	L	T	P		CIA	ESE	Total
								40	60	100
SEMESTER - I										
16LAU101	Language - I	I, II, III	a, e	6	0	0	6	40	60	100
16ENU101	English – I	I, II, III	a, e	4	0	0	4	40	60	100
16PAU101	Financial Accounting	I, II, III, IV	a, c, d,e, h,i	4	0	0	4	40	60	100
16PAU102	Business Law	I,III,IV	a,c,d,e,h,i	5	0	0	5	40	60	100
16PAU111	Accounting Package - Tally (Practical)	I, II, III, IV	a, c, d,e, h,i	4	0	0	2	40	60	100
16PAU112	Business Law (Practical)	I,III,IV	a,c,d,e,h,i	3	0	0	1	40	60	100
16AEC101	Business Communication	I, II, III	a, e, g, f	4	0	0	4	40	60	100
Semester Total				**30**	**0**	**0**	**26**	**280**	**420**	**700**
SEMESTER – II										
16LAU201	Language – II	I, II, III	a, e	6	0	0	6	40	60	100
16ENU201	English – II	I, II, III	a, e	4	0	0	4	40	60	100
16PAU201	Higher Financial Accounting	I, II, III, IV	a, c, d,e, h,i	6	2	0	6	40	60	100
16PAU202	Business Statistics	I, II, III	a, c, d,e, h	5	0	0	5	40	60	100
16PAU211	Statistical Package Using SPSS (Practical)	I, II, III	a, c, d,e, h	3	0	0	1	40	60	100
16AEC201	Environmental Studies	I,III, IV	a, e,h, i	4	0	0	4	40	60	100
Semester Total				**28**	**2**	**0**	**26**	**240**	**360**	**600**
SEMESTER – III										
16ENU301	English – III	I, II, III	a, e	4	0	4	6	40	60	100
16PAU301	Corporate Accounting	I, II, III	a, c, e, d, h	6	2	0	6	40	60	100
16PAU302	Direct Taxation – I	I, II, III, IV	a, c, d,e, h,i	6	2	0	6	40	60	100
16PAU303A	Principles of Auditing	I, II, III, IV	a, c, d,e, h,i	6	0	0	4	40	60	100
16PAU303B	Management Information System	I, II, III, IV	a, e, h,i							
Semester Total				**22**	**4**	**4**	**22**	**160**	**240**	**400**
SEMESTER – IV										
16ENU401	English – IV	I, II, III	a, e	4	0	4	6	40	60	100
16PAU401	Advanced Corporate Accounting	I, II, III, IV	a, c, d,e,h	6	2	0	6	40	60	100
16PAU402	Direct Taxation – II	I, II, III, IV	a, c, d,e, h,i	6	2	0	6	40	60	100
16PAU403A	Company Law and Secretarial Practice	I, II, III, IV	a, c, d,e, h,i	6	0	0	4	40	60	100
16PAU403B	Business Organization and Office Management	I, II, III	a, c, d,e,h							
Semester Total				**22**	**4**	**4**	**22**	**160**	**240**	**600**

Course code	Name of the course	Objectives and outcomes		Instruction hours / week			Credit(s)	Maximum Marks		
		PEOs	POs	L	T	P		CIA	ESE	Total
								40	60	100
SEMESTER V										
16PAU501A	Research Methodology	I, II, III, IV	a, c, d,e,f,g, h,i	6	2	0	6	40	60	100
16PAU501B	Banking and Insurance	I, II, III	a, c, d,e, f,g,h							
16PAU502A	Financial Management	I, II, III	a, c, d,e, h	6	2	0	6	40	60	100
16PAU502B	Financial Markets, Institutions and Financial Services	I, II, III	a, c, d,e, h							
16PAU503A	Applied Cost Accounting	I, II, III	a, e,h	6	0	0	4	40	60	100
16PAU503B	Human Resource Management	I, II, III	a, e, h							
16PAU504A	Principles of Marketing	I, II, III	a, c,d, e,h	6	2	0	6	40	60	100
16PAU504B	Micro Economics	I, II, III	a, c,d, e,h							
Semester Total				**24**	**6**	**0**	**22**	**160**	**240**	**400**
SEMESTER – VI										
16PAU601A	Investment Management	I, II, III, IV	a,e,h,i	8	0	0	6	40	60	100
16PAU601B	Industrial Relations and Labour Laws	I, II, III, IV	a,e,h,i							
16PAU602A	Entrepreneurship and Project Management	I, II, III	a,e,h	8	0	0	6	40	60	100
16PAU602B	International Business	I, II, III	a,e,h							
16PAU603A	Management Accounting	I, II, III, IV	a,e,h,i	6	0	0	4	40	60	100
16PAU603B	Retail Business Management	I, II, III	a,c,d e,h							
16PAU691	Project	I, II, III	a, b, c, d,e,f,g,h	8	0	0	6	40	60	100
ECA/NCC/NSS/Sports/General Interest etc										**Good**
Semester Total				**30**	**0**	**0**	**22**	**160**	**240**	**400**
Programme Total				**180**			**140**	**1160**	**1740**	**2900**

SKILL ENHANCEMENT COURSE

Semester	Course Code	Skill Enhancement Course	Semester	Cours e Code	Skill Enhancement Course
III	16PAU303A	Principles of Auditing	IV	16PAU403A	Company law and Secretarial Practice
	16PAU303B	Management Information System		16PAU403B	Business Organization and Office Management
Semester	**Course Code**	**Skill Enhancement Course**	**Semester**	**Course Code**	**Skill Enhancement Course**
V	16PAU503A	Applied Cost Accounting	VI	16PAU603A	Management Accounting
	16PAU503B	Human Resource Management		16PAU603B	Retail Business Management

DISCIPLINE SPECIFIC ELECTIVE

Semester	Course Code	Discipline Specific Elective	Semester	Course Code	Discipline Specific Elective
V	16PAU501A	Research Methodology	VI	16PAU601A	Investment Management
	16PAU501B	Banking and Insurance		16PAU601B	Industrials Relations and Labour Laws
	16PAU502A	Financial Management		16PAU602A	Entrepreneurship and Project Management
	16PAU502B	Financial Markets, Institutions and Financial Services		16PAU602B	International Business

GENERIC ELECTIVE

Semester	Course Code	Generic Elective	Semester	Course Code	Generic Elective
V	16PAU504A	Principles of Marketing	VI	16PAU691	Project
	16PAU503B	Micro Economics			

PROGRAM OUTCOMES [PO]

a. Graduates will have a knowledge in bookkeeping, accounting, compliance abiding norms of financial services industry.

b. Graduates will apply the IT skills in accounting, taxation and finance career for effective decision making.

c. Graduates will obtain ability to analyze and solve the complex business problems with professional expertise and accuracy using quantitative and qualitative tools and techniques for effective decision making.

d. Graduates will exhibit critical thinking skills to understand the accuracy in financial reporting, real-time business issues and advocate suitable solutions.

e. Graduates will acquire and demonstrate the interpersonal and communication skills to convey the audited findings and negotiate for the conformity of the results got through in-depth analysis.

f. Graduates will attain and exhibit skills to work as team to take effective decisions in achieving the common goals.

g. Graduates will demonstrate the leadership skills to initiate, lead and deliver the best performance together with the team members.

PROGRAM SPECIFIC OUTCOMES (PSO)

h. Graduates will apply a lifelong learning in research and practice gained through knowledge and skills in continuous adaption of the changes in environment factors pertaining to accounting, auditing, and finance.

i. Graduates will demonstrate legal, ethical compliance and socially sustainable code of conduct in both personal and professional decision-making process.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

I. Graduates will gain knowledge of accounting, taxation, auditing, finance and management to perform effectively in professional courses like CA, CMA,CS, ICWA and other courses.
II. Graduates will obtain and demonstrate skills pertaining to professional courses to perform effectively in studies, jobs and entrepreneurial ventures.
III. Graduates will develop a life-long learning by applying the gained knowledge and skills in Professional practice and research.
IV. Graduates will demonstrate high standard of ethical conduct and become socially responsible citizens contributing to the sustainable growth of profession and the community.

Program Educational Objectives	Program Outcomes								
	a	b	c	d	e	f	g	h	i
Graduates will gain knowledge of accounting, taxation, auditing, finance and management to perform effectively in professional courses like CA, CMA, CS, ICWA and other courses.	√	√	√	√					
Graduates will obtain and demonstrate skills pertaining to professional courses to perform effectively in studies, jobs and entrepreneurial ventures.		√	√	√	√	√	√	√	√
Graduates will develop a lifelong learning by applying the gained knowledge and skills in Professional practice and research.	√	√	√	√	√	√		√	
Graduates will demonstrate high standard of ethical conduct and become socially responsible citizens contributing to the sustainable growth of profession and the community.				√	√	√	√	√	√

பகுதி – I, தமிழ் பருவம் I

16LAU101 : தமிழ் முதல் தாள் 6-H,6-C

(இளநிலை கலையியல் பட்ட குப்புகளுக்குரியது)

COURSE OBJECTIVES

To make the students

1. Learning way of thinking and expressive ability.
2. Improving the scope of research.
3. Realizing the subtle parts of life that literature conveys.
4. Realizing the role that literature plays in the maturation of the human mind.
5. Awareness raising on awareness, culture etc. in the growing community.
6. Preparing students for government exams.

COURSE OUTCOMES

Learners should be able to

1. Complete introduction to 'History of Tamil Literature', which is an optional subject in competitive examinations such as Indian Citizenship.
2. Access to literature with a research-oriented approach to inscriptional, manuscript, and archaeological research.
3. 'Scientific Tamil', the field of development of Tamil; Development of multi-pronged research thinking on 'Internet Tamil'.
4. Having creative self-improvement and creativity development for employment.
5. An attitude of seeking literature in support of social and biological values.
6. Skill development for translation based employment.

அலகு – I : இக்கால இலக்கியம்: (20 மணிநேரம்)

கல்வி : மகாகவி பாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணி தேசிய விநாயகம் -ஒற்றுமையே உயிர்நிலை
: கவிஞர் அப்துல்ரகுமான் - கால வழு
மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் – மலையாளக் காற்று கவிஞர் தாமரை – மழைக்குறிப்பு
சூழலியல் : கவிஞர் வைதீஸ்வரன் -விரல் மீட்டிய மழை
பெண்ணியம் :கவிஞர் சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை கவிஞர் வைரமுத்து – அம்மா
வாழ்க்கை : கவிஞர் தருமுசிவராம் – வாழ்வுப் பாடல்
இயற்கை : பாவேந்தர் பாரதிதாசன் – அழகின் சிரிப்பு – வான்.

அலகு – II : அற இலக்கியம்: (15 மணிநேரம்)

கொன்றை வேந்தன்: 1 - 50 பாடல்கள்

திருக்குறள்: பண்புடைமை, வினைத்திட்பம் -20 குறள்கள்

பழமொழி நானூறு: 5 பாடல்கள்

வேதநாயகம்பிள்ளை நீதிநூல்: 74 -78 பாடல்கள்

பெருவாயின் முள்ளியார் ஆசாரக்கோவை: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: (15 மணிநேரம்)

மூவருலா: 1-26 கண்ணிகள்

திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்

குற்றாலக்குறவஞ்சி: 5 பாடல்கள்

முக்கூடற்பள்ளு : 5 பாடல்கள்

கலிங்கத்துப் பரணி: போர்பாடியது- 9 பாடல்கள்

அலகு – IV : கட்டுரை:(10 மணிநேரம்)

1. உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்
2. கட்டிடக்கலை - அ.இராசமாணிக்கனார்
3. வாழ்க்கை -இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: (12 மணிநேரம்)

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. எழுத்து, சொல், பொருள் இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Semester I

16ENU101	ENGLISH-I	L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

To make the students

1. To help students enhance their Language skills
2. To introduce different kinds of literary works
3. To familiarize different genres of Literature
4. To instruct moral values through literature.
5. To improvise their productive and receptive skills
6. To strengthen the basic knowledge about grammar

COURSE OUTCOME:

Learners should be able to

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed.
6. Betterment of language competence

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT V

Short Story: The Bird **–** Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. *Spring* 2013**.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala, V. *English for Communication*. 2006. Emerald Publishers: Chennai

Semester – I

16PAU101	**CORE – FINANCIAL ACCOUNTING**	**L**	**T**	**P**	**C**
		4	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To make the students learn the basic concepts, conventions, nature of accounting and also to acquire Conceptual Knowledge in different accounting standards.
2. To know about the accounting process and preparation of final accounts
3. To understand about the Accommodation of bills, Average Due Date and Account Current.
4. To understand and apply the techniques for preparing accounts in different business organizations like consignment and joint venture.
5. To know about the Bank Reconciliation Statement process and Accounting Standards
6. To understand overall accounting standards to maintain financial accounting.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend the accounting concepts, principles and to comply the accounting standards.
2. Acquire knowledge on accounting process and preparation of final accounts
3. To apply appropriate judgment derived from knowledge about bill of exchange
4. Recognize the accounting process of financial statement and critically think in preparing
5. Accounts, rectification of errors, Consignment and Joint Venture.
6. Recognize the Bank Reconciliation Statement process and Accounting Standards
7. To apply the correct accounting standards in their business.

UNIT I

Fundamentals of Book Keeping - Accounting Concepts and Conventions - Journal - Ledger - - Trial balance - Subsidiary Books - Capital and Revenue.

UNIT II

Final Accounts of a Sole trader with adjustments - Errors and Rectification

UNIT III

Bill of Exchange - Accommodation of bills - Average Due Date - Account Current.

UNIT IV

Accounting for Consignments and Joint Ventures

UNIT V

Bank Reconciliation Statement - Accounting for Non-Trading Concerns - Receipts and Payments Account, Income and Expenditure Account and Balance Sheet - Accounts of Professionals. Accounting Standards (Theory Only) - AS1: Disclosure of Accounting Policy, AS 5: Net Profit or Loss for the Period, Prior Period Items and Changes in Accounting Policies, AS 10: Accounting for Fixed Asset, AS 27: Financial Reporting of Interests in Joint Venture. AS 29: Provisions, Contingent Liability and Contingent Asset.

Note: Distribution of marks between problems and theory shall be 80% and 20%.

SUGGESTED READINGS:

TEXT BOOKS

1. Jain, S.P., & Narang. (2007). *Financial Accounting*. Ludhiana: Kalyani Publishers.

REFERENCES

1. Vinayakam, N., Maniam, P.L., & Nagarajan, K.L. (2010). *Principles of Accountancy.* New Delhi: S.Chand and Company Ltd.
2. ICAI Study material
3. Gupta, R.L., & Shukla, M.C. (2011), *Principles of Accountancy.* New Delhi: S. Chand and Company Ltd.
4. Grewal, T.S. (2010). *Introduction to Accountancy*. New Delhi: S. Chand and Company Ltd.
5. Gupta, R.L., & Gupta, V.K. (2014). *Financial Accounting.* New Delhi: Sultan Chand and Sons.

Semester I

16PAU102	CORE – BUSINESS LAW	L T P C 5 - - 5

COURSE OBJECTIVES:

To make the students

1. To know the essential elements of contract and also the Indian Contract Act 1872.
2. To understand about the Banking Regulation Act 1949
3. To learn the fundamental regulation about the sale of goods act, 1930.
4. To impart basic knowledge of Indian Partnership Act 1932 and Limited Liability Partnership Act, 2008
5. To enhance knowledge in the Negotiable Instruments Act 1881.
6. To learn current business law and its implementation.

COURSE OUTCOMES:

Learners should be able to

1. Recognize the basic legal principles behind contractual agreements.
2. Understand the workings of banking companies and RBI.
3. Understand the relevance of business law in economic and social context.
4. Acquire problem solving techniques and will be able to present coherent, concise legal argument in partnership for achieving common goals.
5. Exhibit attributes in understanding various negotiable instruments, its features and utilization in real-time.
6. Understand the basic law related to business to achieve common goal of the business.

UNIT I

The Indian Contract Act, 1872 - General Principle of Law of Contract - Contract - Meaning - Characteristics and kinds - Essentials of a valid contract - Offer and Acceptance - Consideration - Contractual Capacity - Free Consent - Legality of objects - Void agreements - Discharge of contract - Modes of Discharge - Breach and Remedies against breach of contract - Contingent Contracts - Quasi - Contracts.

UNIT II

Banking Regulation Act 1949 - Origin of the Act - Business of Banking Company - Capital Requirements - Maintenance of Liquid Assets - Licensing of Banks - Powers of the RBI - Winding Up and Amalgamation of Banking Companies - RBI Credit Control Measures - Secrecy of Customer Account.

UNIT III

Contract of Agency - Principal - Agent - The Sale of Goods Act, 1930 - Contract of sale, meaning and difference between sale and agreement to sell. Conditions and warranties - Transfer of ownership in goods including sale by a non-owner - Performance of contract of sale - Unpaid seller - Meaning, rights of an unpaid seller against the goods and the buyer.

UNIT IV

Partnership Law - The Partnership Act, 1932 - Nature and Characteristics of Partnership - Registration of Partnership Firms - Types of Partners - Rights and Duties of Partners - Implied Authority of a Partner - Incoming and outgoing Partners - Mode of Dissolution of Partnership - The Limited Liability Partnership Act, 2008 - Salient Features of LLP - Differences between LLP and Partnership, LLP and Company - LLP Agreement, Partners and Designated Partners - Incorporation Document - Incorporation by Registration Partners and their Relationship

UNIT V

The Negotiable Instruments Act 1881 - Meaning, Characteristics, and Types of Negotiable Instruments : Promissory Note, Bill of Exchange, Cheque - Holder and Holder in Due Course, Privileges of Holder in Due Course. Negotiation: Types of Endorsement - Crossing of Cheque - Bouncing of Cheque

SUGGESTED READINGS:

TEXT BOOKS

1. Kapoor, N.D. (2013). *Elements of Mercantile Law.* New Delhi: S. Chand and Company Ltd.

REFERENCES

1. Kuchhal, M.C., & Vivek Kuchhal. (2011). *Business Law* (6th ed.). New Delhi: Vikas Publishing House.
2. Avtar Singh. (2013). *Business Law* (10th ed.). Lucknow: Eastern Book Company.
3. Ravinder Kumar. (2011). *Legal Aspects of Business* (2nd ed.). Cengage Learning.
4. Maheshwari, S.N., & Maheshwari, S.K.(2011). *Business Law.* New Delhi: Himalaya Publishing House.
5. Aggarwal, S.K. (2012). *Business Law*. New Delhi: Galgotia Publishers Company.
6. Bhushan Kumar Goyal., & Jain Kinneri. (2013). *Business Laws* (2nd ed.). International Book House
7. Akhileshwar Pathak. (2013). *Legal Aspects of Business* (6th ed.). New Delhi: McGraw Hill Education.
8. Tulsian, P.C., & BharatTulsian. (2000). *Business Law* (2nd ed.). New Delhi: McGraw Hill Education.
9. Sharma, J.P., & SunainaKanojia. (2014). *Business Laws*. New Delhi: Ane Books Pvt. Ltd.
10. Shukla, M.C. (2010). *Mercantile Law*. New Delhi: PHI India Pvt., Ltd.
11. Pillai, R.S.N., & Bagavathy. (2007). *Business Laws*, New Delhi: S.Chand and Company Pvt.

Semester I

		L	T	P	C
16PAU111	**ACCOUNTING PACKAGE – TALLY (PRACTICAL)**	**-**	**-**	**4**	**2**

COURSE OBJECTIVES:

To make the students

1. To understand the accounts heads available to create a company in the accounting software
2. To know the mechanics of creating the vouchers and ledgers
3. To be aware of the inventory valuations methods available in the software
4. To understand various financial statements that are built in the software
5. To be aware of financial analysis tools available in the software
6. To understand the recent software application pages with its various functions.

COURSE OUTCOMES:

Learners should be able to

1. Understand the different accounting heads and its importance
2. Create vouchers and ledgers by understanding the reason for posting under different heads
3. Calculate valuation of assets using the software
4. Prepare the financial statements and analyze the financial statement using the option of ratio analysis
5. Exhibit communication skills to communicate the output derived from the program.
6. To know the Accounting software implementation with its functions.

PRACTICAL LIST

1. Create a new company in Integrate Accounts mode and Account with Inventory mode
2. Create a primary and sub groups using single or multiple Ledger mode
3. Create minimum 10 ledgers using single or multiple ledger, and alter and delete any 2 ledger
4. Enter the following voucher
   - Payment vouchers
   - Receipt
   - Purchase
   - Sales
   - Credit note
   - Debit note
   - Journals
   - Memo
   - Optional
5. Create stock, stock groups and enter the vouchers
6. Prepare inventory statements using (calculate inventory using all methods)
   - FIFO
   - LIFO

- Simple Average Method
- Weighted Average Method

7. Prepare the following ratio analysis
    - ➢ Financial ratio
    - ➢ Operating ratio
    - ➢ Investment ratio
8. Prepare the following
    - ➢ Cash flow statement
    - ➢ Fund flow statement
9. Preparation of reports for the following
    - ➢ Trial Balance
    - ➢ Statement of Profit and Loss
    - ➢ Balance sheet
    - ➢ Bank Reconciliation Statement
    - ➢ Back up and restore the company information

TEXT BOOKS

1. Nellai Kannan. (2010). *Tally.* New Delhi: Nels Publishing Company.

16PAU112 **CORE – BUSINESS LAW (PRACTICAL)**

L	T	P	C
-	-	3	1

COURSE OBJECTIVES:
To make the students

1. To know the procedures in opening for savings account, current account and to open various deposits schemes.
2. To familiar in fund transfer procedures.
3. To impact the basic knowledge on Online Application and its procedure for Form Filling for SWIFT and E - Connect
4. To aware on procedure to register a Partnership Firm and Partnership Deed
5. To understand the Specimen of Promissory note and Bill of Exchange
6. To be familiar in current business practical practices under law with its procedure.

COURSE OUTCOMES:
Learners should be able to

1. Know the procedures in opening for savings account, current account and to open various deposits schemes.
2. Feminized in fund transfer procedures.
3. Knowledge on Online Application and its procedure for Form Filling for SWIFT and E - Connect
4. Understand on procedure to register a Partnership Firm and Partnership Deed
5. Understand the Specimen of Promissory note and Bill of Exchange.
6. Knowledge on current business current business practical practices under law with its procedure.

PRACTICAL LIST

1. Opening Online Saving Account and Current Account
2. Opening Online Recurring deposit and Fixed deposit
3. Online Application Form Filling for RTGS / NEFT
4. Procedure for Fund Transfer through RTGS / NEFT
5. Online Application Form Filling for SWIFT
6. Procedure for Fund Transfer through SWIFT
7. Procedure for forming E-Contract
8. Procedure to register a Partnership Firm
9. Format for Partnership Deed
10. Specimen of Promissory note and Bill of Exchange

		Semester I
16AEC101	**BUSINESS COMMUNICATION**	**L T P C**
		4 - - 4

COURSE OBJECTIVES:

To make the students

1. To understand the types of communication and barriers of communication.
2. To acquire knowledge on the different business correspondence used in organization
3. To be aware of the different types of reports prepared for the organization.
4. To be aware of the use of technology.
5. To know the oral presentation techniques used in communication.
6. To aware in visual aid presentation and its techniques.

COURSE OUTCOMES:

Learners should be able to

1. Communicate effectively with the optimal mix of verbal and nonverbal communication mitigating the barriers.
2. Draft business correspondence for the organization requirement.
3. Prepare business reports for organization needs.
4. Draft the resume and develop skills to face the interview
5. Use appropriate technology for business communication.
6. Use appropriate techniques to access visual aid presentation.

UNIT I

Nature of Communication: Process of Communication, Types of Communication (verbal & Non Verbal), Importance of Communication, Different forms of Communication; Barriers to Communication Causes, Linguistic Barriers, Psychological Barriers, Interpersonal Barriers, Cultural Barriers, Physical Barriers, Organizational Barriers

UNIT II

Business Correspondence: Letter Writing, presentation, Inviting quotations, Sending quotations, Placing orders, Inviting tenders, Sales letters, claim & adjustment letters and social correspondence, Memorandum, Inter -office Memo, Notices, Agenda, Minutes.

UNIT III

Report Writing: Business reports, Types, Characteristics, Importance, Elements of structure, Process of writing, Order of writing, the final draft, and check lists for reports.

UNIT IV

Application Letters – Preparation of Resume – Interview: Meaning – Objectives and Techniques of various types of interviews – public speech – Characteristics of a good Speech- Business Report Presentations.

UNIT V
Oral Presentation: Importance, Characteristics, Presentation Plan, Power point presentation, Visual aids.

SUGGESTED READINGS:

TEXT BOOKS

1. Rajendra Pal, J.S. Korlhalli, (2008), Essentials of Business Communication, Sultan.Chand & Sons, New Delhi.

REFERENCES

1. Bovee, and Thill, Business Communication Today, Pearson Education
2. Shirley Taylor, Communication for Business, Pearson Education
3. Locker and Kaczmarek, Business Communication: Building Critical Skills, TMH
4. Leena Sen, Communication Skills, PHI Learning

பகுதி – I, தமிழ் பருவம் II

16LAU201 : தமிழ் இரண்டாம் தாள் 6-H,6-C

(இளநிலை கலையியல் பட்ட வகுப்புகளுக்குரியது)

COURSE OBJECTIVES

To make the students

1. Learning way of thinking and expressive ability.
2. Improving the scope of research.
3. Realizing the subtle parts of life that literature conveys.
4. Realizing the role that literature plays in the maturation of the human mind.
5. Awareness raising on awareness, culture etc. in the growing community.
6. Preparing students for government exams.

COURSE OUTCOMES

Learners should be able to

1. Complete introduction to 'History of Tamil Literature', which is an optional subject in competitive examinations such as Indian Citizenship.
2. Access to literature with a research-oriented approach to inscriptional, manuscript, and archaeological research.
3. 'Scientific Tamil', the field of development of Tamil; Development of multi-pronged research thinking on 'Internet Tamil'.
4. Having creative self-improvement and creativity development for employment.
5. An attitude of seeking literature in support of social and biological values.
6. Skill development for translation-based employment.

அலகு – I : பக்தி இலக்கியம் (10 மணிநேரம்)

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு

1. சைவம் - பெரியபுராணம் - திருமூலநாயனார் புராணம்.

2. வைணவம் - பெரியாழ்வார் திருமொழி: 10 பாடல்கள்

அலகு – II : சங்க இலக்கியம் : (25 மணிநேரம்)

சங்க இலக்கியங்கள் அறிமுகம்

அ). **எட்டுத்தொகை**

நற்றிணை : 1. பிரசம் கலந்த – பாலை-110

2.தடமருப்பு எருமை- மருதம்-130

குறுந்தொகை : 1. கருங்கட்டாக் கலை – குறிஞ்சி- 69

2. உள்ளது சிதைப்போர்- பாலை-283

ஐங்குறுநூறு : 1. நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

2. அன்னாய் வாழி வேண்டன்னை-203

பதிற்றுப்பத்து : 1. சிதைந்தது மன்ற-27

2. மீன்வயின் நிற்ப-90

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு:

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : 1.குறிஞ்சிக்கலி-சுடர்தொடீ -15

2. முல்லைக்கலி-தீம்பால் -11

அகநானூறு : 1.அன்னாய் வாழி வேண்டன்னை-குறிஞ்சி-17

புறநானூறு : 1. யாதும் ஊரே யாவருங் கேளிர்-பொதுவியல்-192

2.கெடுக சிந்தை கடிதிவள் துணிவே -279

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - **பழமுதிர்ச்சோலையின் சிறப்பு**

முருகன் இருப்பிடங்கள்: சிறுதினை மலரொடு:218-275.

முருகன் அருள்புரிதல்: 286-295.

அலகு - III : காப்பியம் (12 மணிநேரம்)

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29) – கண்ணகியின் சிறப்பு: ‘நாகநீள் நகரொடு’ என்பதிலிருந்து தொடங்கி, ‘கண்ணகி என்பாண் மன்னோ’ என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234) - சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: ‘அருந்திறலரசர்’ என்பதிலிருந்து தொடங்கி, ‘மன்னவரேறென்’ என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485) - செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: ‘என்னே’ என்பதிலிருந்து தொடங்கி, ‘விசும்பில் தோன்றுமால்’ என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: ‘நீர்வார் கண்ணை’ என்பதிலிருந்து தொடங்கி, ‘புகாரென் பதியே’ என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: ‘வன்னி மரமும்’ என்பதிலிருந்து தொடங்கி, ‘பதிப்பிறந்தேன்’ என்பது வரையிலான தொடர்கள்.

சூளாமணி: மந்திர சாலைச் சருக்கம் (தேர்ந்தெடுக்கப்பெற்ற 25 பாடல்கள்)

அலகு – IV : சிறுகதை (15 மணிநேரம்)

1. **குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்**
2. **காட்டில் ஒரு மான் - அம்பை**
3. **நாற்காலி – கி.ராஜநாராயணன்**
4. **நகரம் – சுஜாதா**
5. **எஸ்தர் – வண்ண நிலவன்**
6. **மரப்பாச்சி – உமா மகேஸ்வரி**

அலகு- V : மொழிப்பயிற்சி (10 மணிநேரம்)

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை,கட்டுரை, உரைநடை)

மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

16ENU201	ENGLISH-II	Semester II
		L T P C
		4 - - 4

COURSE OBJECTIVES:

To make the students

1. To enable the learners to acquire English language skills.
2. To familiarize them with English literature.
3. To attain basic knowledge on Grammar.
4. To help learners imbibe cultural values.
5. To gain knowledge of making correct sentences.
6. To reflect originality on the application of soft skills and express in writing their views.

COURSE OUTCOME:

Learners should be able to

1. Acquire to enjoy the ecstasy of literature.
2. The select literary pieces will develop the confidence level of the learners.
3. Develop the social values.
4. Recognize the importance of communication
5. Get sound knowledge in English
6. Communicate well for business purpose.

UNIT I

Prose: The Unexpected- Robert Lynd
Poetry: The Village Schoolmaster – Oliver Goldsmith
Short Story: The Lion's Share – Arnold Bennett
Vocabulary: Homonyms
Grammar: Irregular Verb

UNIT II

Prose: Travel by Train – J. B. Priestley
Poetry: The Gift of India – Sarojini Naidu
Grammar: Sentence pattern

UNIT III

Prose: Women's Education is Almost More Important than the Education of Boys and Men – Indira Gandhi
Short Story: The Necklace – Guy De Maupassant
One-Act Play: The Referee – W.H. Andrews and Geoffrey Dearmer
Vocabulary: Similes
Grammar: Discourse Markers

UNIT IV

Poetry: Ozymandias – P.B. Shelley
One-Act Play: The Pot of Broth- W.B. Yeats
Vocabulary: Collective Noun
Grammar: Correction of Sentences

UNIT V

Short Story: The Silver Butterfly– Pearl S. Buck
One-Act Play: The Bear – Anton Chekov
Vocabulary: Acronym
Grammar: Question Tag

Prescribed Text:

Wings of Communication 2014. Board of Directors. Emerald Publishers: Chennai

Suggested Reading:

Syamala, V. *English for Communication*. 2006. Emerald Publishers: Chennai.

Semester II

16PAU201	CORE- HIGHER FINANCIAL ACCOUNTING	L	T	P	C
		6	2	-	6

COURSE OBJECTIVES

To make the students

1. To understand the concept of depreciation.
2. To knowledge in departmental accounts
3. To knowledge in various accounting standards
4. To understand the concepts Branch Accounts
5. To be aware of the Partnership Accounts
6. To be aware on various standards related to partnership account.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend the accounting methods in depreciation accounting.
2. Acquire knowledge on accounting process and preparation of branch accounts
3. To apply appropriate judgment derived from knowledge about Hire Purchase and Installment System.
4. Acquire knowledge on partnership accounts.
5. Recognize the concepts of Accounting Standards
6. Acquire knowledge on various standards related to partnership account.

UNIT I

Depreciation - Meaning - Importance - Causes of Depreciation - Methods of Depreciation - Straight Line Method - Written Down Value Method - Annuity Method - Valuation of Inventory.

UNIT II

Branch Accounts Excluding Foreign Branches - Hire purchase and Installment System including hire Purchase trading accounts - Royalty Accounts - Minimum Rent - Fixed Rent - Short Working - Recouping Short Workings.

UNIT III

Single Entry System - Meaning and Features - Statement of Affairs Method and Conversion Method - Departmental Accounts - Distribution of Expenses - Inter department Transfers.

UNIT IV

Partnership Accounts - Division of Profits - Fixed and Fluctuating Capital - Past Adjustments - Guarantee of Profits - Admission - Retirement - Death

UNIT V

Dissolution of Partnership - Insolvency of Partners - Rule in Garner Vs. Murray - Piecemeal Distribution - Sale to a company - Accounting Standards (Theory Only) - AS 2: Valuation of Inventory - AS 6: Depreciation Accounting - AS 7: Construction Contracts - AS 8: Revenue Reorganization, AS 13 Accounting for Investments.

Note: Distribution of marks for theory and problems shall be 20% and 80% respectively.

SUGGESTED READINGS:

TEXT BOOKS

1. Jain, S.P., & Narang. (2010). *Advanced Accounting*. Ludhiana: Kalyani Publishers.

REFERENCES

1. Shukla, M.C., Grewal, T.S., & Gupta, S.C. (2010). *Advanced Accounts*. New Delhi: Sultan Chand and Sons.
2. Gupta, R.L., & Radhaswamy, M. (2006). *Advanced Accountancy*. New Delhi: Sultan Chand and Sons.
3. Maheswari, S.N., & Maheswari, S.K. (2011). *Advanced Accounting*. New Delhi: Vikas Publishing House Pvt. Ltd.
4. Mukherjee, A., & Hanif, M. (2007). *Modern Accountancy*. New Delhi: Tata McGraw-Hill.
5. VinayahamCharumathi. (2008). *Financial Accounting*. New Delhi: Sultan Chand and Sons.
6. Arulanandam, M.A., & Raman, K.S. (2010). *Advanced Accounting*. New Delhi: Vikas Publishers.
7. Gupta, R.L., & Rathaswamy. (2009). *Advanced Accounting*. New Delhi: Sultan Chand & Sons.
8. Vinayagam, N., Mani, P.L., & Natarajan, K.L. (2010). *Financial Accounting*. New Delhi: Sultan Chand and sons.

Semester II

16PAU202	**BUSINESS STATISTICS**	**L**	**T**	**P**	**C**
		5	**-**	**-**	**5**

COURSE OBJECTIVES

To make the students

1. To understand the concept of matrices
2. To acquire the knowledge of differential calculus
3. To know the concepts of central tendency and dispersion
4. To understand the correlation and regression concepts
5. To be aware of the index numbers and trend analysis
6. To be aware on of issues in the construction of index numbers

COURSE OUTCOMES:

Learners should be able to

1. Utilize the concept of matrices, differential calculus to solve business problems
2. Calculate and apply the measure of central tendency and dispersion in decision making.
3. Evaluate the relationship and association between variables to formulate the strategy in business.
4. Apply the concept of index numbers and trend analysis in business decisions.
5. Demonstrate capabilities as problem-solving, critical thinking, and communication skills related to the discipline of statistics.
6. To overcome on issues in the construction of index numbers

UNIT I

Statistical Data and Descriptive Statistics: Nature and Classification of data: univariate, bivariate and multivariate data- time-series and cross-sectional data Measures of Central Tendency Mathematical averages including arithmetic mean, geometric mean and harmonic mean. Properties and applications. ii. Positional Averages Median and Mode (and other partition values including quartiles, deciles, and percentiles - including graphic determination). Measures of Variation: absolute and relative. Range, quartile deviation, mean deviation, standard deviation, and their coefficients, Properties of standard deviation/variance - Skewness: Meaning, Measurement using Karl Pearson and Bowley's measures- Concept of Kurtosis

UNIT II

Probability and Probability Distributions: Theory of Probability. Approaches to the calculation of probability- Calculation of event probabilities. Addition and multiplication laws of probability (Proof not required)- Conditional probability and Bayes' Theorem (Proof not required) Expectation and variance of a random variable, Probability distributions. Binomial distribution: Probability distribution function, Constants, Shape, Fitting of binomial distribution. Poisson distribution: Probability function, (including Poisson approximation to binomial distribution), Constants, Fitting of Poisson distribution. Normal distribution: Probability distribution function, Properties of normal curve, Calculation of probabilities

UNIT III

Simple Correlation and Regression Analysis: Correlation Analysis: Meaning of Correlation: simple, multiple and partial- linear and non-linear, Correlation and Causation, Scatter diagram, Pearson's coefficient of correlation- calculation and properties (Proof not required). Correlation and Probable error- Rank Correlation.

b. **Regression Analysis**: Principle of least squares and regression lines, Regression equations and estimation- Properties of regression coefficients- Relationship between Correlation and Regression coefficients- Standard Error of Estimate and its use in interpreting the results.

UNIT IV

Index Numbers: Meaning and uses of index numbers- Construction of index numbers: fixed and chain base: univariate and composite. Aggregative and average of relatives – simple and weighted Tests of adequacy of index numbers, Base shifting, splicing and deflating. Problems in the construction of index numbers- Construction of consumer price indices: Important share price indices, including BSE SENSEX and NSE NIFTY

UNIT V

Time Series Analysis: Components of time series- Additive and multiplicative models- Trend analysis: Fitting of trend line using principle of least squares – linear, second degree parabola and exponential. Conversion of annual linear trend equation to quarterly/monthly basis and vice-versa- Moving averages- Seasonal variations: Calculation of Seasonal Indices using Simple averages, Ratio-to-trend, and Ratio-to-moving averages methods. Uses of Seasonal Indices

SUGGESTED READINGS:

TEXT BOOKS

1. Richard I. Levin., Sanjay Rastogi., Masood Husain Siddiqui., & David, S. (2012). *Statistics for Management* (7th ed.). Noida: Pearson Education.
2. David, M., Levine, Mark, L., Berenson, Timothy, C., Krehbiel, & P. K. Viswanathan, *Business Statistics: A First Course* (5th ed.). Noida: Pearson Education.
3. Siegel Andrew, F. *Practical Business Statistics*. NewDelhi: McGraw Hill Education.
4. Gupta, S.P., & Archana Agarwal. Business *Statistics.* NewDelhi: Sultan Chand and Sons.
5. Vohra, N. D. *Business Statistics*. NewDelhi: McGraw Hill Education.
6. Murray, R., Spiegel, Larry, J., Stephens, & Narinder Kumar. *Statistics (Schaum's Outline Series).* NewDelhi: McGraw Hill Education.
7. Gupta, S.C. *Fundamentals of Statistics*. Himalaya Publishing House.
8. Anderson, Sweeney, & Williams. *Statistics for Students of Economics and Business*. Cengage Learning.

REFERENCES

1. Navnitham, P.A . (2004). *Business Mathematics And Statistics*, Trichy: Jai Publications.
2. Pillai, R.S.N., & Bagavathi V. (2002). *Statistics*. NewDelhi: S. Chand & Company Ltd.
3. Srivastava, T.N., & Shailaja Rego. (2012). *Statistics for Management* (2nd ed.). NewDelhi: Mc Graw Hill Education.
4. Amir D. Aczel, & Jayavel Sounderpandian. (2012). *Complete Business Statistics* (7th ed.). NewDelhi: Mc Graw Hill Education.
5. Dr. Arora, P.N. (1997). *A foundation course statistics.* NewDelhi: S.Chand & Company Ltd.

Semester-II

16PAU211	CORE – STATISTICAL PACKAGE USING SPSS (PRACTICAL)	L	T	P	C
		-	-	3	1

Course Objective

To make the students

1. To understand the Usage of Statistical Package and its functions
2. To know about calculation of descriptive statistics and various charts.
3. To analyses the data with various correlation analysis.
4. To understand the Histogram and Pie diagram by using SPSS
5. To understand the simple and multiple bar diagram by using SPSS
6. To know the overall features and functions to evaluate the result by using SPSS.

COURSE OUTCOMES:

Learners should be able to

1. Use the Statistical Package to make appropriate decision
2. Evaluate the data by descriptive statistics and various charts.
3. To analyse the data with various correlation analysis.
4. To draw the Histogram and Pie diagram by using SPSS
5. To draw the simple and multiple bar diagram by using SPSS.
6. Evaluate the results by accessing various features and function by using SPSS.

PRACTICAL LIST

1. Introduction to SPSS Package
2. Working with windows of SPSS
3. Defining variables in variable view window in SPSS
4. Drawing of Simple and multiple bar diagrams in SPSS Package
5. Drawing of Histogram and Pie diagram
6. Calculation of Mean for individual, discrete series using SPSS Package.
7. Mean for continuous series using SPSS Package.
8. Median for individual and discrete series using SPSS Package..
9. Median for continuous series using SPSS Package..
10. Mode for individual and discrete series using SPSS Package..
11. Standard deviation for individual and discrete series using SPSS Package.
12. Coefficient of variation for individual and discrete series using SPSS Package.
13. Karl Pearson's Correlation using SPSS Package.
14. Rank Correlation Coefficient using SPSS Package.

16AEC201	ENVIRONMENTAL STUDIES	Semester – II L T P C 4 - - 4

COURSE OBJECTIVES:
To make the students

1. To understand the ecosystem and its functions
2. To be aware of the difference between the renewable and non-renewable resources.
3. To know about biodiversity and the importance of conservation.
4. To be aware of the different pollution that affects the environment.
5. To know about the social issues prevailing in the environment.
6. To be familiar in Disaster Management.

COURSE OUTCOMES:
Learners should be able to

1. Understand the ecosystem and its impact on human beings.
2. Preserve the non – renewable energy and effectively utilize the renewable energy.
3. Avoid the threats to biodiversity habitat loses.
4. Prevent pollution in the environment
5. Apply the laws relevant to the environment conservation
6. Understand the causes of Disaster Management.

UNIT-I: Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

Unit II: Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources : Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fire works.

Unit III: Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV: Environmental Pollution - Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution , Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit V: Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment

Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

SUGGESTED READINGS:

TEXT BOOKS

1. Tripathy, S.N., & Sunakar Panda. (2004). *Fundamentals of Environmental Studies* (2^{nd} ed.). NewDelhi: Vrianda Publications Private Ltd.
2. Arvind Kumar. (2004). *A Textbook of Environmental Science*. NewDelhi: APH Publishing Corporation.
3. Verma,P.S., & Agarwal, V.K. (2001). *Environmental Biology (Principles of Ecology)*. NewDelhi: S.Chand and Company Ltd.
4. Anubha Kaushik., & Kaushik, C.P. (2004). *Perspectives in Environmental Studies*. NewDelhi: New Age International Pvt. Ltd. Publications.

REFERENCES

1. Singh, M.P., Singh, B.S., & Soma S. Dey. (2004). *Conservation of Biodiversity and Natural Resources*. NewDelhi: Daya Publishing House.
2. Daniel B.Botkin., & Edward A. Keller. (1995). *Environmental Science*. New York: John Wiley and Sons, Inc.
3. Uberoi, N.K. (2005). *Environmental Studies*. NewDelhi: Excel Books Publications.

Semester III

16ENU301 **ENGLISH-III**
Communicative English

L	T	P	C
4	-	4	6

COURSE OBJECTIVES:
To make the students

1. To develop confidence to respond in English during situations where the use of English is imperative.
2. To develop fluency in actual conversation in the English language.
3. To develop knowledge about business communication.
4. To develop knowledge about business writing.
5. To acquire knowledge on communication for different purpose.
6. To get knowledge to communicate in day to affairs.

COURSE OUTCOME:
Learners should be able to

1. Students learnt the basics and purposes of listening skill.
2. Students will know the importance of speaking.
3. Students developed the speaking skills on telephone, business and also in travel
4. Acquired knowledge on effective vocabulary learning strategies.
5. Students will able to communicate clearly and effectively and handle their day to day affairs well with their knowledge of language skills.

UNIT I: Listening

Listening and its types, Basic Listening Lessons, Critical Listening Lessons, Advanced Listening Lessons, and Note Taking

UNIT II: Speaking

Basics of speaking, Regular English, Business English, Interview English, and Travel English

UNIT III: Reading

Reading and its purposes, Types of Reading, Reading Techniques, Reading Comprehension, Note Making

UNIT IV: Writing

Writing defined, Types of Writing, Components of Writing, Writing Contexts, Language and Style with accordance to the contexts

UNIT V: Vocabulary Enrichment

Synonyms, Antonyms, Homonyms, Phrasal Verbs, Idioms and Phrases, One Word Substitutes, and Affixes

Suggested Reading:

Learning to Learn: Study Skills in English Cambridge, 2015
Advanced Skills; Simon Harenes – CUP. 2015
Business Results, Woodward, OUP. 2015
Function in English. Jonathan Middlemiss et al, OUP

Semester III

16PAU301	**CORE- CORPORATE ACCOUNTING**	**L**	**T**	**P**	**C**
		6	**2**	**-**	**6**

COURSE OBJECTIVES:

To make the students

1. To understand the accounting process for Share capital and debenture and its application
2. To prepare final accounts for corporate
3. To understand the accounting standard and its application in inter-holding companies
4. To solve problems relating to Holding Company Accounts,
5. To understand the process related to Liquidation of Companies.
6. To know accounting standard to Liquidation of Companies.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend and apply the accounting process related corporate accounting
2. Prepare final accounts for corporate entity.
3. Understand the accounting standard and apply the same for corporate entity and amalgamation.
4. Understand the accounting for Holding Companies.
5. Enhance the problem-solving skills and analytical skills in the accounting context.
6. Understand the accounting standard and its application of Liquidation of Companies.

UNIT I

Accounting for Share Capital and Debentures Issue - Forfeiture and Reissue of Forfeited Shares - Concept and process of book building - Issue of rights and bonus shares - Buyback of shares - Redemption of preference shares - Issue and Redemption of Debentures

UNIT II

Final Accounts - Statement of Profit and Loss and Balance sheet of Corporate Entities (Excluding Calculation of Managerial Remuneration) - Disposal of Company Profits

UNIT III

Valuation of Goodwill and Valuation of Shares - Concepts and calculation.

UNIT IV

Accounts of Holding Companies / Subsidiary Companies - Preparation of consolidated balance sheet with one subsidiary company. Relevant provisions of Accounting Standard: 21 (ICAI).

UNIT V

Liquidation of Companies - Modes of winding UP or Liquidation - Winding up Under Supervision of the Court - Order of Payment - Form of Statement of Affairs - Procedure - Liquidators Final Statement of Accounts - Liquidators Remuneration. Accounting Standards (Theory Only) - AS 16: Borrowing Costs - AS 19: Leases - AS 20 : Earnings Per Share - AS 26 : Intangible Assets.

Note: Distribution of marks for theory and problems shall be 20% and 80 % respectively.

UGGESTED READINGS:

TEXT BOOKS

1. Jain, S.P., & Narang, K.L. (2014). *Corporate Accounting* (12th ed.). Ludhiana: Kalyani Publishers.

REFERENCES

1. Monga, J.R. *Fudamentals of Corporate Accounting*. New Delhi : Mayur Paper Backs.
2. Shukla, M.C., Grewal,T.S., & Gupta, S.C. (2008). *Advanced Accounts* Vol.-II. New Delhi: S. Chand and Company Ltd.
3. Maheshwari, S.N., & and Maheshwari, S.K. (2009). *Corporate Accounting* (5th ed.). New Delhi: Vikas Publishing House.
4. Goyal, V.K., & RuchiGoyal. (2013). *Corporate Accounting* (3rd ed.). PHI Learning.
5. Bhushan Kumar Goyal. (2014). *Fundamentals of Corporate Accounting* (2nd ed.). New Delhi: International Book House.
6. Tulsian., P.C., & Bharat Tulsian. (2016). *Corporate Accounting* (11th ed.). New Delhi: S.Chand and Sons.
7. Amitabha Mukherjee., Mohammed Hanif. (2009). *Corporate Accounting* (1st ed.). New Delhi: McGraw Hill Education.

Semester III

16PAU302	CORE - DIRECT TAXATION - I	L	T	P	C
		6	2	-	6

COURSE OBJECTIVES:

To make the students

1. To understand the basic principles underlying the provisions of direct tax laws and to develop a broad understanding of the tax laws and accepted tax practices.
2. To recognize the income from property and profession and mode of assessing the same in income tax.
3. To understand the computation of Profits and Gains of Business or Profession of an Individual
4. To obtain the importance of capital gain in computation of Income tax.
5. To gain the exposure on practical aspects of tax planning as an important managerial decision-making process.
6. To gain knowledge on recent Rates of tax for individuals and its procedure.

COURSE OUTCOMES:

Learners should be able to

1. Distinguish sources of income
2. Distinguish between deductible and nondeductible expenses
3. Acquire knowledge on business income and Computation of Profits and Gains of Business
4. Apply the tax code provisions and calculate tax for natural and legal persons
5. Comprehend and apply the practical aspects of tax planning
6. Acquire knowledge on recent Rates of tax for individuals and its procedure.

UNIT I

Income Tax Act 1961- Definition of Income - Assessment Year - Previous Year - Assessee - Assessee in default - Scope of income - Charge of tax - Residential status of Individual, HUF - Company - Income which do not form part of total income.

UNIT II

Salaries and House Property - Computation of Income from Salaries and Income from House Property.

UNIT III

Business Income - Profits and Gains of Business or Profession - Meaning of Business or Profession - Computation of Profits and Gains of Business or Profession of an Individual - Expenses Expressly Allowed - Expenses Expressly Disallowed.

UNIT IV

Capital Gain - Meaning - Definition of Capital assets - Types - Computation of Capital gain - Income From Other Sources - Various income taxable under this head and Computation of Income from other sources.

UNIT V

Computation of Total Income - Set off and Carry forward of losses - Aggregation of agriculture income with non - agricultural income - Rates of tax for individuals - Income of other persons to be included in Income of Individual.

Note: Distribution of marks for theory and problems shall be 40 % and 60 % respectively.

SUGGESTED READINGS:

TEXT BOOKS

1. Gaur., & Narang. (2016). *Income Tax Law and Practice* (14th ed.). Ludhiana : Kalyani Publishers.

REFERENCES

1. Mehrothra. (2016). *Income Tax Law and Practice*. New Delhi: Snow White publications.
2. Jayaprakash Reddy. (2016). *Taxation* (1st ed.). New Delhi: APH Publishing Corporation.
3. Dinkare Pagarae. (2016). *Direct Tax*. New Delhi: Sultan Chand and Sons.
4. Dr. Vasan, M.S. (2016). *Direct Taxation Ready Reckoner* (26th ed.). LexisNexis.

Semester III

		L	**T**	**P**	**C**
16PAU303A	**SEC 1 - PRINCIPLES OF AUDITING**	**5**	**1**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To impart the students knowledge about the principles and practices in Auditing
2. To make the students to know about the Types of Audit and Vouching transaction
3. To apply the best auditing process as lifelong practice.
4. To communicate orally and in written form the auditing concept, techniques and practices in business.
5. To be familiar with the standards and laws pertaining to the auditing.
6. To be familiar to study the auditor report and to be familiar in different forms of reports available globally.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend on the Concept of auditing,
2. Recall the audit techniques and practices.
3. Apply lifelong the key learning of best auditing process.
4. Communicate orally and in written form the auditing concept and techniques in business.
5. Familiar with the standards and laws pertaining to the auditing.
6. Familiar and able to communicate the result from auditor report and able to understand different forms auditor report.

UNIT I

Introduction to Auditing: Definition - General objectives of auditing - Advantages and limitations of auditing - Auditing and investigation - Qualification of an Auditor.

UNIT II

Types of Audit: Continuous Audit - Final Audit - Interim Audit - Balance Sheet Audit - Merits and Demerits - Audit procedure - Planning of Audit - Audit programme - Audit note book - Audit working papers – Internal control - Internal check - Internal checks as regards cash - wages - sales etc - Position of external auditors to Internal Audit.

UNIT III

Vouching: Vouching of cash transactions - Trading transactions - Impersonal ledger – Definition - Nature and Scope of Internal Auditing - Auditor position - Auditors Duty Regarding Depreciation - Reserves and Provisions.

UNIT IV

Company Audit - Appointment and removal of auditor - Rights and duties of company auditors - Liabilities - Audit of share capital and share transfer.

UNIT V

Audit report - Contents and types - Auditors decision regarding the purchase and sale of asset - Audit of Computerized Accounts - Electronic Auditing.

SUGGESTED READING:

TEXT BOOKS

1. Tandon, B.N. (2014). *Principles of Auditing*. New Delhi: S. Chand & Company.

REFERENCES

1. Saxena, R.G., Kuriakose, K.K., & Venugopal, S. (2012). *Auditing Theory and Practicals*. Mumbai: Himalaya Publishing House.
2. Saxena. (2009). *Principles and practices of Auditing*. Mumbai: Himalaya Publishing House.
3. Kamal Gupta. (2010). *Contemporary Auditing*. New Delhi: Tata McGraw-Hill Publishing Company Ltd.
4. Ramaswamy, M.S. (2010). *Principles and Practices of Auditing*. New Delhi: Vikas Publishing House Pvt Ltd.

Semester III

16PAU303B	**SEC 1 – MANAGEMENT INFORMATION SYSTEM**	**L**	**T**	**P**	**C**
		5	**1**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To enable the students to learn the management information system and their applications in organization.
2. To know about various Input and output devices.
3. To create awareness among students in telecommunication revolution
4. To play management role with MIS platform.
5. To understand the types of computer and its revolution.
6. To understand the types of software and its features.

COURSE OUTCOMES:

Learners should be able to

1. Apply management information system and their applications in organization.
2. Understand the usage of various input, output and storage devices.
3. Understand telecommunication revolution and IT Act 2000.
4. Apply MIS platform and to implement management role effectively.
5. Understand the history and generation of computer with its features.
6. Familiar in various software available globally.

UNIT I

Introduction to Information Systems - Definition - Features - Steps in Implementation of MIS - Need for Information - Information System for Decision making- MIS as Competitive Advantages – MIS Structures.

UNIT II

MIS - Strategic Information System - MIS Support for Planning - Organising - controlling - MIS for Specific Functions − Personnel − Finance - Marketing Inventory Production Data Base Management System Models - Hierarchical - Network - Relational - Modular.

UNIT III

Computer Hardware - Description of Electronic Computers − CPU Operations - Classification of Computers - Main - Mini − Workstations - Micro Computers - Super Computers - Personal Computers. Computer Software - Types of Software - Data Representation in Computers - Introduction to Client-Server.

UNIT IV

Input Devices - Mouse - Touch Screens - MICR - OCR - Keyboard - Pen Based Input - Digital Scanners - Voice Input Devices - Sensors. Output Devices - Impact Printers - Non-Impact Printers - Video Display Terminals - Plotters - Voice Output Devices. Secondary Storage Devices - Magnetic Disk, Floppy, Magnetic Tape, Optical Disk Storage - DROM

UNIT V

Telecommunication Revolution - Introduction to Email- Internet - Intranet − Teleconferencing - www Architecture - Introduction to E-Commerce - Models B_B, B_C, and EDI, EDI Applications in Business - Electronic Payment Cash - Smart Cards - Credit Cards - Fundamentals of ERP- Information Technology Act, 2000.

SUGGESTED READINGS:

TEXT BOOKS

1. James O Brien. (2014). *Management Information System*. New Delhi: Tata Mc Grew Hill.

REFERENCES

1. Kenneth Laudon., & Jane Laudon. (2011). *Management Information System- A contemporary perspective*. New Delhi: Pearson Prentice Hall of India.

2. Gordon B Davis. (2012). *Management Information System*. New Delhi: Tata Mc Grew Hill.

3. Sudalaimuthu, S. (2014). *Computer applications in business*. Mumbai: Himalaya Publishing House Pvt.Ltd.

		Semester IV
16ENU401	**ENGLISH-IV**	**L T P C**
		4 - 4 6

COURSE OBJECTIVES:

To make the students

1. To train students in understanding the concepts of communication.
2. To be familiar with the four basic skills of English.
3. To train students in developing their written communication.
4. To train students in developing their presentation skills.
5. To acquire the skill of making grammatically correct sentences.
6. To reflect originality on the application

COURSE OUTCOMES:

Learners should be able to

1. Students have acquired proficiency in communication.
2. Students have become adept in written communication and presentation skills.
3. Developed the skill of writing in English and that of public speaking.
4. Establish and maintain social relationships.
5. Develop communication skills in business environment.
6. Enhanced communication competency through LSRW skills.

UNIT I: Integrated Skills

Development of speaking, listening and grammar skills.

UNIT II: Advanced Reading Skills

Outcomes include improved reading speed, increased reading fluency and increased vocabulary.

UNIT III: Advanced Writing Skills

Planning and writing complex tasks

UNIT IV: News and World Affairs

Newspapers, magazines, the Internet, TV and radio are used to develop listening, reading and discussion skills.

UNIT V: Project Work

The class works together to write and produce a group project. This class is particularly useful for building confidence in using English and improving pronunciation.

Suggested Reading:

In Business; CUP

Oxford Handbook of Writing: St. Martins handbook of Writing
Sound Business. Julian Treasure OUP

Semester IV

		L	T	P	C
16PAU401	**CORE- ADVANCED CORPORATE ACCOUNTING**	**6**	**2**	**-**	**6**

COURSE OBJECTIVES:
To make the students

1. To understand the concepts on Amalgamation of companies and financial statement of insurance companies.
2. To gain knowledge in the Accounting practices in electricity companies and banking companies.
3. To understand the accounting standard and its application in inter-holding companies
4. To solve problems relating to Holding Company Accounts, Liquidation of Companies and various other Accounts
5. To understand and apply accounting process for Banking industry.
6. To gain knowledge on Accounting standard AS4, AS 11, AS 12, AS 14, AS15 and AS17.

COURSE OUTCOMES:
Learners should be able to

1. To enable the students to understand the concepts on Amalgamation of companies and financial statement of insurance companies.
2. The make the students gain knowledge in the Accounting practices in electricity companies and banking companies.
3. Understand the accounting standard and apply the same for corporate entity and amalgamation.
4. Understand the difference of banking balance sheet and non-banking balance sheet
5. Enhance the problem-solving skills and analytical skills in the accounting context.
6. Apply the various Accounting Standard AS4, AS 11, AS 12, AS 14, AS15 and AS17 and its features effectively.

UNIT I

Amalgamation and Reconstruction - Meaning, Objectives - Types - Internal reconstruction - External Reconstruction Accounting Treatment for Amalgamation in the Nature of Merger - Amalgamation in Nature of Purchase.

UNIT II

Financial Statement of Insurance Companies - Introduction to Insurance Business - Types of Insurance - Life Insurance - General Insurance - Fire Insurance - Marine Insurance - Preparation of Valuation Balance Sheet - Determination of Surplus to Policy Holder.

UNIT III

Financial Statement of Banking Companies - Meaning of Banking - Types of Banks - Books of Accounts - Returns - Forms of Financial Statement - Capital Adequacy Norms - Income Recognition - Classification of Assets and their Provision - Rebate on Bills Discounted Preparation of Statement of Profit and Loss and Balance sheet.

UNIT IV

Financial statement of Electricity Company - Formats of Financial Statement - Specific Transactions of Electricity Company - Disposal of Surplus - Reasonable Rate of Return - Implementation of Accelerate Power Development and Reform Program [AADRP] - Objectives - Funding Pattern etc.

UNIT V

Accounting Standards - AS 4: Contingencies and Events Occurring after the Balance Sheet Date, AS 11: The Effects of Changes in Foreign Exchange Rates, AS12: Accounting for Government Grants, AS 14: Accounting for Amalgamation, AS 15: Employee Benefit, AS 17: Segment Reporting.(Theory only)

Note: Distribution of marks for theory and problems shall be 20 % and 80 % respectively.

SUGGESTED READINGS:

TEXT BOOKS

1. Shukla, M.C., & Grewal, T.S., & Gupta, S.C. (2008). *Advanced Accounts* Vol.-II. New Delhi: S. Chand & Company Ltd.

REFERENCES

1. Maheswari, S.N., & Maheswari,S.K. (2011). *Advanced Accounting*. New Delhi: Vikas Publishing House Pvt. Ltd..
2. Jain, S.P., & Narang, K.L. (2014). *Advanced Accountancy* (12^{th} ed.). Ludhiana: Kalyani Publishers.
3. Agarwal, B.D. (2009). *Financial Accounting Advanced*. New Delhi: Pitambar Publishing Company.
4. Patel, R.B. (2012). *Advanced Corporate Accounting*. Jaipur: Mark Publisher.

Semester-IV

16PAU402	CORE – DIRECT TAXATION - II	L	T	P	C
		6	2	-	6

COURSE OBJECTIVES:

To make the students

1. To understand the different deductions available under the income tax.
2. To understand the Assessment of Individuals and HUF.
3. To recognize the Partnership Firms and Association of Persons
4. To obtain the importance tax planning, collection and recovery of tax.
5. To gain the exposure on practical aspects of tax planning as an important managerial decision-making process.
6. To gain knowledge on functions of Tax Administration and procedure in Filing of Return of Income

COURSE OUTCOMES:

Learners should be able to

1. Distinguish between deductible and nondeductible expenses
2. Gain knowledge on Individuals and HUF.
3. Apply the tax code provisions and tax for non-residence.
4. Comprehend and apply the practical aspects of tax planning
5. Exposure to real life situations involving taxation and to equip them with techniques for taking tax-sensitive decisions.
6. Understand the on functions of Tax Administration and procedure in Filing of Return of Income

UNIT I

Deductions - Deductions allowable from Gross Total Income in respect of certain payment and receipts (Sec 80).

UNIT II

Individuals and HUF - Assessment of Individuals - Assessment of Hindu Undivided Family - Co-operative societies, Trust and Political party.

UNIT III

Partnership Firms and Association of Persons: Assessment of Partnership firms and Association of Persons - Taxation for non-residence.

UNIT IV

Collection and Recovery of Tax - Advance Payment of Tax - Tax Deducted at Source - Penalties for offences under Income Tax Act - Double Taxation avoidances agreement.

UNIT V

Tax Administration: Authorities under the Income Tax Act and Assessment procedure under Income Tax Act - Filing of Return of Income.

Note: Distribution of marks for theory and problems shall be 40% and 60 % respectively.

SUGGESTED READING:

TEXT BOOKS

1. Gaur, & Narang, K.L. (2016). *Income Tax Law and Practice* (14^{th} ed). Ludhiana: Kalyani Publishers.

REFERENCES

1. Mehrothra. (2016). *Income Tax Law and Practice*, New Delhi: Snow White publications.
2. Jayaprakash Reddy. (2016). *Taxation* (1^{st} ed.). New Delhi: APH Publishing Corporation.
3. DinkarePagarae. (2016). *Direct Tax*. New Delhi: Sultan Chand and Sons.
4. Dr. Vasan, M.S. (2016). *Direct Taxation Ready Reckoner* (26^{th} ed.). LexisNexis.

Semester-IV

		L	T	P	C
16PAU403A	**SEC 2 COMPANY LAW AND SECRETARIAL PRACTICE**	**5**	**1**	**-**	**4**

COURSE OBJECTIVES:
To make the students

1. To Understand the Concept of laws related to constitution of company, finance structure, management team.
2. To comprehend on the laws pertaining to the need of audit, accounts, dividend and winding up of the company.
3. To analyse few real time cases relevant to company laws
4. To communicate orally and in written form and analyse cases in a team and exhibit leadership skills.
5. To be familiar with the standards and laws pertaining to the corporate and utilize for lifelong practical application.
6. To know the recent National Company Law Tribunal of company account.

COURSE OUTCOMES:
Learners should be able to

1. Understand the Concept of laws related to constitution of company, finance structure, management team.
2. Comprehend on the laws pertaining to the need of audit, accounts, dividend and winding up of the company.
3. Analyse few real time cases relevant to company laws
4. Communicate orally and in written form and analyse cases in a team and exhibit leadership skills.
5. Familiarize with the standards and laws pertaining to the corporate and utilize for lifelong practical application.
6. Understand the recent National Company Law Tribunal of company account.

UNIT I

Companies Act 1956 Vs Companies Act 2013 - Formation of Companies - Promotion - Meaning - Promoters - Functions - Duties of Promoters - Incorporation - Meaning - Certificate of Incorporation - Memorandum of Association - Meaning - Purpose - Alteration of Memorandum - Doctrine of Ultra vires - Articles of Association - Meaning - Forms - Contents - Alteration of Articles.

UNIT II

Directors - Qualification and Disqualification of Directors - Appointment of Directors - Removal of Directors - Director's remuneration - Powers of Directors - Duties of Directors - Liabilities of Directors.

UNIT III

Company Meetings - Kinds - Board of Directors Meeting - Annual General Meeting - Extra Ordinary General Meeting - Duties of a Company Secretary to all the Company Meetings - Drafting of Correspondence - Relating to the Meetings - Notices - Agenda - Chairman's Speech - Writing of Minutes.

UNIT IV

Key Managerial Personnel (KMP) - Company Secretary - Meaning - Definition - Types - Positions - Qualities - Qualifications - Appointment and Dismissal - Power - Rights - Duties - Liabilities of a Company Secretary - Role of a Company Secretary

UNIT V

Accounts of Companies - Audit and Auditors' - Prevention of Oppression and Mismanagement - Winding up - Official Liquidators - National Company Law Tribunal - E - Governance - Ministry of Corporate Governance.

SUGGESTED READINGS:

TEXT BOOKS

1. Kapoor, N.D. (2010). *Elements of Company Law*. New Delhi: Sultan Chand & Sons.

REFERENCES

1. Shukla, M.C., & Gulshan, S.S. (2010). *Principles of Company Law*. New Delhi: S.Chand and Company Ltd.
2. Kuchhal, M.C. (2008). *Secretarial Practice*. New Delhi: Vikas Publications.
3. Avtar Singh. (2014). *Introduction to Company Law*. New Delhi: Eastern book Company.
4. Akhileshwar Pathak. (2013). *Legal Aspects of Business* (6th ed.). New Delhi: McGraw Hill Education.

Semester-IV

16PAU403B SEC 2 BUSINESS ORNGANIZATION AND OFFICE MANAGEMENT

L	T	P	C
5	1	-	4

COURSE OBJECTIVES:

To make the students

1. To understand the concept, functions and form of business organization.
2. To know the different finance sources of business and location of the business.
3. To impart the importance of human behavior and personality to resolve conflict and managing change.
4. To understand the leadership and motivation theories and realise the practical implication in the individual performance and organization behavior.
5. To realize the importance of groups and teamwork and managing of conflict between the members of the organization.
6. To impart the importance of Office machines and equipment's with its uses and limitation.

COURSE OUTCOMES:

Learners should be able to

1. Understand the concepts of business and form of business organization.
2. Execute the managerial functions of planning, organizing and controlling in a variety of circumstances.
3. Assess the impact of the personality traits and their perception in day to day performance.
4. Exhibit the leadership skills whenever required and work in groups and teams by motivating and resolving conflict arising in groups and adapting to change.
5. Understand the Office machines and equipment's.
6. Understand the importance of Office machines and equipment's with its uses and limitation.

Unit I

Nature and scope of Business, Forms of Business Organization –Sole Trader, Partnership firms, Companies and Co-operative Societies –Public Enterprise.

Unit II

Location of Business – Factors influencing location, localization of industries- Size of forms, Sources of Finance – Shares, Debentures, Public Deposits, Bank Credit and Trade Credit – Relative Merits and Demerits.

Unit III

Stock Exchange - Functions – Procedure of Trading – Functions of SEBI – DEMAT of shares- Trade Association-Chamber of Commerce.

Unit IV

Office – Its functions and significance – Office layout and office accommodation – Filing and Indexing

Unit V

Office machines and equipments – Data Processing Systems – EDP –Uses and Limitations – Office Furniture.

SUGGESTED READINGS:

TEXT BOOKS

1. Bhushan, Y.K. (2013). *Business Organisation and Management*. New Delhi: Sultan Chand & Sons.

REFERENCES

1. Shukla. (2010). *Business Organisation and Management*. New Delhi: S.Chand & Company Ltd.
2. Chopra, R.K. (2009). *Office Management*. Mumbai: Himalaya Publishing House.
3. Deneyer, J.C. (2008).*Office Management*. Mumbai: Himalaya Publishing House.
4. Saxena, P.K. (2009). *Management in Organisation*. New Delhi: Global Business Publication.

Semester-V

16PAU501A	**DSE : 1 - RESEARCH METHODOLOGY**	**L**	**T**	**P**	**C**
		6	**2**	**-**	**6**

COURSE OBJECTIVES:

To make the students

1. Explain need of Research, introduction to business research
2. Analyze various types of research and the sampling techniques
3. Analyze collections of data and to draft the questionnaire
4. Describe Knowledge on the application of various statistical tools
5. Experiment preparation of reports
6. To Analyze and to interpret the data by different technique and to present the report in an order.

COURSE OUTCOMES:

Learners should be able to

1. Describe the Basics, types and the stages of the research process and enables to apply and adapt them with relevance to specific research context
2. Apply an advanced understanding of business research design options, methodologies, sampling technique in a research.
3. Analyze the collected data using appropriate statistical tools for interpretation of the data.
4. Apply various statistical tools in a research.
5. Understand and prepare and present research findings in the report.
6. Interpret the data by using different techniques and to able to present the report effectively.

UNIT I

Research - Meaning - Scope and Significance - Utility of Research - Qualities of Good Researcher - Types of Research - Research Process - Identification - Selection and Formulation of Research Problems - Hypothesis - Research Design

UNIT II

Sampling - Methods and techniques - Sample size - Sampling Error - Field work and Data Collection - Tools of Data Collection - Interview Schedule - Questionnaire - Observation - Interview and Mailed Questionnaire - Pilot Study and Final Collection of Data – Secondary Data

UNIT III

Measurement and Scaling Techniques - Processing and Analysis of Data - Editing and Coding - Transcription and Tabulation - Statistical tools used in Research - Measures of Central Tendency – Median – Mode – Standard Deviation – Correlation Analysis – Regression Analysis.

UNIT IV

Hypothesis – Meaning – Sources –Types – Formulation – Data Analysis – Z test (mean, diff. of mean, diff. of proportion) – t-test (mean) – Paired t-test – Chi square test – Introduction to theoretical concept of ANOVA – Factor Analysis and Discriminant Analysis.

UNIT V

Interpretation - Meaning - Techniques of Interpretation - Report writing - Significance - Report Writing - Steps in Report Writing - Layout of report - Types of Reports – Oral Presentation - Executive Summary -

Mechanics of Writing Research Report - Precautions for Writing Report - Norms for using Tables - Charts - and Diagrams - Appendix - Norms for using Index and Bibliography.

Note: The question paper shall cover 60% theory and 40% problem

SUGGESTED READINGS:

TEXT BOOKS

1. Kothari, C.R**.** (2009). *Research Methodology*. New Delhi: Wishwa Prakashan, Publications.

REFERENCES

1. Zikmund, Babin & Carr. (2009). *Business Research Methods* (8^{th} ed.) New Delhi: South-Western.
2. NareshMalhotra. (2012*). Basic Marketing Research: Integration of Social Media*. New Delhi: Pearson Publisher.
3. Mark N.K. Saunders, Philip Lewis, & Adrian Thornhill. (2015). *Research Methods for Business Students* (7^{th} ed.). New Delhi: Vikas Publisher.
4. Rao, K.V. (2012), *Research Methods for Management and Commerce*. Mumbai: Sterling Publishers Pvt., Ltd., Himalaya Publishing house.
5. Donald R.Cooper, & Pamela S.Schindler. (2008), *Business Research Methods.* New Delhi: Tata McGraw Hill.
6. Uma Sekaran. (2007). *Research Methods for Business***.** New Delhi: Wiley Publications.

Semester V

16PAU501B	DSE : 1 - BANKING AND INSURANCE	L	T	P	C
		6	2	-	6

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of banking operations, functions, risk associated with and law pertaining to banking functions,
2. To comprehend on the Indian banking system, its regulatory body and key macro indicators related to banks that affect the economy.
3. To communicate orally and in written form the understanding of banking operations, functions, risk associated with and law pertaining to banking functions and to apply the learning of the bank functions and operations lifelong.
4. To Understand the Concept of insurance, insurance products and services and the regulatory environment guiding the insurance function.
5. To comprehend on the risk mitigation concepts and usage of insurance products to mitigate risk and insurance contract in Indian market
6. To understand the recent trends in different forms of Internet Banking and with its benefit.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of banking operations, functions, risk associated with and law pertaining to banking functions,
2. Comprehend on the Indian banking system, its regulatory body and key macro indicators related to banks that affect the economy.
3. Communicate orally and in written form the understanding of banking operations, functions, risk associated with and law pertaining to banking functions
4. Understand the Concept of insurance, insurance products and services and the regulatory environment guiding the insurance function.
5. Comprehend on the risk mitigation concepts and usage of insurance products to mitigate risk and insurance contract in Indian market.
6. To be familiar in accessing different forms of Internet Banking globally and able to access its benefit.

UNIT I

Introduction - Origin of Banking - Definition - Banker and Customer Relationship - General and Special Types of Customers - Types of deposits - Origin and Growth of Commercial Banks in India - Power , Function and Role of RBI - Financial Services offered by Banks - Changing Role of Commercial Banks - Types of Banks

UNIT II

Cheques and Paying Banker - Crossing and Endorsement - Meaning - Definition - Types and Rules of Crossing - Duties - Statutory Protection in Due Course - Collecting Bankers - Duties - Statutory Protection for Holder in Due Course - Concept of Negligence - Prevention of Money Laundering

UNIT III

Banking Lending - Principles of sound lending - Secured vs. Unsecured advances - Types of advances - Advances against various Securities.

UNIT IV

Internet Banking - Meaning - Benefits - Home Banking - Mobile Banking - Virtual banking - E-payments - ATM Card / Biometric Card - Debit / Credit Card - Smart Card - NEFT - RTGS - ECS (credit/debit) - E-money - Electronic Purse - Digital Cash.

UNIT V

Insurance - Basic concept of risk - Types of Business Risk - Assessment and Transfer - Basic Principles of Utmost Good Faith - Indemnity - Economic Function - Proximate Cause - Subrogation and Contribution - Types of Insurance - Life and Non-life - Re-insurance - Risk and Return Relationship - Need for Coordination - Power - Functions and Role of IRDA - Online Insurance

SUGGESTED READINGS:

TEXT BOOKS

1. Agarwal, O.P. (2011). *Banking and Insurance*. Mumbai: Himalaya Publishing House.

REFERENCES

1. Satyadevi, C. (2009). *Financial Services Banking and Insurance* (1st ed.). New Delhi: S.Chand.
2. Suneja, H.R. (2009). *Practical and Law of Banking* (1st ed.). Mumbai: Himalya Publishing House.
3. Chabra, T.N. (2008). *Elements of Banking Law*, Mumbai: Dhanpat Rai and Sons.
4. Saxena, G.S. (2005). *Legal Aspects of Banking Operations*. New Delhi: Sultan Chand and Sons.
5. Varshney, P.N. (2009). *Banking Law and Practice*. New Delhi: Sultan Chand and Sons.
6. Jyotsna Sethi., & Niswan Bhatia. (2012). *Elements of Banking and Insurance*. New Delhi: PHI Learning.

16PAU502A **DSE : 2 – FINANCIAL MANAGEMENT**

L	T	P	C
6	2	-	6

COURSE OBJECTIVES:
To make the students

1. Explain importance and role of financial management
2. Describe theories and factors affecting capital structure
3. Evaluate Dividend policies and working capital management
4. Discuss financial decision making and sources of finance
5. Analysis financial information from a wide variety of sources and use this information to research and assess corporations.
6. Evaluate and to analyses the cash management.

COURSE OUTCOMES:
Learners should be able to

1. Understand the different financing decision and estimate the value of different financial instruments (including stocks and bonds)
2. Decide the source of finance for an organisation and formulate the optimum Capital Structure
3. Estimate cash flows and make capital budgeting decisions under both certainty and uncertainty
4. Analyse the factors influencing the dividend decision and formulate the dividend policy of the firm.
5. Describe and assess how companies manage the components of working capital to minimize the cost of carrying current assets and the cost of short-term borrowing.
6. Understand the cash management and able to take decisions with its result.

UNIT I
Introduction - Nature - Scope and Objective of Financial Management - Time Value of Money - Risk and Return (including Capital Asset Pricing Model) - Valuation of Securities - Bonds and Equities.

UNIT II
Investment Decisions - The Capital Budgeting Process - Cash Flow Estimation - Payback Period Method, Accounting Rate of Return - Net Present Value (NPV) - Net Terminal Value - Internal Rate of Return (IRR) - Profitability Index, Capital Budgeting under Risk - Certainty Equivalent Approach and Risk- Adjusted Discount Rate.

UNIT III
Financing Decisions - Cost of Capital and Financing Decision - Sources of Long Term Financing - Estimation of Components of Cost of Capital - Methods for Calculating Cost of Equity Capital - Cost of Retained Earnings - Cost of Debt and Cost of Preference Capital - Weighted Average Cost of Capital (WACC) and Marginal Cost of Capital - Capital Structure - Theories of Capital Structure (Net Income, Net Operating Income, MM Hypothesis, Traditional Approach) - Operating and Financial Leverage - Determinants of Capital Structure

UNIT IV
Dividend Decisions - Theories for Relevance and Irrelevance of Dividend Decision for Corporate Valuation - Cash and Stock Dividends - Dividend Policies in Practice.

UNIT V
Working Capital Decisions - Concepts of Working Capital - The risk-return trade off - Sources of Short-Term Finance - Working Capital Estimation - Cash Management - Receivables Management - Inventory Management and Payables Management.

SUGGESTED READINGS:

TEXT BOOKS
1. Maheswari, S.N. (2014). *Financial Management*. New Delhi: Sultan Chand and Sons.

REFERENCES

1. Khan, M.Y., & Jain, P.K. (2007). *Financial Management Text Problem and Cases* (5th ed.). New Delhi: Tata McGraw-Hill Publishing Co. Ltd.
2. Rustogi, R.P. (2011). *Financial Management: Theory Concepts and Practices* (5th R.ed.). New Delhi: Taxmann Publication.
3. Pandey, I.M. (2009). *Financial Management: Theory and Practices* (9th ed.). New Delhi: Vikas Publishing House Pvt Ltd.
4. Brealey, R.A., Myers, S.C., Allen, F., & Mohanty, P. (2002). *Principles of Corporate Finance* (7th ed.). New Delhi: McGraw Hill.
5. Horne, J.V., & Wachowicz, J.M. (2009). *Fundamentals of Financial Management* (13th ed.). New Delhi: Prentice Hall of India Publication.
6. Kulkarni, P.V. (2011). *Financial Management*. Mumbai: Himalaya Publishing house.

Semester V

		L	T	P	C
16PAU502B	**DSE:2- FINANCIAL MARKETS, INSTITUTIONS AND FINANCIAL SERVICES**	**6**	**2**	**-**	**6**

COURSE OBJECTIVES:

To make the students

1. To understand the basic concept of Financial system and its market
2. To know about the Indian money market and the role of SEBI
3. To understand the importance of Financial Institutions
4. To Inculcate knowledge of Financial Services.
5. To Inculcate knowledge of Leasing.
6. To Inculcate knowledge of Hire Purchase.

COURSE OUTCOMES:

Learners should be able to

1. Understand the basic concept of Financial system and its market
2. Know about the Indian money market and the role of SEBI
3. Have a knowledge on Financial Institutions
4. Understand on various financial services available globally.
5. Familiar in leasing and its various types of leasing and able to take decision.
6. Familiar in Hire purchasing and its various forms and its procedure.

UNIT I

Introduction - Financial System and its Components - Financial Markets and Institutions - Financial Intermediation - Flow of Funds matrix - Financial System and Economic Development - An Overview of Indian Financial System

UNIT II

Financial Markets - Money Market - Functions - Organisation and Instruments - Role of Central Bank in Money Market - Indian Money Market - An Overview Capital Markets - Functions - Organisation and Instruments - Indian Debt Market - Indian Equity Market - Primary and Secondary Markets - Role of Stock Exchanges in India.

UNIT III

Financial Institutions - Commercial Banking - Introduction - Its Role in Project Finance and Working Capital Finance - Development Financial Institutions (DFIs) - An Overview and Role in Indian Economy - Life and Non-Life Insurance Companies in India - Mutual Funds - Introduction and their Role in Capital Market Development - Non-Banking Financial Companies (NBFCs).

UNIT IV

Financial Services - Overview of Financial Services Industry - Merchant Banking - Pre and Post Issue Management - Underwriting - Regulatory Framework relating to Merchant Banking in India.

UNIT V

Leasing and Hire Purchase - Consumer and Housing Finance - Venture Capital Finance - Factoring Services - Bank Guarantees and Letter of Credit - Credit Rating - Financial Counseling.

SUGGESTED READINGS:

TEXT BOOKS

1. Meir Kohn. (2013). *Financial Institutions and Markets*. New Delhi: Tata Mc Graw Hill Publication.

REFERENCES

1. Khan, M.Y. (2015). *Financial Services* (8th ed.). New Delhi: Tata McGraw - Hill.
2. Machiraju. (2010). *Indian Financial System* (4th ed.). New Delhi: Vikas Publishing House.
3. Bhole, L.M. (2006). *Financial Institutions and Markets*. New Delhi: Tata Mcgraw Hill Publication.
4. Vasantha desai. (2002). *The Indian Financial System*. New Delhi: Himalaya Publishing House.
5. Khan, M.Y. (2004). *Indian Financial System*. New Delhi: Tata Mcgraw Hill Publication.
6. Varshney, P.N., & Mittal, D.K. (2010). *Indian Financial System*. New Delhi: Sulthan Chand and Sons.
7. Gardon, E., & Natarajan, K. (2004). *Financial Markets and Services*. New Delhi: Himalaya Publishing House.

Semester -V

16PAU503A	SEC 3 - APPLIED COST ACCOUNTING	L	T	P	C
		5	1	-	4

COURSE OBJECTIVES:

To make the students

1. To Understand the cost concepts, types of costing methods and book keeping for cost accounting
2. To learn the tools and techniques to calculate cost and solve the problems.
3. To select the best methods of costing and apply critically based on the situation
4. To communicate orally and in written form the cost accounting concepts, methods and book keeping procedure for cost accounting.
5. To gain a lifelong learning for applying the cost concepts in analyzing the business problems.
6. To Learn standards of book keeping in cost accounting.

COURSE OUTCOMES:

Learners should be able to

1. Understand the cost concepts, types of costing methods and book keeping for cost accounting
2. Apply tools and techniques to calculate cost and solve the problems.
3. Select the best methods of costing by critically analyzing and apply the same to appropriate situation
4. Communicate orally and in written the cost concepts
5. Gain the lifelong learning of cost concepts and apply in the business environment.
6. Apply the procedures of book keeping in cost accounting of a company.

UNIT I

Introduction - Meaning - Objectives and Advantages of Cost Accounting - Difference between Cost Accounting and Financial Accounting - Cost Concepts and Classifications - Elements of Cost - Installation of a Costing System - Role of a Cost Accountant in an Organisation - Preparation of Cost Sheet in Lien with Cost Accounting Standards.

UNIT II

Elements of Cost: Material and Labour - Materials - Material/Inventory Control Techniques - Accounting and Control of Purchases - Storage and Issue of Materials - Methods of Pricing of Materials Issues - FIFO – LIFO - Simple Average - Weighted Average - Replacement - Standard Cost - Treatment of Material Losses - Labour - Accounting and Control of Labour Cost - Time Keeping and Time Booking - Concept and Treatment of Idle Time - Over Time - Labour Turnover and Fringe Benefits - Methods of Wage Payment and the Incentive Scheme - Halsey, Rowan, Taylor’s Differential Piece Wage.

UNIT III

Elements of Cost - Overheads - Classification - Allocation - Apportionment and Absorption of Overheads - Under and Over absorption - Capacity Levels and Costs - Treatments of Certain Items in Costing like Interest on Capital - Packing expenses - Bad debts - Research and Development Expenses - Activity Based Cost Allocation.

UNIT IV

Methods of Costing - Unit costing - Job costing - Contract costing - Process costing (process losses, valuation of work in progress - Joint and by-products) - Service costing (only transport).

UNIT V

Book Keeping in Cost Accounting - Integral and Non-Integral Systems - Reconciliation of Cost and Financial Accounts

Note: - Distribution of Marks: Theory- 20% and Problems -80% respectively.

SUGGESTED READINGS:

TEXT BOOKS

1. Jain, S.P., & Narang, K.L. (2014). *Cost Accounting: Principles and Methods* (12th ed.). Ludhiana: Kalyani Publishers.

REFERENCES

1. Charles T. Horngren, Srikant M. Datar, & Madhav V. Rajan. (2010). *Cost Accounting, A Managerial Emphasis* (13th ed.). New Delhi: Pearson Education.
2. Drury, & Colin. (2012). *Management and Cost Accounting* (8th R.ed.). New Delhi: Cengage Learning.
3. Jawahar Lal. (2013). *Cost Accounting* (5th ed.). New Delhi: McGraw Hill Education.
4. Nigam, B.M. Lall., & Jain, I.C. (2009). *Cost Accounting Principles and Practice* (1st ed.). New Delhi: PHI Learning.
5. Rajiv Goel. (2013). *Cost Accounting* (1st ed.). Mumbai: International Book House.
6. Singh, & Surender. (2014). *Cost Accounting* New Delhi: Scholar Tech Press.
7. Arora, M.N. (2013). *Cost Accounting – Principles and Practice* (12th ed.)., New Delhi: Vikas Publishing House.
8. Maheshwari, S.N., & Mittal, S.N. (2012). *Cost Accounting: Theory and Problems*. New Delhi: Shri Mahavir Book Depot.
9. Iyengar, S.P, (2005). *Cost Accounting* (10th ed.). New Delhi: Sultan Chand and Sons.
10. Jhamb, H.V. (2011). *Fundamentals of Cost Accounting*. New Delhi: Ane Books Pvt.

Semester -V

		L	T	P	C
16PAU503B	**SEC 3 - HUMAN RESOURCE MANAGEMENT**	**5**	**1**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. Describe nature and scope of Human Resources management
2. Evaluate human resource planning, recruitment process and selection methods in the organization
3. Discuss need for motivating employees in an organization.
4. Assess labour relations, industrial disputes and settlement in the organization
5. To know the concept of industrial relations.
6. To know the concept of Collective Bargaining and its significance to a company.

COURSE OUTCOMES:

Learners should be able to

1. Understand the HR environment in India and human resource functions within organizations
2. Plan human resources requirement and formulate HR policy of the organisation with regard to recruitment, selection, training and career planning.
3. Appraise the employee's performance and formulate compensation policy which helps to make organizational excellence.
4. Understand the importance of career planning, job evaluation and factors influencing compensation levels.
5. Analyse the ethical issues in HR management
6. To take decisions in a manner of Collective Bargaining.

UNIT I

Human Resource Management - Concept - Functions - Roles - Skills and competencies - HRD - Definition - Goals and challenges - The changing environment of HRM - Globalization - Cultural Environment - Technological advances - Workforce Diversity - Corporate Downsizing - Changing skill requirement - HRM support for improvement programs Work life balance - HR role in strategy formulation and gaining competitive advantage - HRM issues in Indian Organizations.

UNIT II

Human Resource Planning - Process - Forecasting demand and supply - Skill inventories Human Resource Information System (HRIS) succession planning - Job analysis - Uses, methods, Job description and Job specifications - HR accounting and Human Resource Development (HRD) audit concept. Recruitment, Selection and Orientation - Internal and External sources, E- recruitment - Selection process - Orientation process.

UNIT III

Training - Concept - Needs - Systematic approach to training - Methods of training - Management Development - Concept and Methods - Performance Management System - Performance Appraisal - Performance Management Methods - Factors that Distort appraisal - Appraisal Interview.

UNIT IV

Career Planning - Career Anchors - Career Life Stages - Compensation - Steps of determining compensation - Job evaluation - Components of pay structure - Factors influencing compensation levels -

Wage differentials and incentives - Profit sharing - Gain sharing - Employees' stock option plans - Social Security - Health - Retirement - other benefits.

UNIT V

Industrial Relations - Introduction to Industrial Relations - Trade unions role - Types - Functions - Problems - Industrial dispute - Concept - Causes and Machinery for settlement of disputes - Grievance, Concepts, Causes and grievance redressal machinery - Discipline concept, aspect of discipline and disciplinary procedure, Collective Bargaining - Concept - Types, Process- Problems - Essentials of Effective Collective Bargaining.

SUGGESTED READING:

TEXT BOOKS

1. Memoria, C.B. (2014). *Personnel Management and Industrial Relations*. Mumbai: Himalaya Publishing House.

REFERENCES

1. De Cenzo, D.A., & Robbins. (2012). *Fundamentals of Human Resource Management* (11th ed.).New York: John Wiley and Sons.
2. Dessler, G. (2011). *Human Resource Management* (12th ed.). New Delhi: Pearson India.
3. Arun Monappa, & MirzaSaiyadain. (2001). *Personnel Management* (2nd ed.). New Delhi: Tata McGraw Hill.
4. Rao, V.S.P. (2013). *Human Resource Management - Text and Cases*. New Delhi: Excel Books. Konark Publishers Pvt. Ltd.
5. Wayne Mondy, R., & Rober M. Noe. (2015). *Human Resource Management* (4th ed.). New Delhi: Pearson.
6. Nair, N.G., & Latha Nair. (2004). *Personnel Management and Industrial Relations*. New Delhi: S.Chand and Company Ltd.
7. Kapoor, N.D. (2015). *Elements of Industrial Law*. New Delhi: Sultan Chand and Sons.
8. Tripathy. (2013). *Personnel Management and Industrial Relations*. New Delhi: Sultan Chand and Sons.

Semester V

16PAU504A	GE 1 - PRINCIPLES OF MARKETING	L	T	P	C
		6	2	-	6

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of marketing, and 4Ps of Marketing
2. To communicate orally and in written form the concepts of marketing and 4 Ps of marketing
3. To apply the marketing concepts and skills lifelong.
4. To understand the recent trends in marketing strategies of a companies.
5. To understand the consumer behavior and to adopt the decision according to the consumer.
6. To know the promotion strategies followed by a company.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of marketing, and 4Ps of Marketing
2. Communicate orally and in written form the concepts of marketing and 4 Ps of marketing
3. Apply the marketing concepts and skills lifelong.
4. Apply the marketing strategies of a company's effectively.
5. To be familiar in behavior of consumer in related to market and to take decision effectively.
6. To implement the correct promotion strategies.

UNIT I

Introduction - Nature - Scope and Importance of Marketing - Evolution of Marketing - Selling Vs Marketing - Marketing Mix - Marketing Environment - Concept - Importance and Components (Economic, Demographic, Technological, Natural, Socio-Cultural and Legal).

UNIT II

Consumer Behaviour - Nature and Importance - Consumer Buying Decision Process - Factors Influencing Consumer Buying Behaviour - Market Segmentation - Concept - Importance and Bases - Target Market Selection - Positioning Concept - Importance and Bases - Product differentiation Vs. Market Segmentation.

UNIT III

Product - Concept and Importance - Product Classifications - Concept of Product mix - Branding - Packaging and Labeling - Product-Support Services - Product Life Cycle - New Product Development Process - Consumer Adoption Process.

UNIT IV

Pricing - Significance - Factors Affecting Price of a Product - Pricing Policies and Strategies - Distribution Channels and Physical Distribution - Channels of Distribution - Meaning and Importance - Types of Distribution Channels - Functions of Middle man - Factors Affecting Choice of Distribution Channel - Wholesaling and Retailing - Types of Retailers - e-tailing - Physical Distribution.

UNIT V

Promotion - Nature and Importance of Promotion - Communication Process - Types of Promotion - Advertising - Personal Selling - Public Relations and Sales Promotion and their Distinctive Characteristics - Promotion Mix and Factors Affecting Promotion Mix Decisions - Recent developments in marketing - Social Marketing - Online Marketing - Direct Marketing - Services Marketing - Green Marketing - Rural Marketing- Consumerism.

SUGGESTED READINGS:

TEXT BOOKS

1. Rajan Nair. (2005). *Marketing Management*. New Delhi: Sultan Chand & Sons.

REFERENCES

1. Kotler, P., & Keller, K. L. (2009). *Marketing Management* (13th ed.). New Delhi: Pearson Prentice Hall.
2. Kotler, P., Armstrong, G., Agnihotri, P. Y., & UlHaq, E. (2010). P*rinciples of Marketing: A South Asian Perspective* (13th ed.). New Delhi: Pearson India.
3. Ramaswamy, V.S., & Namakumari, S. (2009). *Marketing Management: Global Perspective-Indian Context* (4th ed.). New Delhi: Macmillan Publishers India Limited.
4. Grahame Robert Dowling M. (2004). *The Art and Science of Marketing* (1st ed.). Chennai: Oxford University Press.
5. Varshney, R.L., & Bhattacharya, B. (2007). *International Marketing Management*. New Delhi: Sultan Chand and Sons.
6. Mamoria, C.B. & Satish Mamoria.(2013). *Marketing Management*. Patna: Kitab Mahal.
7. Philip Kotler., & Gary Armstrong. (2011). *Principles of Marketing.* New Delhi: Prentice Hall of India Pvt. Ltd.

Semester V

16PAU504B	GE 1 - MICRO ECONOMICS	L	T	P	C
		6	2	-	6

COURSE OBJECTIVES:

To make the students

1. To understand the demand, supply functions and its applicability.
2. To know the importance of the production function and cost and revenue concepts.
3. To gain knowledge on the market structure and price determination.
4. To understand the importance of macroeconomic indicators like National income, GDP, Inflation etc.
5. To understand the concepts of Monetary policy, Balance of payment and Money supply.
6. To understand the power of monopoly in a market.

COURSE OUTCOMES:

Learners should be able to

1. Apply the demand and supply concept in managerial decisions
2. Calculate the Cost, Revenue and breakeven point and apply it in decision making process.
3. Formulate the pricing strategies based on the market structure.
4. Gain familiarity on the macro level business components like money, banking, monetary policy, fiscal policy, trade, business cycles and balance of payments and make business decision based on the Macroeconomic indicators, inflation and business cycle and understand the impact of monetary policy, money supply and Balance of payments on running a business.
5. Demonstrate capabilities as problem-solving, critical thinking, and communication skills.
6. To gain knowledge on power of monopoly in a market

UNIT I

Demand and Consumer Behaviour - Concepts of Revenue - Marginal and Average - Revenue Under Conditions of Perfect and Imperfect Competition Elasticity of Demand - Price - Income and Cross - Consumer Behaviour - Indifference Curve Analysis of Consumer Behavior - Consumer’s Equilibrium (necessary and sufficient conditions) - Price Elasticity and Price Consumption Curve - Income Consumption Curve and Engel Curve - Price Change and Income and Substitution Effects. Indifference Curves as an Analytical Tool (Cash Subsidy Vs. Kind Subsidy). Revealed Preference Theory.

UNIT II

Production and Cost - Production isoquants - Marginal Rate of Technical Substitution - Economic Region of

Production - Optimal Combination of Resources - The Expansion Path - isoclines- Returns to scale using isoquants. Cost of Production - Social and Private Costs of Production - Long run and Short run Costs of Production - Economies and Diseconomies of Scale and the Shape to the Long Run Average Cost. Learning Curve and Economies of Scope.

UNIT III

Perfect Competition - Perfect Competition - Assumptions - Equilibrium of the Firm and the Industry in the Short and the Long runs - Including Industry’s Long Run Supply Curve - Measuring Producer Surplus Under Perfect Competition - Stability Analysis - Walrasian and Marshallian - Demand - Supply Analysis Including Impact of Taxes and Subsidy.

UNIT IV

Monopoly - Monopoly Short run and Long run Equilibrium - Shifts is Demand Curve and the Absence of the Supply Curve - Measurement of Monopoly Power and the Rule of Thumb for Pricing - Horizontal and Vertical Integration of Firms - The Social Costs of Monopoly Power Including Deadweight Loss - Degrees of Price Discrimination.

UNIT V

Imperfect Competition - Monopolistic Competition and Oligopoly - Monopolistic Competition Price and Output Decision-Equilibrium - Monopolistic Competition and Economic Efficiency Oligopoly and Interdependence - Cournot's Duopoly Model - Stackelberg model - Kinked demand model - Prisoner's Dilemma - Vollusive Oligopoly - Price-leadership Model - Dominant Firm - Cartels - Sales Maximization -Contestable Markets theory - Pricing Public Utilities.

SUGGESTED READING:

TEXT BOOKS

1. Maheshwari, Y. (2012). *Managerial Economics* (3rd ed.). New Delhi: PHI Learning Pvt., Ltd.

REFERENCES

1. Dominick Salvatore. (2009). *Principles of Microeconomics* (5th ed.). Mumbai: Oxford University Press.
2. Richard G. Lipsey, & K. Alec Chrystal. (2007). *Economics*. Mumbai: Oxford University Press.
3. Pindyck, Rubinfeld, & Mehta, (2009) *Micro Economics*. New Delhi: Pearson Prentice Hall of India.
4. Sundaram, K.P., & Sundaram, E. (2008). *Business Economics*. New Delhi: Sultan Chand & Sons.

Semester VI

16PAU601A	DSE : 3 - INVESTMENT MANAGEMENT	L	T	P	C
		6	2	-	6

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of investing and mechanics for formulating investment decisions.
2. To communicate orally and in written form the concepts of Concept of investing and mechanics for formulating investment decisions.
3. To apply the investing concepts and skills lifelong.
4. To understand the function of Capital market and Stock Exchange in India.
5. To know the fundamental analysis techniques and to forecast the Economic and Industry globally.
6. To understand the important of portfolio management.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of investing and mechanics for formulating investment decisions.
2. Communicate orally and in written form the concepts of Concept of investing and mechanics for formulating investment decisions.
3. Apply the investing concepts and skills lifelong.
4. Take decision related to Stock market operation and to understand recent norms of Stock Exchange in India.
5. Be familiar in predicting the economic stability of a country.
6. Take decision related to portfolio management.

UNIT I

Nature - Meaning and Scope of Investment - Importance of Investment - Factors Influencing Investment - Investment Media - Features of an Investment Programme - Investment Process - Alternative Forms of Investment- Mutual Funds. Risk - Systematic Risk - Unsystematic Risk.

UNIT II

Capital Market and Stock Exchange in India - Structure of Capital Market - New Issue Market - Stock Exchanges in India - Mechanics of Trading - Legal Control of Stock Exchanges - SEBI and Its Role - Guidance - BSE - NSE - OTCEI - Recent trends - Stock Market Operation - Security Market Indicators.

UNIT III

Fundamental Analysis - Economic Analysis - Economic Forecasting - Forecasting Techniques - Industrial Analysis - Industry Classification - Economy and Industry Analysis - Industry Life Cycle.

UNIT IV

Company analysis - Measuring earnings - Forecasting earnings - Technical analysis - Charting methods - Market indicators - Trend - Moving average - Fundamental Vs Technical analysis.

UNIT V

Portfolio Analysis - Markowitz Theory - Optimum Portfolio - Portfolio Construction - Performance evaluation - Portfolio revision.

Note: The question paper shall be covered of 100% theory.

SUGGESTED READING:

TEXT BOOKS

1. Preethi Singh. (2015). *Investment Management*. Mumbai: Himalaya PublicationsMumbai.

REFERENCES

1. Singh,R.(2009). *Security Analysis and Portfolio Management* (1st ed.). New Delhi: Excel Books.
2. Nagarajan, K., & Jayabal, G. (2011). *Security Analysis and Portfolio Management* (1st ed.). Kochi: New Age International Publisher.
3. Frank K Reilly., & Keith C Brown. (2011). *Investment Analysis and Portfolio Management* (10th ed.). New Delhi: Cengage India Pvt. Ltd.
4. Avadhani. (2014). *Investment Management*. Mumbai: Himalaya Publications.
5. Jack Clark Francis. (2001). *Investments Analysis and Management*. Singapore: Mc Graw Hill International Edition.
6. Srivatsava, R.M. (2010). *Management of Indian Financial Institution.* Mumbai: Himalaya Publishing House.
7. Bhalla, V.K. (2010). *Investment Management*. New Delhi: Sultan Chand and Sons.

Semester VI

		L	T	P	C
16PAU601B	**DSE :3 – INDUSTRIAL RELATIONS AND LABOUR LAWS**	**6**	**2**	**-**	**6**

COURSE OBJECTIVES:

To make the students

1. To expose the students to learn the concepts of Industrial Relations
2. To impart the student knowledge in trade unions, Collective Bargaining, discipline and various labour enactments.
3. To know the method and techniques of managing grievances.
4. To have in-depth knowledge on industrial dispute act 1947
5. To understand the collective bargaining and its procedures.
6. To have in-depth knowledge in staff welfare measure.

COURSE OUTCOMES:

Learners should be able to

1. Understand the concept of Industrial relation
2. Know about the Importance of Trade Unions and its activities
3. To handle the grievances
4. Gain knowledge on industrial dispute act 1947.
5. Be familiar in applying procedures in collective bargaining
6. Practice the right staff welfare measures in industries

UNIT I

Industrial Relations (IR) Concept of Industrial Relations - Nature of Industrial Relations - Objectives of IR - Factors affecting IR in changing Environment - Evolution of IR in India- Role of State - Trade Union - Employers' Organisation - Human Resource Management and IR Role of ILO in Industrial Relations - International Dimensions of IR.

UNIT II

Trade Union - Origin and Growth - Unions after Independence - Unions in the era of liberalization - Factors Affecting Growth of Trade Unions in India - Multiplicity and Recognition of Trade Unions - Major Provisions of Trade Union Act 1926.

UNIT III

Collective Bargaining - Meaning -Nature - Types - Process and Importance of Collective Bargaining - Pre-requisites - Issues involved - Status of Collective Bargaining in India - Functions and role of Trade Unions in collective bargaining - Workers' Participation in Management – Consent - Practices in India - Works Committees - Joint Management Councils - Participative Management and Co-ownership - Productive Bargaining and Gain Sharing.

UNIT IV

Discipline and Grievance Redressal Discipline - Causes of Indiscipline - Maintenance of Discipline and Misconduct - Highlights of Domestic Enquiries - Principle of Natural Justice - Labour turnover - Absenteeism - Grievance - Meaning of Grievance - Grievance Redressal Machinery in India - Grievance handling procedure - Salient Features of Industrial Employment (Standing Orders) Act 1946.

UNIT V

The Industrial Disputes Act, 1947 - Definitions of Industry - Workman and Industrial Dispute - Authorities under the Act: Procedure - Powers and Duties of Authorities - Strikes and Lock outs - Lay-off and Retrenchment - Provisions relating to Layoff - Retrenchment and closure - The Factories Act, 1948 - Provisions relating to Health - Safety - Welfare Facilities - Working Hours - Employment of Young Persons - Annual Leave with Wages.

SUGGESTED READINGS:

TEXT BOOKS

1. Padhi, P.K. (2012). *Industrial Relations and Labour Law* (2nd ed.). New Delhi: PHI Learning.

REFERENCES

1. Arun Monappa. (2012). *Industrial Relations and Labour Law* (2nd ed.). New Delhi: McGraw Hill Education.
2. Srivastav, S.C. (2009). *Industrial Relations and Labour Law* (5th ed.). New Delhi: Vikas Publishing House.
3. Venkata Ratnam, C.S. (2006). *Industrial Relations* (5th ed.). New Delhi: Oxford University Press.
4. Malik's, P.L. (2000). *Handbook of Labour and Industrial Law* (7th ed.). Eastern Book Company.
5. Sharma, J.P. (2011). *Simplified Approach to Labour Laws* (4th ed.). Bharat Law House (P) Ltd.

Semester VI

		L	T	P	C
16PAU602A	**DSE : 4 – ENTREPRENEURSHIP AND PROJECT MANAGEMENT**	**6**	**2**	**-**	**6**

COURSE OBJECTIVES:
To make the students

1. To Understand the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
2. To communicate orally and in written form the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
3. To apply the understanding of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government in lifelong practice.
4. To become a entrepreneur with the best start up process.
5. To stimulate the women to become an entrepreneur by accessing various opportunities.
6. To know the taxation benefits for entrepreneur.

COURSE OUTCOMES:
Learners should be able to

1. Understand the Concept of entrepreneurship, entities of business, creating ideas, mobilizing funds and support from government.
2. Communicate orally and in written form the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
3. Apply the understanding of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government in lifelong practice.
4. Choose the right project or product and able to analyze the idea to become an entrepreneur.
5. Have confidence to become an women entrepreneur.
6. Acquire the taxation benefits for entrepreneur.

UNIT I

Entrepreneurship - Definition - Nature and Characteristics of Entrepreneurship - Function and Type of Entrepreneurship Phases of EDP - Development of Women Entrepreneur and Rural Entrepreneur - Including Self Employment of Women Council Scheme.

UNIT II

The Start-Up Process - Project Identification - Selection of the Product - Project Formulation - Evaluation - Feasibility analysis - Project Report.

UNIT III

Institutional Service to Entrepreneur - DIC - SIDO - NSIC - SISI - SSIC - SIDCO - ITCOT - IIC - KUIC and Commercial Bank.

UNIT IV

Institutional Finance to Entrepreneurs - IFCI - SFC - IDBI - ICICI - TIIC - SIDCS - LIC and GIC - UTI - SIPCOT - SIDBI - Commercial Bank - Venture Capital.

UNIT V

Incentives and Subsidies - Subsidized Services - Subsidy for Market - Transport - Seed Capital Assistance - Taxation Benefit to SSI Role of Entrepreneur in Export Promotion and Import Substitution - MSMED Act.

SUGGESTED READING:

TEXT BOOKS

1. Vasant Desai. (2013). *Dynamics of Entrepreneurial Development and Management*. Mumbai: Himalaya Publishing House.

REFERENCES

1. Poornima, M. (2012), *Entrepreneurship Development Small Business Enterprises*. Pearson Education, Chanantimath.
2. Khanka. (2012). *Entrepreneurial Development*. New Delhi: Sultan Chand and Sons.
3. Gupta, C.B., & Srinivasan, N.P. (2007). *Entrepreneurial Development*. New Delhi: Sulthan Chand and Sons.
4. Saravanavel,P. (2001). *Entrepreneurial Development*. Madras: Ess Pee Kay Publishing House.
5. Prasanna Chandra. (2009). *Project Managemen* (7th ed.). New Delhi: Tata McGraw Hill.

Semester VI

		L	T	P	C
16PAU602B	**DSE : 4 – INTERNATIONAL BUSINESS**	**6**	**2**	**-**	**6**

COURSE OBJECTIVES:
To make the students

1. To understand the concepts of International business
2. To know the export procedure for production and shipment
3. To enhance the students knowledge in EXIM policy
4. To have in-depth knowledge on different forms of Tarif and Non Tarif and its barriers.
5. To understand the recent International Financial Environment.
6. To know the recent organizational structure for International Business.

COURSE OUTCOMES:
Learners should be able to

1. To understand the concepts of International business
2. To know the export procedure for production and shipment
3. To enhance the students knowledge in EXIM policy
4. Work and follow the procedure on different forms of Tarif and Non Tarif
5. Gather information to work on it and to manage the risk management.
6. Analyze the different organizational structure for International Business.

UNIT I

Introduction to International Business - Globalisation and Its Importance in World Economy - Impact of globalization - International Business Vs. Domestic Business - Complexities of International Business - Modes of entry into International Business - International Business Environment - National and Foreign Environments and their Components - Economic - Cultural and political - Legal Environments.

UNIT II

Theories of International Trade - An Overview (Classical Theories, Product Life Cycle theory, Theory of National Competitive Advantage) - Commercial Policy Instruments - Tariff and Non-tariff Measures - Difference in Impact on Trade - Types of Tariff and Non Tariff Barriers (Subsidy, Quota and Embargo in detail) - Balance of Payment Account and Its Components - International Organizations and Arrangements: WTO - Its Objectives - Principles - Organizational Structure and Functioning - An overview of other organizations - UNCTAD - Commodity and other trading agreements (OPEC).

UNIT III

Regional Economic Co-operation - Forms of regional groupings - Integration efforts among countries in Europe - North America and Asia (NAFTA, EU , ASEAN and SAARC) - International Financial Environment - International Financial system and Institutions (IMF and World Bank - Objectives and Functions) - Foreign Exchange Markets and Risk Management - Foreign investments - Types and Flows - Foreign Investment in Indian Perspective

UNIT IV

Organizational Structure for International Business Operations - International Business Negotiations - Developments and Issues in International Business - Outsourcing and Its Potentials for India - Role of IT in International Business - International Business and Ecological Considerations.

UNIT V

Foreign Trade Promotion Measures and Organizations in India- Special Economic Zones (SEZs) and Export Oriented Units (EOUs) - FEMA Act 1999 - Measures for Promoting Foreign Investments into and from India - Indian Joint Ventures and Acquisitions Abroad - Financing of Foreign Trade and Payment Terms - sources of Trade Finance (Banks, Factoring, Forfaiting, Banker's Acceptance and Corporate Guarantee) and Forms of Payment (Cash in advance, Letter of Credit, Documentary Collection, Open Account)

SUGGESTED READINGS:

TEXT BOOKS

1. Balagopal, T.A.S. (2010). *Export Management*, Mumbai: Himalaya Publications. Mumbai.

REFERENCES

1. Srinivasan,T.N., & Suresh D. Tendulkar. (2003). *Reintegrating India with the World Economy*. Washington: Institute for International Economics.
2. Connor, & David E. O'. (2006). *Encyclopedia of the Global Economy: A guide for students and researchers*. Newdelhi: Academic Foundation.
3. Bibek Debroy., & Debashis Chakraborty. (2007). *The Trade Game: Negotiation trends at WTO and concerns of developing countries*. New Delhi: Academic Foundation.
4. Paul R. Krugman, Maurice Obstfeld, & Marc Melitz. (2016). *International Economics: Theory and Policy* (10^{th} ed.). New Delhi: Pearson Education.
5. Rajiv Sikri. (2013). *Challenge and Strategy: Rethinking India's Foreign Policy*. New Delhi: SAGE Publication India Pvt., Ltd.
6. Francis Cherunilam. (2013). *International Trade and Export Management*. Mumbai: Himalaya Publications.
7. Dr. Varma., & Agarwal. (2006). *Foreign Trade Management*. New Delhi: Forward Book Depot.
8. Manab Adhikary. (2011). *Global Business Management*. New Delhi: Macmillan India Limited.

Semester VI

		L	T	P	C
16PAU603A	**SEC 4 - MANAGEMENT ACCOUNTING**	**5**	**1**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To understand the objectives of management accounting and Difference between Financial Accounting, Cost accounting and Management Accounting
2. To recognize the concept of Budget and Budgetary control.
3. To identify the Standard Costing and Variance Analysis
4. To understand the concept of marginal costing and Relevant Costs and Benefits
5. To know the operations of fund flow and cash flow statement.
6. To have in-depth knowledge in Accounting Standard.

COURSE OUTCOMES:

Learners should be able to

1. Explain nature and scope of management accounting
2. Evaluate Costing systems, cost management systems, budgeting systems and performance measurement systems
3. Extend Classification of ratios, capital structure and leverage.
4. Analysis performance evaluation applications of management accounting.
5. Prepare management reports by using funds flow and cash flow statement.
6. Prepare the Financial Statement under the defined Accounting standard.

UNIT I

Introduction - Meaning - Objectives - Nature and Scope of Management Accounting - Difference between Financial Accounting, Cost Accounting and Management Accounting - Cost Control and Cost Reduction - Cost Management - Financial Statement Analysis - Trend Analysis - Comparative Statement - Common Size Statement.

UNIT II

Budgetary Control - Budgeting and Budgetary Control - Concept of Budget - Budgeting and Budgetary control - Objectives - Merits and Limitations - Budget Administration - Functional Budgets - Fixed and Flexible Budgets - Zero Base Budgeting - Programme and Performance Budgeting.

UNIT III

Standard Costing - Standard Costing and Variance Analysis - Meaning of Standard Cost and Standard Costing - Advantages - Limitations and Applications - Variance Analysis - Material - Labour - Overheads and Sales Variances - Disposition of Variances - Control Ratios - Ratio Analysis - Short term Solvency - Profitability - Turnover

UNIT IV

Marginal Costing - Absorption versus Variable Costing - Distinctive Features and Income Determination - Cost Volume Profit Analysis - Profit / Volume Ratio - Break-even analysis - Algebraic and Graphic Methods. Angle of Incidence - Margin of Safety - Key Factor - Determination of Cost Indifference Point - Decision Making - Steps in Decision Making Process - Concept of Relevant Costs and Benefits - Various Short Term Decision Making Situations - Profitable Product Mix - Acceptance or Rejection of Special / Export Offers - Make or Buy - Addition or Elimination of a Product Line - Sell or Process Further - Operate or Shut Down - Pricing Decisions - Major factors influencing pricing decisions, various methods of pricing.

UNIT V

Contemporary Issues - Funds Flow Statement - Schedule of Changes in Working Capital - Calculation of Funds from Operation - Sources and Applications of Funds - Cash Flow Statement - Cash from Operation - Inflow and Outflow of Funds - Responsibility Accounting - Concept - Significance - Different Responsibility Centres - Divisional Performance Measurement - Financial and Non-Financial measures - Transfer Pricing - Accounting Standards (Theory Only) - AS 3: Cash flow Statement - AS 21: Consolidated Financial Statement - AS 23: Accounting for Investments in Associates in Consolidated Financial Statement.

Note: - Distribution of Marks: Theory- 20% and Problems -80% respectively.

SUGGESTED READINGS:

TEXT BOOKS

1. Maheswari, S.N. (2009). *Management Accounting*. New Delhi: Sultan Chand & Sons.

REFERENCES

1. Horngren, C.T., Gary L. Sundem, Jeff O. Schatzberg, & Dave Burgstahler. (2008). *Introduction to Management Accounting* (14thed.). New Delhi: Pearson Prentice Hall.
2. Arora, M.N. (2009). *A Textbook of Cost and Management Accounting* (8^{th} ed.). New Delhi: Vikas Publishing House Pvt Ltd.
3. Khan, M.Y., & Jain, P.K. (2013). *Management Accounting*: *Text Problems and Cases* (6^{th} ed.).Mumbai: Tata McGraw-Hill Education.
4. Maheshwari, S.N. & Maheshwari, S.K. (2009). *A Textbook of Accounting for Management* (1^{st} ed.). New Delhi: Vikas Publishing House Pvt. Limited.

Semester VI

16PAU603B	SEC 4 - RETAIL BUSINESS MANAGEMENT	L	T	P	C
		5	1	-	4

COURSE OBJECTIVES:

To make the students

1. To make the students understand the features of Retailing.
2. To enhance the students knowledge in the theories of Retail Development
3. To enlighten the students knowledge in global Retail Markets.
4. To communicate orally and in written form Concept of management in retail business.
5. To have in-depth knowledge on Retail strategies.
6. To understand the importance of Servicing the Retail Customer

COURSE OUTCOMES:

Learners should be able to

1. Understand the features of Retailing.
2. Knowledge in the theories of Retail Development
3. Knowledge in global Retail Markets.
   Communicate orally and in written form Concept of management in retail business.
4. Understand the Concept of management, Behaviour as individual, group and organization.
5. Implement the right retail strategies to make success the retail business.
6. Follow and take decisions related to Servicing the Retail Customer

UNIT I

Retail - Meaning – Functions and Special Characteristics of Retailer - Types of Retailers – Franchising – The Evolution of retail in India – Retailing as a Career– Consumer Behaviour in Retail Context

UNIT II

Retail Strategies – Retail Location – Site Selection – Merchandise Management – Managing Service and Quality – Strategic planning - Global retail markets: Strategic planning process for global retailing - Factors affecting the Success of a Global Retailing Strategy .

UNIT III

Organization Structure and Human Resource Management in Retail – Retail Store Operations – Financial Aspects of Retail – Retail Marketing and Communication.

UNIT IV

Servicing the Retail Customer – Retail Store Design and Visual Merchandising – Retail Management Information Systems – Supply Chain Management.

UNIT V

IT Applications in Retail – Data Base Marketing – Electronic Retailing – International Retailing Trends – Ethics in Retailing – Competition Commission of India.

SUGGESTED READING:

TEXT BOOKS

1. Swapna Pradhan. (2014). *Retailing Management* (2nd ed.). New Delhi: The Mc Graw- Hill Companies.

REFERENCES

1. Cullen, & Newman. (2006). *Retailing – Environment and Operations* (1st ed.). New Delhi: Cengage Learning EMEA.
2. Berman, & Evarv. (2012). *Retail Management* (12th ed.). New Delhi: Prentice Hall.
3. Bajaj, Tuli, & Srivastava. (2010). *Retail Management* (2nd ed.). New Delhi: Oxford University Publications.
4. Gibson G Vedamani. (2012). *Retail Management: Functional Principles and Practices* (4th ed.). New Delhi: Jaico Publishing House.
5. Harjit Singh. (2011). *Retail Management* (2nd ed.). New Delhi: S. Chand Publication.
6. Burman Barry, & Joel Evan. (2006). *Retail Management*. New Delhi: Macmillan.
7. Geroge H. Lucas, Robert P. Bush, & Larry G. Gresham. (2004). *Retailing*. New Delhi: All India Publishers.

Semester VI

16PAU691	PROJECT	L	T	P	C
		-	-	8	6

COURSE OBJECTIVES:

To make the students

1. To identify an issue to be analysed and to be solved in a business setup or real time scenario using primary or secondary data collection.
2. To understand the application of Research process in the area of accounting/Finance/Marketing/HR/ International business etc.
3. To analyse the data and critically evaluate the result and formulate the suggestion for the problem identified.
4. To apply the theoretical and practical learning of doing research into lifelong practice.
5. To Communicate in oral and written form and prepare report
6. To Work in team and exhibit leadership skills
7. To utilise the IT applications for analysis and preparation of report.

COURSE OUTCOMES:

Learners should be able to

1. Identify an issue to be analysed and to be solved in a business setup or real time scenario using primary or secondary data collection.
2. Understand the application of Research process in the area of accounting/Finance/Marketing/HR/ International business etc.
3. Analyse the data and critically evaluate the result and formulate the suggestion for the problem identified.
4. Apply the theoretical and practical learning of doing research into lifelong practice.
5. Communicate in oral and written form and prepare report
6. Work in team and exhibit leadership skills
7. Utilise the IT applications for analysis and preparation of report.

The students should select a problem in Accounting, Finance, Marketing or any other arears related to commerce.

Report should contain

- Introduction
    - Introduction about the industry
    - Introduction about the Company
    - Review of literature – Minimum 10 papers from referred journal
    - Need for the Study
    - Objectives
- Research Methodology
    - Research Design
    - Sampling Design
    - Sources of Data Collection
    - Tools used for analysis
    - Limitation
- Data analysis and interpretation
- Findings and Suggestions
- Conclusion
- Bibiliography (APA format)

KARPAGAM ACADEMY OF HIGHER EDUCATION,
(Deemed to be University)
(Established Under Section 3 of UGC Act 1956)
MASTER OF COMMERCE (Computer Applications)
M.Com.
(For the Students admitted during the year 2016 – 2018 Batch onwards)

Scheme of Examination

Course Code	Name of the Course	Objectives and Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEOs	Pos	L	T	P		CIA	ESE	Total
								40	60	100
Semester 1										
16CMP101	Corporate Finance	I,II	a,e,	4	-	-	4	40	60	100
16CMP102	Managerial Economics	IV	b,g,h,i	4	-	-	4	40	60	100
16CMP103	Operations Research	IV	b,g,h,i	4	-	-	4	40	60	100
16CMP104	Advanced Corporate Accounting	I,II, IV	a,e,b,g,h ,i	4	-	-	4	40	60	100
16CMP105A	Financial Markets and Institutions	IV	b,g,h,i	4	-	-	4	40	60	100
16CMP105B	Marketing Management	IV	b,g,h,i	4	-	-	4	40	60	100
16CMP105C	Human Resource Development	I,II	a,e,	4	-	-	4	40	60	100
16CMP106	Organizational Behavior	I,II	a,e,	-	-	4	2	40	60	100
16CMP111	Computer Application in Business (Practical)	I, II, III	a,e,c,d,f	-	-	4	2	40	60	100
	Journal Paper Analysis & Presentation	III	c,d,f	2	-	-	-	-	-	-
				22	**-**	**8**	**24**	**280**	**420**	**700**
Semester II										
16CMP201	Applied Cost Accounting	IV	b,g,h,i	4	-	-	4	40	60	100
16CMP202	Retail Management	IV	b,g,h,i	4	-	-	4	40	60	100
16CMP203	Direct Taxation	III	c,d,f	4	-	-	4	40	60	100
16CMP204	Insurance and Risk Management	I,II	a,e,	4	-	-	4	40	60	100
16CMP205A	Advertisement and Sales Promotion	IV	b,g,h,i	4	-	-	4	40	60	100
16CMP205B	Security Analysis & Portfolio Management	III	c,d,f	4	-	-	4	40	60	100
16CMP205C	Strategic Human Resource Management	I,II	a,e,	4	-	-	4	40	60	100

16CMP206	Human Resource Management	I,II	a,e,	-	-	4	2	40	60	100
16CMP211	Tally (Practical)	I, II, III	a,e, c,d,f	-	-	4	2	40	60	100
	Journal Paper Analysis & Presentation	III	c,d,f	2	-	-	-			
				22	**0**	**8**	**24**	**280**	**420**	**700**
Semester III										
16CMP301	Management Accounting	IV	b,g,h,i	4	-	-	4	40	60	100
16CMP302	Business Research Methods and Techniques	III	c,d,f	4	-	-	4	40	60	100
16CMP303	Indirect Taxation	III	c,d,f	4	-	-	4	40	60	100
16CMP304	Business Environment	IV	b,g,h,i	4	-	-	4	40	60	100
16CMP305A	International Financial Management	IV	b,g,h,i	4	-	-	4	40	60	100
16CMP305B	Consumer Behavior	IV	b,g,h,i	4	-	-	4	40	60	100
16CMP305C	Labour Legislation	I, II, III	a,e,c,d,f	4	-	-	4	40	60	100
16CMP306	Financial Services	I, II, III	a,e,c,d,f	-	-	4	2	40	60	100
16CMP311	SPSS (Practical)	I, II, III	a,e,c,d,f	-	-	4	2	40	60	100
	Journal Paper Analysis and Presentation	III	c,d,f	2			-	-	-	-
				22	**0**	**8**	**24**	**280**	**420**	**700**
Semester IV										
16CMP401	Corporate Administration and Secretarial Practice	IV	b,g,h,i	4	0	0	4	40	60	100
16CMP402	Entrepreneurship and Small Business Management	IV	b,g,h,i	3	0	0	3	40	60	100
16CMP491	Project and Viva Voce	III	c,d,f	0	0	23	8	80	120	200
				7	**0**	**23**	**15**	**160**	**240**	**400**
							87	**1000**	**1500**	**2500**

PROGRAMME OUTCOMES (PO)

a) Postgraduates will develop an understanding of various commerce functions such as finance, accounting, financial analysis, project evaluation, cost accounting.

b) Postgraduates will have exposure to solve complex commerce problems and analyze problems critically through research based or project based approach of learning.

c) Postgraduates will excerpt information from various sources and apply mathematical, analytical, statistical and IT tools for financial and accounting analysis.

d) Postgraduates will develop an ability to effectively communicate both orally and in written forms.

e) Postgraduates will appreciate the importance of working independently and in a team in order to achieve common goals.

f) Postgraduates will acquire critical and analytical thinking and will be able to apply the same in effective decision making.

g) Postgraduates will acquire professional and intellectual integrity, professional code of conduct, ethics and values to contribute for sustainable development of society by becoming socially responsible citizen.

PROGRAMME SPECIFIC OUTCOMES (PSO)

h) Postgraduates will apply the lifelong learning and exhibit high level of commitment to identify a timely opportunity and use business innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

i) Postgraduates will acquire managerial positions or take up entrepreneurial ventures by applying the skills and knowledge gained.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

I. Postgraduates will gain advanced knowledge in the domain of commerce, management and finance

II. Postgraduates will be able to apply the accounting, finance and management tools and techniques to implement systematic decision making process.

III. Postgraduates will attain research insights, professional skills and competencies to enhance lifelong learning and excel in diverse career path.

IV. Postgraduates will adapt to a rapidly changing global environment and become socially responsible and value driven citizens committed to sustainable growth.

Program Educational Objectives	Program Outcomes								
	a	b	c	d	e	f	g	h	i
Postgraduates will gain advanced knowledge in the domain of commerce, management and finance	✓				✓				
Postgraduates will be able to apply the accounting, finance and management tools and techniques to implement systematic decision making process.	✓				✓				
Postgraduates will attain research insights, professional skills and competencies to enhance lifelong learning and excel in diverse career path.			✓	✓		✓			
Postgraduates will adapt to a rapidly changing global environment and become socially responsible and value driven citizens committed to sustainable growth.		✓					✓	✓	✓

		Semester – I			
		L	T	P	C
16CMP101	**CORPORATE FINANCE**	4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To Explain the core concepts of corporate finance and its importance in managing a business
2. To understand the nature, importance, structure of corporate finance related areas.
3. To impart knowledge regarding source of finance for a business.
4. To develop a conceptual framework of finance function
5. To acquaint the participants with the tools, techniques
6. To know the process of financial management in the realm of financial decision making.

COURSEOUTCOMES:

Learners should be able to

1. Understand the role of a financial manager and their role intaking decisions professionally.
2. Demonstrate knowledge and compute value of money over time
3. Apply the concept to Evaluate the business proposal applying capital budgeting techniques
4. Computethecostofcapitalandfinancialleveragetoestimatetheoptimalcapitalstructure
5. Comprehendtheknowledgeofassessingtheworkingoforganizationtoassesstheliquidity position of the firm.
6. Demonstrate capabilities of teamwork, problem-solving, critical thinking, and communication skills related to finance decisions.

Unit – I

Scope and Functions of Finance – Role of Financial Manager – Goals of Financial Management – Functions of Controller and Treasurers in India

Unit – II

Cost of Capital – Significance – Concepts of Cost of Capital – Cost of Debt Capital, Preference Capital, Equity Capital and Retained Earnings – Weighted Average Cost of Capital

Unit – III

Capital Structure – Concept – Capital Structure Theories – Net Income Theory, Net Operating Income Theory – MM's Proportion on Capital Structure – Determinants of Optimal Capital Structure – Financial and Operating Leverage

Unit – IV

Capital Budgeting Decisions – Investment Evaluation Criteria – Payback Method – ARR – NPV Method – IRR – Profitability Index – Risk Analysis in Capital Budgeting – Nature of Risk – Conventional and Statistical Technique to handle risk

Unit –V

Management of Working Capital – Determinants of Working Capital – Management of Accounts Receivable, Inventory and Cash – Financing of Working Capital – Dividend Theories – Walter's Model – Gordon's Model – MM's Hypothesis – Dividend Policy – Determinants of Dividend Policy.

Note: Theory :80 Marks and Problems : 20 Marks

SUGGESTED READINGS

Text Book

1. **Pandey, I.M. (2014)**. *Financial Management.* New Delhi, Vikas Publishing House Private Limited.

References

1. **Prasana Chandra (2012)**. *Financial Management – Theory and Practice.* New Delhi, Tata Mc Graw Hill Publishing Company Limited.
2. **Khan, M.Y., and Jain, P.K. (2014)**. *Financial Management.* New Delhi, Tata Mc Graw Hill Publishing Company Limited.

	Semester – I			
	L	T	P	C
16CMP102 **MANAGERIAL ECONOMICS**	4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To obtain fundamental knowledge on economic concepts and tools that have direct managerial applications.
2. To illustrate the application of economic theory and methodology as an alternative in managerial decisions.
3. To gain a rigorous understanding of competitive markets as well as alternative market structures.
4. To obtain familiarity on the macro level business components like money, banking, monetary policy, fiscal policy, trade, business cycles and balance of payment and understand the forces determining macroeconomic variables such as inflation, unemployment, interest rates, and the exchange rate.
5. Demonstrate capabilities of teamwork, problem-solving, critical thinking, and communication skills
6. To enable students to obtain managerial problem solving skills.

COURSE OUTCOMES:

Learners should be able to

1. Apply the economic way of thinking to individual decisions and business decisions
2. Measure the responsiveness of consumers' demand to changes in the price of a goods or service, and understand how prices get determined in markets,
3. Understand the different costs of production and how they affect short and long run decisions and derive the equilibrium conditions for cost minimization and profit maximization
4. Demonstrate an understanding of monetary and fiscal policy options as they relate to economic stabilization in the short run and in the long run
5. Critically evaluate the consequences of basic macroeconomic policy options under differing economic conditions within a business cycle.
6. Understand and exhibit the communication skills to convey the thoughts and ideas to the individuals and group.

Unit - I

Nature, Objectives and Scope of Managerial Economics – Role and Responsibilities of Managerial Economist – Circular Flow of Economic Activity – Nature of the Firm – Economic Profit – Profits in the Market System

Unit – II

Demand Theory and Analysis – Supply Theory and Analysis

Unit – III

Production Theory – Cost Theory – Cost Concept – Cost Output Relationship – Break Even Analysis

Unit – IV

Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly, Duopoly, Bilateral Monopoly – Monopsony.

Unit – V

Pricing Decision – Pricing of Goods and Services – Pricing and Employment of Inputs – Pricing in Public Sector – Risk and Decision Making – Input – Output Analysis

SUGGESTED READINGS

Text Book

1. **Varshney and Maheswari (2014)**. *Managerial Economics.* New Delhi, Sultan Chand and Sons.

References

1. **Heynes, Mole and Paul (2007)**. *Managerial Economics.* New Delhi, Tata Mc Graw Hill Publishing Company Limited.
2. **Joel Dean (2011).** *Managerial Economics.* Jaipur, Mangal Deep Publications.
3. **Sumitra Pal (2011).** *Managerial Economics.* New Delhi, Macmillan
4. India Limited.

		Semester – I			
		L	**T**	**P**	**C**
16CMP103	**OPERATIONS RESEARCH**	**4**	**-**	**-**	**4**

COURSE OBJECTIVES:

Course Objectives

This course enables the students

1. To provide essential knowledge on Linear programming
2. To offer practical exposure to transportation and assignment problems
3. To gain the knowledge on Assignment and Queuing Theory Problems
4. To train students on Inventory Control
5. To helps to facilitates the learning of network analysis
6. To enhance learner knowledge in optimal use of performance measures of queues, optimal use of Inventory and Network scheduling with various applications in mathematics

Course Outcomes

On successful completion of this course, the students will be able to

1. Students may gather relevant knowledge for minimizing Operation Cost
2. Students are equipped to cut total cost and able to minimize time required for completing assigned task
3. Students could learn to maintain optimal level of inventory
4. Understand various mathematical applications in industries.
5. Decision making for real time environment.
6. course concentrates on Linear programming, transportation model, Queuing theory and Inventory

Unit – I

Introduction to Operations Research – Application in Management Decision Making – Linear Programming: Formulation of LPP – Graphical Solution to LPP – Simplex Method (using slack variables only)

Unit - II

Transportation Model: Introduction – Mathematical Formulation –Finding Initial Basic Feasible Solutions – Optimum Solution for Nondegeneracy and Degeneracy Model - Unbalanced Transportation Problems and Maximization case in Transportation Problem- Traveling Sales Man Problem.

Unit- III

The Assignment problem - Mathematical Formulation of the Problem – Hungarian Method –Unbalanced Assignment Problem- Maximization Case in

Assignment Problem - Travelling Salesman Problem. Queuing Theory : Introduction – Characteristics of Queuing System. Problems in (M/M/1):(∞/FIFO) and (M/M/1):(N/FIFO) models

Unit - IV

Inventory Control: Introduction – Costs involved in Inventory – Deterministic EOQ Models – Purchasing Model without and with Shortage, Manufacturing Model without and with Shortage -Price Break

Unit - V

PERT and CPM: Network Representation – Calculation of Earliest expected time, latest allowable occurrence time. CPM - Various Floats for Activities – Critical Path- PERT –Time Estimates in PERT- Probability of Meeting scheduled date of Completion of Projects

SUGGESTED READINGS

Text Book

1. **Kanthi Swarup**, **Gupta P.K., Man Mohan (2006).** *Operations Research.* New Delhi, Sultan Chand and Sons.

References

1. **Sharma, J.K**. **(2008).** *Operations Research Theory Applications*. New Delhi, Macmillan India Limited.
2. **Sundaresan, V., Ganapathy Subramanian, K.S., and Ganesan, K.** (2005). *Resource Management Techniques*. Nagapatinam, A. R. Publications.
3. **Shanthi Sophia Bharathi, D. (1999).** *Operations Research*. Chennai, Charulatha Publications.
4. **Hamdy A.Taha (2007).** *Operations Research.* New Delhi, Prentice Hall of India.
5. **Vittal.** *Operations Research.* Chennai, Margham Publications.

	Semester – I			
	L	T	P	C
16CMP104 ADVANCED CORPORATE ACCOUNTING	4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To understand the Redemption of Preference shares, Mergers& Acquisitions, Internal Reconstruction, Liquidation of shares, recent Development in Accounting.
2. To Post the journal, ledger Prepare the balance sheet for corporate Accounting.
3. To comprehend on recent developments and accounting standards
4. To enable the students to have working knowledge in corporate and special accounts.
5. To enable the students to have working knowledge in corporate and special accounts.
6. To provide knowledge on the importance of Human Resources Accounting

COURSE OUTCOMES :

Learners should be able to

1. Understand the Redemption of Preference shares, Mergers & Acquisitions, Internal Reconstruction, Liquidation of shares, recent Development in Accounting.
2. Post the journal, ledger Prepare the balance sheet for corporate Accounting.
3. Comprehend on recent developments and accounting standards
4. Demonstrate capabilities of problem-solving, critical thinking, and communication skills related to the discipline of accounting.
5. course includes preparation of final accounts, Amalgamation, Absorption and Reconstruction, Holding Company, Insurance and Banking Company Accounts, Inflation and Human Resource Accounting
6. Provide knowledge on the importance of Human Resources Accounting

Unit – I

Preparation of Company Final Accounts – Treatment and Provisions for Income Tax – Divisible Profit – Bonus Shares – Calculation of Managerial Remuneration

Unit –II

Amalgamation, Absorption and Reconstruction of Companies (Advanced Problems in Amalgamation, Absorption and Reconstruction of Companies including adjustment regarding elimination of Unrealized Profit, Inter Company Owings and Inter-Company Holdings)

Unit – III

Holding Company Accounts – Capital Profit – Revenue Profit – Minority Interest – Cost of Control – Preparation of Consolidated Balance Sheet

Unit – IV

Insurance Company Accounts – Life and General Insurance Accounts – Preparation of Revenue Accounts and Balance Sheet (Under the New Format) - Banking Company Accounts – Rebate on Bills Discounted – Classification of Advances and Investments – Preparation of Profit and Loss Account and Balance Sheet (Under the New Format)

Unit – V

Inflation Accounting – Human Resource Accounting –International Accounting Standards (Theory Only) – International Financial Reporting Standards.

Note: Theory 20%; Problems 80%

SUGGESTED READINGS

Text Book

1. **Jain, S.P., and Narang (2010)**. *Advanced Corporate Accounting.* New Delhi, Kalyani Publishers.

References

1. **Gupta, R.L. (1998)**. *Corporate Accounts.* New Delhi, Sultan Chand and Company.
2. **Singhal, A.K**. **(2010)**. *Corporate Accounting.* New Delhi, Vayu Education of India.

		Semester – I			
16CMP105A	**FINANCIAL MARKETS AND INSTITUTIONS**	**L**	**T**	**P**	**C**
		4	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To comprehend on the concept financial markets, instruments and financial institution and its role in economic development
2. To understand the regulatory bodies governing the functioning of financial markets and financial institution
3. To analyze the structure of financial markets and its functions
4. To provide knowledge on Financial System of India and
5. To provide knowledge on Financial System of India and to familiarize the structure of financial markets
6. To familiarize the structure of financial markets

COURSE OUTCOMES:

Learners should be able to

1. Comprehend on the concept financial markets, instruments and financial institution and its role in economic development
2. Understand the regulatory bodies governing the functioning of financial markets and financial institution
3. Obtain the capacity to do lifelong learning on financial markets, instruments, financial institution and its applications.
4. To communicate orally and in written format about the financial markets and institutions
5. The course includes Money Market, Money Market Instruments, Capital Market, Depository System and various types of Financial Institutions
6. Course includes Money Market, Money Market Instruments, Capital Market, Depository System and various types of Financial Institutions

Unit – I

Financial Concept: Financial Assets, Intermediaries, Financial Markets, Financial Rate of Return, Financial Instruments. Financial Markets Classification – Development of Financial System in India, Legislative Support – Weakness of Indian Financial System

Unit - II

Money Market – Definition – Money Market Vs Capital Market- Objectives – Importance of Money Market – Composition of Money Market – Participants – Commercial Bill Market – Types of Bills – Importance of Bill Market –Discount Market – Acceptance Market – Bill Market Scheme – Treasury Bill Market – Types of Treasury

Bills –Importance – Commercial Paper – Certificate of Deposit – REPO – Structure of Indian Money Market –Recent Developments in Money Markets.

Unit – III

Capital Market – Meaning – Stock Exchange – Distinction between New Issue Market and Stock Exchange – Relationship between New Issues Market and Stock Exchange – Functions of New Issue Market – Instruments of Issues – Players in the New Issue Market – Book Building – Follow on Public Offer – Recent Trends – Reasons for Poor Performance – Suggestions

Unit - IV

Depository System : Definition and Meaning – Objectives – Interacting Institutions – Depository Process – Trading in a Depository System – Depository System in India – Depository Participants – Benefits – NSDL – Central Depository Services (India) Ltd. – Drawbacks – Remedial Measures - Derivatives

Unit - V

RBI – Commercial Banks – Public and Private – Co-operative Banks - LIC – IDBI – IFCI – ICICI – NHB – SFCs – DIC – TIIC. SEBI – Objectives – Functions of SEBI - Guidelines for Investor Protection

SUGGESTED READINGS

Text Book

1. **Gordon and Natarajan (2010)**. *Financial Markets and Institutions.* New Delhi, Himalaya Publishing House.

References

1. **Gupta, N.K.**, **and Monika Chopra (2011)**. *Financial Markets and Institutions.* New Delhi, ANE Books Limited
2. **Gurussamy, S. (2009)**. *Financial Markets and Institutions*. New Delhi, Tata Mc Graw Hill Publishing.

	Semester – I
	L T P C
16CMP105B MARKETING MANAGEMENT	**4 - - 4**

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of marketing, and 4Ps of Marketing
2. To communicate orally and in written form the concepts of marketing and 4 Ps of marketing
3. To apply the marketing concepts and skills lifelong.
4. To understand the recent trends in marketing strategies of a companies.
5. To understand the consumer behavior and to adopt the decision according to the consumer.
6. To know the promotion strategies followed by a company.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of marketing, and 4Ps of Marketing
2. Communicate orally and in written form the concepts of marketing and 4 Ps of marketing
3. Apply the marketing concepts and skills lifelong.
4. Apply the marketing strategies of a company's effectively.
5. To be familiar in behavior of consumer in related to market and to take decision effectively.
6. To implement the correct promotion strategies.

Unit-I

Definition of Marketing and Marketing Management – Object and Importance of Marketing – Evolution of Concept of Marketing – Recent Development in Marketing Concept – Marketing Functions – Approaches to the Study of Marketing – Market Segmentation – Basis – Criteria – Benefits.

Unit-II

Product Policy: Product Planning and Development – Product Life Cycle – Product Line and Product Mix Strategies. Branding: Features – Types – Functions. Packaging: Features – Types – Advantages – Brand Name and Trademark.

Unit-III

Pricing: Definition - Objectives of Pricing Decisions - Factors influencing Pricing Decisions – Methods of Setting Prices – Cost – Demand and Competition – Pricing Policies and Strategies.

Unit-IV

Sales Promotion: Meaning and Definition – Objectives and Importance of Sales Promotion – Personal Selling – Steps in Personal Selling - Advertising – Meaning – Objectives – Functions and Importance – Kinds of Media – Direct Marketing – Multi-level Marketing. Distribution Channels: Types of Channels – Factors affecting Choice of Distribution.

Unit-V

Marketing of Services – E–Marketing – Marketing Ethics – Consumerism – Meaning – Evolution – Types of Exploitation – Consumer Rights – Laws Protecting the Consumer Interest – Consumer Protection Acts – Consumer Courts - Retail Marketing – Methods – Problems – Retail Marketing in India – Customer Relationship Management

SUGGESTED READINGS

Text Book

1. **Pillai, R.S.N., and Bagavathi (2012)**. *Modern Marketing Principles and Practices.* New Delhi, S. Chand and Company Private Limited.

References

1. **Gupta,C.B., and Rajan Nair (2014)**. *Marketing Management*, New Delhi, Sultan Chand and Sons.
2. **Philip Kotler (2014).** *Principles of Marketing.* New Delhi, Prentice Hall of India.

			Semester – I			
			L	T	P	C
16CMP105C	**HUMAN RESOURCE DEVELOPMENT**		4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To acquire knowledge in human resource management, HR audit, and HR analytics.
2. To gain knowledge of HR planning, Selection, Recruitment, job analysis and its interrelations.
3. To understand the concepts and practical implications of performance management, Training methods and career planning.
4. To know about compensation and reward management and its practice in industry.
5. To be familiar with Employee relations and its application for the development of Human resources.
6. To understand the Job analysis and Design

COURSEOUTCOMES:

Learners should be able to

1. Assess the job analysis for a profile and understand its linkage with HR planning
2. Evaluate the training needs and draft a training programme.
3. Understand the compensation and reward system applicable to the industry based and understand its linkage with performance management
4. Understand and apply the appropriate employee relations measures.
5. Understand the HR functions and latest developments in the field of HR and effectively communicate ideas, explain procedures and interpret results and solutions in written and oral forms to different audiences.
6. consists of Job Analysis, Job Evaluation, Orientation, Performance Appraisal, Rewards, Punishment, Industrial Relations, Collective Bargaining and Grievances Handling

Unit – I

Introduction to Human Resource Development: Concept and evolution; Relationship between human resource management and human resource development; HRD mechanisms, processes and outcomes; HRD matrix; HRD interventions; Roles and competencies of HRD professionals

Unit –II

HRD Process: Assessing HRD needs; Designing and developing effective HRD programs; Implementing HRD programs; Evaluating HRD programs.

Unit – III

Learning and HRD: Maximizing learning; Individual differences in learning process; Learning strategies and styles; Principles of learning; Learning and motivation; HRD culture and climate.

Unit – IV

HRD Activities and Applications: HRD for Workers; HRD mechanisms for workers; Role of trade unions; Employee training and development- Process, methods, and types; Coaching, counselling and performance management; Career management and development; Organization development.

Unit – V

HRD in Organisations, Trends and Practices: Select cases for HRD Practices in Government organisations, defence, police, private sectors and public sectors units; HRD audit; Balanced scorecard; People capability maturity model; Integrating HRD with technology; Employer branding and other recent trends; Future of HRD.

SUGGESTED READINGS

Text Book

1. **Rao, T.V.** *Future of HRD.* New Delhi, Macmillan Publishers India Limited.

References

1. **Werner J. M., DeSimone, R.L.** *Human Resource Development*, South Western.
2. **Nadler, L.** *Corporate Human Resources Development*, Van Nostrand Reinhold.
3. **Blanchard, P.N., Thacker, J.W., Anand Ram, V.** *Effective Training, Systems Strategies and Practices.* Pearson Education.
4. **Raymond, N. and Kodwani, A.D**. *Employee Training and Development.* New Delhi, McGrawHill Education.
5. **Mankin, D.** *Human Resource Development.* Oxford University Press India.
6. **Haldar, U. K.** *Human Resource Development.* Oxford University Press India.
7. **Rao, T.V**. *HRD Score Card 2500: Based on HRD audit.* Sage Publications.

		Semester – I
16CMP106	**ORGANIZATIONAL BEHAVIOUR**	**L T P C** **4 - - 4**

COURSE OBJECTIVES:

To make the students

1. To understand the basic concepts of organizational behavior.
2. To analyze the individual behavior traits required for performing as individual or group.
3. To obtain the knowledge and skills of perceiving, motivating using different learning styles.
4. To understand how to perform in group and team and how to manage the power, politics and conflict.
5. To recognize the importance of organizational culture and organizational change.
6. The course comprise of Organizational behavior, Personality, Attitude, Stress and Organizational Conflict

COURSE OUTCOMES:

Learners should be able to:

1. Analyze behavior issues in the context of the organizational behavior theories and concepts.
2. Assess the behavior of the individuals and groups in organization by applying personality, motivation and learning theories.
3. Manage team and resolve conflict arising between the members.
4. Explain how organizational changes held in the company
5. and culture affect working relationships within organizations.
6. Exhibit the communication skills to convey the thoughts and ideas to the individuals and group.

Unit – I

Organizational Behaviour – Nature – Disciplines contributing to Organizational Behavior – Role of Organizational Behavior – Foundations of Organizational Behavior – Implications of Hawathorne Experiments

Unit – II

Individual Difference – Nature – Causes – Models of Man – Perception – Perceptual Process – Perceptual Selectivity – Distortion in Perception – Personality – Determinants of Personality

Unit – III

Attitude – Concepts – Theories of Attitude Formation – Factors in Attitude Formations – Attitude Change. Stress – Causes of Stress – Effects of Stress – Stress Coping Strategies – Individual and Organizational

Unit – IV

Group Dynamics – Concepts and Features of Group – Types of Groups – Formal and Informal Groups – Causes of Informal Organizations – Types of Industrial Organization – Effects of Informal Organization – Group Cohesiveness

Unit – V

Organizational Conflicts – Functional and Dysfunctional Aspects of Conflicts – Role Conflicts – Interpersonal Conflict – Conflict Management

SUGGESTED READINGS

Text Book

1. **Aswathappa, K. (2012)**. *Organizational Behaviour*. Mumbai, Himalaya Publishing House.

References

1. **Steven Mc Shane (2014)**. *Organizational Behaviour*. New Delhi, Tata Mc Graw Hill Publishing Company Limited.
2. **Stephen Robbins (2013)**. *Organizational Behaviour*. New Delhi, Prentice Hall of India Private Limited.

Semester – I

	L	T	P	C
16CMP111 PRACTICAL 1 - COMPUTER APPLICATION IN BUSINESS	-	-	4	2

COURSE OBJECTIVES:

To make the students

1. To prepare template to present the financial data for supporting analysis.
2. To use advanced formula in financial calculations
3. To use visualization tools to represent the financial data graphically
4. To forecast the financial data using the in build tools
5. To Understand and apply Sensitivity analysis on models like Goal Seek , Scenarios; for financial decision-making
6. To insert the slides with animation effects.

COURSEOUTCOMES:

Learners should be able to

1. Apply advanced formulas to lay data in readiness for financial analysis
2. Use advanced techniques for financial report visualizations
3. Leverage on various methodologies of summarizing financial data
4. Understand and apply Sensitivity ("What-if") analysis models like Goal Seek , Scenarios; Excel models for financial decision-making
5. Exhibit communication skills to communicate the output derived from the program.
6. Course includes practical on paragraph formatting, usage of Excel funtions, Automation of Presentation, creation of database and report generation.

I - MS WORD

1. Prepare an research article related to the specialization using Bold, Underline, Font Size, style, Background color, Text color, Line spacing, Spell Check, Alignment, Header & Footer, Inserting pages and page numbers, Find and Replace.
2. Prepare an inter collegiate invitation for the college function using Text boxes and clip parts, Word Art, Symbols, Borders and Shading.
3. Prepare an end semester mark statement through template and perform the following operations: Inserting the table, Data Entry, Alignment of Rows and Columns, Inserting and Deleting the Rows and Columns and Change of table Format.
4. Prepare a Convocation letter for the passed out students for 10 members using mail merge operation.
5. Prepare a resume for attending interview using alignment and formatting.

II - MS EXCEL

1. Prepare a cost sheet and perform the following operations: Data Entry, Total, by using arithmetic function.
2. Draw the different type of charts (Line, Pie, Bar) to illustrate year-wise performance of sales, purchase, profit of a steel manufacturing company by using chart wizard.
3. Prepare a statement of Bank customer's account showing simple and compound interest calculations for 10 different customers using mathematical and logical functions.
4. Prepare a Product Life Cycle which should contain the following stages: Introduction, Growth, Maturity, Saturation, decline of a product.
5. Prepare an income tax filling return as per the income tax department format.
6. Carry out result analysis of your department by employing statistical and mathematical functions.
7. Calculate Electricity statement by making use IF statement.

III - MS POWERPOINT

1. Design presentation slides for a product of your choice. The slides must include name, brand name, type of product, characteristics, special features, price, special offer etc. Add voice if possible to explain the features of the product. The presentation should work in manual mode.
2. Design Presentation slides for Organization details for 5 levels of hierarchy of a company by using organization chart.
3. Design presentation slides about an illustrate story and perform frame movement by interesting clip arts to illustrate running of an image automatically.
4. Design presentation slides for the Seminar/Lecture Presentation using animation effects and perform the following operations: Creation of different slides, changing background color, font color using word art.

IV - MS ACCESS

1. Prepare a payroll for employee database of an organization with the following Details: Employee id, Employee name, Date of Birth, Department and Designation,

Date of appointment, Basic pay, Dearness Allowance, House Rent Allowance and other deductions if any. Perform queries for different categories.

2. Create mailing labels for student database which should include at least three table must have at least two fields with the following details: Roll Number, Name, Course, Year, College Name, University, Address, Phone Number.
3. Gather price, quantity and other descriptions for five products and enter in the Access table. Perform query for calculation total and create an invoice in form design view.
4. Create report for the Product database.

		Semester – II			
		L	**T**	**P**	**C**
16CMP201	**APPLIED COST ACCOUNTING**	**4**	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To Explain the core concepts of costing, costing types and its importance in managing a business
2. To develop a conceptual framework of costing and to acquaint the participants with the tools, techniques
3. To know the process of cost reduction and control in the realm of decision making.
4. To familiarizes students with the various concepts and elements of cost
5. To Create cost consciousness among the students
6. To provide the students knowledge about use of costing data for Planning, Control and decision making

COURSEOUTCOMES:

Learners should be able to

1. Explain the core concepts of costing, costing types and its importance in managing a business
2. Develop a conceptual framework of costing and to acquaint the participants with the tools, techniques and process cost reduction and control in the realm of decision making
3. Compute using different costing methods.
4. Demonstrate capabilities of teamwork, problem-solving and critical thinking
5. Communication skills related to finance decisions.
6. course include Material Cost, Labour Cost, Overheads, Process Costing, Activity Based Costing and Target Costing

Unit – I

Cost Accounting – Meaning and Objectives – Importance – Limitations – Limitations of Financial Accounting – Differences between Cost Accounting and Financial Accounting, Cost Accounting and Management Accounting – Methods of Costing – Elements of Cost – Preparation of Cost Sheet – Tender – Quotations – Reconciliation of Cost and Financial Accounting

Unit – II

Material Control – Objectives – Levels of Inventory – EOQ – Methods of Inventory Control – Methods of Valuing Material Issues – Control over Wages – Scrap and Spoilage - Labour - Labour Cost Control – Importance – Systems of Wage Payment – Incentives – Idle Time – Control Over Idle Time – Labour Turnover

Unit – III

Overheads – Classification of Overheads – Allocation, Apportionment and Absorption of Overheads – Methods of Absorption of Overheads

Unit – IV

Process Costing – Features – General Principles – Comparison between Job Costing and Process Costing – Process Losses – Normal Loss – Abnormal Loss – Abnormal Gains – Inter Process Profit – Equivalent Production – Procedure for Evaluation – Joint Product and by Product

Unit-V

Activity Based Costing: Meaning and Methodology of Activity Based Costing (ABC Analysis)-Merits, Demerits and Suitability of Activity Based Costing-Implementation of Activity Based Costing- Draw Back of Conventional Costing - Target costing**:** Meaning-Characteristics-Principles-Implementation of Target Costing-Installation of Target Costing-Target Costing Vs. Traditional Costing- Life Cycle Costing-Meaning-Definition-Applications of LCC -Importance-Process of LCC

SUGGESTED READINGS

Text Book

1. **Jain, S.P., and Narang, K.L (2012)**. *Cost Accounting Principles and Practice.* New Delhi, Kalyani Publishers.

References

1. **Iyyangar, S.P. (2005)**. *Cost Accounting Principles and Practices.* New Delhi, Sultan Chand and Sons Private Limited.
2. **Pillai, R.S.N., and Bhagavathi (2010)**. *Cost Accounting*. New Delhi, Sultan Chand and Sons Private Limited.
3. **Maheswari, S.N. (2013)**. *Cost Accounting*. New Delhi, Sultan Chand and Sons Private Limited.

Semester – II

	L	T	P	C
	4	-	-	4

16CMP202 RETAIL MANAGEMENT

***COURSE OBJECTIVES** :*

To make the students

1. To understand the concept of retailing, retailing strategy and the trends of retailing in India
2. To obtain the knowledge on the retail location and importance of choosing the retail location.
3. To gain knowledge on the retail formats and importance of choosing the retail formats.
4. To know the process of retail pricing and merchandising.
5. To recognize the importance of advertising and technology usage in retailing.
6. To develop an understanding of the retail strategy and planning process

LEARNING OUTCOMES :

Learners should be able to

1. Comprehend on the retailing concept, retailing strategy and the trends of retailing in India.
2. Select the appropriate location for the setting up of retail store.
3. Evaluate the importance of the various retail formats
4. Formulate pricings strategies, apply the concept of merchandising and assess the different advertising and technology options suitable for the success of the retail operations.
5. Exhibitthecommunicationskillstoconveythethoughtsandideastotheindividualsandgroup.
6. Course includes Overview of Retailing, Retail location and layout, Merchandizing, Communication, Advertisement and Sales Promotion.

Unit – I

An overview of Retailing - Types of stores - Product Retailing vs. Service Retailing - Non store Retailing - Retail strategy - Achieving competitive advantage and positioning Retailing environment - Legal, Social, Economic, Technological, issues - Trends in the Indian Retailing Industry

Unit – II

Retail store location and layout - Country/Region analysis - Trade area analysis - Site evaluation and selection - Store design and layout - Comprehensive store planning - Exterior design and layout - Interior store design and layout - Interior design elements

Unit – III

Planning merchandise needs and merchandise budgets - Methods for determining inventory evaluation - Assortment planning, buying and vendor relations - Merchandise pricing - Price strategies - Psychological pricing - Mark-up and markdown strategies.

Unit – IV

Communicating with the retail customer - Retail promotion mix-Advertising - Sales promotion - Publicity - Retail selling process - Retail database- In-store customer service.

Unit – V

Globalization and changing retail formats – Online retailing - International Retailing – Opportunities and Challenges - Market entry formulas - New customized formats (customized stores, portable stores, merchandise depots, retail theater, service malls, customer-made stores, interactive kiosk 'shopping arcades')

SUGGESTED READINGS

Text Book

1. **Chetan Bajaj, Tuli and Srivastava (2010)**. *Retail Management.* New Delhi, Oxford University Press.

References

1. **Giridhar Joshi (2009)**. *Information Technology for Retail.* New Delhi, Oxford University Press.
2. **Swapna Pradhan (2008).** *Retail Management Text and Cases*, New Delhi, Tata McGraw-Hill Publishing Company Limited.
3. **Fernie (2010).** *Principles of Retailing.* Elsevier Publishing

		Semester – II			
		L	**T**	**P**	**C**
16CMP203	**DIRECT TAXATION**	**4**	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of assessment, assessee, Income heads and the Income Tax laws.
2. To help students to understand different heads of income
3. To learn the tools and techniques to compute the tax for the various income heads.
4. To select the best ways to compute the income tax based on the income heads for various assesseeandtogainalifelonglearningforapplyingtheITcalculationforvariousincomeheads based on each case of assessee.
5. To communicate orally and in written form the income tax concepts and computations.
6. To be familiar with the laws pertaining to the Income Tax and apply it lifelong.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend on the concepts related to assessment, assesse, Income heads and the Income Tax laws.
2. Compute Income Tax Returns.
3. Provide the students knowledge about Tax planning
4. Formulate the Income Tax calculations by critically analyzing the assessee's situation under various income heads and deductions and acquire a Lifelong practice for computation of Tax under various income heads and deductions for any assessee
5. Communicate orally and in written the Income tax computation under various income heads and deductions.
6. Familiar with the laws pertaining to the Income Tax and its apply it lifelong.

Unit- I

Income Tax Act 1961- Scope of income - Total Income and residential status - income which do not form part of the total income – Income from Salaries.

Unit - II

Income from House Property – Profits and gains of business or profession – Income From business- Income from Profession.

Unit - III

Capital Gains – Capital Gain –Short Term and Long Term Gain - Income from other sources – Aggregation of income- set off and carry forward of losses.

Unit - IV

Deduction out of Gross Total Income - Computation of Total Income-Assessment of Individual.

Unit - V

Tax Planning – Advance payment of tax –Tax Deducted at Source - ETDS Software - Returns to be submitted by various assesses-Different Types of Tax Planning – Tax Software – e-filing Procedure e-filing of income tax return.

Note: The question paper shall cover 40% theory and 60% problems

SUGGESTED READINGS

Text Book

1. **Gaur and Narang (2013)**. *Income Tax Law and Practice.* Ludhiana, Kalyani Publishers.

References

1. **Mehrothra (2007).** *Income Tax Law and Practice.* New Delhi, Snow White Publications.
2. **Jayaprakash Reddy (2014)**. *Taxation.* New Delhi, APH Publishing
3. Corporation.

Semester – II

16CMP204	INSURANCE AND RISK MANAGEMENT	L	T	P	C
		4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of risk, and insurance a product to mitigate risk, its design and pricing
2. To comprehend on the reforms in Indian insurance industry.
3. To understand the categorization and application of the life and non-life insurance as a risk mitigation instrument,
4. To create awareness among students on various insurance policies and the procedures followed on availing policies
5. To communicate orally and in written form the understanding of insurance, insurance types, designing and pricing.
6. To create awareness among students on various insurance policies and the procedures followed on availing policies

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of risk, and insurance a product to mitigate risk, its design and pricing
2. Comprehend on the reforms in Indian insurance industry.
3. Understandthecategorizationandapplicationofthelifeandnon-lifeinsuranceasariskmitigation instrument,
4. Communicate orally and in written form the understanding of insurance, insurance types, designing and pricing.
5. course consists of types of risks, risk management, Life and General Insurance
6. Create awareness among students on various insurance policies and the procedures followed on availing policies

Unit – I

Introduction to Risk Management : The Concept of Risk – Risk Vs Uncertainty – Types of Risks: Market Risk, Credit Risk, Operational Risk, Interest Risk, Business Risk, Systematic Risk – Classifying Pure Risks – Methods of Handling Pure Risks – Risk Management Process – Risk Financing Techniques – Risk Management Objectives – Risk Management Information System (RMIS) – Risk Control

Unit - II

Risk Management by Individuals: Factors affecting individual demands for insurance – Risk Management by Corporations – Corporate Risk Management Process – Types of Risk Managing Firms

Unit – III

Growth and Development of Indian Insurance Industry – Regulations of Insurance Business and the Emerging Scenario – Introduction to Life and General Insurance – Life Insurance: Features of Life Insurance – Essentials of Life Insurance Contract – Kinds of Insurance Policies – Premium Determination – Life Policy Conditions

Unit –IV

Fire Insurance – Fire Insurance Contracts – Fire Insurance Coverage – Policies for Stocks – Rate Fixation in Fire Insurance – Settlement of Claims – Marine Insurance: Marine Insurance Contract – Types of Marine Insurance – Marine Cargo Losses and Frauds – Settlement of Claims

Unit – V

Miscellaneous Insurance: Motor Insurance – Employer's Liability Insurance – Personal Accident and Sickness Insurance – Aviation Insurance – Burglary Insurance – Fidelity Guarantee Insurance – Engineering Insurance – Cattle Insurance – Crop Insurance

SUGGESTED READINGS

Text Book

1. **Gupta, P.K. (2015).** *Insurance and Risk Management.* New Delhi, Himalaya Publishing House.

References

1. **Mishra, M.N. and Mishra, S.B. (2012)**. *Insurance Principles and Practice.* New Delhi, S. Chand and Sons.
2. **Periasamy (2011)**. *Insurance Principles and Practice.* New Delhi, Himalaya Publishing House.

		Semester – II			
16CMP205A	**ADVERTISEMENT AND SALES PROMOTION**	**L**	**T**	**P**	**C**
		4	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To know about the various types of advertising
2. To understand the motivational aspects of salesmen
3. To understand the concept of sales force management
4. To know about the social effects of advertising
5. To know about the promotional strategy.
6. To introduce the students to latest methods and tools of advertising and sales promotion.

COURSE OUTCOMES:

Learners should be able to

1. Knowing the concepts of advertising.
2. Getting the details about the various types of advertising
3. Understanding the motivational aspects of salesmen
4. Understanding the concept of sales force management
5. Knowing about the social effects of advertising
6. Knowing about the promotional strategy.

Unit - I

Advertising - Features, Purpose, Scope and Function - Classifications - Social and Economic Aspects & Ethical Issues in Advertising - Need for Advertising

Unit – II

Advertising Process - Advertising Strategy - Psychology of Target Audience - Effectiveness of Advertising - Buying Behavior - Audience Perception -Setting Advertising Objectives, Advertisement Planning and Organization -Advertisement Copy.

Unit - III

Advertising Media - Role of Media - Print Media - Radio and Television - Online Advertising - Media research - Media Selection - Advertising Budget - Evaluation of Effectiveness of Advertising - Areas of Assessment - Media testing

Unit – IV

Sales Promotions - Scope - Functions and Importance - Sales Promotional Methods - Fundamental of Successful Selling - Retail Marketing

Unit – V

Salesmanship - Salesmen Recruitment and Training - Personnel Selling - Skills for Good Salesmanship - Training of Sales Personnel - Motivating and Evaluating Sales Personnel - Sales Records - Rewarding Good Salesmanship

SUGGESTED READINGS

Text Book

1. **Mahendra Mohan (2008)**. *Advertising Management.* New Delhi, Tata McGraw Hill Publishing Company Limited.

References

1. **Philip Kotler, Kevin Lane Keller, Abraham Koshy, Mithileshwar Jha (2013).** *Marketing Management.* New Delhi, Pearson Education.
2. **Rathore (1998).** *Advertising Management.* New Delhi, Himalaya Publishing House.
3. **Francis Cherunilam (2010).** *Advertisement and Salesmanship.* New Delhi, Himalaya Publishing House.
4. **Varma and Agarwal (2000).** *Salesmanship and Publicity.* New Delhi, King Books.

16CMP205B	**SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT**	**Semester – II** **L T P C** **4 - - 4**

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of investing and mechanics for formulating investment decisions.
2. To communicate orally and in written form the concepts of Concept of investing and mechanics for formulating investment decisions.
3. To apply the investing concepts and skills lifelong.
4. To analyse the EIC framework make decisions based on investing in different avenues.
5. To Critically evaluate the risk return parameters and select the best alternative.
6. To Communicate in written form and prepare report

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of investing and mechanics for formulating investment decisions.
2. Communicate orally and in written form the concepts of Concept of investing and mechanics for formulating investment decisions.
3. Apply the investing concepts and skills lifelong.
4. Analyse the EIC framework make decisions based on investing in different avenues.
5. Critically evaluate the risk return parameters and select the best alternative.
6. Communicate in written form and prepare report

Unit- I

Introduction of Investment**:** Concepts of Investment – Common Forms of Investment - Types of Securities – Government Securities – Government Securities Market — India Money Market and Capital Market Institutions- Risk and Return – Systematic and Unsystematic Risk.

Unit - II

Stock Markets: Concepts **–** Bull- Bear-PE Ratio-Different Stock Market Ratio **-** SEBI - Structure – Functioning – NSE and BSE – Functions – Listing of Securities – New Issue Market- Mechanics of Trading in Stock Exchange – Evaluation of Securities, Equity , Preference, Debt, Hybrid Securities, - OTCEI .

Unit - III

Fundamental Analysis **-** Economic analysis and Industry analysis**:** Asset Pricing Theories (APT)s s- Option Pricing Theory – Economic Analysis –Economic Forecasting – Stock Investment Decision - Techniques Company Analysis – Industry Analysis

Unit - IV

Technical Analysis–Charting Methods – Market Indicators – Trend Analysis - Trend Reversal – Patterns Moving Average – Exponential Moving Average – Oscillators –RSI - Fundamental Analysis Vs. Technical Analysis.

Unit - V

Portfolio Analysis: Methods of Portfolio Construction – Selection of Portfolio Management- Practical Aspects – Performance Evaluation - Portfolio Revision – Problems.

Note: This Paper consisting of 80% Theory and 20% Problem.

SUGGESTED READINGS

Text Book

1. **Preeti Singh (2014).** *Investment Management.* Bangalore, Himalaya Publishing House.

References

1. **Prasanna Chandra (2012).** *Investment Analysis and Portfolio Management*. New Delhi, Tata Mc Graw Hill Publishing Company Limited.
2. **Fisher Donald (2000).** *Security Analysis and Portfolio Management.* New Delhi, Prentice Hall of India.
3. **Avadhani,V.A. (2011)**. *Securities Analysis and Portfolio Management*. Bangalore, Himalaya Publishing House.
4. **Kevin, S. (2005)**. *Portfolio Management.* New Delhi, Prentice Hall of India Private Limited.

	Semester – II			
	L	T	P	C
16CMP205C STRATEGIC HUMAN RESOURCE MANAGEMENT	4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To acquire knowledge in human resource management, HR audit, and HR analytics.
2. To gain knowledge of HR planning, Selection, Recruitment, job analysis and its interrelations.
3. To understand the concepts and practical implications of performance management, Training methods and career planning.
4. To know about compensation and reward management and its practice in industry.
5. To be familiar with Employee relations and its application for the development of Human resources.
6. To understand the Job analysis and Design

COURSEOUTCOMES:

Learners should be able to

1. Assess the job analysis for a profile and understand its linkage with HR planning
2. Evaluate the training needs and draft a training programme.
3. Understand the compensation and reward system applicable to the industry based and understand its linkage with performance management
4. Understand and apply the appropriate employee relations measures.
5. Understand the HR functions and latest developments in the field of HR and effectively communicate ideas, explain procedures and interpret results and solutions in written and oral forms to different audiences.
6. consists of Job Analysis, Job Evaluation, Orientation, Performance Appraisal, Rewards, Punishment, Industrial Relations, Collective Bargaining and Grievances Handling

Unit –I

Introduction**:** Concept and context of strategic human resource management (SHRM); Corporate strategy and SHRM; Evolution of SHRM; SHRM & HR; Challenges in SHRM; Resource based view of a firm; Competencies of HR professionals.

Unit – II

HR Strategies**:** Strategic HR planning and acquisition: Recruitment and selection; Strategic training and development; Reward and compensation strategy; Corporate strategy and career systems; Employee separation and retention management, retrenchment; Strategic approach to industrial relations; Managing workforce diversity.

Unit – III

Implementing Strategic Human Resource Management**:** Identifying strategic positions; Human resource analytics; Employee engagement; Matching culture with strategy; Behavioural issues in strategy implementation.

Unit – IV

Linking SHRM to Competitive Success and Corporate Strategy**:** SHRM for competitive advantage; HC Bridge Model and Decision science model; Tools for work analysis and talent strategies; HR implications of mergers and acquisitions; Outsourcing and its HR implications.

Unit – V

Trends and Issues in SHRM**:** Alignment of HR strategies and the impact on business performance; HR metrics; Human resource strategy in international context; Future of SHRM.

SUGGESTED READINGS

Text Book

1. **Das, P**. *Strategic Human Resource Management: A Resource Driven Perspective.* Cengage Learning India.

References

1. **Greer, C.R.** *Strategic Human Resource Management: A General Managerial Approach.* New Delhi, Pearson Education.
2. **Paul, B.** *Strategic Human Resource Management*. New Delhi, McGraw Hill Education.
3. **Armstrong, M.** *Armstrong's Handbook of Strategic Human Resource Management.* Kogan Page.
4. **Mello, J. A**. *Strategic Management of Human Resources.* South Western.
5. **Schuler, R. S., and Jackson, S. E.** *Strategic Human Resource Management.* Wiley India

		Semester – II			
		L	**T**	**P**	**C**
16CMP206	**HUMAN RESOURCE MANAGEMENT**	**4**	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To acquire knowledge in human resource management, HR audit, and HR analytics.
2. To gain knowledge of HR planning, Selection, Recruitment, job analysis and its interrelations.
3. To understand the concepts and practical implications of performance management, Training methods and career planning.
4. To know about compensation and reward management and its practice in industry.
5. To be familiar with Employee relations and its application for the development of Human resources.
6. To understand the Job analysis and Design

COURSEOUTCOMES:

Learners should be able to

1. Assess the job analysis for a profile and understand its linkage with HR planning
2. Evaluate the training needs and draft a training programme.
3. Understand the compensation and reward system applicable to the industry based and understand its linkage with performance management
4. Understand and apply the appropriate employee relations measures.
5. Understand the HR functions and latest developments in the field of HR and effectively communicate ideas, explain procedures and interpret results and solutions in written and oral forms to different audiences.
6. consists of Job Analysis, Job Evaluation, Orientation, Performance Appraisal, Rewards, Punishment, Industrial Relations, Collective Bargaining and Grievances Handling

Unit -I

Evolution of HRM**:** Role of Human Resource in Management - Human Resource Philosophy- Organization of HR Departments- Line and Staff functions- HR Planning – factors affecting HR Planning. Changing Environments of HRM- Strategic Human Resource Management- Using HRM to attain Competitive Advantage- Trends in HRM- Qualities and Role of HR Managers.

Unit - II

Job analysis and Design: Job evaluation- Computerized Job Evaluation. Recruitment and Selection Process: Employment Planning and Forecasting- Building

Employee Commitment: Promotion from within- Sources. Developing and Using Application Forms. IT and Recruiting on the Internet - Employee Testing and Selection process.

Unit - III

Orientation and Training: Orienting the employees, The Training Process, Need Analyses, Training Techniques, Special Purpose Training, Training via the Internet. Performance Appraisal- Traditional and Modern Techniques of Performance Appraisal- 360^{o} Feedback

Unit - IV

Establishing pay plans: Basics of Compensation- Factors determining Pay Rate- Current Trends in Compensation - Pricing Managerial and Professional Jobs- Pay for Performance and Financial Incentives - Benefits and Services-Promotion – Rewards and Punishment.

Unit - V

Auditing and HR functions**:** Future of HRM function – International HRM. Industrial Relation and Collective Bargaining - Discipline Administration- Grievances Handling - Managing Dismissals and Separation-Trade Union activities and Workers Participation in Management

SUGGESTED READINGS

Text Book

1. **Rao**, **V.S.P. (2010)**. *Human Resource Management* Text and Cases. New Delhi, Excel Books.

References

1. **Milkovich, Boudreau (1997).** *Human Resource Management.* New Delhi, Irwin Book Team.
2. **Beardwell Holden (2003).** *Human Resource Management*. Guargon, Macmillan India.

Semester – II			
L	**T**	**P**	**C**
-	**-**	**4**	**2**

16CMP211 PRACTICAL 2 - TALLY

COURSE OBJECTIVES:
To make the students
1. To understand the accounts heads, vouching, inventory valuations, available in the accounting software
2. To classify the items under items heads
3. To Generate the financial Reports evaluate the output.
4. To communicate the outputs in written form identifying the objective and outcome of each exercise.
5. To apply the utilization of computerized system as a lifelong learning.
6. To develop practical skills for maintain the book of accounts.

COURSE OUTCOMES:
Learners should be able to
1. Familiarize on the account's heads, vouching, inventory valuations available in the accounting software
2. Classify the items under items heads
3. Generate the financial Reports, evaluate the output.
4. Communicate the outputs in written form identifying the objective and outcome of each exercise.
5. To apply the utilization of computerized system as a lifelong learning.
6. Course covers Company Creation, Ledger, Voucher, Trading and Profit and Loss Account, Balance Sheet, Inventory Valuation and Ratio Analysis

Creating a Company
1. Create a Company with all relevant details including VAT options

Creating Ledger
2. Create the ledgers under appropriate predefined groups

Cash a/c	Computer sales a/c
Buildings a/c	Machinery a/c
Furniture a/c	Commission received a/c
Printer purchase a/c	Commission paid a/c
Rent received a/c	Salary a/c
Rent paid a/c	Indian bank a/c
Wages a/c	Sales returns a/c
Capital a/c	Depreciation a/c
Purchase returns a/c	John & Co. a/c (purchased goods from this company)

Ram agency a/c (sold goods to this company)

Create vouchers
3. **Create vouchers and view Profit and loss a/c and Balance sheet for the following**:
Hindustan Ltd. started the business on 01-04-2011

1 Apr. Contributed capital by cash Rs 2, 00,000
1 Apr. Cash deposited in Indian bank Rs 50,000
2 Apr. Credit purchases from Krishna traders Rs. 20000 invoice no 12
3 Apr. Credit purchases from PRAVIN traders Rs 20,000 invoice no 12
4 Apr. Credit purchase from KRISHNA traders Rs 20000 invoice no 14
5 Apr. Credit purchase from PRAVIN traders Rs 20,000 invoice no 44
6 Apr. Returned goods to KRISHNA traders Rs 5000 invoice no 12
7 Apr. Returned goods to PRAVIN traders Rs 5000 invoice no 44
8 Apr. Credit sales to RAVI & Co Rs 50,000 inv no 1
9 Apr. Credit sales to KUMAR & Co Rs 50,000 inv no 2
10 Apr. Cash sales Rs 20,000 inv no 3
11 Apr. Credit sales to RAVI & Co Rs 50,000 inv no 2
12 Apr. Credit sales to RAVI & Co Rs 50000 inv no 5
14 Apr. Goods returned by RAVI & Co Rs 5000 inv no 1
14 Apr. Goods returned by KUMAR & Co Rs 5000 inv no 1
15 Apr. Payment made by cheque to Krishna Traders Rs 30,000 ch no 505580
16 Apr. Payment made by cheque to Pravin Traders Rs 30,000 ch no 505592
17 Apr. Received cheque from: Ravi & Co and Kumar & Co 75,000 each.

Payments made by cash
3 Apr. Paid to petty cash by cash Rs.1000
4 Apr. Furniture purchased Rs.20000
5 Apr. Salaries paid Rs. 10000
6 Apr. Rent Rs.4000
7 Apr. Electricity charges Rs.3000
8 Apr. Telephone charges Rs.3500
9 Apr. Cash purchases Rs.5000

Payments made by petty cash
10 Apr. Conveyance Rs.150
11 Apr. Postage Rs.100
12 Apr. Stationeries Rs.200
14 Apr. Staff welfare Rs.100
14 Apr. Stationeries purchased from Sriram & Co 1500 on credit
15 Apr. Depreciation on furniture 10%

4. Emerald & Co., started a business of home appliances from 1-4-2011
01-04 received cash for capital 5, 00,000
07-04 credit purchases from LG Limited invoice no 123
Oven 100nos at Rs 800,Mixes 100nos at Rs 1000,DVD player 100nos at Rs 1500,
Fridge 100nos at Rs 2000
10-04 Credit Sales to AMN invoice no 1:
Oven 70nos at Rs 1000,Mixes 70nos at Rs 1500,DVD player 70nos at Rs 2000
Fridge 70nos at Rs 2500+TNGST 4% ON TOTAL SALES
10-04 Cash Sales invoice no 2:
Oven 10nos at Rs 1000,Mixes 10nos at Rs 1500,DVD player 10nos at Rs 2000,

Fridge 10nos at Rs 2500+TNGST 4% ON TOTAL SALES CASH discount 5%
15-4 Paid cheque to LG limitedRs 2,00,000
15-4 Received cheque from AMN&coRs 3,00,000

5.Payment made by cash
Paid to petty cash Rs 2000, Furniture Rs 15000, Salaries Rs 10000
Wages Rs 7000, Carriage inward Rs 1500.
25-04 Payment made by petty cash
Conveyance Rs 200, Postage Rs 150, Stationeries Rs 150, Staff Welfare Rs 200
30-04 Journal depreciate 10% on furniture:
Prepare Trading Profit and Loss Account and Balance sheet.
6. From the Balances of Ms. Kavitha, Prepare Trading A/C, Profit And Loss A/C and Balance Sheet for The Year Ending

Stock - 9,300 Repairs - 310 Machinery - 12,670 Furniture - 1430 Office expenses - 750 Trading expenses - 310 Land & Builiding - 15,400 Bank charges - 50 Capital - 24,500 Loan - 5,000 Closing stock - 7,580	Misc. income - 200 Purchases - 15,450 Purchase return - 440 Sales return - 120 Sundry creditors - 12,370 Advertisement - 500 Cash in hand - 160 Cash at bank - 5,870 Sales - 20,560 Sundry expenses - 150 Insurance - 500 Traveling expenses - 200

INVENTORY VALUATION
7. From the Information given below create unit of measurement, stock groups and stock items
Find the stock summary:
Stock groups: 1. Magazine 2. Baby drinks 3. Cool drinks 4.dailynews paper 5. Hot drinks 6.Stationeries 7. Vegetables
Stock items:

Item	Qty	Rate	Units
Boost	25	80	nos
Sports star	20	15	nos
Potato	260	30	kgs
Star dust	20	25	nos
The Hindu	50	3.25	nos
Tomato	150	15	kgs
Fanta	10	25	lit

Dinamalar	40	2.50	nos
Coco	55	120	nos
Horlicks	60	70	nos
India today	10	10	nos
Lactogin	10	100	nos

MAINTAIN BILLWISE DETAILS

8. Create bill wise details from the following

1. Ravi commenced business with a capital of Rs 2,00,000
2. Purchased goods from Kumar & Co Rs.15, 000 Paid in three installments within 5 days gap
3. Purchased goods for cash Rs.8000
4. Sold goods to Ratna & co Rs. 20,000 amount to be paid in two installment
5. Sold goods for cash for Rs .5000
6. Received cash from Ratna & co Rs. 75000
7. Paid to Kumar & co Rs. 7500
8. Sold goods for cash Rs.5000

CONSOLIDATION OF ACCOUNTS

9. Bharath Agencies, A Wholesaler Gives The Following Information:

Opening balances:
Capital: 20, 00,000 cash at bank: 10, 00,000
Cash in hand: 5, 00,000 furniture: 5, 00,000
Bharath agencies are dealing in stationeries. The selling prices are as follows;
Pen Rs 35 per dozen, pencil Rs. 30 per dozen,Ink pens Rs 140 per dozen

The following transactions take on a particular date:
1.purchased 100 dozens of pens from Ravana bros. @ Rs.25 per dozen for cash
2.purchased 200 dozens of pencils from Gughan bros.@ Rs.21.50 per dozen for credit less discount of Rs 100
3.sold 10 dozens of pens to Dharma bros. For cash
4.sold 10 dozens of pens to Bema bros for credit
5.sold 50 dozens of pencils to Arjuna bros.
6.purchased from Ravana bros 50 dozens of ink pens @ Rs.120 and by cheque.

Prepare following statements using Ex-accounting packages:
Stores ledger, Trading account, Income statement, Balance sheet, Account summary
Ignore dates

FOREIGN GAINS/LOSS

10. Calculate

01.01.2005 Purchased goods from U.K supplier 1000 £
02.01.2005 Sold goods to U.S buyer 1500
03.01.2005 Cash received from U.S buyer 1500
(Selling rate rs.46/$)

04.02.2005 Paid cash to U.K supplier 1000
(Selling rate Rs 53/ £)
Dollar $:
Std rate - 1$ - 43 Rs
Sales rate - 1$ - 44 Rs
Buying rate - 1$ - 42 Rs
Pound £:
Std rate - 1 £ - 51 Rs
Sales rate - 1 £ - 50 Rs
Buying rate - 1 £ - 52 Rs

11. MEMO VOUCHER
An advance amount paid Rs 1500 given to sales executive for traveling. The actual expenses for traveling expenses for the sales is Rs 500

12. CHEQUE PRINTING
Print a cheque:
Company name on cheque: Wipro India Ltd.: name of the bank Indusind bank.
Width 168, height 76, starting location 116, distance from top 23.

13. RATIO ANALYSIS
Enter the following details comment upon the short-term solvency position of the company:
Working capital Rs 20560492
Cash 14500
Bank 18500
Debtors 518260
Creditors 429337
Sales 515252
Purchases 433310
Stock 125982
Net profit …?

14. INTEREST CALCULATIONS
Cash deposited in Scotia bank Rs 1,00,000
Sold goods to Ganesh Rs 25,000
31-12- cash deposited at Scotia bank Rs 50,000
Sold goods to Ganesh 50,000
Interest parameters rate 14% per 365 days year

15. Calculate Interest
Cash deposited in SBI 1, 00,000 Rs
1-12 purchased goods from suppliers Rs 20,000
Deposited in SBI Rs.50, 000
Purchased goods from suppliers Rs 40,000
Interest parameters rate 16% per 365 days year

16. Display the interest calculations for the period 1-4-2011 to 31-12-2011
Opening balance
Ram & Co Rs 25,000
Krishna traders Rs 20,000
Interest parameters rate 12% per 365 days year
Interest parameters rate 12% and 16% for sundry creditors per 365 days year
Purchased goods from Krishna for 25,000(credit period 45 days)
Sold goods to Ram for Rs. 50,000(credit period 30 days)
Paid to Krishna the amount plus interest
Received from Ram plus interest

17. Create stock items, stock groups, sales categories, godowns, units of measure.

Stock	Category	Group	Godown	Unit of measure	Std cost	Sell Price	Op. Qty	Total Value
Inter Celeron	Processor	Celeron	Mumbai	Nos.	15000	20000	2	30000
Intel Premium III	Processor		Chennai	Nos	20000	25000	3	60000
Tally Silver	Accounting	Tally	Chennai	Nos	20000	22500	5	100000
Tally gold	Accounting	Tally	Chennai	Nos	42000	45000	5	210000
								400000

18. Using the above exercise create various vouchers including VAT calculation for the following

Date Transactions	Transcation
O9/4/2006	Intel Pentium III (3 Nos) @ 25,000 delivered to Vijay & CO, from Madras Go down.
10/4/2006	10 Nos of Intel Celeron @ 15000 per unit received from Jayaram and Co, and sent to Madras Go down.
12/4/2006	2Nos of Intel Premium III received from Vijay & CO, as it was not in a working position.
14/4/2006	2Nos of Intel Celeron returned to Jayaram & Co from Madras Go down.
14/4/2006	Physical Stock verification shows Shortage of 1 No Intel Pentium III.

19. Create the following Inventory vouchers with data from any cost accounting book.

a. Purchase order
b. sales order
c. Rejection out
d. Rejection in
e. Stock journal
f. Delivery note
g. Receipt note
h. Physical stock

20. In addition to the above mentioned lab exercises work out a problem from any advanced accountancy book with a minimum of 20 transactions and generate the tally reports in full.

				Semester – III			
				L	**T**	**P**	**C**
16CMP301	**MANAGEMENT ACCOUNTING**			4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of management accounting, costing behaviour, budgeting and enrich the lifelong learning.
2. To comprehend on the contemporary issues relevant to accounting concepts.
3. To analyse the alternatives using appropriate tools and techniques.
4. To solve the problems and take decisions based on the result.
5. To communicate orally and in written form the concepts and solutions.
6. To provide the students knowledge about budgetary control.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of management accounting, costing behaviour, budgeting and enrich the lifelong learning.
2. Comprehend on the contemporary issues relevant to accounting concepts.
3. Analyse the alternatives using appropriate tools and techniques.
4. Solve the problems and take decisions based on the result.
5. Communicate orally and in written form the concepts and solutions.
6. course incorporates Financial Statement Analysis, Ratio Analysis, Fund Flow and Cash Flow Analysis, Budgeting and Marginal Costing

Unit – I

Management Accounting – Meaning – Definition – Objectives and Scope – Relationship between Management Accounting and Financial Accounting – Management Accounting and Cost Accounting

Unit – II

Financial Statement Analysis – Types of Financial Statement Analysis - Ratio Analysis – Meaning – Uses – Limitations – Classification of Ratios – Computation of Ratios from Financial Statements

Unit – III

Fund Flow Analysis – Cash Flow Analysis – Working Capital Statements – Funds from Operations

Unit – IV

Budgetary Control – Flexible Budget – Sales Budget – Cash Budget – Production Budget – Purchase Budget

Unit – V

Marginal Costing – Break Even Analysis – Applications of Marginal Costing Techniques – Determination of Sales Mix – Key factor – Make or Buy Decision (Simple Problems Only)

Note: Theory -20% Problems - 80%

SUGGESTED READINGS

Text Book

1. **Maheswari, S.N. (2007)**. *Management Accounting.* New Delhi, Kalyani Publishers.

References

2. **Sharma Shashi K. Gupta (2003).** *Management Accounting.* New Delhi, Kalyani Publishers.
3. **Khan, P.K. and Jain (2009).** *Management Accounting.* New Delhi, Tata Mc Graw Hill Publishing Company Limited.

16CMP302	**BUSINESS RESEARCH METHODS AND TECHNIQUES**	**Semester – III** **L T P C** **4 - - 4**

COURSE OBJECTIVES:

To make the students

1. To understand the basic framework of research and research process and its important in business decision.
2. To develop an understanding of various research designs and sampling techniques and its application.
3. Toidentifyappropriatesourcesofinformationandmethodsofdatacollectionforsolving abusiness issue.
4. To understand the selection of appropriate tools to analyse the quantitative and qualitative data.
5. To understand the ethical norms for research and select the best type of research report and be familiar with the content to be included in the report.
6. To gain the sampling techniques along with hypothesis testing.

COURSE OUTCOMES :

Learners should be able to

1. Assessthebestsuitableresearchtypeandformulatetheresearchobjectiveforthebusines sproblem.
2. Formulatethesuitableresearchdesignsandselectappropriatesamplingtechniquesforth eresearch.
3. Select the appropriate data collection method for solving the business issue and decide the appropriate measurement scale for designing the instrument for data collection.
4. Apply appropriate analytical tools for the data collected and formulate a suitable suggestion for the business problem.
5. Demonstrate capabilities of team work, problem-solving, critical thinking, and communication skills and design a suitable research report based on the ethical norms of research.
6. The course comprise of Types of Research, Research Design, Sampling, Data Collection, Scaling Techniques, Hypothesis Testing and Statistics

Unit-I

Introduction to Research: Meaning – Purpose – Types of Research – Significance – Qualities of a good research – Steps in Research - Identification, Selection and Formulation of Research Problem. Research Design: Components of Research Design – Methods of Research Design.

Unit-II

Sampling Design: Census and Sample Survey – Characteristics of a Good Sample Plan – Steps in Sampling – Types of Sampling – Advantages and Limitations of Sampling. Data Collection: Primary Data - Meaning – Significance – Methods of Collecting Data: Observation – Interview Schedule – Questionnaire. Secondary Data – Meaning - Sources of Secondary Data – Precautions while using Secondary Data.

Unit-III

Scaling Techniques: Meaning of Scale–Measurement of Scale – Important Scaling Techniques - Processing of Data - Editing – Purpose – Analysis and Interpretation of Data: Meaning – Need for Interpretation – Techniques of Interpretation.- Report Writing: Types of Research Reports – Layout of the Report – Steps in Writing the Report – Contents of Research Reports

Unit-IV

Hypothesis: Characteristics of a good Hypothesis – Formulation of Hypothesis – Procedure for Testing of Hypothesis – T test, F test and Chi Square Test, Analysis of Variance - Business Forecasting – Exponential Smoothing

Unit-V

Descriptive Statistics - Measures of Central Tendency: - Mean, Median and Mode - Standard deviation – Karl Pearson Correlation – Spearman Rank Correlation - Regression Models – Inferential Statistics – Multivariate Analysis - Factor Analysis – Kruskal Wallis Test

Note:

The question paper shall cover 80% theory and 20% problems

SUGGESTED READINGS

Text Book

1. **Kothari**, **C.R. (2014)**. *Research Methodology – Methods and Techniques.* New Delhi, New Age International (P) Limited, Publishers.

References

1. **Anil Kumar Gupta (2011)**. *Research Methodology: Methods and Techniques.* New Delhi, Vayu Education of India.
2. **Krishnaswami, O.R. and Ranganatham, M. (2014).** *Methodology of Research in Social Sciences.* Mumbai, Himalaya Publishing House Private Limited.
3. **Gupta. S.P. (2014).** *Practical Statistics.* New Delhi, S. Chand and Company.
4. **Vinayagamoorthy,A. (2013).** *Business Research Methods.* Pune, Vaishali Publications.
5. **Saravanavel (2008).** *Research Methodology.* Mumbai, Kitab Mahal.
6. **Rao (2013)**. *Research Methodology in Commerce and Management.* New Delhi, Streling Publishers Private Limited.

16CMP303	INDIRECT TAXATION	Semester – III L T P C 4 - - 4

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of indirect taxes emphasizing VAT and customs law.
2. To learn and compute the VAT liabilities.
3. To know how to register VAT and apply the VAT provisions.
4. To communicate orally and in written form the indirect taxations concepts and provisions.
5. To be familiar with the standards and laws pertaining to the VAT and customs and utilize for lifelong practical application.
6. To understand the statutory compliance under indirect taxes.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend on the Concept of indirect taxes emphasizing VAT and customs law.
2. Comprehend and compute VAT liabilities.
3. Know the procedure to register VAT and apply VAT provisions to business situations.
4. Communicate orally and in written form the indirect taxations concepts and provisions.
5. Familiar with the standards and laws pertaining VAT and customs and utilize for lifelong practical application.
6. The course covers Indirect Tax, Central Excise, Customs Laws, Service Tax and Central Sales Tax and VAT

Unit-I

Indirect Taxes- Features of Indirect Tax- Indirect Tax Laws-Administration and Relevant Procedures - Advantages and Disadvantages of Indirect Taxes

Unit-II

Central Excise - The Central Excise Law – Goods- Excisable goods, Manufacture and Manufacturer- Classification- Valuation-Related Person-Captive Consumption- Powers of Officers-Tariff Commission and other Tariff Authorities.

Unit-III

Customs Laws -Basic Concepts of Customs Law - Types of Custom Duties.- Anti- Dumping Duty, Safeguard Duty- Valuation -Customs Procedures- Import and

Export Procedures-Baggage- Exemptions – Warehousing- Demurrage - Project Imports and Re- Imports- Penalties and Offences- Export Promotion Schemes- Duty Drawback.

Unit-IV

Service Tax - Introduction, Nature of Service Tax-Service Provider and Service Receiver- Registration procedure- Records to be Maintained - Classification of Taxable Services - Valuation of Taxable Services- Exemptions and Abatements - Payment of Service Tax- Return - Export and Import of Services- Other aspects of Service Tax- Taxable Services.

Unit-V

Central Sales Tax Act & VAT Act- Introduction, Definition of Sale under CST – VAT- Salient Features of State VAT Acts- Treatment of Stock & Branch Transfer under State VAT Acts - Filing & Return under State VAT Act.

SUGGESTED READINGS

Text Book

1. **Datey, V.S. (2015).** *Indirect Taxes.* Mumbai, Taxmann Publications Private Limited.

References

1. **Balachandran, V. (2006).** *Indirect Taxation.* New Delhi, Sultan Chand and Sons.
2. **Mittal, J.K. (2015).** *Law Practice and Procedures of Service Tax.* New Delhi, Jain Book Agency.
3. **RadhaKrishnan, R. (2009).** *Indirect Taxation.* New Delhi, Kalyani Publishers.
4. **Sethurajan (2005).** *Indirect Taxation including Wealth Tax.* Speed Publications

Semester – III

L	T	P	C
4	-	-	4

16CMP304 BUSINESS ENVIRONMENT

COURSE OBJECTIVES:

To make the students

1. To understand the basic concepts of environmental forces for business decisions
2. To learn the political and government influence on business activities
3. To analyses the social factors affecting the business structure
4. To critically evaluate the economic and global factors influencing the business environment.
5. To expose the students to the environmental aspects of business
6. To expose the students to the Social Environment: Social Responsibilities of Business

COURSEOUTCOMES:

Learners should be able to

1. Understand the basic concepts of environmental forces for business decisions
2. Learn the political and government influence on business activities
3. Analyze the social factors affecting the business structure
4. Critically evaluate the economic and global factors influencing the business
5. The course incorporates Economic, Political, Technological and Social Environments
6. Know the concept of Social Responsibilities of Business

Unit-I

Introduction to Business Environment – Objectives – Types of Environment – Nature and Scope – Relationship between Economic and Non-Economic Environment – Elements of Business Environment

Unit-II

Economic Environment: Industrial Policy 1991 – Liberalization – Privatization and Globalization – Pros and Cons of Globalization – Forms of Privatization

Unit-III

Political Environment: Government and Business Relationship – Different Roles of Government in Indian Economy – Objectives of State Intervention – Indian Constitution – The Preamble Fundamental Rights.

Unit-IV

Technological Environment: Features – Impact of Technology on Society and Economy – Restraints on Technological Growth – Technology Policy.

Unit-V

Social Environment: Social Responsibilities of Business – Business and Society - Women and Business Opportunities – Child Labour – Corporate Governance. – Green Marketing – Global Warming

SUGGESTED READINGS

Text Books

1. **Francis Cherunilum (2014).** *Business Environment: Text and Cases.* Mumbai, Himalaya Publishing House.
2. **Ashwathappa, K. (2011)**. *Essentials of Business Environment.* Mumbai, Himalaya Publishing House.

References

1. **Ashish Bhalla (2011)**. *Business Environment.* New Delhi, Vayu Education of India. **Gopal Namita (2010)**. *Business Environment.* New Delhi, Tata Mc Graw Hill Education Private Limited.

	Semester – III			
	L	T	P	C
16CMP305A INTERNATIONAL FINANCIAL MANAGEMENT	4	-	-	4

Course Objectives
To make the students

1. To make the students understand principles of financial management
2. To enable the students to take investment decisions.
3. To help the students to make financial decisions.
4. To provide the students with the basic knowledge of Dividend decisions.
5. To impart knowledge of working capital and cash management.
6.To provide knowledge on Foreign exchange and its significance in a developing economy

Course Outcomes
Learners should be able to

1. Students will be familiarized with basic concepts of financial management.
2. Students will know the technicalities of making investment decisions.
3. Students will be capable of making financing decisions.
4. Students will be familiarized with concepts of dividend decisions.
5. Students will be capable of making working capitalization and cash management.
6. course includes Balance of Payment, International Monetary System, Foreign Exchange Market, Foreign Exchange Risk and International Financial Market Instruments

Unit - I

IFM- Nature and Scope, IFM and Domestic Financial Management- Balance of payments - Significance- Preparation of BOP Statement - Link between BOP and the Economy.

Unit - II

International Monetary System - Gold Standard - IMF and World Bank Exchange Rate Mechanism - Factors influencing Exchange Rate - Purchasing Power Parity and Interest Rate Parity Theorems.

Unit - III

Foreign Exchange Market Transactions Spot, Forward, Futures, Options and Swaps - Arbitrage and Speculation in Foreign Exchange Market.- Exchange Arithmetic, Spread, Premium and Discount. – Currency Derivatives and Swaps

Unit - IV

Foreign Exchange Exposure - Managing Transaction, Translation and Operating Exposure - Techniques for covering the Foreign Exchange Risk - Internal and External Techniques of Risk.

Unit -V

International Financial Market Instruments - International Equities - ADR and GDR - Foreign Bond and Euro-bond - Short-term and Medium-term instruments.

SUGGESTED READINGS

Text Book

1. **Sharan, V. (2012).** *International Financial Management.* New Delhi, Prentice Hall of India

References

1. **Bhalla V,K**. **(2007)**. *International Financial Management.* New Delhi, Anmal Publications Private Limited.

2. **Apte (2011)**. *International Financial Management.* New Delhi, Tata Mc Graw Hill Public Company Limited.

16CMP305B	CONSUMER BEHAVIOUR	Semester – III L T P C 4 - - 4

COURSE OBJECTIVES:

To make the students

1. To understand the consumer behavior concepts, dimensions used in consumer behaviour research.
2. To recognize the Internal Influencing factors that affect the Consumer Behaviour
3. To identify the external Influencing factors that affect the Consumer Behaviour
4. To conceptualize on the consumer decision making process.
5. To know the application consumer behaviour concepts to access the changing behavior of the customers.
6. To appreciate the personal and environmental factors that influence consumer decisions. To understand the strategic implications of consumer influences, and marketing decisions

COURSEOUTCOMES:

Learners should be able to

1. Understand the importance of Culture, Subculture, Social Class, Reference Groups
2. Understand the importance of Family Influences in Consumer Behaviour.
3. Explore, analyze and compare the core theories of consumer behaviour and its application in both consumer and organizational markets
4. Appraise models of Consumer Behaviour and determine their relevance to particular marketing situations
5. Critique the theoretical perspectives associated with consumer decision making, including recognizing cognitive biases and heuristics
6. Demonstrate capabilities of teamwork, critical thinking, and communication skills related to investment decisions.

Unit – I

Definition, Scope, and Application of Consumer Behavior-Evolution of Consumer Behavior as a field of study and its relationship with Marketing; Behavioral Dimension-Interdisciplinary Nature of Consumer Behavior studies

Unit – II

Consumer Decision Making Process - Buying Motives - Buying Roles, Consumer Decision Making Process, Levels of Consumer Decision Making, Perspectives-Models

Unit – III

Psychological Influence on Consumer Decision Making – Consumers Needs & Motivation, Emotions and Mood, Consumer Involvement; Consumer Learning, Personality, Self-concept and Self-image; Consumer Perception, Risk and Imagery; Consumer Attitude: Belief, Attitude and Intention, Formation-Change-Consumer Communication.

Unit – IV

Sociological Influences – Consumer Groups - Consumer Reference Groups, Family and Life cycle, Social Class and Mobility, Lifestyle Analysis - Culture; Sub-Culture, Cross Culture - Interpersonal Communication and influence, Opinion Leadership.

Unit – V

Diffusion of Motivation - Consumer Orientation - Diffusion Process, Adoption Process, Consumer Innovators, Multiplicative Innovation Adoption (MIA) Model.

SUGGESTED READINGS

Text Books

1. **Schiffman, Leon.G, Kanuk Leslie Lazar, and Kumar Ramesh.** S.,**(2010).** *Consumer Behavior.* New Delhi, Pearson Education.
2. **Gupta, S.L., and Pal Sumitra (2013).** *Consumer Behaviour: An Indian Perspective Text and Cases.* New Delhi, Sultan Chand and Sons.

References

1. **Peter Paul J., and Olson Jerry C., (2010).** *Consumer Behavior and Marketing Strategy.* New Delhi, McGraw Hill Higher Education.
2. **Solomon, M.R. (2014).** *Consumer Behavior: Buying, Having, and Being.* New Delhi, Prentice Hall of India.
3. **Loudon, David, Bitta Albert Della (2001).** *Consumer Behavior: Concepts and Applications.* New Delhi, Tata McGraw Hill Education Private Limited.

Semester – III

		L	T	P	C
16CMP305C	**LABOUR LEGISATION**	4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of risk, and insurance a product to mitigate risk, its design and pricing
2. To comprehend on the reforms in Indian insurance industry.
3. To understand the categorization and application of the life and non-life insurance as a risk mitigation instrument,
4. To communicate orally and in written form the understanding of insurance, insurance types, designing and pricing.
5. To offer knowledge on managing industrial relations and the processes, regulations and the authorities regarding industrial relations.
6. To enable students acquire knowledge on fundamental objects and principles of individual laws; understand the significant provisions of the various Acts applicable to Labour Legislation.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of risk, and insurance a product to mitigate risk, its design and pricing
2. Comprehend on the reforms in Indian insurance industry.
3. Understandthecategorizationandapplicationofthelifeandnon-lifeinsuranceasariskmitigation instrument,
4. Communicate orally and in written form the understanding of insurance, insurance types, designing and pricing.
5. The course encompass Labour Problems, Trade unionism, Industrial Disputes, Management and Personnel Administration and Grievances
6. Course includes Factories Act, Workmen Compensation Act, Wages Act, Gratuity Act, Bonus Act and Industrial Dispute Act

Unit – I

Factories Act 1948 – Definition – Registration of Factories – Health – Safety and Welfare Measures – Provisions relating to Hazardous Process – Working Hours – Holidays – Employment of Young Persons – Women – Annual Leave with Wages – Provision relating to Penalties and its Procedure and Appeal

Unit – II

Workmen Compensation Act 1923 – Definition – Employer's Liability for Compensation – Arising out of and in the course of employment – Amount of Compensation – Notice and Claims – Obligations and Rights of Employers.

Unit – III

Payment of Wages Act 1936 – Application of the Act – Definitions – Rules for Payment of Wages – Deductions from Wages – Enforcement of the Act. Minimum Wages Act 1948 – Object of the Act – Definitions – Fixation and Revision of Wages – Procedure – Advisory Board and Central Advisory Board – Safeguards in Payment of Minimum Wages – Enforcement of the Act – Offences and Penalties

Payment of Gratuity Act 1972 – Definitions – Payment of Gratuity – Forfeiture of Gratuity – Nomination – Determination and Recovery of the amount of Gratuity – Obligations and Rights of Employers and Employees

Unit – IV

Payment of Bonus Act 1965 – Definition – Eligibility – Disqualification – Determination of Bonus – Computation of Gross Profit – Determination of Available Surplus – Allocable Surplus – Amount of Bonus – Payment of Bonus linked with Production or Productivity

Unit - V

Industrial Dispute Act, 1947 – Definition – Types of Disputes – Grievance Settlement Authorities – Procedure for Settlement of Industrial Disputes – Works Committee – Conciliation Officer – Court of Enquiry – Labour Court – Industrial Tribunal – National Tribunal – Award and Settlement – Strikes and Lockouts – Prohibition of Strikes and Lockouts – Illegal Strikes and Lockouts – Layoff and Retrenchment – Closure

SUGGESTED READINGS

Text Book

1. **Kapoor, N.D.** *Hand Book on Industrial Law.* New Delhi, Sultan Chand and Sons.

Reference Books

2. **Verma, M.M. and Agarwal, R.K.** *Mercantile Law and Industrial Law.* New Delhi, Forward Book Depot Educational Publishers.
3. **Das, S.K. and Gupta.** *Commercial Law and Industrial Law.* New Delhi, Sterling Publishers Private Limited.
4. **Davar, R**. *Mercantile Law including Industrial Law.* Progressive Corporation

		Semester – III
		L T P C
16CMP306	**FINANCIAL SERVICES**	**4 - - 4**

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept financial services its impact on economy
2. To categorise financial services as fund based and fees based services
3. To understand the application of the fee and fund based services in economic development.
4. To communicate orally and in written form the understanding of financial services concepts and application.
5. To expose the students to the contemporary theory and practice of Indian Financial Services Sector
6. To familiarize the students with various types of Financial Services and their role in Social Change.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept financial services its impact on economy
2. Categorise financial services as fund based and fees based services
3. Understand the application of the fee and fund based services in economic development.
4. Communicate orally and in written form the understanding of financial services concepts and application.
5. comprise of Financial Instruments, Merchant Banking, Hire Purchase, Leasing, Venture Capital, Factoring, Mutual Funds and Credit Rating
6. Know the various types of Financial Services and their role in Social Change.

Unit – I

Financial Services – Meaning – Classification – Scope – Fund Based Activities – Non Fund Based Activities – Modern Activities – Sources of Revenue – Causes for Financial Innovation – New Financial Products and Services – Innovative Financial Instruments – Challenges facing the Financial Service Sector. Merchant Banking – Definition – Origin – Merchant Banking in India- Merchant Banks and Commercial Banks – Services of Merchant Banks- Qualities required of Merchant Bankers – Problems – Scope of Merchant Banking in India

Unit – II

Hire Purchase – Meaning – Features – Legal Position – Hire Purchase and Credit Sale – Hire Purchase and Instalment Scale – Hire Purchase and Leasing – Origin and Development – Banks and Hire Purchase Business – Bank Credit for Hire Purchase. Leasing – Definition – Steps in Leasing Transactions – Types of Lease – Advantages and Disadvantage of Lease – Problems of Leasing

Unit – III

Venture Capital – Concept – Meaning – Features – Scope of Venture Capital – Importance – Method of Venture Financing – Suggestion for the Growth of Venture Capital – Factoring – Meaning – Functions – Types – Factoring Vs Discounting – Benefits of Factoring

Unit – IV

Mutual Funds – Types – Importance – Selection of a Fund – Securitization – Stages of Securitization – Benefits – Derivatives – Kinds – Forward, Future, Options and Swaps.

Unit – V

Credit Rating – Definition and Meaning – Functions of Credit Rating – Origin – Credit Rating in India – Benefits of Credit Rating – Credit Rating Agencies in India: CRISIL, ICRA, CARE- Limitations of Rating – Future of Credit Rating in India

SUGGESTED READINGS

Text Book

1. **Gordon, E and Natarajan, K. (2014).** *Financial Markets and Services.* Mumbai, Himalaya Publishing House.

References

1. **Khan M.Y.** (2013). *Financial Services.* New Delhi, Tata McGraw Hill Company Limited.
2. **Dharmaraj (2010).** *Financial Services.* New Delhi, S. Chand and Sons Limited.
3. **Tripathy Nalini Prava (2007).** *Financial Services.* New Delhi, Prentice Hall of India.

		Semester – III
16CMP311	**PRACTICAL 3 -SPSS**	**L T P C**
		- - 4 2

COURSE OBJECTIVES:

To make the students

1. To understand the Importance of SPSS and the features for entering the data according to the variable type.
2. To understand and apply the descriptive analytical tools
3. To know the univariate tools and its application
4. To comprehend the application of Bivariate analysis
5. To understand and compute the multivariate analysis using the package
6. To understand the correlation analysis

COURSEOUTCOMES:

Learners should be able to

1. Create datasheet and enter the data
2. Compute descriptive statistics using the package and graphically represent the data.
3. Perform univariate and bivariate analysis in the software package.
4. Perform multivariate analysis in the software package.
5. Demonstrate capabilities of problem-solving, critical thinking, and communication skills to infer the output.
6. Demonstrate capabilities of problem-solving, critical thinking, and communication skills to infer the output.

Workout the following statistics:

1. Descriptive Statistics
2. Chi-square
3. Independent Sample ‘t’ Test
4. Paired ‘t’ Test
5. Analysis of Variance (ANOVA)
6. Karl Pearson Correlation
7. Spearman Rank Correlation
8. Regression
9. Factor Analysis
10. Kolmogorov and Smirnov test
11. Mann Whitney U Test
12. Wilcoxon Test
13. Friedman Rank Test
14. Kruskal Wallis H-Test

15. Garett Ranking

16CMP401	CORPORATE ADMINISTRATION AND SECRETARIAL PRACTICE	Semester – IV			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of auditing, corporate governance
2. To learn the audit techniques, corporate governance
3. To apply the best auditing process as lifelong practice,
4. To communicate orally and in written form the auditing concept and techniques, Corporate governance
5. To be familiar with the standards and laws pertaining to the auditing, Corporate Governance
6. To know the information related to global reporting initiatives.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend on the Concept of auditing, corporate governance
2. Recall audit techniques, corporate governance practices.
3. Apply lifelong the key learning of best auditing process, Corporate governance practices
4. Communicate orally and in written form the auditing concept and techniques, Corporate governance concepts and practices in business.
5. Familiar with the standards and laws pertaining to the auditing, Corporate Governance.
6. Reminiscence with statistics on global reporting.

Unit – I

Company Administration – Hierarchy – Share Holders – Membership – Termination – Rights and Duties – Board of Directors – Qualification – Appointment – Powers – Duties – Other Managerial Personnel

Unit – II

Company Secretary – Meaning – Types – Qualities – Appointment – Dismissal – Power – Rights – Duties and Liabilities – Role of a Secretary in the Administration of a Company

Unit – III

Meeting – Law Governing Meetings – Requisites of a Valid Meeting – Chairman of a Meeting – Appointment – Duties – Powers – Notice – Agenda – Minutes – Quorum – Motion – Resolution – Methods of Voting

Unit – IV

Kinds of Company Meetings – Board of Directors Meeting – Share holder Meeting – Statutory Meeting – Annual General Meeting – Extraordinary General Meeting – Duties of a Company Secretary relating to the Meetings

Unit – V

Drafting of Correspondence relating to the Meetings – Drafting of Notices – Agenda and Minutes of the Meetings of Shareholders and Directors – Drafting of Chairman's Speech – Annual Report and Auditors Report

SUGGESTED READINGS

Text Book

1. **Kuchhal, M.C. (2008)**. *Secretarial Practice.* New Delhi, Vikas Publishing House Private Limited.

References

1. **Kapoor, N.D. (2015)**. *Elements of Company Law.* New Delhi, Sultan Chand and Sons.
2. **Ashok K. Bagrial (2007)**. *Company Law.* New Delhi, Vikas Publishing House Private Limited.

16CMP402	ENTREPRENEURSHIP AND SMALL BUSINESS MANAGEMENT	Semester – IV			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
2. To communicate orally and in written form the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
3. To apply the understanding of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government in lifelong practice.
4. To initiate the required skills for entrepreneurial development.
5. To help students understand the process of establishing and developing an enterprise
6. To make the students Small Business as seed bed of Entrepreneurship

COURSE OUTCOMES:

Learners should be able to

1. Assessthebestsuitableresearchtypeandformulatetheresearchobjectiveforthebusinessproblem.
2. Formulatethesuitableresearchdesignsandselectappropriatesamplingtechniquesfortheresearch.
3. Select the appropriate data collection method for solving the business issue and decide the appropriate measurement scale for designing the instrument for data collection.
4. Apply appropriate analytical tools for the data collected and formulate a suitable suggestion for the business problem.
5. Demonstrate capabilities of team work, problem-solving, critical thinking, and communication skills and design a suitable research report based on the ethical norms of research.
6. The course comprise of Types of Research, Research Design, Sampling, Data Collection, Scaling Techniques, Hypothesis Testing and Statistics

Unit – I

Small Business Enterprise - Small Business framework - Concept and Definition- Nature and Characteristics - Relationship between Small and Large Business - Scope and Types of Small Business - Rationale and Objectives - Small Business as seed bed of Entrepreneurship

Unit –II

Entrepreneurship - Entrepreneur and Entrepreneurship Concept - Distinction between Entrepreneur and Manager - Entrepreneurial Competency - Functions - Types (including women and rural).

Unit – III

Establishing a Small Enterprise - Learning the important steps for starting a Business - Project Identification and Selecting the Product - Generation and Screening the Project Ideas - Market Analysis - Technical Analysis, Financial Analysis (up to cost of production) Project Formulation - Assessment of Project Feasibility - Preparation of Project Report - Dealing with basic startup problems.

Unit –IV

Growth Strategy - Growth strategy for Small Business - Need for Growth - Types of Growth Strategy - Expansion - Diversification-Sub contracting.

Unit-V

Institutional Support - Sources of Finance - Financial Support to Small Business- Various Incentives and Subsidies - Central and State Government Schemes

SUGGESTED READINGS

Text Books

1. **Khanka, S. S**, **(2012)**. *Entrepreneurial Development.* New Delhi, Sultan Chand and Publications.
2. **Shaprio Alan, C. (2009).** *Multinational Financial Management.* New Delhi, Prentice Hall of India.

References

1. **Gupta, C.B., and Srinivasan, N.P. (2014)**. *Entrepreneurial Development.* New Delhi, Sultan Chand and Sons.
2. **Suresh Jayasree (2010).** *Entrepreneurial Development.* Chennai, Margham Publications.

		Semester – IV			
		L	**T**	**P**	**C**
16CMP491	**PROJECT AND VIVA-VOCE**	-	-	23	8

COURSE OBJECTIVES:

To make the students

1. To identify an issue to be analyzed and to be solved in a business setup or real time scenario using primary or secondary data collection.
2. To understand the application of Research processin the area of accounting/Finance/Marketing/HR/International business etc.
3. To analyze the data and critically evaluate the result and formulate the suggestion for the problem identified.
4. To apply the theoretical and practical learning of doing research into lifelong practice.
5. To Communicate in oral and written form and prepare report
6. To Work in team and exhibit leadership skills

COURSE OUTCOMES:

Learners should be able to

1. Identify an issue to be analyzed and to be solved in a business setup or real time scenario using primary or secondary data collection.
2. Understand the application of Research processin the area of accounting/Finance/Marketing/HR/International business etc.
3. Analyze the data and critically evaluate the result and formulate the suggestion for the problem identified.
4. Apply the theoretical and practical learning of doing research into lifelong practice.
5. Communicate in oral and written form and prepare report
6. Work in team and exhibit leadership skills

The students should select a problem in Accounting, Finance, Marketing or any other arears related to commerce.

Report should contain

- Introduction
    - Introduction about the industry
    - Introduction about the Company
    - Review of literature – Minimum 10 papers from referred journal
    - Need for the Study
    - Objectives
- Research Methodology

- Research Design
- Sampling Design
- Sources of Data Collection
- Tools used for analysis
- Limitation

* Data analysis and interpretation
* Findings and Suggestions
* Conclusion
* Bibliography (APA format)

KARPAGAM ACADEMY OF HIGHER EDUCATION,

(Deemed to be University)

(Established Under Section 3 of UGC Act 1956)

MASTER OF COMMERCE (Computer Applications)

M.Com. (CA)

(For the Students admitted during the year 2016 – 2018 Batch onwards)

Scheme of Examination

Course Code	Name of the Course	Objectives and Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEOs	Pos	L	T	P		CIA	ESE	Total
								40	60	100
				Semester 1						
16CCP101	Corporate Finance	I,II	a,e	4	-	-	4	40	60	100
16CCP102	Managerial Economics	IV	b,g,h	4	-	-	4	40	60	100
16CCP103	Operations Research	IV	b,g,h	4	-	-	4	40	60	100
16CCP104	Object Oriented Programming with C++	I, II, III	a,e c,d,f,i,j	4	-	-	4	40	60	100
16CCP105A	Financial Markets and Institutions	IV	b,g,h	4	-	-	4	40	60	100
16CCP105B	Marketing Management	IV	b,g,h	4	-	-	4	40	60	100
16CCP105C	Human Resource Development	I,II	a,e	4	-	-	4	40	60	100
16CCP111	C++ (Practical)	I, II, III	a,e c,d,f,i,j	-	-	4	2	40	60	100
16CCP112	Computer Application in Business (Practical)	I, II, III	a,e c,d,f,i,j	-	-	4	2	40	60	100
	Journal Paper Analysis & Presentation	III	c,d,f,i,j	2	-	-	-	-	-	-
				22	**-**	**8**	**24**	**280**	**420**	**700**
				Semester II						
16CCP201	Applied Cost Accounting	IV	b,g,h	4	-	-	4	40	60	100
16CCP202	Retail Management	IV	b,g,h	4	-	-	4	40	60	100
16CCP203	Direct Taxation	III	c,d,f,i,j	4	-	-	4	40	60	100

16CCP204	Visual Basic. Net	I, II, III	a,e c,d,f,i,j	4	-	-	4	40	60	100
16CCP205A	Advertisement and Sales Promotion	IV	b,g,h	4	-	-	4	40	60	100
16CCP205B	Security Analysis & Portfolio Management	III	c,d,f,i,j	4	-	-	4	40	60	100
16CCP205C	Strategic Human Resource Management	I,II	a,e	4	-	-	4	40	60	100
16CCP211	VB.Net (Practical)	I, II, III	a,e c,d,f,i,j	-	-	4	2	40	60	100
16CCP212	Tally (Practical)	I, II, III	a,e c,d,f,i,j	-	-	4	2	40	60	100
	Journal Paper Analysis & Presentation	III	c,d,f,i,j	2	-	-	-			
				22	**0**	**8**	**24**	**280**	**420**	**700**
Semester III										
16CCP301	Management Accounting	IV	b,g,h	4	-	-	4	40	60	100
16CCP302	Business Research Methods and Techniques	III	c,d,f,i,j	4	-	-	4	40	60	100
16CCP303	Indirect Taxation	III	c,d,f,i,j	4	-	-	4	40	60	100
16CCP304	Java	I, II, III	a,e c,d,f,i,j	4	-	-	4	40	60	100
16CCP305A	International Financial Management	IV	b,g,h	4	-	-	4	40	60	100
16CCP305B	Consumer Behavior	IV	b,g,h	4	-	-	4	40	60	100
16CCP305C	Labour Legislation	I, II, III	a,e c,d,f,i,j	4	-	-	4	40	60	100
16CCP311	JAVA (Practical)	I, II, III	a,e c,d,f,i,j	-	-	4	2	40	60	100
16CCP312	SPSS (Practical)	I, II, III	a,e c,d,f,i,j	-	-	4	2	40	60	100
	Journal Paper Analysis and Presentation	III	c,d,f,i,j	2			-	-	-	-
				22	**0**	**8**	**24**	**280**	**420**	**700**
Semester IV										
16CCP401	Corporate Administration and Secretarial Practice	IV	b,g,h	4	0	0	4	40	60	100
16CCP402	Entrepreneurship and Small Business Management	IV	b,g,h	3	0	0	3	40	60	100
16CCP491	Project and Viva Voce	III	c,d,f,i,j	0	0	23	8	80	120	200
				7	**0**	**23**	**15**	**160**	**240**	**400**
							87	**1000**	**1500**	**2500**

PROGRAMME OUTCOMES (PO)

a) Postgraduates will develop an understanding of various commerce functions such as finance,
accounting, financial analysis, project evaluation, cost accounting and gain expertise in
computer application.

b) Postgraduates will have exposure to solve complex commerce problems and analyze problems critically through research based or project based approach of learning with the support of computer applications.

c) Postgraduates will excerpt information from various sources and apply mathematical, analytical, statistical and IT tools for financial and accounting analysis.

d) Postgraduates will develop an ability to effectively communicate both orally and in written
forms.

e) Postgraduates will appreciate the importance of working independently and in a team in order to achieve common goals.

f) Postgraduates will acquire critical and analytical thinking and will be able to apply the same in effective decision making.

g) Postgraduates will evaluate the implications of uncertainty in global perspective and cross
cultural issues that affect the functioning of the system or business.

h) Postgraduates will acquire professional and intellectual integrity, professional code of conduct, ethics and values to contribute for sustainable development of society by becoming socially responsible citizen.

PROGRAMME SPECIFIC OUTCOMES (PSO)

i) Postgraduates will acquire ability to employ management knowledge and skills in their career
advancement and personal enrichment

j) Postgraduates will acquire ability to utilize the programming skills or the latest computer application for developing a new software or usage of the existing tool in the decision-making process.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

I. Postgraduates will gain advanced knowledge in the domain of commerce, management and finance

II. Postgraduates will understand the system functioning and develop the capability of modeling, designing, implementing and verifying a computing system to meet specified requirements while considering real-world constraints.

III. Postgraduates will attain research insights, professional skills and competencies to enhance lifelong learning and excel in diverse career path

IV. Postgraduates will adapt to a rapidly changing global environment and become socially
responsible and value driven citizens committed to sustainable growth.

Program Educational Objectives	Program Outcomes									
	a	b	c	d	e	f	g	h	i	J
Postgraduates will gain advanced knowledge in the domain of commerce, management and finance	✓				✓					
Postgraduates will understand the system functioning and develop the capability of modeling, designing, implementing and verifying a computing system to meet specified requirements while considering real-world constraints.	✓				✓					
Postgraduates will attain research insights, professional skills and competencies to enhance lifelong learning and excel in diverse career path			✓	✓		✓			✓	✓

Postgraduates will adapt to a rapidly changing global environment and become socially responsible and value driven citizens committed to sustainable growth.		✓					✓	✓		

		Semester – I			
		L	T	P	C
16CCP101	**CORPORATE FINANCE**	4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To Explain the core concepts of corporate finance and its importance in managing a business
2. To understand the nature, importance, structure of corporate finance related areas.
3. To impart knowledge regarding source of finance for a business.
4. To develop a conceptual framework of finance function
5. To acquaint the participants with the tools, techniques
6. To know the process of financial management in the realm of financial decision making.

COURSEOUTCOMES:

Learners should be able to

1. Understand the role of a financial manager and their role intaking decisions professionally.
2. Demonstrate knowledge and compute value of money over time
3. Apply the concept to Evaluate the business proposal applying capital budgeting techniques
4. Computethecostofcapitalandfinancialleveragetoestimatetheoptimalcapitalstructure
5. Comprehendtheknowledgeofassessingtheworkingoforganizationtoassesstheliquidity position of the firm.
6. Demonstrate capabilities of teamwork, problem-solving, critical thinking, and communication skills related to finance decisions.

Unit – I

Scope and Functions of Finance – Role of Financial Manager – Goals of Financial Management – Functions of Controller and Treasurers in India

Unit – II

Cost of Capital – Significance – Concepts of Cost of Capital – Cost of Debt Capital, Preference Capital, Equity Capital and Retained Earnings – Weighted Average Cost of Capital

Unit – III

Capital Structure – Concept – Capital Structure Theories – Net Income Theory, Net Operating Income Theory – MM's Proportion on Capital Structure – Determinants of Optimal Capital Structure – Financial and Operating Leverage

Unit – IV

Capital Budgeting Decisions – Investment Evaluation Criteria – Payback Method – ARR – NPV Method – IRR – Profitability Index – Risk Analysis in Capital Budgeting – Nature of Risk – Conventional and Statistical Technique to handle risk

Unit –V

Management of Working Capital – Determinants of Working Capital – Management of Accounts Receivable, Inventory and Cash – Financing of Working Capital – Dividend Theories – Walter's Model – Gordon's Model – MM's Hypothesis – Dividend Policy – Determinants of Dividend Policy.

Note: Theory :80 Marks and Problems : 20 Marks

SUGGESTED READINGS

Text Book

1. **Pandey, I.M. (2014)**. *Financial Management.* New Delhi, Vikas Publishing House Private Limited.
2. **References**
3. **Prasana Chandra (2012)**. *Financial Management – Theory and Practice.* New Delhi, Tata Mc Graw Hill Publishing Company Limited.
4. **Khan, M.Y., and Jain, P.K. (2014)**. *Financial Management.* New Delhi, Tata Mc Graw Hill Publishing Company Limited.

		Semester – I			
		L	T	P	C
16CCP102	**MANAGERIAL ECONOMICS**	4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To obtain fundamental knowledge on economic concepts and tools that have direct managerial applications.
2. To illustrate the application of economic theory and methodology as an alternative in managerial decisions.
3. To gain a rigorous understanding of competitive markets as well as alternative market structures.
4. To obtain familiarity on the macro level business components like money, banking, monetary policy, fiscal policy, trade, business cycles and balance of payment and understand the forces determining macroeconomic variables such as inflation, unemployment, interest rates, and the exchange rate.
5. Demonstrate capabilities of teamwork, problem-solving, critical thinking, and communication skills
6. To enable students to obtain managerial problem solving skills.

COURSE OUTCOMES:

Learners should be able to

1. Apply the economic way of thinking to individual decisions and business decisions
2. Measure the responsiveness of consumers' demand to changes in the price of a goods or service, and understand how prices get determined in markets,
3. Understand the different costs of production and how they affect short and long run decisions and derive the equilibrium conditions for cost minimization and profit maximization
4. Demonstrate an understanding of monetary and fiscal policy options as they relate to economic stabilization in the short run and in the long run

5. Critically evaluate the consequences of basic macroeconomic policy options under differing economic conditions within a business cycle.
6. Understand and exhibit the communication skills to convey the thoughts and ideas to the individuals and group.

Unit - I

Nature, Objectives and Scope of Managerial Economics – Role and Responsibilities of Managerial Economist – Circular Flow of Economic Activity – Nature of the Firm – Economic Profit – Profits in the Market System

Unit – II

Demand Theory and Analysis – Supply Theory and Analysis

Unit – III

Production Theory – Cost Theory – Cost Concept – Cost Output Relationship – Break Even Analysis

Unit – IV

Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly, Duopoly, Bilateral Monopoly – Monopsony.

Unit – V

Pricing Decision – Pricing of Goods and Services – Pricing and Employment of Inputs – Pricing in Public Sector – Risk and Decision Making – Input – Output Analysis

SUGGESTED READINGS

Text Book

1. **Varshney and Maheswari (2014)**. *Managerial Economics.* New Delhi, Sultan Chand and Sons.
2. **References**
3. **Heynes, Mole and Paul (2007)**. *Managerial Economics.* New Delhi, Tata Mc Graw Hill Publishing Company Limited.
4. **Joel Dean (2011).** *Managerial Economics.* Jaipur, Mangal Deep Publications.
5. **Sumitra Pal (2011).** *Managerial Economics.* New Delhi, Macmillan India Limited.

		Semester – I			
		L	T	P	C
16CCP103	**OPERATIONS RESEARCH**	4	-	-	4

COURSE OBJECTIVES:

This course enables the students

1. To provide essential knowledge on Linear programming
2. To offer practical exposure to transportation and assignment problems
3. To gain the knowledge on Assignment and Queuing Theory Problems
4. To train students on Inventory Control
5. To helps to facilitates the learning of network analysis
6. To enhance learner knowledge in optimal use of performance measures of queues, optimal use of Inventory and Network scheduling with various applications in mathematics

Course Outcomes

On successful completion of this course, the students will be able to

1. Students may gather relevant knowledge for minimizing Operation Cost
2. Students are equipped to cut total cost and able to minimize time required for completing assigned task
3. Students could learn to maintain optimal level of inventory
4. Understand various mathematical applications in industries.
5. Decision making for real time environment.
6. course concentrates on Linear programming, transportation model, Queuing theory and Inventory

Unit – I

Introduction to Operations Research – Application in Management Decision Making – Linear Programming: Formulation of LPP – Graphical Solution to LPP – Simplex Method (using slack variables only)

Unit - II

Transportation Model: Introduction – Mathematical Formulation –Finding Initial Basic Feasible Solutions – Optimum Solution for Nondegeneracy and Degeneracy Model

- Unbalanced Transportation Problems and Maximization case in Transportation Problem- Traveling Sales Man Problem.

Unit- III

The Assignment problem - Mathematical Formulation of the Problem – Hungarian Method –Unbalanced Assignment Problem- Maximization Case in Assignment Problem - Travelling Salesman Problem. Queuing Theory : Introduction – Characteristics of Queuing System. Problems in (M/M/1):(∞/FIFO) and (M/M/1):(N/FIFO) models

Unit - IV

Inventory Control: Introduction – Costs involved in Inventory – Deterministic EOQ Models – Purchasing Model without and with Shortage, Manufacturing Model without and with Shortage -Price Break

Unit - V

PERT and CPM: Network Representation – Calculation of Earliest expected time, latest allowable occurrence time. CPM - Various Floats for Activities – Critical Path-PERT –Time Estimates in PERT- Probability of Meeting scheduled date of Completion of Projects

SUGGESTED READINGS

Text Book

1. **Kanthi Swarup**, **Gupta P.K., Man Mohan (2006).** *Operations Research.* New Delhi, Sultan Chand and Sons.

References

1. **Sharma, J.K**. **(2008).** *Operations Research Theory Applications*. New Delhi, Macmillan India Limited.
2. **Sundaresan, V., Ganapathy Subramanian, K.S., and Ganesan, K.** (2005). *Resource Management Techniques*. Nagapatinam, A. R. Publications.

3. **Shanthi Sophia Bharathi, D. (1999).** *Operations Research*. Chennai, Charulatha Publications.
4. **Hamdy A.Taha (2007).** *Operations Research.* New Delhi, Prentice Hall of India.
5. **Vittal.** *Operations Research.* Chennai, Margham Publications.

Semester – I

16CCP104	OBJECT ORIENTED PROGRAMMING WITH C	L	T	P	C
		4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To understand the concept of OOPS with C++
2. To familiarize on the classes, objects, pointers.
3. To comprehend on the working with the files.
4. To critically analyse and write appropriate programme with use of classes, objects and pointers.
5. To develop programming based on the need.
6. To develop programming based on the need.

COURSE OUTCOMES:

Learners should be able to

1. Understand the concept of OOPS with C++ and apply the learning for lifelong.
2. Familiarize on the classes, objects, pointers
3. Critically analyse the need and develop the program in OOPS with C++ required for the situation.
4. Write the program and present orally and in written form.
5. Develop programming based on the need. T
6. Develop practical skills by using C++ Program

Unit - I

Oriented programming- Principles of Object Oriented Programming – a Look at Procedure and Object Oriented Paradigm – Basic Concepts of Object Oriented Programming- Basic Concepts of Object Oriented Programming- Benefits of OOP – Object Oriented Languages – Application of OOP, Beginning with C++ - What is C++? – Applications of C++ - C++ Statements – Structure of C++ Program.

Unit - II

Tokens and Control Structures- Tokens , Expressions and Control Structures – Token – Keywords – Identifiers – Basic and User – Defined Data Types – Operators in C++ - Operator Overloading- Operator Precedence – Control Structure Functions in C++ - the Main Function – Call By Reference – Return by Reference – In line Function – Function Overloading.

Unit -III

Classes and objects – Introduction- Specifying a Class – Defining Member Function – Nesting of Member Functions - Private Member Functions- Arrays within a Class – Static Data Members- Static Member Functions- Array of Objects – Objects as Function Arguments- Friendly Functions- Pointers to Members. Constructors and Destructors

Unit - IV

Operator Overloading – Type Conversions – Introduction – Defining Operator Overloading– Manipulation of String using Operators – Rules for Overloading Operators- Types Conversions. Inheritance – Abstract Classes.

Unit - V

Pointers, Virtual functions and Polymorphism – Pointers to Objects – This Pointer – Pointer to Derived Classes – Virtual Functions. Working with Files – Classes for File Stream Operations Opening and Closing a File

SUGGESTED READINGS

Text Book

1. **Balagurusamy, E. (2013).** *Object Oriented Programming with C++*. New Delhi, Tata McGraw Hill Publishing Company Limited.

References

1. **Venugopal, K.R. Rajkumar, Ravishankar. T. (2013).** *Mastering C+*. New Delhi, Tata McGraw-Hill Publishing Company Limited.
2. **Ravichandran, D. (2011)**. *Programming with C++*. New Delhi, Tata McGraw-Hill Publishing Company Limited.

16CCP105A FINANCIAL MARKETS AND INSTITUTIONS	**Semester – I**			
	L	**T**	**P**	**C**
	4	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To comprehend on the concept financial markets, instruments and financial institution and its role in economic development
2. To understand the regulatory bodies governing the functioning of financial markets and financial institution
3. To analyze the structure of financial markets and its functions
4. To provide knowledge on Financial System of India and
5. To provide knowledge on Financial System of India and to familiarize the structure of financial markets
6. To familiarize the structure of financial markets

COURSE OUTCOMES:

Learners should be able to

1. Comprehend on the concept financial markets, instruments and financial institution and its role in economic development
2. Understand the regulatory bodies governing the functioning of financial markets and financial institution
3. Obtain the capacity to do lifelong learning on financial markets, instruments, financial institution and its applications.
4. To communicate orally and in written format about the financial markets and institutions
5. The course includes Money Market, Money Market Instruments, Capital Market, Depository System and various types of Financial Institutions
6. Course includes Money Market, Money Market Instruments, Capital Market, Depository System and various types of Financial Institutions

Unit – I

Financial Concept: Financial Assets, Intermediaries, Financial Markets, Financial Rate of Return, Financial Instruments. Financial Markets Classification – Development of Financial System in India, Legislative Support – Weakness of Indian Financial System

Unit - II

Money Market – Definition – Money Market Vs Capital Market- Objectives – Importance of Money Market – Composition of Money Market – Participants – Commercial Bill Market – Types of Bills – Importance of Bill Market –Discount Market – Acceptance Market – Bill Market Scheme – Treasury Bill Market – Types of Treasury Bills –Importance – Commercial Paper – Certificate of Deposit – REPO – Structure of Indian Money Market –Recent Developments in Money Markets.

Unit – III

Capital Market – Meaning – Stock Exchange – Distinction between New Issue Market and Stock Exchange – Relationship between New Issues Market and Stock Exchange – Functions of New Issue Market – Instruments of Issues – Players in the New Issue Market – Book Building – Follow on Public Offer – Recent Trends – Reasons for Poor Performance – Suggestions

Unit - IV

Depository System : Definition and Meaning – Objectives – Interacting Institutions – Depository Process – Trading in a Depository System – Depository System in India – Depository Participants – Benefits – NSDL – Central Depository Services (India) Ltd. – Drawbacks – Remedial Measures - Derivatives

Unit - V

RBI – Commercial Banks – Public and Private – Co-operative Banks - LIC – IDBI – IFCI – ICICI – NHB – SFCs – DIC – TIIC. SEBI – Objectives – Functions of SEBI - Guidelines for Investor Protection

SUGGESTED READINGS

Text Book

1. **Gordon and Natarajan (2010)**. *Financial Markets and Institutions.* New Delhi, Himalaya Publishing House.

References

1. **Gupta, N.K**., **and Monika Chopra (2011)**. *Financial Markets and Institutions.* New Delhi, ANE Books Limited
2. **Gurussamy, S. (2009)**. *Financial Markets and Institutions*. New Delhi, Tata Mc Graw Hill Publishing.

Semester – I

L	T	P	C
4	-	-	4

16CCP105B MARKETING MANAGEMENT

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of marketing, and 4Ps of Marketing
2. To communicate orally and in written form the concepts of marketing and 4 Ps of marketing
3. To apply the marketing concepts and skills lifelong.
4. To understand the recent trends in marketing strategies of a companies.
5. To understand the consumer behavior and to adopt the decision according to the consumer.
6. To know the promotion strategies followed by a company.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of marketing, and 4Ps of Marketing
2. Communicate orally and in written form the concepts of marketing and 4 Ps of marketing
3. Apply the marketing concepts and skills lifelong.
4. Apply the marketing strategies of a company's effectively.
5. To be familiar in behavior of consumer in related to market and to take decision effectively.
6. To implement the correct promotion strategies.

Unit-I

Definition of Marketing and Marketing Management – Object and Importance of Marketing – Evolution of Concept of Marketing – Recent Development in Marketing Concept – Marketing Functions – Approaches to the Study of Marketing – Market Segmentation – Basis – Criteria – Benefits.

Unit-II

Product Policy: Product Planning and Development – Product Life Cycle – Product Line and Product Mix Strategies. Branding: Features – Types – Functions. Packaging: Features – Types – Advantages – Brand Name and Trademark.

Unit-III

Pricing: Definition - Objectives of Pricing Decisions - Factors influencing Pricing Decisions – Methods of Setting Prices – Cost – Demand and Competition – Pricing Policies and Strategies.

Unit-IV

Sales Promotion: Meaning and Definition – Objectives and Importance of Sales Promotion – Personal Selling – Steps in Personal Selling - Advertising – Meaning – Objectives – Functions and Importance – Kinds of Media – Direct Marketing – Multi-level Marketing. Distribution Channels: Types of Channels – Factors affecting Choice of Distribution.

Unit-V

Marketing of Services – E–Marketing – Marketing Ethics – Consumerism – Meaning – Evolution – Types of Exploitation – Consumer Rights – Laws Protecting the Consumer Interest – Consumer Protection Acts – Consumer Courts - Retail Marketing – Methods – Problems – Retail Marketing in India – Customer Relationship Management

SUGGESTED READINGS

Text Book

1. **Pillai, R.S.N., and Bagavathi (2012)**. *Modern Marketing Principles and Practices.* New Delhi, S. Chand and Company Private Limited.

References

1. **Gupta,C.B., and Rajan Nair (2014)**. *Marketing Management*, New Delhi, Sultan Chand and Sons.
2. **Philip Kotler (2014).** *Principles of Marketing.* New Delhi, Prentice Hall of India.

Semester – I

L	T	P	C
4	-	-	4

16CCP105C HUMAN RESOURCE DEVELOPMENT

COURSE OBJECTIVES:

To make the students

1. To acquire knowledge in human resource management, HR audit, and HR analytics.
2. To gain knowledge of HR planning, Selection, Recruitment, job analysis and its interrelations.
3. To understand the concepts and practical implications of performance management, Training methods and career planning.
4. To know about compensation and reward management and its practice in industry.
5. To be familiar with Employee relations and its application for the development of Human resources.
6. To understand the Job analysis and Design

COURSEOUTCOMES:

Learners should be able to

1. Assess the job analysis for a profile and understand its linkage with HR planning
2. Evaluate the training needs and draft a training programme.
3. Understand the compensation and reward system applicable to the industry based and understand its linkage with performance management
4. Understand and apply the appropriate employee relations measures.
5. Understand the HR functions and latest developments in the field of HR and effectively communicate ideas, explain procedures and interpret results and solutions in written and oral forms to different audiences.
6. consists of Job Analysis, Job Evaluation, Orientation, Performance Appraisal, Rewards, Punishment, Industrial Relations, Collective Bargaining and Grievances Handling

Unit – I

Introduction to Human Resource Development: Concept and evolution; Relationship between human resource management and human resource development;

HRD mechanisms, processes and outcomes; HRD matrix; HRD interventions; Roles and competencies of HRD professionals

Unit –II

HRD Process: Assessing HRD needs; Designing and developing effective HRD programs; Implementing HRD programs; Evaluating HRD programs.

Unit – III

Learning and HRD: Maximizing learning; Individual differences in learning process; Learning strategies and styles; Principles of learning; Learning and motivation; HRD culture and climate.

Unit – IV

HRD Activities and Applications: HRD for Workers; HRD mechanisms for workers; Role of trade unions; Employee training and development- Process, methods, and types; Coaching, counselling and performance management; Career management and development; Organization development.

Unit – V

HRD in Organisations, Trends and Practices: Select cases for HRD Practices in Government organisations, defence, police, private sectors and public sectors units; HRD audit; Balanced scorecard; People capability maturity model; Integrating HRD with technology; Employer branding and other recent trends; Future of HRD.

SUGGESTED READINGS

Text Book

1. **Rao, T.V.** *Future of HRD.* New Delhi, Macmillan Publishers India Limited.

References

1. **Werner J. M., DeSimone, R.L.** *Human Resource Development*, South Western.
2. **Nadler, L.** *Corporate Human Resources Development*, Van Nostrand Reinhold.
3. **Blanchard, P.N., Thacker, J.W., Anand Ram, V.** *Effective Training, Systems Strategies and Practices.* Pearson Education.
4. **Raymond, N. and Kodwani, A.D**. *Employee Training and Development.* New Delhi, McGrawHill Education.
5. **Mankin, D.** *Human Resource Development.* Oxford University Press India.
6. **Haldar, U. K.** *Human Resource Development.* Oxford University Press India.
7. **Rao, T.V**. *HRD Score Card 2500: Based on HRD audit.* Sage Publications.

		Semester – I
16CCP111	**PRACTICAL -1 - C++**	**L T P C** **- - 4 2**

COURSE OBJECTIVES:

To make the students

1. To understand the concept of OOPS with C++
2. To familiarize on the classes, objects, pointers.
3. To comprehend on the working with the files.
4. To critically analyse and write appropriate programme with use of classes, objects and pointers.
5. To develop programming based on the need.
6. To develop practical skills by using C++ Program

COURSE OUTCOMES:

Learners should be able to

1. Understand the concept of OOPS with C++, classes, objects, pointers, working with file and apply the learning for lifelong.
2. Develop Program using the Classes, objects and printers.
3. Critically analyse the need and develop the program in OOPS with C++ required for the situation.
4. Write the program and present orally and in written form.
5. Develop programming based on the need.
6. Develop practical skills by using C++ Program

1. Pay Roll calculation (Using simple program)

2. Find out EOQ, Minimum Level, Maximum Level, Re-order level (Using simple program)

3. Write a c++ program to calculate the working capital using class and objects (member Function should be write inside and outside the class)

4. Calculate Simple Interest and compound interest using inline functions.

5. Calculate Depreciation – by using constructors and Destructors
6. Write a C++ program to calculate the sum and product numbers using operator overloading.
7. Write a c++ program to prepare the cost sheet using inheritance
8. Calculation of BEP and MOS (give your own data).
9. Perform bank transactions like deposit, withdrawal, interest's calculation – by using classes and objects.
10. Program to create the student files and prepare the marks slips by accessing the File.
11. Write a perform to calculate over all cost of capital
12. Write a program to calculate funds from operation using (member function outside the class)

Semester – I

	L	T	P	C
16CCP112 PRACTICAL 2 - COMPUTER APPLICATION IN BUSINESS	-	-	4	2

COURSE OBJECTIVES:

To make the students

1. To prepare template to present the financial data for supporting analysis.
2. To use advanced formula in financial calculations
3. To use visualization tools to represent the financial data graphically
4. To forecast the financial data using the in build tools
5. To Understand and apply Sensitivity analysis on models like Goal Seek , Scenarios; for financial decision-making
6. To insert the slides with animation effects.

COURSEOUTCOMES:

Learners should be able to

1. Apply advanced formulas to lay data in readiness for financial analysis
2. Use advanced techniques for financial report visualizations
3. Leverage on various methodologies of summarizing financial data
4. Understand and apply Sensitivity ("What-if") analysis models like Goal Seek , Scenarios; Excel models for financial decision-making
5. Exhibit communication skills to communicate the output derived from the program.
6. Course includes practical on paragraph formatting, usage of Excel funtions, Automation of Presentation, creation of database and report generation.

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I - MS WORD

1. Prepare an research article related to the specialization using Bold, Underline, Font Size, style, Background color, Text color, Line spacing, Spell Check, Alignment, Header & Footer, Inserting pages and page numbers, Find and Replace.
2. Prepare an inter collegiate invitation for the college function using Text boxes and clip parts, Word Art, Symbols, Borders and Shading.

3. Prepare an end semester mark statement through template and perform the following operations: Inserting the table, Data Entry, Alignment of Rows and Columns, Inserting and Deleting the Rows and Columns and Change of table Format.
4. Prepare a Convocation letter for the passed out students for 10 members using mail merge operation.
5. Prepare a resume for attending interview using alignment and formatting.

II - MS EXCEL

1. Prepare a cost sheet and perform the following operations: Data Entry, Total, by using arithmetic function.
2. Draw the different type of charts (Line, Pie, Bar) to illustrate year-wise performance of sales, purchase, profit of a steel manufacturing company by using chart wizard.
3. Prepare a statement of Bank customer's account showing simple and compound interest calculations for 10 different customers using mathematical and logical functions.
4. Prepare a Product Life Cycle which should contain the following stages: Introduction, Growth, Maturity, Saturation, decline of a product.
5. Prepare an income tax filling return as per the income tax department format.
6. Carry out result analysis of your department by employing statistical and mathematical functions.
7. Calculate Electricity statement by making use IF statement.

III - MS POWERPOINT

1. Design presentation slides for a product of your choice. The slides must include name, brand name, type of product, characteristics, special features, price, special offer etc. Add voice if possible to explain the features of the product. The presentation should work in manual mode.
2. Design Presentation slides for Organization details for 5 levels of hierarchy of a company by using organization chart.
3. Design presentation slides about an illustrate story and perform frame movement by interesting clip arts to illustrate running of an image automatically.

4. Design presentation slides for the Seminar/Lecture Presentation using animation effects and perform the following operations: Creation of different slides, changing background color, font color using word art.

IV - MS ACCESS

1. Prepare a payroll for employee database of an organization with the following Details: Employee id, Employee name, Date of Birth, Department and Designation, Date of appointment, Basic pay, Dearness Allowance, House Rent Allowance and other deductions if any. Perform queries for different categories.
2. Create mailing labels for student database which should include at least three table must have at least two fields with the following details: Roll Number, Name, Course, Year, College Name, University, Address, Phone Number.
3. Gather price, quantity and other descriptions for five products and enter in the Access table. Perform query for calculation total and create an invoice in form design view.
4. Create report for the Product database.

		Semester – II			
		L	**T**	**P**	**C**
16CCP201	**APPLIED COST ACCOUNTING**	**4**	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To Explain the core concepts of costing, costing types and its importance in managing a business
2. To develop a conceptual framework of costing and to acquaint the participants with the tools, techniques
3. To know the process of cost reduction and control in the realm of decision making.
4. To familiarizes students with the various concepts and elements of cost
5. To Create cost consciousness among the students
6. To provide the students knowledge about use of costing data for Planning, Control and decision making

COURSEOUTCOMES:

Learners should be able to

1. Explain the core concepts of costing, costing types and its importance in managing a business
2. Develop a conceptual framework of costing and to acquaint the participants with the tools, techniques and process cost reduction and control in the realm of decision making
3. Compute using different costing methods.
4. Demonstrate capabilities of teamwork, problem-solving and critical thinking
5. Communication skills related to finance decisions.
6. course include Material Cost, Labour Cost, Overheads, Process Costing, Activity Based Costing and Target Costing

Unit – I

Cost Accounting – Meaning and Objectives – Importance – Limitations – Limitations of Financial Accounting – Differences between Cost Accounting and Financial Accounting, Cost Accounting and Management Accounting – Methods of

Costing – Elements of Cost – Preparation of Cost Sheet – Tender – Quotations – Reconciliation of Cost and Financial Accounting

Unit – II

Material Control – Objectives – Levels of Inventory – EOQ – Methods of Inventory Control – Methods of Valuing Material Issues – Control over Wages – Scrap and Spoilage - Labour - Labour Cost Control – Importance – Systems of Wage Payment – Incentives – Idle Time – Control Over Idle Time – Labour Turnover

Unit – III

Overheads – Classification of Overheads – Allocation, Apportionment and Absorption of Overheads – Methods of Absorption of Overheads

Unit – IV

Process Costing – Features – General Principles – Comparison between Job Costing and Process Costing – Process Losses – Normal Loss – Abnormal Loss – Abnormal Gains – Inter Process Profit – Equivalent Production – Procedure for Evaluation – Joint Product and by Product

Unit-V

Activity Based Costing: Meaning and Methodology of Activity Based Costing (ABC Analysis)-Merits, Demerits and Suitability of Activity Based Costing-Implementation of Activity Based Costing- Draw Back of Conventional Costing - Target costing**:** Meaning-Characteristics-Principles-Implementation of Target Costing-Installation of Target Costing-Target Costing Vs. Traditional Costing- Life Cycle Costing-Meaning-Definition-Applications of LCC -Importance-Process of LCC

SUGGESTED READINGS

Text Book

1. **Jain, S.P., and Narang, K.L (2012)**. *Cost Accounting Principles and Practice.* New Delhi, Kalyani Publishers.

References

1. **Iyyangar, S.P. (2005)**. *Cost Accounting Principles and Practices.* New Delhi, Sultan Chand and Sons Private Limited.
2. **Pillai, R.S.N., and Bhagavathi (2010)**. *Cost Accounting*. New Delhi, Sultan Chand and Sons Private Limited.
3. **Maheswari, S.N. (2013)**. *Cost Accounting*. New Delhi, Sultan Chand and Sons Private Limited.

Semester – II

16CCP202	**RETAIL MANAGEMENT**	**L**	**T**	**P**	**C**
		4	**-**	**-**	**4**

COURSE OBJECTIVES *:*

To make the students

1. To understand the concept of retailing, retailing strategy and the trends of retailing in India
2. To obtain the knowledge on the retail location and importance of choosing the retail location.
3. To gain knowledge on the retail formats and importance of choosing the retail formats.
4. To know the process of retail pricing and merchandising.
5. To recognize the importance of advertising and technology usage in retailing.
6. To develop an understanding of the retail strategy and planning process

LEARNING OUTCOMES :

Learners should be able to

1. Comprehend on the retailing concept, retailing strategy and the trends of retailing in India.
2. Select the appropriate location for the setting up of retail store.
3. Evaluate the importance of the various retail formats
4. Formulate pricings strategies, apply the concept of merchandising and assess the different advertising and technology options suitable for the success of the retail operations.
5. Exhibitthecommunicationskillstoconveythethoughtsandideastotheindividualsandg roup.
6. Course includes Overview of Retailing, Retail location and layout, Merchandizing, Communication, Advertisement and Sales Promotion.

Unit – I

An overview of Retailing - Types of stores - Product Retailing vs. Service Retailing - Non store Retailing - Retail strategy - Achieving competitive advantage and positioning Retailing environment - Legal, Social, Economic, Technological, issues - Trends in the Indian Retailing Industry

Unit – II

Retail store location and layout - Country/Region analysis - Trade area analysis - Site evaluation and selection - Store design and layout - Comprehensive store planning - Exterior design and layout - Interior store design and layout - Interior design elements

Unit – III

Planning merchandise needs and merchandise budgets - Methods for determining inventory evaluation - Assortment planning, buying and vendor relations - Merchandise pricing - Price strategies - Psychological pricing - Mark-up and markdown strategies.

Unit – IV

Communicating with the retail customer - Retail promotion mix-Advertising - Sales promotion - Publicity - Retail selling process - Retail database- In-store customer service.

Unit – V

Globalization and changing retail formats – Online retailing - International Retailing – Opportunities and Challenges - Market entry formulas - New customized formats (customized stores, portable stores, merchandise depots, retail theater, service malls, customer-made stores, interactive kiosk 'shopping arcades')

SUGGESTED READINGS

Text Book

1. **Chetan Bajaj, Tuli and Srivastava (2010)**. *Retail Management.* New Delhi, Oxford University Press.

References

1. **Giridhar Joshi (2009)**. *Information Technology for Retail.* New Delhi, Oxford University Press.
2. **Swapna Pradhan (2008).** *Retail Management Text and Cases*, New Delhi, Tata McGraw-Hill Publishing Company Limited.
3. **Fernie (2010).** *Principles of Retailing.* Elsevier Publishing.

		Semester – II			
		L	**T**	**P**	**C**
16CCP203	**DIRECT TAXATION**	**4**	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of assessment, assessee, Income heads and the Income Tax laws.
2. To help students to understand different heads of income
3. To learn the tools and techniques to compute the tax for the various income heads.
4. To select the best ways to compute the income tax based on the income heads for various assesseeandtogainalifelonglearningforapplyingtheITcalculationforvariousincomeheads based on each case of assessee.
5. To communicate orally and in written form the income tax concepts and computations.
6. To be familiar with the laws pertaining to the Income Tax and apply it lifelong.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend on the concepts related to assessment, assesse, Income heads and the Income Tax laws.
2. Compute Income Tax Returns.
3. Provide the students knowledge about Tax planning
4. Formulate the Income Tax calculations by critically analyzing the assessee's situation under various income heads and deductions and acquire a Lifelong practice for computation of Tax under various income heads and deductions for any assessee
5. Communicate orally and in written the Income tax computation under various income heads and deductions.
6. Familiar with the laws pertaining to the Income Tax and its apply it lifelong.

Unit- I

Income Tax Act 1961- Scope of income - Total Income and residential status - income which do not form part of the total income – Income from Salaries.

Unit - II

Income from House Property – Profits and gains of business or profession – Income From business- Income from Profession.

Unit - III

Capital Gains – Capital Gain –Short Term and Long Term Gain - Income from other sources – Aggregation of income- set off and carry forward of losses.

Unit - IV

Deduction out of Gross Total Income - Computation of Total Income- Assessment of Individual.

Unit - V

Tax Planning – Advance payment of tax –Tax Deducted at Source - ETDS Software - Returns to be submitted by various assesses-Different Types of Tax Planning – Tax Software – e-filing Procedure e-filing of income tax return.

Note: The question paper shall cover 40% theory and 60% problems

SUGGESTED READINGS

Text Book

1. **Gaur and Narang (2013)**. *Income Tax Law and Practice.* Ludhiana, Kalyani Publishers.

References

1. **Mehrothra (2007).** *Income Tax Law and Practice.* New Delhi, Snow White Publications.
2. **Jayaprakash Reddy (2014)**. *Taxation.* New Delhi, APH Publishing Corporation.

		Semester – II			
		L	T	P	C
16CCP204	**VISUAL BASIC.NET**	4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of Visual Basics.Net and its application.
2. To learn tools and utilize the tools of Visual Basic.net to design programmes.
3. To communicate orally and in written form the Concept of Visual Basics.Net and its application.
4. To understand the Visual Basic Language and Loops
5. To understand the Object-Oriented Programming
6. To understand the Data Access with ADO.NET

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of Visual Basics.Net and its application.
2. Learn tools and utilize the tools of Visual Basic.net to design programmes.
3. Communicate orally and in written form the Concept of Visual Basics.Net and its application.
4. Know the Visual Basic Language and Loops
5. Know the Object-Oriented Programming
6. Exhibit the Menus and Dialog-Boxes

Unit-I

Getting Started With VB.NET: The Integrated Development Environment-IDE Components- Environment Options. Visual Basic: The Language -Variables-Constants-Arrays – Variables as Objects-Flow Control Statements.

Unit-II

Writing and Using Procedures: Module Coding – Arguments. Working with Forms: Appearance of Forms- Loading and Showing Forms -Designing Menus. Multiple Document Interface

Unit- III

Basic Windows Controls: Textbox Control- ListBox, CheckedListBox-Scrollbar and TrackBar Controls. More Windows Control: The common Dialog Controls-The Rich TextBox Control.The TreeView and ListView Controls: Examining the Advanced Controls-The TreeView Control-The ListView Control-Content Page Holder

Unit-IV

Handling Strings, characters and Dates: Handling Strings and Characters – Handling Dates. Working with Folders and Files: Accessing Folders and Files – Accessing Files. Drawing and Painting with Visual Basic: Displaying Images – Drawing with GDI – Co-ordinate Transformation – Bitmaps.

Unit-V

Databases: Architecture and Basic Concepts: What is database? - Server Explorer – Structured Query Language – The Query Builder – Building database Application with ADO.Net: The Architecture of ADO.Net-Creating the dataset – Data Binding – Programming the Data Adapter Objects – The Command and Data Reader Object. Programming the ADO.Net objects: The Structure of the dataset – The DataForm Wizard – Transactions – Performing Update Operations.

SUGGESTED READINGS

Text Book

1. **Evangelos Petroutsos (2006)**. *Mastering Vb. Net.* USA, SYBEX Inc.

References

1. **Steven Holzner (2005)**. *Vb.Net Programming Black Book.* USA, Dream Tech Publications.

2. **Bill Evjen, Scott Hanselman, Farhan Mohammed, Srinivasa Siva Kumar and Devin Rader (2006)**. *Asp.Net 2.0.* USA, Wiley Publication.
3. **Burrowss W.E and D. Langford (2003)**. *Learning Programming using Visual Basic .Net.* New Delhi, McGraw Hill Edition.
4. **Jeffrey R. Shapiro (2008)**. *The Complete Reference Visual Basic.Net.* New Delhi, Tata **-**McGraw-Hill Edition.
5. **Richard Bowman (2002)**. *Visual Basic.Net.* Canada, Hungry Minds Inc. Publication

16CCP205A	ADVERTISEMENT AND SALES PROMOTION	Semester – II L T P C 4 - - 4

COURSE OBJECTIVES:

To make the students

1. To know about the various types of advertising
2. To understand the motivational aspects of salesmen
3. To understand the concept of sales force management
4. To know about the social effects of advertising
5. To know about the promotional strategy.
6. To introduce the students to latest methods and tools of advertising and sales promotion.

COURSE OUTCOMES:

Learners should be able to

1. Knowing the concepts of advertising.
2. Getting the details about the various types of advertising
3. Understanding the motivational aspects of salesmen
4. Understanding the concept of sales force management
5. Knowing about the social effects of advertising
6. Knowing about the promotional strategy.

Unit - I

Advertising - Features, Purpose, Scope and Function - Classifications - Social and Economic Aspects & Ethical Issues in Advertising - Need for Advertising

Unit – II

Advertising Process - Advertising Strategy - Psychology of Target Audience - Effectiveness of Advertising - Buying Behavior - Audience Perception -Setting Advertising Objectives, Advertisement Planning and Organization -Advertisement Copy.

Unit - III

Advertising Media - Role of Media - Print Media - Radio and Television - Online Advertising - Media research - Media Selection - Advertising Budget - Evaluation of Effectiveness of Advertising - Areas of Assessment - Media testing

Unit – IV

Sales Promotions - Scope - Functions and Importance - Sales Promotional Methods - Fundamental of Successful Selling - Retail Marketing

Unit – V

Salesmanship - Salesmen Recruitment and Training - Personnel Selling - Skills for Good Salesmanship - Training of Sales Personnel - Motivating and Evaluating Sales Personnel - Sales Records - Rewarding Good Salesmanship

SUGGESTED READINGS

Text Book

1. **Mahendra Mohan (2008)**. *Advertising Management.* New Delhi, Tata McGraw Hill Publishing Company Limited.

References

1. **Philip Kotler, Kevin Lane Keller, Abraham Koshy, Mithileshwar Jha (2013).** *Marketing Management.* New Delhi, Pearson Education.
2. **Rathore (1998).** *Advertising Management.* New Delhi, Himalaya Publishing House.
3. **Francis Cherunilam (2010).** *Advertisement and Salesmanship.* New Delhi, Himalaya Publishing House.
4. **Varma and Agarwal (2000).** *Salesmanship and Publicity.* New Delhi, King Books.

		Semester – II			
16CCP205B	**SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT**	**L**	**T**	**P**	**C**
		4	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of investing and mechanics for formulating investment decisions.
2. To communicate orally and in written form the concepts of Concept of investing and mechanics for formulating investment decisions.
3. To apply the investing concepts and skills lifelong.
4. To analyse the EIC framework make decisions based on investing in different avenues.
5. To Critically evaluate the risk return parameters and select the best alternative.
6. To Communicate in written form and prepare report

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of investing and mechanics for formulating investment decisions.
2. Communicate orally and in written form the concepts of Concept of investing and mechanics for formulating investment decisions.
3. Apply the investing concepts and skills lifelong.
4. Analyse the EIC framework make decisions based on investing in different avenues.
5. Critically evaluate the risk return parameters and select the best alternative.
6. Communicate in written form and prepare report

Unit- I

Introduction of Investment: Concepts of Investment – Common Forms of Investment - Types of Securities – Government Securities – Government Securities Market — India Money Market and Capital Market Institutions- Risk and Return – Systematic and Unsystematic Risk.

Unit - II

Stock Markets: Concepts – Bull- Bear-PE Ratio-Different Stock Market Ratio - SEBI - Structure – Functioning – NSE and BSE – Functions – Listing of Securities – New Issue Market- Mechanics of Trading in Stock Exchange – Evaluation of Securities, Equity , Preference, Debt, Hybrid Securities, - OTCEI .

Unit - III

Fundamental Analysis - Economic analysis and Industry analysis: Asset Pricing Theories (APT)s s- Option Pricing Theory – Economic Analysis –Economic Forecasting – Stock Investment Decision - Techniques Company Analysis – Industry Analysis

Unit - IV

Technical Analysis–Charting Methods – Market Indicators – Trend Analysis - Trend Reversal – Patterns Moving Average – Exponential Moving Average – Oscillators –RSI - Fundamental Analysis Vs. Technical Analysis.

Unit - V

Portfolio Analysis: Methods of Portfolio Construction – Selection of Portfolio Management- Practical Aspects – Performance Evaluation - Portfolio Revision – Problems.

Note: This Paper consisting of 80% Theory and 20% Problem.

SUGGESTED READINGS

Text Book

1. **Preeti Singh (2014).** *Investment Management.* Bangalore, Himalaya Publishing House.

References

1. **Prasanna Chandra (2012).** *Investment Analysis and Portfolio Management*. New Delhi, Tata Mc Graw Hill Publishing Company Limited.
2. **Fisher Donald (2000).** *Security Analysis and Portfolio Management.* New Delhi, Prentice Hall of India.
3. **Avadhani,V.A. (2011)**. *Securities Analysis and Portfolio Management*. Bangalore, Himalaya Publishing House.
4. **Kevin, S. (2005)**. *Portfolio Management.* New Delhi, Prentice Hall of India Private Limited.

Semester – II

16CCP205C STRATEGIC HUMAN RESOURCE MANAGEME

L	T	P	C
4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To acquire knowledge in human resource management, HR audit, and HR analytics.
2. To gain knowledge of HR planning, Selection, Recruitment, job analysis and its interrelations.
3. To understand the concepts and practical implications of performance management, Training methods and career planning.
4. To know about compensation and reward management and its practice in industry.
5. To be familiar with Employee relations and its application for the development of Human resources.
6. To understand the Job analysis and Design

COURSEOUTCOMES:

Learners should be able to

1. Assess the job analysis for a profile and understand its linkage with HR planning
2. Evaluate the training needs and draft a training programme.
3. Understand the compensation and reward system applicable to the industry based and understand its linkage with performance management
4. Understand and apply the appropriate employee relations measures.
5. Understand the HR functions and latest developments in the field of HR and effectively communicate ideas, explain procedures and interpret results and solutions in written and oral forms to different audiences.
6. consists of Job Analysis, Job Evaluation, Orientation, Performance Appraisal, Rewards, Punishment, Industrial Relations, Collective Bargaining and Grievances Handling

Unit –I

Introduction**:** Concept and context of strategic human resource management (SHRM); Corporate strategy and SHRM; Evolution of SHRM; SHRM & HR; Challenges in SHRM; Resource based view of a firm; Competencies of HR professionals.

Unit – II

HR Strategies**:** Strategic HR planning and acquisition: Recruitment and selection; Strategic training and development; Reward and compensation strategy; Corporate strategy and career systems; Employee separation and retention management, retrenchment; Strategic approach to industrial relations; Managing workforce diversity.

Unit – III

Implementing Strategic Human Resource Management**:** Identifying strategic positions; Human resource analytics; Employee engagement; Matching culture with strategy; Behavioural issues in strategy implementation.

Unit – IV

Linking SHRM to Competitive Success and Corporate Strategy**:** SHRM for competitive advantage; HC Bridge Model and Decision science model; Tools for work analysis and talent strategies; HR implications of mergers and acquisitions; Outsourcing and its HR implications.

Unit – V

Trends and Issues in SHRM**:** Alignment of HR strategies and the impact on business performance; HR metrics; Human resource strategy in international context; Future of SHRM.

SUGGESTED READINGS

Text Book

1. **Das, P**. *Strategic Human Resource Management: A Resource Driven Perspective.* Cengage Learning India.

References

1. **Greer, C.R.** *Strategic Human Resource Management: A General Managerial Approach.* New Delhi, Pearson Education.
2. **Paul, B.** *Strategic Human Resource Management*. New Delhi, McGraw Hill Education.
3. **Armstrong, M.** *Armstrong's Handbook of Strategic Human Resource Management.* Kogan Page.
4. **Mello, J. A**. *Strategic Management of Human Resources.* South Western.
5. **Schuler, R. S., and Jackson, S. E.** *Strategic Human Resource Management.* Wiley India

		Semester – II			
		L	T	P	C
16CCP211	**PRACTICAL 3 –VB.NET**	**-**	**-**	**4**	**2**

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of Visual Basics.Net and its application.
2. To learn tools and utilize the tools of Visual Basic.net to design programmes.
3. To communicate orally and in written form the Concept of Visual Basics.Net and its application.
4. To understand the Visual Basic Language and Loops
5. To understand the Object-Oriented Programming
6. To understand the Data Access with ADO.NET

COURSE OUTCOMES:

Learners should be able to

7. Understand the Concept of Visual Basics.Net and its application.
8. Learn tools and utilize the tools of Visual Basic.net to design programmes.
9. Communicate orally and in written form the Concept of Visual Basics.Net and its application.
10. Know the Visual Basic Language and Loops
11. Know the Object-Oriented Programming
12. Exhibit the Menus and Dialog-Boxes

VISUALBASIC .NET

1. Calculate Simple interest and compound Interest
2. Find mouse events and coordinates where the mouse is clicked.
3. Implement Calculator.
4. Implement Notepad

5. Draw several shapes and fill with color.
6. Perform the following in list box
   a) Add an item
   b) Delete an item
   c) List count
   d) Clear the List
7. Calculate the days elapsed between the given two dates.
8. Create Menu and link multiple forms with different colors.
9. Animate the picture using animation control.
10. Check whether given string is a Palindrome or not.
11. Generate Fibonacci series for the input given using Input box.
12. Calculate the total marks of the student and print the grade
13. Maintain details of students. Use Crystal Report to generate report.
14. Implement Employee Payroll.
15. Create and manipulate a File.

Semester – II			
L	**T**	**P**	**C**
-	**-**	**4**	**2**

16CCP212 PRACTICAL 4 - TALLY

COURSE OBJECTIVES:

To make the students

1. To understand the accounts heads, vouching, inventory valuations, available in the accounting software
2. To classify the items under items heads
3. To Generate the financial Reports evaluate the output.
4. To communicate the outputs in written form identifying the objective and outcome of each exercise.
5. To apply the utilization of computerized system as a lifelong learning.
6. To develop practical skills for maintain the book of accounts.

COURSE OUTCOMES:

Learners should be able to

1. Familiarize on the account's heads, vouching, inventory valuations available in the accounting software
2. Classify the items under items heads
3. Generate the financial Reports, evaluate the output.
4. Communicate the outputs in written form identifying the objective and outcome of each exercise.
5. To apply the utilization of computerized system as a lifelong learning.
6. Course covers Company Creation, Ledger, Voucher, Trading and Profit and Loss Account, Balance Sheet, Inventory Valuation and Ratio Analysis

Creating a Company

1. Create a Company with all relevant details including VAT options

Creating Ledger

2. Create the ledgers under appropriate predefined groups

Cash a/c	Computer sales a/c
Buildings a/c	Machinery a/c

Furniture a/c	Commission received a/c
Printer purchase a/c	Commission paid a/c
Rent received a/c	Salary a/c
Rent paid a/c	Indian bank a/c
Wages a/c	Sales returns a/c
Capital a/c	Depreciation a/c
Purchase returns a/c	John & Co. a/c (purchased goods from this company)

Ram agency a/c (sold goods to this company)

Create vouchers

3. **Create vouchers and view Profit and loss a/c and Balance sheet for the following**:

Hindustan Ltd. started the business on 01-04-2011

1 Apr. Contributed capital by cash Rs 2, 00,000

1 Apr. Cash deposited in Indian bank Rs 50,000

2 Apr. Credit purchases from Krishna traders Rs. 20000 invoice no 12

3 Apr. Credit purchases from PRAVIN traders Rs 20,000 invoice no 12

4 Apr. Credit purchase from KRISHNA traders Rs 20000 invoice no 14

5 Apr. Credit purchase from PRAVIN traders Rs 20,000 invoice no 44

6 Apr. Returned goods to KRISHNA traders Rs 5000 invoice no 12

7 Apr. Returned goods to PRAVIN traders Rs 5000 invoice no 44

8 Apr. Credit sales to RAVI & Co Rs 50,000 inv no 1

9 Apr. Credit sales to KUMAR & Co Rs 50,000 inv no 2

10 Apr. Cash sales Rs 20,000 inv no 3

11 Apr. Credit sales to RAVI & Co Rs 50,000 inv no 2

12 Apr. Credit sales to RAVI & Co Rs 50000 inv no 5

14 Apr. Goods returned by RAVI & Co Rs 5000 inv no 1

14 Apr. Goods returned by KUMAR & Co Rs 5000 inv no 1

15 Apr. Payment made by cheque to Krishna Traders Rs 30,000 ch no 505580

16 Apr. Payment made by cheque to Pravin Traders Rs 30,000 ch no 505592

17 Apr. Received cheque from: Ravi & Co and Kumar & Co 75,000 each.

Payments made by cash

3 Apr. Paid to petty cash by cash Rs.1000

4 Apr. Furniture purchased Rs.20000

5 Apr. Salaries paid Rs. 10000

6 Apr. Rent Rs.4000

7 Apr. Electricity charges Rs.3000

8 Apr. Telephone charges Rs.3500

9 Apr. Cash purchases Rs.5000

Payments made by petty cash

10 Apr. Conveyance Rs.150

11 Apr. Postage Rs.100

12 Apr. Stationeries Rs.200

14 Apr. Staff welfare Rs.100

14 Apr. Stationeries purchased from Sriram & Co 1500 on credit

15 Apr. Depreciation on furniture 10%

4. Emerald & Co., started a business of home appliances from 1-4-2011

01-04 received cash for capital 5, 00,000

07-04 credit purchases from LG Limited invoice no 123

Oven 100nos at Rs 800,Mixes 100nos at Rs 1000,DVD player 100nos at Rs 1500,

Fridge 100nos at Rs 2000

10-04 Credit Sales to AMN invoice no 1:

Oven 70nos at Rs 1000,Mixes 70nos at Rs 1500,DVD player 70nos at Rs 2000

Fridge 70nos at Rs 2500+TNGST 4% ON TOTAL SALES

10-04 Cash Sales invoice no 2:

Oven 10nos at Rs 1000,Mixes 10nos at Rs 1500,DVD player 10nos at Rs 2000,

Fridge 10nos at Rs 2500+TNGST 4% ON TOTAL SALES CASH discount 5%

15-4 Paid cheque to LG limitedRs 2,00,000

15-4 Received cheque from AMN&coRs 3,00,000

5.Payment made by cash

Paid to petty cash Rs 2000, Furniture Rs 15000, Salaries Rs 10000

Wages Rs 7000, Carriage inward Rs 1500.

25-04 Payment made by petty cash

Conveyance Rs 200, Postage Rs 150, Stationeries Rs 150, Staff Welfare Rs 200

30-04 Journal depreciate 10% on furniture:

Prepare Trading Profit and Loss Account and Balance sheet.

6. From the Balances of Ms. Kavitha, Prepare Trading A/C, Profit And Loss A/C and Balance Sheet for The Year Ending

Stock - 9,300 Repairs - 310 Machinery - 12,670 Furniture - 1430 Office expenses - 750 Trading expenses - 310 Land & Builiding - 15,400 Bank charges - 50 Capital - 24,500 Loan - 5,000 Closing stock - 7,580	Misc. income - 200 Purchases - 15,450 Purchase return - 440 Sales return - 120 Sundry creditors - 12,370 Advertisement - 500 Cash in hand - 160 Cash at bank - 5,870 Sales - 20,560 Sundry expenses - 150 Insurance - 500 Traveling expenses - 200

INVENTORY VALUATION

7. From the Information given below create unit of measurement, stock groups and stock items

Find the stock summary:

Stock groups: 1. Magazine 2. Baby drinks 3. Cool drinks 4.dailynews paper 5. Hot drinks 6.Stationeries 7. Vegetables

Stock items:

Item	Qty	Rate	Units
Boost	25	80	nos
Sports star	20	15	nos
Potato	260	30	kgs
Star dust	20	25	nos
The Hindu	50	3.25	nos
Tomato	150	15	kgs
Fanta	10	25	lit
Dinamalar	40	2.50	nos
Coco	55	120	nos
Horlicks	60	70	nos
India today	10	10	nos
Lactogin	10	100	nos

MAINTAIN BILLWISE DETAILS

8. Create bill wise details from the following

1. Ravi commenced business with a capital of Rs 2,00,000
2. Purchased goods from Kumar & Co Rs.15, 000 Paid in three installments within 5 days gap
3. Purchased goods for cash Rs.8000
4. Sold goods to Ratna & co Rs. 20,000 amount to be paid in two installment
5. Sold goods for cash for Rs .5000
6. Received cash from Ratna & co Rs. 75000
7. Paid to Kumar & co Rs. 7500
8. Sold goods for cash Rs.5000

CONSOLIDATION OF ACCOUNTS

9. Bharath Agencies, A Wholesaler Gives The Following Information:

Opening balances:

Capital: 20, 00,000 cash at bank: 10, 00,000

Cash in hand: 5, 00,000 furniture: 5, 00,000

Bharath agencies are dealing in stationeries. The selling prices are as follows;

Pen Rs 35 per dozen, pencil Rs. 30 per dozen,Ink pens Rs 140 per dozen

The following transactions take on a particular date:

1.purchased 100 dozens of pens from Ravana bros. @ Rs.25 per dozen for cash

2.purchased 200 dozens of pencils from Gughan bros.@ Rs.21.50 per dozen for credit less discount of Rs 100

3.sold 10 dozens of pens to Dharma bros. For cash

4.sold 10 dozens of pens to Bema bros for credit

5.sold 50 dozens of pencils to Arjuna bros.

6.purchased from Ravana bros 50 dozens of ink pens @ Rs.120 and by cheque.

Prepare following statements using Ex-accounting packages:

Stores ledger, Trading account, Income statement, Balance sheet, Account summary

Ignore dates

FOREIGN GAINS/LOSS

10. Calculate

01.01.2005 Purchased goods from U.K supplier 1000 £

02.01.2005 Sold goods to U.S buyer 1500

03.01.2005 Cash received from U.S buyer 1500

(Selling rate rs.46/$)

04.02.2005 Paid cash to U.K supplier 1000

(Selling rate Rs 53/ £)

Dollar $:

Std rate - 1$ - 43 Rs

Sales rate - 1$ - 44 Rs

Buying rate - 1$ - 42 Rs

Pound £:

Std rate - 1 £ - 51 Rs

Sales rate - 1 £ - 50 Rs

Buying rate - 1 £ - 52 Rs

11. MEMO VOUCHER

An advance amount paid Rs 1500 given to sales executive for traveling. The actual expenses for traveling expenses for the sales is Rs 500

12. CHEQUE PRINTING

Print a cheque:

Company name on cheque: Wipro India Ltd.: name of the bank Indusind bank.

Width 168, height 76, starting location 116, distance from top 23.

13. RATIO ANALYSIS

Enter the following details comment upon the short-term solvency position of the company:

Working capital Rs 20560492

Cash 14500

Bank 18500

Debtors 518260

Creditors 429337

Sales 515252

Purchases 433310

Stock 125982

Net profit …?

14. INTEREST CALCULATIONS

Cash deposited in Scotia bank Rs 1,00,000

Sold goods to Ganesh Rs 25,000

31-12- cash deposited at Scotia bank Rs 50,000

Sold goods to Ganesh 50,000

Interest parameters rate 14% per 365 days year

15. Calculate Interest

Cash deposited in SBI 1, 00,000 Rs

1-12 purchased goods from suppliers Rs 20,000

Deposited in SBI Rs.50, 000

Purchased goods from suppliers Rs 40,000

Interest parameters rate 16% per 365 days year

16. Display the interest calculations for the period 1-4-2011 to 31-12-2011

Opening balance

Ram & Co Rs 25,000

Krishna traders Rs 20,000

Interest parameters rate 12% per 365 days year

Interest parameters rate 12% and 16% for sundry creditors per 365 days year

Purchased goods from Krishna for 25,000(credit period 45 days)

Sold goods to Ram for Rs. 50,000(credit period 30 days)

Paid to Krishna the amount plus interest

Received from Ram plus interest

17. Create stock items, stock groups, sales categories, godowns, units of measure.

Stock	Category	Group	Godown	Unit of measure	Std cost	Sell Price	Op. Qty	Total Value
Inter Celeron	Processor	Celeron	Mumbai	Nos.	15000	20000	2	30000
Intel Premium III	Processor		Chennai	Nos	20000	25000	3	60000

Tally Silver	Accounting	Tally	Chennai	Nos	20000	22500	5	100000
Tally gold	Accounting	Tally	Chennai	Nos	42000	45000	5	210000
								400000

18. Using the above exercise create various vouchers including VAT calculation for the following

Date Transactions	Transcation
O9/4/2006	Intel Pentium III (3 Nos) @ 25,000 delivered to Vijay & CO, from Madras Go down.
10/4/2006	10 Nos of Intel Celeron @ 15000 per unit received from Jayaram and Co, and sent to Madras Go down.
12/4/2006	2Nos of Intel Premium III received from Vijay & CO, as it was not in a working position.
14/4/2006	2Nos of Intel Celeron returned to Jayaram & Co from Madras Go down.
14/4/2006	Physical Stock verification shows Shortage of 1 No Intel Pentium III.

19. Create the following Inventory vouchers with data from any cost accounting book.

a. Purchase order
b. sales order
c. Rejection out
d. Rejection in
e. Stock journal
f. Delivery note
g. Receipt note

h. Physical stock

20. In addition to the above mentioned lab exercises work out a problem from any advanced accountancy book with a minimum of 20 transactions and generate the tally reports in full.

		Semester – III			
		L	**T**	**P**	**C**
16CCP301	**MANAGEMENT ACCOUNTING**	**4**	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of management accounting, costing behaviour, budgeting and enrich the lifelong learning.
2. To comprehend on the contemporary issues relevant to accounting concepts.
3. To analyse the alternatives using appropriate tools and techniques.
4. To solve the problems and take decisions based on the result.
5. To communicate orally and in written form the concepts and solutions.
6. To provide the students knowledge about budgetary control.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of management accounting, costing behaviour, budgeting and enrich the lifelong learning.
2. Comprehend on the contemporary issues relevant to accounting concepts.
3. Analyse the alternatives using appropriate tools and techniques.
4. Solve the problems and take decisions based on the result.
5. Communicate orally and in written form the concepts and solutions.
6. course incorporates Financial Statement Analysis, Ratio Analysis, Fund Flow and Cash Flow Analysis, Budgeting and Marginal Costing

Unit – I

Management Accounting – Meaning – Definition – Objectives and Scope – Relationship between Management Accounting and Financial Accounting – Management Accounting and Cost Accounting

Unit – II

Financial Statement Analysis – Types of Financial Statement Analysis - Ratio Analysis – Meaning – Uses – Limitations – Classification of Ratios – Computation of Ratios from Financial Statements

Unit – III

Fund Flow Analysis – Cash Flow Analysis – Working Capital Statements – Funds from Operations

Unit – IV

Budgetary Control – Flexible Budget – Sales Budget – Cash Budget – Production Budget – Purchase Budget

Unit – V

Marginal Costing – Break Even Analysis – Applications of Marginal Costing Techniques – Determination of Sales Mix – Key factor – Make or Buy Decision (Simple Problems Only)

Note: Theory -20% Problems - 80%

SUGGESTED READINGS

Text Book

1. **Maheswari, S.N. (2007)**. *Management Accounting.* New Delhi, Kalyani Publishers.

References

1. **Sharma Shashi K. Gupta (2003).** *Management Accounting.* New Delhi, Kalyani Publishers.
2. **Khan, P.K. and Jain (2009).** *Management Accounting.* New Delhi, Tata Mc Graw Hill Publishing Company Limited.

16CCP302 **BUSINESS RESEARCH METHODS AND TECHNIQUES**

Semester – III

L	T	P	C
4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To understand the basic framework of research and research process and its important in business decision.
2. To develop an understanding of various research designs and sampling techniques and its application.
3. Toidentifyappropriatesourcesofinformationandmethodsofdatacollectionforsolving abusiness issue.
4. To understand the selection of appropriate tools to analyse the quantitative and qualitative data.
5. To understand the ethical norms for research and select the best type of research report and be familiar with the content to be included in the report.
6. To gain the sampling techniques along with hypothesis testing.

COURSE OUTCOMES :

Learners should be able to

1. Assessthebestsuitableresearchtypeandformulatetheresearchobjectivefortheresearchbusines sproblem.
2. Formulatethesuitableresearchdesignsandselectappropriatesamplingtechniquesforth eresearch.
3. Select the appropriate data collection method for solving the business issue and decide the appropriate measurement scale for designing the instrument for data collection.
4. Apply appropriate analytical tools for the data collected and formulate a suitable suggestion for the business problem.
5. Demonstrate capabilities of team work, problem-solving, critical thinking, and communication skills and design a suitable research report based on the ethical norms of research.

6. The course comprise of Types of Research, Research Design, Sampling, Data Collection, Scaling Techniques, Hypothesis Testing and Statistics

Unit-I

Introduction to Research: Meaning – Purpose – Types of Research – Significance – Qualities of a good research – Steps in Research - Identification, Selection and Formulation of Research Problem. Research Design: Components of Research Design – Methods of Research Design.

Unit-II

Sampling Design: Census and Sample Survey – Characteristics of a Good Sample Plan – Steps in Sampling – Types of Sampling – Advantages and Limitations of Sampling. Data Collection: Primary Data - Meaning – Significance – Methods of Collecting Data: Observation – Interview Schedule – Questionnaire. Secondary Data – Meaning - Sources of Secondary Data – Precautions while using Secondary Data.

Unit-III

Scaling Techniques: Meaning of Scale–Measurement of Scale – Important Scaling Techniques - Processing of Data - Editing – Purpose – Analysis and Interpretation of Data: Meaning – Need for Interpretation – Techniques of Interpretation.- Report Writing: Types of Research Reports – Layout of the Report – Steps in Writing the Report – Contents of Research Reports

Unit-IV

Hypothesis: Characteristics of a good Hypothesis – Formulation of Hypothesis – Procedure for Testing of Hypothesis – T test, F test and Chi Square Test, Analysis of Variance - Business Forecasting – Exponential Smoothing

Unit-V

Descriptive Statistics - Measures of Central Tendency: - Mean, Median and Mode - Standard deviation – Karl Pearson Correlation – Spearman Rank Correlation - Regression Models – Inferential Statistics – Multivariate Analysis - Factor Analysis – Kruskal Wallis Test

<u>Note:</u>

The question paper shall cover 80% theory and 20% problems

SUGGESTED READINGS

Text Book

1. **Kothari**, **C.R. (2014)**. *Research Methodology – Methods and Techniques.* New Delhi, New Age International (P) Limited, Publishers.

References

1. **Anil Kumar Gupta (2011)**. *Research Methodology: Methods and Techniques.* New Delhi, Vayu Education of India.
2. **Krishnaswami, O.R. and Ranganatham, M. (2014).** *Methodology of Research in Social Sciences.* Mumbai, Himalaya Publishing House Private Limited.
3. **Gupta. S.P. (2014).** *Practical Statistics.* New Delhi, S. Chand and Company.
4. **Vinayagamoorthy,A. (2013).** *Business Research Methods.* Pune, Vaishali Publications.
5. **Saravanavel (2008).** *Research Methodology.* Mumbai, Kitab Mahal.
6. **Rao (2013)**. *Research Methodology in Commerce and Management.* New Delhi, Streling Publishers Private Limited.

	Semester – III			
	L	**T**	**P**	**C**
16CCP303 INDIRECT TAXATION	**4**	**-**	**-**	**4**

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of indirect taxes emphasizing VAT and customs law.
2. To learn and compute the VAT liabilities.
3. To know how to register VAT and apply the VAT provisions.
4. To communicate orally and in written form the indirect taxations concepts and provisions.
5. To be familiar with the standards and laws pertaining to the VAT and customs and utilize for lifelong practical application.
6. To understand the statutory compliance under indirect taxes.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend on the Concept of indirect taxes emphasizing VAT and customs law.
2. Comprehend and compute VAT liabilities.
3. Know the procedure to register VAT and apply VAT provisions to business situations.
4. Communicate orally and in written form the indirect taxations concepts and provisions.
5. Familiar with the standards and laws pertaining VAT and customs and utilize for lifelong practical application.
6. The course covers Indirect Tax, Central Excise, Customs Laws, Service Tax and Central Sales Tax and VAT

Unit-I

Indirect Taxes- Features of Indirect Tax- Indirect Tax Laws-Administration and Relevant Procedures - Advantages and Disadvantages of Indirect Taxes

Unit-II

Central Excise - The Central Excise Law – Goods- Excisable goods, Manufacture and Manufacturer- Classification- Valuation-Related Person-Captive Consumption- Powers of Officers-Tariff Commission and other Tariff Authorities.

Unit-III

Customs Laws -Basic Concepts of Customs Law - Types of Custom Duties.- Anti- Dumping Duty, Safeguard Duty- Valuation -Customs Procedures- Import and Export Procedures-Baggage- Exemptions – Warehousing- Demurrage - Project Imports and Re- Imports- Penalties and Offences- Export Promotion Schemes- Duty Drawback.

Unit-IV

Service Tax - Introduction, Nature of Service Tax-Service Provider and Service Receiver- Registration procedure- Records to be Maintained - Classification of Taxable Services - Valuation of Taxable Services- Exemptions and Abatements - Payment of Service Tax- Return - Export and Import of Services- Other aspects of Service Tax- Taxable Services.

Unit-V

Central Sales Tax Act & VAT Act- Introduction, Definition of Sale under CST – VAT- Salient Features of State VAT Acts- Treatment of Stock & Branch Transfer under State VAT Acts - Filing & Return under State VAT Act.

SUGGESTED READINGS

Text Book

1. **Datey, V.S. (2015).** *Indirect Taxes.* Mumbai, Taxmann Publications Private Limited.

References

1. **Balachandran, V. (2006).** *Indirect Taxation.* New Delhi, Sultan Chand and Sons.
2. **Mittal, J.K. (2015).** *Law Practice and Procedures of Service Tax.* New Delhi, Jain Book Agency.
3. **RadhaKrishnan, R. (2009).** *Indirect Taxation.* New Delhi, Kalyani Publishers.
4. **Sethurajan (2005).** *Indirect Taxation including Wealth Tax.* Speed Publications

		Semester – III			
		L	T	P	C
16CCP304	**JAVA**	4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To understand of fundamental programming constructs and concepts
2. To comprehend on the object-oriented programming concepts of Class and Object
3. To gain knowledge on the packages and interface and its applications.
4. To obtain the application of Multi thread models in programming
5. To know about the applet class and its application
6. To know about the Creating an executable applet

COURSEOUTCOMES:

Learners should be able to

1. Obtain programming skills in the Java programming language,
2. Gain knowledge of object-oriented paradigm in the Java programming language
3. Know about the usage of the Java programming language for
   various programming technologies
4. Understand to usage tools to design webpage using the java
   programming and realize the usage of standard and third-party
   Java's API's when writing applications.
5. Exhibit the communication skills to convey the output of the programme.
6. Gain knowledge of Creating an executable applet

Unit – I

An overview of Java: Object oriented programming – Java features – Java environment - Data types, variables and arrays. Operators- Expressions - Control Statements: Branching statements – Iteration statements – Jump statements – Sample java program.

Unit – II

Classes – Objects – Methods – Constructors – The this keyword – finalize () method – Overloading methods – Returning objects – Recursion – Static – Final – Nested inner classes – Command line arguments – Inheritance.

Unit – III

Packages and Interfaces: Packages – Access protection – Importing packages – Interfaces – Exception handling: Fundamentals – Exception types – Try and catch – Multiple catch – Nested try – throw – throws – finally – Build in exception.

Unit – IV

Multithread programming: Thread model –Life cycle of thread – Creating thread – Multiple threads – Thread priorities – Synchronization – Inter thread Communication – Suspending, Resuming and Stopping threads – I/O Applets, and other topics.

Unit – V

The Applet Class: Basics – Building applet code – Applet life cycle – Creating an executable applet – Designing a web page – Running the applet – Getting input from the user – Graphics programming: The graphic class – Lines and rectangles – Circles and ellipses – Using control loops in applets – Drawing bar charts.

SUGGESTED READINGS

Text Book

1. **Partrick Naughton (2002).** *Java Hand Book.* New Delhi, McGraw Hill Publishing Company Limited.

References

1. **Herbert Schmidt (2007).** *Java Complete Reference.* New Delhi, Tata McGraw Hill Publishing Limited.
2. **Balagurysamy, E. (2009).** *Programming with Java.* New Delhi, Tata Mcgraw-Hill Publishing Company Limited.
3. **Schildt, (2011).** *Java Completer Reference.* New Delhi, Tata Mcgraw-Hill Publishing Company Limited.
4. **C.Muthu** (2008) Java Programming Essentials, Vijay Ni Code Imprints (P) Ltd**.**

	Semester – III			
	L	T	P	C
16CCP305A INTERNATIONAL FINANCIAL MANAGEMENT	4	-	-	4

Course Objectives

To make the students

1. To make the students understand principles of financial management
2. To enable the students to take investment decisions.
3. To help the students to make financial decisions.
4. To provide the students with the basic knowledge of Dividend decisions.
5. To impart knowledge of working capital and cash management.
6. To provide knowledge on Foreign exchange and its significance in a developing economy

Course Outcomes

Learners should be able to

1. Students will be familiarized with basic concepts of financial management.
2. Students will know the technicalities of making investment decisions.
3. Students will be capable of making financing decisions.
4. Students will be familiarized with concepts of dividend decisions.
5. Students will be capable of making working capitalization and cash management.
6. course includes Balance of Payment, International Monetary System, Foreign Exchange Market, Foreign Exchange Risk and International Financial Market Instruments

Unit - I

IFM- Nature and Scope, IFM and Domestic Financial Management- Balance of payments - Significance- Preparation of BOP Statement - Link between BOP and the Economy.

Unit - II

International Monetary System - Gold Standard - IMF and World Bank Exchange Rate Mechanism - Factors influencing Exchange Rate - Purchasing Power Parity and Interest Rate Parity Theorems.

Unit - III

Foreign Exchange Market Transactions Spot, Forward, Futures, Options and Swaps - Arbitrage and Speculation in Foreign Exchange Market.- Exchange Arithmetic, Spread, Premium and Discount. – Currency Derivatives and Swaps

Unit - IV

Foreign Exchange Exposure - Managing Transaction, Translation and Operating Exposure - Techniques for covering the Foreign Exchange Risk - Internal and External Techniques of Risk.

Unit -V

International Financial Market Instruments - International Equities - ADR and GDR - Foreign Bond and Euro-bond - Short-term and Medium-term instruments.

SUGGESTED READINGS

Text Book

1. **Sharan, V. (2012).** *International Financial Management.* New Delhi, Prentice Hall of India

References

1. **Bhalla V,K**. **(2007)**. *International Financial Management.* New Delhi, Anmal Publications Private Limited.
2. **Apte (2011)**. *International Financial Management.* New Delhi, Tata Mc Graw Hill Public Company Limited.

16CCP305B	CONSUMER BEHAVIOUR	Semester – III L T P C 4 - - 4

COURSE OBJECTIVES:

To make the students

1. To understand the consumer behavior concepts, dimensions used in consumer behaviour research.
2. To recognize the Internal Influencing factors that affect the Consumer Behaviour
3. To identify the external Influencing factors that affect the Consumer Behaviour
4. To conceptualize on the consumer decision making process.
5. To know the application consumer behaviour concepts to access the changing behavior of the customers.
6. To appreciate the personal and environmental factors that influence consumer decisions. To understand the strategic implications of consumer influences, and marketing decisions

COURSEOUTCOMES:

Learners should be able to

1. Understand the importance of Culture, Subculture, Social Class, Reference Groups
2. Understand the importance of Family Influences in Consumer Behaviour.
3. Explore, analyze and compare the core theories of consumer behaviour and its application in both consumer and organizational markets
4. Appraise models of Consumer Behaviour and determine their relevance to particular marketing situations
5. Critique the theoretical perspectives associated with consumer decision making, including recognizing cognitive biases and heuristics
6. Demonstrate capabilities of teamwork, critical thinking, and communication skills related to investment decisions.

Unit – I

Definition, Scope, and Application of Consumer Behavior-Evolution of Consumer Behavior as a field of study and its relationship with Marketing; Behavioral Dimension-Interdisciplinary Nature of Consumer Behavior studies

Unit – II

Consumer Decision Making Process - Buying Motives - Buying Roles, Consumer Decision Making Process, Levels of Consumer Decision Making, Perspectives-Models

Unit – III

Psychological Influence on Consumer Decision Making – Consumers Needs & Motivation, Emotions and Mood, Consumer Involvement; Consumer Learning, Personality, Self-concept and Self-image; Consumer Perception, Risk and Imagery; Consumer Attitude: Belief, Attitude and Intention, Formation-Change-Consumer Communication.

Unit – IV

Sociological Influences – Consumer Groups - Consumer Reference Groups, Family and Life cycle, Social Class and Mobility, Lifestyle Analysis - Culture; Sub-Culture, Cross Culture - Interpersonal Communication and influence, Opinion Leadership.

Unit – V

Diffusion of Motivation - Consumer Orientation - Diffusion Process, Adoption Process, Consumer Innovators, Multiplicative Innovation Adoption (MIA) Model.

SUGGESTED READINGS

Text Books

1. **Schiffman, Leon.G, Kanuk Leslie Lazar, and Kumar Ramesh. S.,(2010).** *Consumer Behavior*. New Delhi, Pearson Education.
2. **Gupta, S.L., and Pal Sumitra (2013).** *Consumer Behaviour: An Indian Perspective Text and Cases*. New Delhi, Sultan Chand and Sons.

References

1. **Peter Paul J., and Olson Jerry C., (2010).** *Consumer Behavior and Marketing Strategy*. New Delhi, McGraw Hill Higher Education.
2. **Solomon, M.R. (2014).** *Consumer Behavior: Buying, Having, and Being*. New Delhi, Prentice Hall of India.
3. **Loudon, David, Bitta Albert Della (2001).** *Consumer Behavior: Concepts and Applications*. New Delhi, Tata McGraw Hill Education Private Limited.

Semester – III

		L	T	P	C
16CCP305C	**LABOUR LEGISATION**	4	-	-	4

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of risk, and insurance a product to mitigate risk, its design and pricing
2. To comprehend on the reforms in Indian insurance industry.
3. To understand the categorization and application of the life and non-life insurance as a risk mitigation instrument,
4. To communicate orally and in written form the understanding of insurance, insurance types, designing and pricing.
5. To offer knowledge on managing industrial relations and the processes, regulations and the authorities regarding industrial relations.
6. To enable students acquire knowledge on fundamental objects and principles of individual laws; understand the significant provisions of the various Acts applicable to Labour Legislation.

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of risk, and insurance a product to mitigate risk, its design and pricing
2. Comprehend on the reforms in Indian insurance industry.
3. Understandthecategorizationandapplicationofthelifeandnon-lifeinsuranceasariskmitigation instrument,
4. Communicate orally and in written form the understanding of insurance, insurance types, designing and pricing.
5. The course encompass Labour Problems, Trade unionism, Industrial Disputes, Management and Personnel Administration and Grievances
6. Course includes Factories Act, Workmen Compensation Act, Wages Act, Gratuity Act, Bonus Act and Industrial Dispute Act

Unit – I

Factories Act 1948 – Definition – Registration of Factories – Health – Safety and Welfare Measures – Provisions relating to Hazardous Process – Working Hours – Holidays – Employment of Young Persons – Women – Annual Leave with Wages – Provision relating to Penalties and its Procedure and Appeal

Unit – II

Workmen Compensation Act 1923 – Definition – Employer's Liability for Compensation – Arising out of and in the course of employment – Amount of Compensation – Notice and Claims – Obligations and Rights of Employers.

Unit – III

Payment of Wages Act 1936 – Application of the Act – Definitions – Rules for Payment of Wages – Deductions from Wages – Enforcement of the Act. Minimum Wages Act 1948 – Object of the Act – Definitions – Fixation and Revision of Wages – Procedure – Advisory Board and Central Advisory Board – Safeguards in Payment of Minimum Wages – Enforcement of the Act – Offences and Penalties

Payment of Gratuity Act 1972 – Definitions – Payment of Gratuity – Forfeiture of Gratuity – Nomination – Determination and Recovery of the amount of Gratuity – Obligations and Rights of Employers and Employees

Unit – IV

Payment of Bonus Act 1965 – Definition – Eligibility – Disqualification – Determination of Bonus – Computation of Gross Profit – Determination of Available Surplus – Allocable Surplus – Amount of Bonus – Payment of Bonus linked with Production or Productivity

Unit - V

Industrial Dispute Act, 1947 – Definition – Types of Disputes – Grievance Settlement Authorities – Procedure for Settlement of Industrial Disputes – Works Committee – Conciliation Officer – Court of Enquiry – Labour Court – Industrial Tribunal – National Tribunal – Award and Settlement – Strikes and Lockouts – Prohibition of Strikes and Lockouts – Illegal Strikes and Lockouts – Layoff and Retrenchment – Closure

SUGGESTED READINGS

Text Book

1. **Kapoor, N.D.** *Hand Book on Industrial Law.* New Delhi, Sultan Chand and Sons.

Reference Books

1. **Verma, M.M. and Agarwal, R.K.** *Mercantile Law and Industrial Law.* New Delhi, Forward Book Depot Educational Publishers.
2. **Das, S.K. and Gupta.** *Commercial Law and Industrial Law.* New Delhi, Sterling Publishers Private Limited.
3. **Davar, R**. *Mercantile Law including Industrial Law.* Progressive Corporation

16CCP311	**PRACTICAL 5 -JAVA**	**Semester – III** **L T P C** **- - 4 2**

COURSE OBJECTIVES:

To make the students

1. To understand and write programs the JAVA programming language
2. To Use standard and third-party Java's API's when writing applications.
3. To test a Java application of medium complexity, consisting of multiple classes.
4. To understand Java-based software code of medium-to-high complexity by applying it
5. To Understand the basic approaches to the design of software applications.
6. To understand the perform string operations

COURSEOUTCOMES:

Learners should be able to

1. Implement Object Oriented Programming Concepts
2. Use and create packages and interfaces in a Java program
3. Use graphical user interface in Java programs and handle security implementations in Java
4. Create Applets; Implement exception handling in Java;
   implement Multithreading and use Input/output Streams
5. Exhibit the multiplication tables by multithreading
6. Exhibit communication skills to communicate the output derived from the program

1. Write a program to find the sum of series 1+X+X^2+X^3+…….
2. Write a program to find prime or not.
3. Write a program to find average of five numbers.
4. Define a class for employee with name and data of appointment create employee objects and sort them as per their date of appointment.
5. Write a program to find factorial of number using recursion.
6. Write a program to find simple interest getting values from keyboard.

7. Write a program to find maximum of N numbers.
8. Write a program to find maximum and sum of an array.
9. Write a program to perform string operations.
10. Write a program to accept more strings and arrange them in alphabetical order.
11. Write a program to create a window and draw cross lines.
12. Write a program to create an applet and draw the shape.
13. Write a program to create a window with a background color and display the message.
14. Write a program for multiplication tables by multithreading.
15. Write a program to create an exception for mark out of bounds. If mark is greater than 100 throw an exception.

16CCP312	PRACTICAL 6 -SPSS	Semester – III L T P C - - 4 2

COURSE OBJECTIVES:

To make the students

1. To understand the Importance of SPSS and the features for entering the data according to the variable type.
2. To understand and apply the descriptive analytical tools
3. To know the univariate tools and its application
4. To comprehend the application of Bivariate analysis
5. To understand and compute the multivariate analysis using the package.
6. To understand the correlation analysis

COURSEOUTCOMES:

Learners should be able to

1. Create datasheet and enter the data
2. Compute descriptive statistics using the package and graphically represent the data.
3. Perform univariate and bivariate analysis in the software package.
4. Perform multivariate analysis in the software package.
5. Perform the correlation analysis
6. Demonstrate capabilities of problem-solving, critical thinking, and communication skills to infer the output.

Workout the following statistics:

1. Descriptive Statistics
2. Chi-square
3. Independent Sample ‘t’ Test
4. Paired ‘t’ Test
5. Analysis of Variance (ANOVA)
6. Karl Pearson Correlation
7. Spearman Rank Correlation

8. Regression
9. Factor Analysis
10. Kolmogorov and Smirnov test
11. Mann Whitney U Test
12. Wilcoxon Test
13. Friedman Rank Test
14. Kruskal Wallis H-Test
15. Garett Ranking

16CCP401	CORPORATE ADMINISTRATION AND SECRETARIAL PRACTICE	Semester – IV L T P C 4 - - 4

COURSE OBJECTIVES:

To make the students

1. To Understand the Concept of auditing, corporate governance
2. To learn the audit techniques, corporate governance
3. To apply the best auditing process as lifelong practice,
4. To communicate orally and in written form the auditing concept and techniques, Corporate governance
5. To be familiar with the standards and laws pertaining to the auditing, Corporate Governance
6. To know the information related to global reporting initiatives.

COURSE OUTCOMES:

Learners should be able to

1. Comprehend on the Concept of auditing, corporate governance
2. Recall audit techniques, corporate governance practices.
3. Apply lifelong the key learning of best auditing process, Corporate governance practices
4. Communicate orally and in written form the auditing concept and techniques, Corporate governance concepts and practices in business.
5. Familiar with the standards and laws pertaining to the auditing, Corporate Governance.

Unit – I

Company Administration – Hierarchy – Share Holders – Membership – Termination – Rights and Duties – Board of Directors – Qualification – Appointment – Powers – Duties – Other Managerial Personnel

Unit – II

Company Secretary – Meaning – Types – Qualities – Appointment – Dismissal – Power – Rights – Duties and Liabilities – Role of a Secretary in the Administration of a Company

Unit – III

Meeting – Law Governing Meetings – Requisites of a Valid Meeting – Chairman of a Meeting – Appointment – Duties – Powers – Notice – Agenda – Minutes – Quorum – Motion – Resolution – Methods of Voting

Unit – IV

Kinds of Company Meetings – Board of Directors Meeting – Share holder Meeting – Statutory Meeting – Annual General Meeting – Extraordinary General Meeting – Duties of a Company Secretary relating to the Meetings

Unit – V

Drafting of Correspondence relating to the Meetings – Drafting of Notices – Agenda and Minutes of the Meetings of Shareholders and Directors – Drafting of Chairman's Speech – Annual Report and Auditors Report

SUGGESTED READINGS

Text Book

1. **Kuchhal, M.C. (2008)**. *Secretarial Practice.* New Delhi, Vikas Publishing House Private Limited.

References

1. **Kapoor, N.D. (2015)**. *Elements of Company Law.* New Delhi, Sultan Chand and Sons.
2. **Ashok K. Bagrial (2007)**. *Company Law.* New Delhi, Vikas Publishing House Private Limited.

Semester – IV

16CCP402 ENTREPRENEURSHIP AND SMALL BUSINESS MANAGEMENT

L	T	P	C
3	-	-	3

COURSE OBJECTIVES:

1. To make the students
2. To Understand the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
3. To communicate orally and in written form the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
4. To apply the understanding of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government in lifelong practice.
5. To initiate the required skills for entrepreneurial development.
6. To help students understand the process of establishing and developing an enterprise

COURSE OUTCOMES:

Learners should be able to

1. Understand the Concept of entrepreneurship, entities of business, creating ideas, mobilizing funds and support from government.
2. Communicate orally and in written form the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
3. Apply the understanding of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government in lifelong practice.
4. course include Entrepreneur and Entrepreneurship, Market and Technical Analysis, Diversification, Sub-contracting, Incentives and Subsidies

Unit – I

Small Business Enterprise - Small Business framework - Concept and Definition-Nature and Characteristics - Relationship between Small and Large Business - Scope and

Types of Small Business - Rationale and Objectives - Small Business as seed bed of Entrepreneurship

Unit –II

Entrepreneurship - Entrepreneur and Entrepreneurship Concept - Distinction between Entrepreneur and Manager - Entrepreneurial Competency - Functions - Types (including women and rural).

Unit – III

Establishing a Small Enterprise - Learning the important steps for starting a Business - Project Identification and Selecting the Product - Generation and Screening the Project Ideas - Market Analysis - Technical Analysis, Financial Analysis (up to cost of production) Project Formulation - Assessment of Project Feasibility - Preparation of Project Report - Dealing with basic startup problems.

Unit –IV

Growth Strategy - Growth strategy for Small Business - Need for Growth - Types of Growth Strategy - Expansion - Diversification-Sub contracting.

Unit-V

Institutional Support - Sources of Finance - Financial Support to Small Business-Various Incentives and Subsidies - Central and State Government Schemes

SUGGESTED READINGS

Text Books

1. **Khanka, S. S**, **(2012)**. *Entrepreneurial Development.* New Delhi, Sultan Chand and Publications.
2. **Shaprio Alan, C. (2009).** *Multinational Financial Management.* New Delhi, Prentice Hall of India.

References

1. **Gupta, C.B., and Srinivasan, N.P. (2014)**. *Entrepreneurial Development.* New Delhi, Sultan Chand and Sons.
2. **Suresh Jayasree (2010).** *Entrepreneurial Development.* Chennai, Margham Publications.

		Semester – IV			
		L	T	P	C
16CCP491	**PROJECT AND VIVA-VOCE**	-	-	23	8

COURSE OBJECTIVES:

To make the students

1. To identify an issue to be analyzed and to be solved in a business setup or real time scenario using primary or secondary data collection.
2. To understand the application of Research processin the area of accounting/Finance/Marketing/HR/International business etc.
3. To analyze the data and critically evaluate the result and formulate the suggestion for the problem identified.
4. To apply the theoretical and practical learning of doing research into lifelong practice.
5. To Communicate in oral and written form and prepare report
6. To Work in team and exhibit leadership skills

COURSE OUTCOMES:

Learners should be able to

1. Identify an issue to be analyzed and to be solved in a business setup or real time scenario using primary or secondary data collection.
2. Understand the application of Research processin the area of accounting/Finance/Marketing/HR/International business etc.
3. Analyze the data and critically evaluate the result and formulate the suggestion for the problem identified.
4. Apply the theoretical and practical learning of doing research into lifelong practice.
5. Communicate in oral and written form and prepare report Work in team and exhibit leadership skills
6. Work in team and exhibit leadership skills

The students should select a problem in Accounting, Finance, Marketing or any other arears related to commerce.

Report should contain

- Introduction
    - Introduction about the industry
    - Introduction about the Company
    - Review of literature – Minimum 10 papers from referred journal
    - Need for the Study
    - Objectives
- Research Methodology
    - Research Design
    - Sampling Design
    - Sources of Data Collection
    - Tools used for analysis
    - Limitation
- Data analysis and interpretation
- Findings and Suggestions
- Conclusion
- Bibliography (APA format)

கற்பகம்உயர்கல்விகலைக்கழகம்

தமிழ்த்துறை

பகுதி - I தமிழ்ப்பாடத்திட்டம் (2016 - 2017)

இரண்டாம்பருவம்

(இளநிலை அறிவியல் பட்டவகுப்புகளுக்குரியது)

(For I-UG Science Degree Classes) 16LSU101

பாடத்திட்டப்பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

- இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக்குரியஆய்வுமனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
- தமிழின்வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்' ; 'இணையதமிழ்' குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைமேம்பாடு.
- வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
- சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
- மொழிபெயப்புத்துறைசார்ந்தவேலைவாய்புத்திறன்பெற்றிருத்தல்

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தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
இரண்டு	II	4	3	40 / 60	100	4

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016-2017)

பகுதி – I, தமிழ் | பருவம் I

16LAU101 : தமிழ் முதல் தாள் 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

அலகு – I : இக்கால இலக்கியம்: (10 மணிநேரம்)

கல்வி : மகாகவி பாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணி தேசிக விநாயகம் பிள்ளை – ஒற்றுமையே உயிர்நிலை.
மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் –மலையாளக் காற்று.
சூழலியல் : கவிஞர் வைதீஸ்வரன் - விரல் மீட்டிய மழை.
பெண்ணியம் : கவிஞர் சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை.

அலகு – II : அற இலக்கியம்: (10 மணிநேரம்)

கொன்றை வேந்தன்: 1-50 பாடல்கள்

திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்

பழமொழி நானூறு: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: (10 மணிநேரம்)

மூவருலா: 1-26 கண்ணிகள்

திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்

கலிங்கத்துப் பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV : கட்டுரை: (10 மணிநேரம்)

1. **உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்**
2. **கட்டிடக்கலை** - அ. இராசமாணிக்கனார்
3. **வாழ்க்கை** - இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: (8 மணிநேரம்)

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

16CAU101 PROGRAMMING FUNDAMENTALS USING C / C++ 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int.: **40** Ext.: **60** Total: **100**

Course Objectives

Enable the student

- To impart adequate knowledge on the need of programming languages and problem-solving techniques.
- To develop programming skills using the fundamentals and basics of C Language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To study the concepts of Call by value and call be reference.
- To learn file organization and the usage of file systems.
- To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Understand data types and control structures in programming languages.
2. Solve the memory access problems by using pointers
3. Understand about the dynamic memory allocation using pointers which is essential for utilizing memory
4. Understand about the code reusability with the help of user defined functions.
5. Apply pointer concepts in C++
6. Use the concepts of preprocessor directives and macros.

Unit-I

Introduction to C and C++: History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++.

Data Types, Variables, Constants, Operators and Basic I/O: Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putchar etc), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.h etc).

Expressions, Conditional Statements and Iterative Statements: Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

Unit-II

Functions and Arrays: Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.
Creating and Using One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays.

Unit-III

Derived Data Types (Structures and Unions): Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members.
Pointers and References in C++: Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, using references as function arguments and function return values

Unit-IV
Memory Allocation in C++: Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation.
File I/O, Preprocessor Directives: Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros.

Unit-V

Using Classes in C++: Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors, Constructor Overloading, Function overloading in classes, Class Variables &Functions, Objects as parameters, Specifying the Protected and Private access, Copy Constructors, Overview of Template classes and their use.

Overview of Function Overloading and Operator Overloading: Need of Overloading functions and operators, Overloading functions by number and type of arguments, Looking at an operator as a function call, Overloading Operators (including assignment operators, unary operators)

Inheritance, Polymorphism and Exception Handling: Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism (Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch and throw, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowing exceptions.

Suggested Readings

1. Andrew Koenig, Barbara, E. Moo, (2000). *ACCelerated C++*. Addison-Wesley.
2. Balaguruswamy,E.,(2008). *Object Oriented Programming with C++*. Tata McGraw-Hill Education.
3. Bjarne Stroustroup, (2014). *Programming -- Principles and Practice using C++*. (2nd ed.). Addison-Wesley.
4. Bjarne Stroustrup, (2013). *The C++ Programming Language*, (4th ed.). Addison-Wesley.
5. Harry, H. Chaudhary,(2014). *Head First C++ Programming*: *The Definitive Beginner's Guide.* CreateSpace Independent Publishing Platform.
6. Herbtz Schildt, (2012). *C++: The Complete Reference.* (5th ed.). McGraw-Hill Osborne Media
7. John R. Hubbard, (2000). *Programming with C++*. (2nd ed.). Schaum's Series.
8. Paul Deitel, Harvey Deitel, (2011).*C++ How to Program.* (8th ed.). Prentice Hall.
9. Scott Meyers, (2005). *Effective C++*, (3rd ed.), Addison-Wesley.
10. Stanley B. Lippman, JoseeLajoie, Barbara E. Moo,(2012). *C++ Primer*. (5th ed.). Addison-Wesley.
11. Walter Savitch, (2007). *Problem Solving with C+.*, (7th ed.). Pearson Education.

Websites

1. http://www.cs.cf.ac.uk/Dave/C/CE.html
2. http://www2.its.strath.ac.uk/courses/c/
3. http://www.iu.hio.no/~mark/CTutorial/CTutorial.html
4. http://www.cplusplus.com/doc/tutorial/
5. www.cplusplus.com/
6. www.cppreference.com/

Semester – I

16CAU102 **COMPUTER SYSTEM ARCHITECTURE** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To discuss the basic concepts of Logic gates, multiplexers and de multiplexers.
- To enable the students to gain knowledge on the architecture of modern computer.
- To understand how computer stores positive and negative numbers and to perform arithmetic operation of positive and negative numbers.
- Explain different types of addressing modes.
- To learn CISC and RISC architecture.
- To summarize the types of memory and I/O channels.

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Students will acquire a basic knowledge about computer system architecture, arithmetic, digital circuits and the low - level programming skills.
2. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
3. Understand the inner workings and performance capabilities of microprocessors.
4. Understand the concept of registers and Instruction set.
5. Know the addressing modes and instruction format of various microprocessors.
6. Understand memory and I/O channels.

Unit -I

Introduction: Logic gates, Boolean algebra, circuit simplification, combinational circuits: Adders and Subtractors –Multiplexers and De multiplexers – Encoders and Decoders- sequential circuits: Flip Flop's, registers, counters and memory units.

Unit -II

Data Representation and Basic Computer Arithmetic: Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

Unit–III

Basic Computer Organization and Design: Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

Unit-IV

Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

Unit –V

Memory and Input-Output Organization: Cache memory, Associative memory, mapping Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels

Suggested readings

1. Carl Hamacher,(2012). *Computer Organization*, (5th ed.), McGrawHill.
2. Dos Reis, A. J.,(2009). *Assembly Language and Computer Architecture using C++ and JAVA*, Course Technology.
3. Mano, M.M.,(2013). *Digital Design*, Pearson Education Asia
4. Stallings, W., (2010). *Computer Organization and Architecture Designing for Performance*, (8th ed.), Prentice Hall of India.

Semester – I

16CAU103 INTRODUCTION TO INFORMATION TECHNOLOGY 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To identify types of computers, how they process information and how individual computers interact with other computing systems and devices.
- To identify the function of computer hardware components.
- To identify the factors that goes into an individual or organizational decision on how to purchase computer equipment.
- To identify how to maintain computer equipment and solve common problems relating to computer hardware.
- To identify how software and hardware work together to perform computing tasks and how software is developed and upgraded.
- To identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Understand the meaning and basic components of a computer system,
2. Define and distinguish Hardware and Software components of computer system,
3. Explain and identify different computing machines during the evolution of computer system,
4. Gain knowledge about five generations of computer system,
5. Explain the functions of a computer,
6. Identify and discuss the functional units of a computer system,

Unit- I

Introduction to Computers-Classification of Digital Computer systems-Anatomy of a digital computer-Computer architecture - Data and Information-Introduction - Types of data -Data processing using a computer - Desktop computer - Acquisition of numbers and textual data-Introduction-input units-Internal representation of numeric data-representation of characters in Computers-Error detecting codes.

Unit-II

Acquiring graphical data-Introduction-Acquisition of textual data and pictures-Storage format for pictures-Image compression fundamentals-Image acquisition with digital camera-Acquiring audio data-Acquisition of video processing textual and multimedia data.

Unit-III
Data storage-Memory cell-physical devices used as memory cells-RAM-ROM-Secondary memory-I/O devices-CPU-Data Organization.

Unit-IV
Computer software and Software Development: Introduction to Computer Software-Operating systems-Functions of an OS-Classification of OS-Programming Languages-Compilers and Interpreters-General software features and trends.

Unit-V
Computers and Communication-Internet Applications-Introduction-E-mail-Information browsing service-world wide web-Information retrieval from worldwide web-other facilities provided by browser-Audio-Graphics-Animation and Video on the Internet-Business Information Systems.

Suggested readings

1. Alexis Leon and Mathews Leon. (1999). "***Fundamentals of Information Technology***." (1st ed.).Leon Tech World.
2. Rajaraman,V.,(2003). "***Introduction to Information Technology***". (1st ed.). Prentice Hall of India. Delhi.
3. Anurag Jain,(2002). "***Information Technology***". (1st ed.) Excel Books.

Websites

1. www.tesu.edu/watson/IT
2. www.bcanotes.com/It.html
3. ww.amazon.in/Fundamentals of IT

Semester – I

16CAU111 PROGRAMMING FUNDAMENTALS USING C / C++ PRACTICAL **3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To impart adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basics of C Language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To study the concepts of Call by value and call be reference.
- To learn file organization and the usage of file systems.
- To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Develop programs using the basic elements like control statements, Arrays and Strings .
2. Solve the memory access problems by using pointers
3. Learn the basics of file handling mechanism that is essential for understanding the concepts in database management systems.
4. Understand the uses of preprocessors and various header file directives.
5. Use the characteristics of an object-oriented programming language in a program.
6. Implement File handling mechanisms.

List of Programs:

1. Write a program to print the sum and product of digits of an integer.
2. Write a program to reverse a number.
3. Write a program to compute the sum of the first n terms of the following series S = 1+1/2+...
4. Write a program to compute the sum of the first n terms of the following series S=1-2+3-4+5..
5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7. Write a program to compute the factors of a given number.

8. Write a macro that swaps two numbers. Write a program to use it.
9. Write a program to print a triangle of stars as follows (take number of lines from user):

```
*
***
*****
*******
*********
```

10. Write a program to perform following actions on an array entered by the user:
    i) Print the even-valued elements
    ii) Print the odd-valued elements
    iii) Calculate and print the sum and average of the elements of array
    iv) Print the maximum and minimum element of array
    v) Remove the duplicates from the array
    vi) Print the array in reverse order
11. Write a program that swaps two numbers using pointers.
12. Write a program in which a function is passed address of two variables and then alter its contents.
13. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
14. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.
15. Write a program to calculate Factorial of a number (i)using recursion, (ii) using iteration

Semester – I

16CAU112 COMPUTER SYSTEM ARCHITECTURE (PRACTICAL) 3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

(Any 8 Experiments)

Course Objectives

Enable the student

- To discuss the basic concepts of Logic gates, multiplexers and de multiplexers.
- To enable the students to gain knowledge on the architecture of modern computer.
- To understand how computer stores positive and negative numbers and to perform arithmetic operation of positive and negative numbers.
- Explain different types of addressing modes.
- To learn CISC and RISC architecture.
- To summarize the types of memory and I/O channels.

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Students will acquire a basic knowledge about computer system architecture, arithmetic, digital circuits and the low - level programming skills.
2. Understand the inner workings and performance capabilities of advanced microprocessors.
3. analyze the use of encoder and decoder.
4. Understand the working of half adder and full adder.
5. Design and analyze memory, I/O devices and cache structures for processor.
6. Evaluate the performance of computer systems

List of Programs:

1. Verification of Logic Gates
2. Code converters
3. Realization of Multiplexer using basic gates
4. Encoder and Decoder
5. Realization Half and Full adders
6. Realization of Subtractor
7. Realization of Parity generator
8. Flip-Flop Circuits
9. Digital to analog Converters
10. Demonstrate a Basic Arithmetic Computing operations

Semester – I

16CAU113 INTRODUCTION TO INFROMATION TECHNOLOGY PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- Create a document in Microsoft Word with formatting options.
- Add a graphic to a document.
- Write functions in Microsoft Excel to perform basic calculations and to convert number to text and text to number.
- Indicate the names and functions of the Excel interface components.
- Construct formulas, including the use of built-in functions, and relative and absolute references.
- Create and modify charts.

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Modify text using various formatting options from the editing tools under the Home tab
2. Demonstrate the mechanics and uses of Word tables to organize and present data.
3. Demonstrate working knowledge of using Word's themes and clip art to create a variety of visual effects.
4. Create and design a spreadsheet for general office use.
5. Demonstrate the basic mechanics and navigation of an Excel spreadsheet.
6. Demonstrate formatting techniques and presentation styles.

List of Programs:

1. Create a set of slides with sound and animation using power point and to select various styles of slides from slide template.
2. Prepare an organization chart for a company and a college using power point.
3. To perform comparative study of your UG degree subject marks and create a various styles of graph using excel.
4. To perform student and hostel fee particulars in a worksheet. Analysis the results using excel.
5. To create a word document for salary preparation and access the calculation, graph from excel using OLE.
6. Apply the mail merge concept using word.
7. Image compression using Java.
8. Animation using Java.
9. Create simple accounts using Tally.
10. Create balance sheet using Tally.

Semester – I

16VAE101 **ENVIRONMENTAL SCIENCE** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **100** Total: **100**

Course Objectives

Enable the student

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To encourage to learn ecosystems and biodiversity.
- To learn environment pollution and control measures of pollution.
- To create system concepts and methodologies and analyze interactions.

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Unit-I

Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

Unit- II

Natural Resources: Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources : Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fire works.

Semester – I

16VAE101 ENVIRONMENTAL SCIENCE 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **100** Total: **100**

Unit- III

Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit- IV

Environmental Pollution: Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution , Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit-V

Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

Suggested Readings

1. Tripathy.S.N. and Sunakar Panda. (2004). Fundamentals of Environmental Studies; 2^{nd} Edition, Vrianda Publications Private Ltd., New Delhi.
2. Arvind Kumar,(2004). A Textbook of Environmental Science; APH Publishing Corporation, New Delhi.
3. Verma, P.S., Agarwal, V.K.,(2001). Environmental Biology (Principles of Ecology); S.Chand and Company Ltd., New Delhi.

4. Anubha Kaushik, Kaushik, C.P. ,(2004). Perspectives in Environmental Studies, New Age International Pvt. Ltd. Publications, New Delhi.
5. Singh, M.P., B.S. Singh and Soma S. Dey, (2004). Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.
6. Daniel B.Botkin and Edward A. Keller, (1995). Environmental Science, John Wiley and Sons, Inc., New York.
7. Uberoi, N.K., (2005). Environmental Studies, Excel Books Publications, New Delhi, India.

கற்பகம்உயர்கல்விகலைக்கழகம்

தமிழ்த்துறை

பகுதி - I தமிழ்ப்பாடத்திட்டம் (2016 - 2017)

இரண்டாம்பருவம்

(இளநிலை அறிவியல் பட்டவகுப்புகளுக்குரியது)

(For I-UG Science Degree Classes) 16LSU201

பாடத்திட்டப்பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

- இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக்குரியஆய்வுமனப்பான்மை யுடன், இலக்கியங்களைஅணுகுதல்.
- தமிழின்வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்' ; 'இணையதமிழ்' குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைமேம்பாடு.
- வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
- சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
- மொழிபெயப்புத்துறைசார்ந்தவேலைவாய்புத்திறன்பெற்றிருத்தல்

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தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
இரண்டு	II	4	3	40 / 60	100	4

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)

பகுதி – I, தமிழ் பருவம் II

16LAU201 : **தமிழ்** இரண்டாம் **தாள்** 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது**)**

அலகு – I : பக்தி **இலக்கியம் (10 மணிநேரம்)**

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. **சைவம் -** பெரியபுராணம் - திருமூலநாயனார் புராணம்.
2. **வைணவம் -** பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

அலகு – II : சங்க இலக்கியம் : (15 மணிநேரம்)

சங்க இலக்கியங்கள் அறிமுகம்

அ**). எட்டுத்தொகை**

நற்றிணை : பிரசம் கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகா°ச்சிறப்பு –

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : சுடா°தொடீ கேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு : அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி - 48

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள் – 'சிறுதினை மலரொடு' என்பதிலிருந்துதொடங்கி, 'அறிந்தவாறே' என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – 'தெய்வம் சான்ற' என்பதிலிருந்து தொடங்கி, 'நல்குமதி' என்பது வரையிலான தொடர்கள்: 286-295.

அலகு - III : காப்பியம் (6 மணிநேரம்)

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: **(21-29) –** கண்ணகியின் சிறப்பு:

'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி,

'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: **(207-234) -** சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: **(482-485) -** செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

அலகு – IV : சிறுகதை (10 மணிநேரம்)

1. **குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்**
2. காட்டில் ஒரு மான் - அம்பை
3. நாற்காலி – கி.ராஜநாராயணன்
4. **நகரம் – சுஜாதா**

அலகு- V : மொழிப்பயிற்சி **(7 மணிநேரம்)**

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Semester – II

16CAU201 PROGRAMMING IN JAVA 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To understand the fundamental of Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)

1. Student will obtain knowledge of the structure and model of the Java programming language.
2. How to use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

Unit-I

Introduction to Java: Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods),

Unit-II

Arrays, Strings and I/O: Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining & Using Classes, Controlling access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

Unit-III

Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata: Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

Unit-IV

Exception Handling, Threading, Networking and Database Connectivity: Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

Unit-V

Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, textfields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Suggested readings:

1. Ken Arnold, James Gosling, David Homes, (2005). The Java Programming Language, 4th Edition.
2. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley,(2014). The Java Language Specification, Java SE, 8th edition (Java Series)", Published by Addison Wesley.
3. Joshua Bloch, (2008)."Effective Java" 2nd edition,Publisher: Addison-Wesley.
4. Cay S. Horstmann, GaryCornell,(2012). "Core Java 2 Volume 1 ,9th Edition,Printice Hall.

5. Cay S. Horstmann, Gary Cornell, (2013). "Core Java 2 Volume 2 - Advanced Features)", 9th edition, Printice Hall.
6. Bruce Eckel,(2002). "Thinking in Java", 3rd Edition, PHI.
7. Balaguruswamy,E.,(2009). "Programming with Java", 4th Edition, McGraw Hill.
8. Paul Deitel, Harvey Deitel,(2011). "Java: How to Program", 10th Edition, Prentice Hall.
9. Bert Bates, Kathy Sierra, (2005). "Head First Java", Orielly Media Inc. 2nd Edition.
10. David J. Eck, (2009). "Introduction to Programming Using Java", Published by Create Space Independent Publishing Platform.
11. John R. Hubbard,(2004). "Programming with JAVA", Schaum's Series, 2nd Edition.

Websites

1. java.sun.com/docs/books/tutorial/
2. www.en.wikipedia.org/wiki/Java
3. www.java.net/

Semester – II

16CAU202 **DISCRETE STRUCTURES** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To develop logical thinking and its application to computer science
- To write and evaluate a proof or outline the basic structure of and give examples of each proof technique described
- To know the concepts of sets and functions.
- to transform a given problem into a combination of several simpler statements and arrive at a solution to the problem and be able to prove it logically
- To solve problems with the help of tools of mathematical analysis.
- To reason and ability to present a coherent and mathematically accurate argument.

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Familiar with elementary algebraic set theory.
2. Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.
3. Understand the basic principles of sets and operations in sets.
4. Demonstrate an understanding of relations and functions and be able to determine their properties.
5. Demonstrate different traversal methods for trees and graphs.
6. Initiate to knowledge from inference theory.

Unit-I

Sets: Introduction, Sets , finite and infinite sets, uncountably infinite sets, functions, relations, properties of binary relations, closure, partial ordering relations, counting , Pigeonhole principle, Permutation and Combination, Mathematical Induction, Principle of inclusion and Exclusion.

Unit-II

Growth of Functions: Asymptotic Notations, Summation formulas and properties, Bounding Summations, approximation by Integrals

Unit-III

Recurrences: Recurrence relations, generating functions, linear recurrence relations with constant coefficients and their solution, Substitution Method, recurrence trees, Master theorem.

Unit-IV

Graph Theory : Basic terminology, models and types, multigraphs and weighted graphs, graph representation, graph isomorphism, connectivity, Euler and Hamiltonian Paths and circuits, Planar graphs, graph coloring, trees, basic terminology and properties of trees, introduction to Spanning trees

Unit-V

Prepositional Logic: Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory.

Suggested readings

1. Kenneth Rosen, (2006). Discrete Mathematics and its Applications, 6th edition, McGraw Hill, New Delhi.

2. Tremblay,J .P., and Manohar, R., (1997). Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Company, New Delhi.

3. Coremen, T.H., Leiserson, C.E., Rivest, R. L., (2009). Introduction to algorithms, 3rd edition, Prentice Hall on India.

4. Albertson,M. O., and Hutchinson, J. P.,(1988). Discrete Mathematics with Algorithms, John wiley Publication.

5. Hein, J. L., (2009). Discrete Structures, Logic, and Computability, 3rd edition, Jones and Bartlett Publishers.

6. Hunter, D.J., (2008). Essentials of Discrete Mathematics, Jones and Bartlett Publishers.

Semester – II

16CAU203 SCRIPT LANGUAGE 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To study the basics of HTML
- To study the basics of Java Script
- To study the basics of Cascading style sheets and DHTML
- To study the basics of XML
- To understand the principles of creating an effective web page.
- To develop skills in analyzing the usability of a website.

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Independently understand basic of web design languages.
2. To develop a website
3. Enumerate the architecture of website.
4. Gain the skills and project-based experience needed for entry into web design and development careers.
5. Develop awareness and appreciation of the many ways that people access the web, and will be able to create standards-based websites that can be accessed by the full spectrum of web access technologies
6. Select and apply markup languages for processing, identifying, and presenting of information in web

Unit- I

HTML: Introduction - SGML - Outline of HTML Document - Head section-Body section - HTML forms.

Unit-II

Introduction - Language elements - Object of java script - Other objects - Arrays.

Unit- III

DHTML: Cascading style sheets - DHTML Document object model and collections - Event Handling - Filters and Transitions - Data binding

Unit- IV

XML: Syntax of XML Document - XML Attributes - XML Validation - XML DTD - XML -DTD Elements - DTD Attributes - DTD Entities - DTD Validation

Unit-V

PHP: Introduction to PHP - Syntax - Saving PHP files - Variables - Constants - If and Switch Statements - Operators - Loops and Strings.

Suggested readings

1. Gopalan,N.P.,.Akilandeswari,J., (2007). Web Technology: A Developer's Perspective , 2nd Edition , Prentice Hall of India. New Delhi. [Unit I – II]
2. Ivan Bayross.,(2009). Web Enabled Commercial Application Development using HTML, DHTML ,JavaScript, Perl CGI 2nd Edition, BPB Publications, New Delhi. [Unit III – V]
3. Ashok Lodha.(2007). Guide to PHP, 1st Edition. LawPoint, Kolkata.
4. Dave W.Mercer, Allan Kent, Steven D.Nowicki, Davd Mercer, Dan Squie, Wankyu Choi.(2006). Beginning PHP5, Wiley India (P) Ltd. New Delhi.
5. Tim Converse ,Joyce Park, Clark Morgan.,(2006). PHP5 & MySQL Bible, 1st Edition, John Wily, India.

Websites

1. http://www.mvps.org/scripting/languages
2. Http://en.wikipedia.org/wiki/script_language
3. http://www.mvps.org/scripting/languages

Semester – II

16CAU211 PROGRAMMING IN JAVA PRACTICAL 3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To implement the Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Student will obtain knowledge of the structure and model of the Java programming language.
2. How to use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

List of Programs:

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of .lenth in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard

7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(, setLength(), append(), insert(), concat()and equals().
9. Write a program to create a ―distance‖ class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
10. Modify the ―distance‖ class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)
12. Write a program to show the difference between public and private aCSUess specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
13. Write a program to show the use of static functions and to pass variable length arguments in a function.
14. Write a program to demonstrate the concept of boxing and unboxing.
15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
16. Write a program to create a multilevel package and also creates a reusable class to generate FibonaCSUi series, where the function to generate fibonacii series is given in a different file belonging to the same package.

17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
18. Write a program ―DivideByZero‖ that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
21. Write a program to demonstrate priorities among multiple threads.
22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
23. Write a program to create URL object, create a URLConnection using the openConnection() method and then use it examine the different components of the URLand content.
24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
25. Write a program that creates a banner and then creates a thread to scrolls the message in the banner from left to right across the applet‘s window.
26. Write a program to get the URL/location of code (i.e. java code) and document(i.e. html file).
27. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
28. Write a program to demonstrate different keyboard handling events.

29. Write a program to generate a window without an applet window using main() function.
30. Write a program to demonstrate the use of push buttons.

Semester – II

16CAU212 **DISCRETE STRUCTURES PRACTICAL** **3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To develop logical thinking and its application to computer science
- To write and evaluate a proof or outline the basic structure of and give examples of each proof technique described
- To know the concepts of sets and functions.
- to transform a given problem into a combination of several simpler statements and arrive at a solution to the problem and be able to prove it logically
- To solve problems with the help of tools of mathematical analysis.
- To reason and ability to present a coherent and mathematically accurate argument.

Course Outcomes(COs)

Upon successful completion of the course, the student will be able to:

1. Familiar with elementary algebraic set theory.
2. Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.
3. Understand the basic principles of sets and operations in sets.
4. Demonstrate an understanding of relations and functions and be able to determine their properties.
5. Demonstrate different traversal methods for trees and graphs.
6. Initiate to knowledge from inference theory.

List of Programs:

1. Write a C Program to find the number of subsets of a set contains n elements.
2. Write a C Program to find transitive closure of a relation.
3. Write a C Program to prove
   $1/ (1*2) + 1/(2*3) \ldots\ldots\ldots+1/(n(n+1)) = n/(n+1)$

4. Write a C Program to to perform the sum = 1+ (1+2) + (1+2+3) + … + (1+2…+n)

5. Write a C program to print Fibonacci series till Nth term using recursion

6. Write a C program in c to calculate factorial of a number using recursion

7. Write a C Program to find a minimum spanning tree using Prim’s algorithm

8. Write a C program to find the shortest path with the lower cost in a graph using Dijkstra's Algorithm

9. Write a C Program to construct the truth table for the following formula.
   (i) $P \wedge Q \wedge \urcorner R$ (ii) $P \wedge \urcorner Q \wedge R$ (iii) $P \wedge Q \wedge \urcorner R$

10. Write a C Program to prove De – Morgan’s law.

Semester – II

16CAU213 SCRIPT LANGUAGE PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To understand the principles of creating an effective web page.
- To develop skills in analyzing the usability of a website.
- To learn the language of HTML and JavaScript.
- To learn to design web pages using Forms, Tables, Frames, TextBox
- To study the basics of JavaScript
- To learn to validate input in web pages using JavaScript

Course Outcomes (COs)

Upon successful completion of the course, the student will be able to:

1. Gain the skills and project-based experience needed for entry into web design and development careers.
2. Develop awareness and appreciation of the many ways that people access the web, and will be able to create standards-based websites that can be accessed by the full spectrum of web access technologies
3. Select and apply markup languages for processing, identifying, and presenting of information in web pages.
4. Create and manipulate web media objects using editing software.
5. Create web pages and validate input using JavaScript.
6. Develop web pages and perform computation using JavaScript.

List of Programs:

1. Create a form to reserve a ticket in the railways if the source and destination place is given.
2. Create a web page to display student mark statement.
3. Design an home page for a company
4. Develop DHTML Script to illustrate Color and Background attribute.
5. Create a DHTML page using various filters on images, mask image, mask Text.
6. Design a PHP program to find greatest of three numbers.
7. Design an student application form using PHP program.
8. Write a java script program design a calculator

9. Develop a Java script program for display greetings based on Time
10. Create an XML document for student information with relevant attributes and validation.
11. Develop a program to copy the content of one file to another file using PHP program.
12. Develop an E-mail application using PHP program.

Semester – II

16ENU201 **ENGLISH** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **100** Total: **100**

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcome:

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed.
6. Betterment of language competence

Unit-I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

Unit-II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

Unit-III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

Unit-IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O’ Henry
Vocabulary: Words Often Confused, Anagrams

Grammar: Preposition, Voice- Active and Passive

Unit-V

Short Story: The Bird – Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. (2013).*Spring* **.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala,V. (2006). *English for Communication*. 2006. Emerald Publishers: Chennai.

Semester – III

16CAU301 **DATA STRUCTURES** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- To understand the fundamental concepts of data structures
- To Learn linear data structures – lists, stacks, and queues
- To apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms
- To develop application using data structures
- Choose appropriate data structures and algorithms for problem solving.

Course Outcome:

Upon completion of this course, the student will be able to:

1. Implement abstract data types for linear data structures.
2. Apply the different linear and non-linear data structures to problem solutions.
3. Analyze the applications of tree.
4. Implement graph theory over various data structures.
5. Critically analyze the various sorting algorithms.
6. Able to use linear and non-linear data structures like stacks, queues , linked list etc.

Unit-I

Arrays-Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation).Stacks Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack

Unit-II

Linked Lists Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular, representation of Stack in Lists; Self Organizing Lists; Skip Lists Queues, Array and Linked representation of Queue, De-queue, Priority Queues

Unit-III

Trees - Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion , Recursive and Iterative Traversals on Binary Search Trees); Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees).

Unit-IV

Searching and Sorting, Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Insertion Sort, Shell Sort, Comparison of Sorting Techniques

Unit-V

Hashing - Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collusion by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing, Function

Suggested readings

1. 1. Aaron M. Tenenbaum, Moshe J. Augenstein, Yedidyah Langsam,(2003). *Data Structures Using Java*.
2. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, (2009). *Data Structures Using C and C++*, (2nd ed.), PHI.
3. Adam Drozdek, (2012). *Data Structures and algorithm in C++*, (3rd ed.), Cengage Learning.
4. Goodrich, M. and Tamassia, R.,(2013). *Data Structures and Algorithms Analysis in Java*, (4th ed.), Wiley. Herbert Schildt, (2014). "Java The Complete Reference (English) 9th Edition Paperback", Tata McGraw Hill.
5. John Hubbard,(2009). *Data Structures with JAVA*, (2nd ed.), India, McGraw Hill Education.
6. Malik, D. S., Nair, P.S., (2003). *Data Structures Using Java*, Course Technology.
7. Malik, D.S., (2010). *Data Structure using C++*,(2nd ed.), Cengage Learning.
8. Mark Allen Weiss, (2011). *Data Structures and Algorithms Analysis in Java*, Pearson Education, (3rd ed.).
9. Robert L. Kruse, (1999). *Data Structures and Program Design in C++*, Pearson.
10. Robert Lafore, (2003). *Data Structures and Algorithms in Java*, (2nd ed.), Pearson Macmillan Computer Publications.
11. Sartaj Sahni, (2011). *Data Structures, Algorithms and applications in C+*, (2nd ed.) Universities Press.

Websites

1. http://en.wikipedia.org/wiki/Data_structure
2. http://www.cs.sunysb.edu/~skiena/214/lectures/
3. www.amazon.com/Teach-Yourself-Structures-Algorithms

Semester – III

16CAU302 **OPERATING SYSTEMS** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- To Study the basic concepts and functions of operating systems.
- To understand the structure and functions of OS.
- To Learn about Processes, Threads and Scheduling algorithms.
- To Understand the principles of concurrency, Deadlocks and Memory Management
- To Learn about the Protection and Security Concepts.
- Understand basic resource management techniques.

Course Outcome (COs):

Upon completion of this course the students will be able to:

1. Design various Scheduling algorithms.
2. Apply the principles of concurrency.
3. Design deadlock, prevention and avoidance algorithms.
4. Compare and contrast various memory management schemes.
5. Apply the Security Concepts based on Authentication.
6. Appreciate the role of operating system as System software.

Unit-I

Introduction to Operating System: Basic OS Functions-Resource Abstraction-Types of Operating Systems–Multiprogramming Systems-Batch Systems-Time Sharing Systems-Operating Systems for Personal Computers & Workstations-Process Control & Real Time Systems.

Unit-II

Operating System Organization: Processor and user modes-Kernels-System Calls and System Programs. **Process Management:** System view of the process and resources-Process abstraction-Process hierarchy-Threads-Threading issues-Thread libraries-Process Scheduling-Non pre-emptive and Preemptive scheduling algorithms-Concurrent and processes-Critical Section-Semaphores-Methods for inter-process communication-Deadlocks.

Unit-III

Memory Management: Physical and Virtual address space-Memory Allocation strategies –Fixed and Variable partitions-Paging-Segmentation-Virtual memory.

Unit-IV
File and I/O Management: Directory structure-File operations-File Allocation methods-Device management.

Unit-V
Protection and Security: Policy mechanism-Authentication-Internal aCSUess Authorization.

Suggested readings

1. Silberschatz,A., Galvin, P.B., Gagne,G.,(2008). *Operating Systems Concepts*, (8th ed.), John Wiley Publications.
2. Stallings,W., (2008). *Operating Systems, Internals & Design Principles*, (5th Edition), Prentice Hall of India.
3. Tanenbaum, A.S., (2007). *Modern Operating Systems*, (3rd ed.), Pearson Education.

Websites

1. www.cs.columbia.edu/~nieh/teaching/e6118_s00/
2. www.clarkson.edu/~jnm/cs644pages.cs.wisc.edu/~remzi/Classes/736/Fall2002/

Semester – III

16CAU303 **COMPUTER NETWORKS** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To read the fundamentals and basics concepts of Physical layer with real time examples
- To study data link layer concepts, design issues, and protocols.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer and Application layer.
- Channel error detection and correction, MAC protocols, Ethernet and WLAN.

Course Outcome:

Upon completion of this course, the student will be able to:

- Describe the functions of each layer in OSI and TCP/IP model.
- Explain the functions of Application layer and Presentation layer paradigms and Protocols.
- Describe the Session layer design issues and Transport layer services.
- Classify the routing protocols and analyze how to assign the IP addresses for the given network.
- Describe the functions of data link layer and explain the protocols.
- Explain the types of transmission media with real time applications

Unit- I

Introduction to Computer Networks : Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite. **Data Communication Fundamentals and Techniques**: Analog and digital signal; data-ratelimits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission;

Unit-II

Digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

Networks Switching Techniques and Access mechanisms: Circuit switching; packetswitching - connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

Unit-III

Data Link Layer Functions and Protocol: Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.

Unit-IV

Multiple Access Protocol and Networks: CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways;

Networks Layer Functions and Protocols: Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols.

Unit-V

Transport Layer Functions and Protocols: Transport services- error and flow control, Connection establishment and release- three way handshake;

Overview of Application layer protocol: Overview of DNS protocol; overview of WWW &HTTP protocol.

Suggested readings

1. Forouzan B. A., (2007). *Data Communications and Networking*, (4th ed.), THM.
2. Tanenbaum, A. S. , (2002). Computer Networks**,** (4th ed.), PHI.

Websites

1. en.wikipedia.org/wiki/Internet_protocol_suite
2. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
3. www.yale.edu/pclt/COMM/**TCPIP**.HTM
4. www.w3schools.com/**tcpip**/default.asp
5. https://www.cse.iitb.ac.in/

16CAU304A ANDROID PROGRAMMING **Semester – III**
3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- To compare the differences between Android and other mobile development environments.
- To learn the Object-oriented features of Kotlin and APIs for Android Development.
- To describe the working of Android applications, life cycle, manifest, and Intents
- To demonstrate the implementation of Form widgets for Android App development.
- To learn the SQLite database connectivity and database operations with android
- To design and develop useful Android applications with compelling user. interfaces .by using, extending, and creating your own layouts and Views and using Menus.

Course Outcome (Cos):

Upon completion of this course, the student will be able to:

1. Analyze the Architecture and features of Android with another Mobile Operating System.
2. Evaluate the standard of Kotlin language for developing Android Applications
3. Apply knowledge for creating user Interface and develop activity for Android App.
4. Evaluate the user interface architecture of Android for developing Android Apps
5. Understand the implementation of SQLite database operations with Android.
6. Design and implement Database Application and Content providers.

Unit-I

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture. (2L)

Unit-II

Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine. (4L)

Unit-III

Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project– Hello Word, run on emulator, Deploy it on USB-connected Android device. (5L)

Unit-IV

User Interface Architecture: Application context, intents, Activity life cycle, multiple screen size s.(2L) **User Interface Design:** Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners(Combo boxes),Images, Menu, Dialog.(2L)

Unit-V

Database: Understanding of SQL database, connecting with the database. (2L)

Suggested readings

1. James C.Sheusi,(2013). *Android application development for Java for Java programmers*, Cengage Learning.

Websites

1. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html
4. http://developer.android.com/guide/components/activities.html
5. http://developer.android.com/guide/components/fundamentals.html
6. http://developer.android.com/guide/components/intents-filters.html.
7. http://developer.android.com/training/multiscreen/screensizes.html
8. http://developer.android.com/guide/topics/ui/controls.html
9. http://developer.android.com/guide/topics/ui/declaring-layout.html
10. http://developer.android.com/training/basics/data-storage/databases.html

16CAU304B	**STRUTS FRAMEWORK**	**Semester – III** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the students to

- Understand the Model, View, Controller (MVC) design pattern and how it is applied by Struts Framework
- Know the components of Struts Application and database connectivity
- Implement JSP functions using Struts
- Perform client and server side validation using Struts Validator Framework
- Develop web applications using Struts
- Develop EJB programs and get familiar with Struts framework

Course Outcome (COs):

Upon completion of the course, the students will be able to:

1. Know about MVC and overview of JSP
2. Identify the components of a Struts Application and how to connect database in web based applications
3. Know about the struts Sub elements and Control Tags
4. Develop programs with Data Tags and Bean Tags
5. Develop programs with HTML Tags and Logic Tags and able to construct enterprise-level web based applications
6. Construct web based applications and Identify where data structures are appearing in them.

Unit-I

Introduction, Understanding the MVC Design Pattern, The Struts Implementation of the MVC, Directory Structure, Web Application Deployment Descriptor, The Tomcat JSP/Servlet Container, Installing and Configuring Tomcat, Testing Your Tomcat Installation, An Overview of the Java Servlet and JavaServer Pages, The GenericServlet and HttpServlet Classes, Life Cycle of a Servlet. Struts OverView, Life Cycle of Struts.

Unit-II

Components of a Struts Application, The Controller, The View, DynaActionForm & LazyDynaBean, ActionServlet, RequestProcessor, ActionForm, IncludeAction, Forward Action, LocaleAction, DispatchAction, LookupDispatchAction, MappingDispatchAction, EventDispatchAction, SwitchAction, Interceptors, Implementing Custom interceptors, Struts Validation, Exception Handling, Managing Errors, Struts Error Management - ActionError, ActionErrors, Creating Custom ActionMappings, Struts JDBC Connection, Using a DataSource in Struts Application, Debugging Struts Applications.

Unit-III

The struts-config.xml, The Struts Subelements, The icon Tag Subelement, display-name Tag Subelement, description Tag Subelement, set-property Tag Subelement, Adding a Struts DataSource, Adding FormBean Definitions, Adding Global Forwards, Adding Actions, Adding a RequestProcessor, Adding Message Resources, Adding a Plug-in. The Bean Tag Library, Installing the Bean Tags, bean:cookie Tag, bean:define Tag, bean:header Tag, bean:include Tag, bean:message Tag, bean:page Tag, bean:parameter Tag ,bean:resource Tag,<bean:size Tag, bean:struts Tag, bean:write Tag

Unit-IV

HTML Tag Library, Base Tag, Button Tag, Cancel Tag, Checkbox Tag, Errors Tag, Form Tag, Hidden Tag, Html Tag, Image Tag, Img Tag, Link Tag, Multibox Tag, Select Tag, Option Tag, Options Tag, Password Tag, Radio Tag, Reset Tag, Rewrite Tag, Submit Tag, Text Tag, Textarea Tag

Unit-V

The Logic Tag Library , Empty Tag, notEmpty Tag ,equal Tag, notEqual Tag, forward Tag, redirect Tag, greaterEqual Tag, greaterThan Tag, iterate Tag, lessEqual Tag, lessThan Tag, match Tag, notMatch Tag, present Tag, notPresent Tag

Suggested readings

1. James Goodwill,(2002). *Mastering Jakarta Struts*, Wiley Publishing, Inc.

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- To understand the fundamental concepts of data structures
- To Learn linear data structures – lists, stacks, and queues
- To apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms
- To develop application using data structures
- Choose appropriate data structures and algorithms for problem solving.

Course Outcome:

Upon completion of this course, the student will be able to:

1. Implement abstract data types for linear data structures.
2. Apply the different linear and non-linear data structures to problem solutions.
3. Analyze the applications of tree.
4. Implement graph theory over various data structures.
5. Critically analyze the various sorting algorithms.
6. Able to use linear and non-linear data structures like stacks, queues , linked list etc.

List of Programs:

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.
2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.
3. Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).
4. Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
5. Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
6. Perform Stack operations using Linked List implementation.
7. Perform Stack operations using Array implementation. Use Templates.

8. Perform Queues operations using Circular Array implementation. Use Templates.
9. Create and perform different operations on Double-ended Queues using Linked List implementation.
10. Write a program to scan a polynomial using linked list and add two polynomial.
11. Write a program to calculate factorial and to compute the factors of a given no. (i)using recursion, (ii) using iteration
12. Write a program to display Fibonacci series (i)using recursion, (ii) using iteration
13. Write a program to calculate GCD of 2 number (i) with recursion (ii) without recursion
14. Write a program to create a Binary Search Tree and include following operations in tree:
    - (a) Insertion (Recursive and Iterative Implementation)
    - (b) Deletion by copying
    - (c) Deletion by Merging
    - (d) Search a no. in BST
    - (e) Display its preorder, postorder and inorder traversals Recursively
    - (f) Display its preorder, postorder and inorder traversals Iteratively

(g) Display its level-by-level traversals
(h) Count the non-leaf nodes and leaf nodes
(i) Display height of tree
(j) Create a mirror image of tree
(k) Check whether two BSTs are equal or not

15. Write a program to convert the Sparse Matrix into non-zero form and vice-versa.
16. Write a program to reverse the order of the elements in the stack using additional stack.
17. Write a program to reverse the order of the elements in the stack using additional Queue.
18. Write a program to implement Diagonal Matrix using one-dimensional array.
19. Write a program to implement Lower Triangular Matrix using one-dimensional array.
20. Write a program to implement Upper Triangular Matrix using one-dimensional array.
21. Write a program to implement Symmetric Matrix using one-dimensional array.
22. Write a program to create a Threaded Binary Tree as per inorder traversal, and implement operations like finding the suCSUessor / predecessor of an element, insert an element, inorder traversal.
23. Write a program to implement various operations on AVL Tree.

		Semester – III
16CAU312	**OPERATING SYSTEMS PRACTICAL**	**4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- To Study the basic concepts and functions of operating systems.
- To understand the structure and functions of OS.
- To Learn about Processes, Threads and Scheduling algorithms.
- To Understand the principles of concurrency, Deadlocks and Memory Management
- To Learn about the Protection and Security Concepts.
- Understand basic resource management techniques.

Course Outcome (COs):

Upon completion of this course the students will be able to:

1. Design various Scheduling algorithms.
2. Apply the principles of concurrency.
3. Design deadlock, prevention and avoidance algorithms.
4. Compare and contrast various memory management schemes.
5. Apply the Security Concepts based on Authentication.
6. Appreciate the role of operating system as System software.

List of Programs:

1. Write a program (using *fork()* and/or *exec()* commands) where parent and child execute:

   a) same program, same code.

   b) same program, different code.

   c) before terminating, the parent waits for the child to finish its task.
2. Write a program to report behavior of Linux kernel including CPU information and. memory information
3. Write a program to print file details including owner a access permissions, file access time, where file name is given as argument.
4. Write a program to copy files using system calls.
5. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.
6. Write program to implement FCFS scheduling algorithm.

7. Write program to implement Round Robin scheduling algorithm.
8. Write program to implement SJF scheduling algorithm.
9. Write program to implement non-preemptive priority based scheduling algorithm.
10. Write program to implement preemptive priority based scheduling algorithm.
11. Write program to implement SRJF scheduling algorithm.
12. Write program to calculate sum of n numbers using *thread* library.

		Semester – III
16CAU313	**COMPUTER NETWORKS PRACTICAL**	**4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To read the fundamentals and basics concepts of Physical layer with real time examples
- To study data link layer concepts, design issues, and protocols.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer and Application layer.
- Channel error detection and correction, MAC protocols, Ethernet and WLAN.

Course Outcomes (COs):

Upon completion of this course, the student will be able to:

- Describe the functions of each layer in OSI and TCP/IP model.
- Explain the functions of Application layer and Presentation layer paradigms and Protocols.
- Describe the Session layer design issues and Transport layer services.
- Classify the routing protocols and analyze how to assign the IP addresses for the given network.
- Describe the functions of data link layer and explain the protocols.
- Explain the types of transmission media with real time applications

List of Programs:

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

Semester – III

16CAU314A ANDROID PROGRAMMING PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- To compare the differences between Android and other mobile development environments.
- To learn the Object-oriented features of Kotlin and APIs for Android Development.
- To describe the working of Android applications, life cycle, manifest, and Intents
- To demonstrate the implementation of Form widgets for Android App development.
- To learn the SQLite database connectivity and database operations with android
- To design and develop useful Android applications with compelling user. interfaces .by using, extending, and creating your own layouts and Views and using Menus.

Course Outcome (Cos):

Upon completion of this course, the student will be able to:

1. Analyze the Architecture and features of Android with another Mobile Operating System.
2. Evaluate the standard of Kotlin language for developing Android Applications
3. Apply knowledge for creating user Interface and develop activity for Android App.
4. Evaluate the user interface architecture of Android for developing Android Apps
5. Understand the implementation of SQLite database operations with Android.
6. Design and implement Database Application and Content providers.

List of Programs

1. Create ―Hello World‖ application. That will display ―Hello World‖ in the middle of the screen in the emulator. Also display ―Hello World in the middle of the screen in the Android Phone.
2. Create an application with login module. (Check username and password).
3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.
4. Create a menu with 5 options and and selected option should appear in text box.

5. Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen.
6. Create an application with three option buttons, on selecting a button colour of the screen will change.
7. Create and Login application as above. On successful login, pop up the message.
8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.

16CAU314B	**STRUTS PRACTICAL**	**Semester – III** **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the students to

- Understand the Model, View, Controller (MVC) design pattern and how it is applied by Struts Framework
- Know the components of Struts Application and database connectivity
- Implement JSP functions using Struts
- Perform client and server side validation using Struts Validator Framework
- Develop web applications using Struts
- Develop EJB programs and get familiar with Struts framework

Course Outcome (COs):

Upon completion of the course, the students will be able to:

1. Know about MVC and overview of JSP
2. Identify the components of a Struts Application and how to connect database in web based applications
3. Know about the struts Sub elements and Control Tags
4. Develop programs with Data Tags and Bean Tags
5. Develop programs with HTML Tags and Logic Tags and able to construct enterprise-level web based applications
6. Construct web based applications and Identify where data structures are appearing in them.

List of Programs:

1. Create a Simple Struts Human Resource (HR) Application
2. Create Struts Login Application Using Action form
3. Create a Strut Global Action Forwards and Action Mappings
4. Create and implement Multiple Struts Configuration File
5. Create Struts Application to implement struts Lookup Dispatch Action
6. Create Struts Application to mapping the struts Action Servlet
7. Create a Feedback form to implement struts HTML Tag
8. Create Struts Application to use of action forms for validating user input.
9. Create Struts Applications to implement Struts Logic Tag
10. Create a Struts LOGIC tag library provides tags that are useful in managing conditional generation of output text

Semester – IV

16CAU401 **SOFTWARE ENGINEERING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To introduce the fundamental concepts of software engineering.
- To Analyze, specify and document software requirements for a software system.
- To Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its cost and time.
- Expose the criteria for test cases.
- Be familiar with test management and test automation techniques
- Implement a given software design using sound development practices.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Identify suitable life cycle models to be used and translate a requirement specification to a design using an appropriate software engineering methodology.
2. Apply systematic procedure for software design and deployment.
3. Analyze a problem and identify and define the computing requirements to the problem.
4. Formulate appropriate testing strategy for the given software system.
5. Develop software projects based on current technology, and test the software using testing tools.
6. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

Unit-I

Introduction: The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

Unit-II

Requirement Analysis; Initiating Requirement EngineeringProcess- Requirement Analysis and Modeling Techniques- FlowOriented Modeling- Need for SRS- Characteristics and Components of SRS- Software Project Management: Estimation in Project Planning Process, Project Scheduling.

Unit-III

Risk Management: Software Risks, Risk Identification Risk Projection and Risk Refinement, RMMM plan, **Quality Management-** Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects

Semester – IV

16CAU401 SOFTWARE ENGINEERING 4H – 4C

Unit-IV

Design Engineering-Design Concepts, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design

Unit-V

Testing Strategies & Tactics: Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing Black-Box Testing, White-Box Testing and their type, Basis Path Testing

Suggested Readings

1. Aggarwal K.K., Singh,Y., (2008). *Software Engineering*, (2^{nd} ed.), New Age International Publishers.
2. Bell,D., (2005). *Software Engineering for Students*, (4^{th} ed.), Addison-Wesley.
3. Jalote,P., (2008). *An Integrated Approach to Software Engineering* (2^{nd} ed.), New Age International Publishers.
4. Mall,R.,(2004). *Fundamentals of Software Engineering*, (2^{nd} ed.), Prentice-Hall of India.
5. Pressman, R.S.,(2009). *Software Engineering: A Practitioner's Approach,* (7^{th} Edition), McGraw-Hill.
6. Sommerville, I.,(2006), *Software Engineering*, (8^{th} ed.), Addison Wesley.

Websites

1. http://en.wikipedia.org/wiki/Software_engineering
2. http://www.onesmartclick.com/engineering/software-engineering.html
3. http://www.CSU.gatech.edu/classes/AY2000/cs3802_fall/

Semester – IV

16CAU402 **DATA BASE MANAGEMENT SYSTEMS** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To describe a good introduction to the discipline of database management systems.
- To give a good formal foundation on the data models and E-R model.
- To demonstrate the principles database constraints behind systematic database design by covering normalization concept.
- To introduce the concepts of basic SQL as a universal Database language.
- To have an introductory knowledge about the PL/SQL concept
- To train the student to translate business requirements into relational database schemas and manipulate databases using the SQL Data Manipulation Language.

Course Outcomes (COs)

Upon completion of this course, students will be able to:

1. Demonstrate an understanding of the elementary features of RDBMS
2. Design conceptual models of a database using ER modeling for real life applications
3. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database
4. Able to develop structured query language (SQL) queries to create, read, update, and delete relational database
5. Design efficient PL/SQL programs to access Oracle databases
6. Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.

Unit-I

Introduction: Characteristics of database approach, data models, database system architecture and data independence. **Entity Relationship(ER) Modeling:** Entity types, relationships, constraints.

Unit-II

Relation data model: Relational model concepts, relational constraints, relational algebra.

Unit-III

Relation data model: SQL queries **Database design:** Mapping ER/EER model to relational database, functional dependencies, Lossless decomposition.

Unit-IV

Database design: Normal forms (upto BCNF).**Transaction Processing :** ACID properties, concurrency control

Unit-V

File Structure and Indexing (8 Lectures) Operations on files, File of Unordered and ordered records, overview of File organizations, Indexing structures for files(Primary index, secondary index, clustering index), Multilevel indexing using B and B+ trees.

Suggested Readings

1. Elmasri, R., Navathe S.B., (2013). *Database Systems Models, Languages, Design and application Programming*, (6th ed.), Pearson Education.
2. Elmasri, R., Navathe, S.B.,(2010). *Fundamentals of Database Systems*, (6th ed.), Pearson Education.
3. Ramakrishanan,R., Gehrke,J., (2002). *Database Management Systems* (3rd ed.), McGraw-Hill.
4. Silberschatz,A., Korth, H.F., Sudarshan,S.,(2010). *Database System Concepts* (6th ed.), McGraw Hill.

Websites

1. http://en.wikipedia.org/wiki/RDBMS
2. http://aspalliance.com/1211_Relational_Database_Management_Systems__Concepts_and_Terminologies
3. www.compinfo-center.com/apps/rdbms.html

Semester – IV

16CAU403 **WEB PROGRAMMING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To understand the concepts and architecture of the World Wide Web.
- To understand and practice markup languages
- Understand the technologies used in Web Programming.
- Know the importance of object-oriented aspects of Scripting.
- To understand and practice embedded dynamic scripting on client-side Internet Programming
- To develop dynamic web applications, create and consume web services

Course Outcomes (COs)

Upon Completion of the course, the students will be able to

1. Design web pages.
2. Use technologies of Web Programming.
3. Apply object-oriented aspects to Scripting.
4. Create a basic website using HTML and Cascading Style Sheets.
5. Design and implement dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms.
6. Use scripting languages and web services to transfer data and add interactive components to web pages.

Unit-I

Creating an HTML Document – creating list – creating links between document – linking to resources on the internet – working with hypertext attributes – working with fonts and text styles – tables – creating frameset – working with forms – working with cascading style sheets.

Unit-II

JavaScript: Introduction to javascript – Programming fundamentals – Functions and objects – Navigator object model

Unit-III

JavaScript: Form and form elements – Scripting frames and multiple windows – Event object – Functions and custom objects.

Unit-IV

ASP: Client side scripting vs. Server side scripting- Variables & Constants- Procedures – Forms – Cookies – Application - #include – Global.asa - Functions-ASP object model: Response- Request- Application- Session – Server – Error – Array

Unit-V

ASP: Collections & Control Structure-File system object: File System – Text Stream- Drive – File – Folder – Directory – ADO - sql & Databases for data driven applications- ASP Components: Ad Rotator – Browser Cap. – Content Linking – Content Rotator .

Suggested Readings

1. Patrick Carey, (2005). *New Perspectives on HTML and XHTML*, (1st ed.), Thomson Course Technology Publishing. **(Unit- I).**
2. Rohit Khurana's, (2002). *Javascript Professional edition*, (2nd ed.), A.P.H. Publishing company, NewDelhi**.(Unit -II)**
3. Danny Goodman, (2000). *Javascript Bible*, (3rd ed.), IDG Books India Pvt Ltd. **(Unit-III).**
4. Russell Jones, A. (2000). *Mastering ActiveServerPages 3*, **(**1st ed.), BPB Publishing, New Delhi.(**Unit- IV & Unit -V).**
5. David Flanagan, (2006). *JavaScript: The Definitive Guide*, O'Reilly,
6. Nicholas C. Zakas, Inc Ebrary and Ebrary,(2005). *Professional JavaScript for Web Developers*, New Delhi , John Wiley & Sons Inc.

Web Sites:

1. www.w3schools.com/
2. www.**javascript**kit.com
3. www.**asp**free.com
4. www.aspnettutorials.com

Semester – IV

16CAU404A **R PROGRAMMING** **3H – 3C**

Instruction Hours / week: L:3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives :

Enable the student

- To acquire the computing tasks such as using conditional processing statements, loops, and writing one's own functions.
- Performing advanced graphing of data and statistical modeling of data.
- Use statistical distribution functions in R
- Read Structured Data into R from various sources
- Understand split-apply-combine (group-wise operations) in R
- Perform basic statistical modeling of data

Course Outcome(COs):

Upon completion of this course, the students will be able to:

1. Learn how to install and configure software necessary for a statistical programming environment.
2. Discuss generic programming language concepts as they are implemented in a high-level statistical language.
3. The course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, and organizing and commenting R code.
4. Import external data into R for data processing and statistical analysis
5. Learn the main R data structures – vector and data frame
6. Learn the file processing in R

Unit-I

History and Overview of R : The S Philosophy - Back to R -Basic Features of R - Free Software -Design of the R System - Limitations of R- R Resources .Getting Started with R :Installation - Getting started with the R interface -.R Nuts and Bolts :Entering Input - Evaluation -R Objects - Numbers - Attributes - Creating Vectors - Mixing Objects - Explicit Coercion - Matrices -Lists -Factors - Missing Values - Data Frames - Names .

Unit-II

Getting Data In and Out of R :Reading and Writing Data - Reading Data Files with read.table() - Reading in Larger Datasets with read.table - Calculating Memory Requirements for R Objects . Using the readr Package .Using Textual and Binary Formats for Storing Data :Using dput() and dump() – Binary Formats - Interfaces to the Outside World : File Connections - Reading Lines of a Text File - Reading From a URL Connection - Subsetting R Objects :Subsetting a Vector - Subsetting a Matrix - Subsetting Lists - Subsetting Nested Elements of a List - Extracting Multiple Elements of a List - Partial Matching -Removing NA Values .

Unit-III

Vectorized Operations :Vectorized Matrix Operations .Dates and Times :Dates in R - Times in R - Operations on Dates and Times .Managing Data Frames with the dplyr package :Data Frames -The dplyr Package - dplyr Grammar - Installing the dplyr package - select() - filter() -arrange() - rename() - mutate() - group_by()-%>%.Control Structures :if-else - for Loops - Nested for loops - while Loops - repeat Loops - next, break .

Unit-IV

Functions: Functions in R - Your First Function - Argument Matching - Lazy Evaluation – The Argument - Arguments Coming After the Argument .Scoping Rules of R : A Diversion on Binding Values to Symbol - Scoping Rules - Lexical Scoping: Why Does It Matter? -Lexical vs. Dynamic Scoping -- Application: Optimization - Plotting the Likelihood. Coding Standards for R .Loop Functions : Looping on the Command Line - lapply() - sapply() - split() - Splitting a Data Frame - tapply - apply() - Col/Row Sums and Means -Other Ways to Apply - mapply()-Vectorizing a Function .

Unit-V

Debugging -:Something's Wrong! - Figuring Out What's Wrong - Debugging Tools in R . Using traceback() - Using debug() - Using recover().Profiling R Code: Using system.time() . Timing Longer Expressions - The R Profiler - Using summaryRprof().Simulation :Generating Random Numbers - Setting the random number seed -Simulating a Linear Model - Random Sampling .

Suggested Readings

1. Daniel Navarro, (2013). *Learning Statistics with R.* University of Adelaide Publications.
2. Hadley Wickham, (2014). *Advanced R Programming*, (1st ed.)

3. Jeffrey Stanton, (2013). *Introduction to Data Science, with Introduction to R*, Version 3 ,
4. Roger.D.Peng, (2015). *R Programming for Data Science*

Semester – IV

16CAU404B **SOFTWARE TESTING** **3H – 3C**

Instruction Hours / week: L:3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives:

To help students:

- to understand the strengths and weaknesses of a variety of software testing techniques.
- to get familiar with the techniques, and tools in the area of software testing and its practice in the industry
- to become a good software tester
- to gain confidence in and providing information about the level of quality of the software
- to find defects which may get created by the programmer while developing the software.
- Know to develop software

Course Outcome:

1. Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.
2. Implement various test processes for quality improvement
3. Design test planning.
4. Manage the test process
5. Apply the software testing techniques in commercial environment
6. Test the various types in the software application

Unit- I

Assessing Testing Capabilities and Competencies

Who is associated with testing? – The multiple Roles of Testing – Defect – The business perspective for testing – test process and testers ; Building a software testing strategy: Computer System Strategic risks – Economics of Testing – Common Computer Problems – Economics of System Development Life Cycle (SDLC) Testing – Testing-an Organizational Issue – Establishing a testing policy – Structured approach to testing – Test Strategy; Software Testing Methodology: Reduce the cost of testing – Functional and Structural testing – Workbench concept – Eight considerations in developing testing methodologies

Unit -II

Software Testing Fundamentals

Examining the specification: Getting started – Performing a high-level review of the specification – Low-level specification test techniques; Testing the software with blinders on: Dynamic Black-Box Testing- Test-to-Pass and Test-to-Fail- Equivalence Partitioning- Data testing – State testing – Other Black-box test techniques; Examining the code: Static White-Box testing- Formal reviews – Coding Standards and Guidelines- Generic Code Review Checklist; Testing the software with X-Ray glasses: Dynamic White-Box testing- Dynamic White-Box testing versus Debugging- Testing the Pieces- Data Coverage- Code Coverage.

Unit- III

Software Testing Techniques

Determining your software testing techniques: Testing Techniques/Tools selection process – Selecting Techniques/tools – Structural system testing techniques- Functional system testing techniques – Unit testing technique – Functional testing and analysis – Functional testing – Test factor/Test technique matrix

Testing process

The Cost of Computer Testing – Life Cycle Testing concept – Verification and validation in the software. Assess Project Management Development Estimate and Status - Develop Test Plan - Requirements Phase Testing -Design Phase Testing -Program Phase Testing

Unit -IV

Testing process

Execute Test and Record results- Acceptance Test- Report Test Results- Testing Software Installation- Test Software Changes - Evaluate Test Effectiveness.

Unit- V

Testing Specialized Systems and Applications

Testing client/server systems - Testing web-based systems - Testing security - Building tests documentation.

Suggested Readings

1. Ron Patton, (2004). *Software Testing*, (2nd ed.), New Delhi, Pearson Education. (2nd unit)

2. William E.Perry, (2001). *Effective methods for Software Testing*, (2nd ed.), New Delhi: John Wiley & Sons, Inc., (1, 3, 4 & 5 units)

Semester – IV

16CAU411 SOFTWARE ENGINEERING PRACTICAL 4H – 2C

Course Objectives

- To introduce the fundamental concepts of software engineering.
- To Analyze, specify and document software requirements for a software system.
- To Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its cost and time.
- Expose the criteria for test cases.
- Be familiar with test management and test automation techniques
- Implement a given software design using sound development practices.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Identify suitable life cycle models to be used and translate a requirement specification to a design using an appropriate software engineering methodology.
2. Apply systematic procedure for software design and deployment.
3. Analyze a problem and identify and define the computing requirements to the problem.
4. Formulate appropriate testing strategy for the given software system.
5. Develop software projects based on current technology, and test the software using testing tools.
6. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

Sample Projects:

1. **Criminal Record Management**: Implement a criminal record management system for jailers, police officers and CBI officers
2. **DTC Route Information**: Online information about the bus routes and their frequency and fares
3. **Car Pooling: To maintain a web based intranet application that enables the** corporate employees within an organization to avail the facility of carpooling effectively.
4. Patient Appointment and Prescription Management System
5. Organized Retail Shopping Management Software
6. Online Hotel Reservation Service System
7. Examination and Result computation system
8. Automatic Internal Assessment System
9. Parking Allocation System
10. Wholesale Management System

Semester – IV

16CAU412 DATA BASE MANAGEMENT SYSTEMS PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To describe a good introduction to the discipline of database management systems.
- To give a good formal foundation on the data models and E-R model.
- To demonstrate the principles database constraints behind systematic database design by covering normalization concept.
- To introduce the concepts of basic SQL as a universal Database language.
- To have an introductory knowledge about the PL/SQL concept
- To train the student to translate business requirements into relational database schemas and manipulate databases using the SQL Data Manipulation Language.

Course Outcomes (COs)

Upon completion of this course, students will be able to:

1. Demonstrate an understanding of the elementary features of RDBMS
2. Design conceptual models of a database using ER modeling for real life applications
3. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database
4. Able to develop structured query language (SQL) queries to create, read, update, and delete relational database
5. Design efficient PL/SQL programs to access Oracle databases
6. Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.

List of Programs:

1.Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

Field	**Type**	**NULL**	**KEY**	**DEFAULT**
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
Job_type	Varchar(50)	NO		NIL
Manager	Char(3)	Yes	FK	NIL
Hire_date	Date	NO		NIL
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES		NIL
Salary	Decimal(7,2)	NO		NIL

DEPARTMENT Schema

Field	**Type**	**NULL**	**KEY**	**DEFAULT**
Dno	Integer	No	PRI	NULL
Dname	Varchar(50)	Yes		NULL
Location	Varchar(50)	Yes		New Delhi

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than $2850
6. Query to display Employee Name and Department Number for the Employee No= 7900.

7. Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.

8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.

9. Query to display Name and Hire Date of every Employee who was hired in 1981.

10. Query to display Name and Job of all employees who don‘t have a current Manager.

11. Query to display the Name, Salary and Commission for all the employees who earn commission.

12. Sort the data in descending order of Salary and Commission.

13. Query to display Name of all the employees where the third letter of their name is _A‘.

14. Query to display Name of all employees either have two _R‘s or have two _A‘s in their name and are either in Dept No = 30 or their Manger‘s Employee No = 7788.

15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.

16. Query to display the Current Date.

17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.

18. Query to display Name and calculate the number of months between today and the date each employee was hired.

19. Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.

20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with _J‘, ‘A‘ and _M‘.

21. Query to display Name, Hire Date and Day of the week on which the employee started.

22. Query to display Name, Department Name and Department No for all the employees.

23. Query to display Unique Listing of all Jobs that are in Department # 30.

24. Query to display Name, Dept Name of all employees who have an _A‘ in their name.

25. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.

26. Query to display Name and Employee no. Along with their Manger‘s Name and the Manager‘s employee no; along with the Employees‘ Name who do not have a Manager.

27. Query to display Name, Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.

28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.

29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees

30. Query to display the number of employees performing the same Job type functions.

31. Query to display the no. of managers without listing their names.

32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.

33. Query to display Name and Hire Date for all employees in the same dept. as Blake.

34. Query to display the Employee No. And Name for all employees who earn more than the average salary.

35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a _T‘.

36. Query to display the names and salaries of all employees who report to King.

37. Query to display the department no, name and job for all employees in the Sales department.

Semester – IV

16CAU413 WEB PROGRAMMING PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To understand the concepts and architecture of the World Wide Web.
- To understand and practice markup languages
- Understand the technologies used in Web Programming.
- Know the importance of object-oriented aspects of Scripting.
- To understand and practice embedded dynamic scripting on client-side Internet Programming
- To develop dynamic web applications, create and consume web services

Course Outcomes (COs)

Upon Completion of the course, the students will be able to

1. Design web pages.
2. Use technologies of Web Programming.
3. Apply object-oriented aspects to Scripting.
4. Create a basic website using HTML and Cascading Style Sheets.
5. Design and implement dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms.
6. Use scripting languages and web services to transfer data and add interactive components to web pages.

List of Programs:

1. Develop a website for Karpagam University using HTML.
2. Write Online Quiz program (Include Style Sheets)
3. Create a simple animation using DHTML.
4. Write a program to apply Mask into an Image Using Filters in DHTML.
5. Generate web page that represents clock-every 60 see the page updated with server current time Using JavaScript.
6. Design a form and validate it using JavaScript.
7. Show the demo of AD Rotator Component.
8. Write Database Access program using ASP.
9. Program to retrieve Cookies information using ASP

10. Program to count web page hits using ASP
11. Program to create Date & Time, String Manipulation using ASP
12. Write a program to find the visitor's Browser Type, IP Address and More Information

Semester – IV

16CAU414A R PROGRAMMING (PRACTICAL) 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives :

Enable the student

- To acquire the computing tasks such as using conditional processing statements, loops, and writing one's own functions.
- Performing advanced graphing of data and statistical modeling of data.
- Use statistical distribution functions in R
- Read Structured Data into R from various sources
- Understand split-apply-combine (group-wise operations) in R
- Perform basic statistical modeling of data

Course Outcome(COs):

Upon completion of this course, the students will be able to:

1. Learn how to install and configure software necessary for a statistical programming environment.
2. Discuss generic programming language concepts as they are implemented in a high-level statistical language.
3. The course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, and organizing and commenting R code.
4. Import external data into R for data processing and statistical analysis
5. Learn the main R data structures – vector and data frame
6. Learn the file processing in R

List of Programs:

1. Write a program to demonstrate functions and operators
2. **Vectors:** Grouping values into vectors, then doing arithmetic and graphs with them
3. **Matrices:** Creating and graphing two-dimensional data sets
4. **Summary Statistics:** Calculating and plotting some basic statistics: mean, median, and standard deviation

5. **Factors:** Creating and plotting categorized data
6. **Data Frames:** Organizing values into data frames, loading frames from files and merging them
7. Write a program to design R as a calculator
8. Write a program to demonstrate Probability distributions
9. Write a program to demonstrate Importing and exporting data
10. Write a program to Establish a Regression

16CAU414B	**Software Testing PRACTICAL**	**Semester – IV** **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course objective

Enable the student

- Basic software debugging methods.
- White box testing methods and techniques.
- Black Box testing methods and techniques.
- Designing test plans.
- Different testing tools (familiar with open source tools)
- Quality Assurance models.

Course outcome

Upon the completion of the course, student able to

1. Apply modern software testing processes in relation to software development and project management.
2. Create test strategies and plans, design test cases, prioritize and execute them.
3. Manage incidents and risks within a project.
4. Contribute to efficient delivery of software solutions and implement improvements in the software development processes.
5. To gain expertise in designing
6. implement and development of computer based systems and IT processes.

List of Programs:

1. Create a VB form with the following fields and create the database also for them. Insert 3 records. Using Win Runner tool record the above 3 transaction and test them and produce the Report. (Blackbox Testing).

2. Create a VB form and then add login dialog form. Using Win Runner tool check the Username and Password and produce the Report. (Security testing).

3. Create a VB form with the following fields and check the calculation is correct or not by using the test toll Win Runner. (Functional Testing) Fields – Name, Designation, Department, Basic, HRA, DA, PF and netsal.

4.using Win Runner test tool check the database values after changing. Using Flight database. (Regression testing).

5. Write a C program for Boundary Testing.

6. Write a C program for Loop Testing.

7. Write a C program for Integration Testing.

8. Write a C program for Interface Testing.

9. Write a C program for Unit testing.

Semester – V

16CAU501A **Oracle (SQL / PL-SQL)** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- create and use table, column, primary key, foreign key,
- Use constraint, data type and view.
- Use SQL DDL commands to on a very basic level create and edit an Oracle database.
- Use SQL DML commands to select, update and delete data in an Oracle database.
- Use built-in functions and dynamic SQL in an Oracle 10g database.
- Use PL/SQL to build procedures, functions and triggers with variables, cursors, flow control and error management in Oracle 10g database

Course Outcomes:

Upon the completion of the course, student able to

1. Develop efficient PL/SQL programs to access Oracle databases
2. Use some of the Oracle supplied PL/SQL packages to generate screen and file outputs
3. Design modular applications using packages
4. Invoke native dynamic SQL to build runtime SQL statements
5. Manage data retrieval with cursors and cursor variables
6. Enhance performance using collection datatypes and bulk operations

Unit-I

Introduction to Oracle as RDBMS SQL Vs. SQL * Plus: SQL Commands and Data types, Operators and Expressions, Introduction to SQL * Plus.

Unit-II

Managing Tables and Data: Creating and Altering Tables (Including constraints) ,Data Manipulation Command like Insert, update, delete, SELECT statement with WHERE, GROUP BY and HAVING, ORDER BY, DISTINCT, Special operator like IN, ANY, ALL BETWEEN, EXISTS, LIKE, Join, Built in functions

Unit-III

Other Database Objects - View, Synonyms, Index

Unit-IV

Transaction Control Statements - Commit, Rollback, Savepoint

Unit-V

Introduction to PL/SQL SQL v/s PL/SQL, PL/SQL Block Structure, Language construct of PL/SQL (Variables, Basic and Composite Data type, Conditions looping etc.) TYPE and % ROWTYPE , Using Cursor (Implicit, Explicit)

Suggested Readings

1. Ivan Bayross, (2010). SQL, *PL/SQL the Programming Language of Oracle Paperback*, BPB Publicatins.

2. John Watson, Roopesh Ramklass,(2008). *OCA Oracle Database11g SQL Fundamentals I Exam Guide*, Oracle Press.

3. Michael Mclaughlin,(2008). *Oracle Database 11g PL/SQL Programming*, Oracle Press.

4. Rajeeb C. Chatterjee,(2012). *Learning Oracle SQL and PL/SQL: A simplified Guide*, PHI.

5. Ron Hardman, Michael Mclaughlin, (2005). *Expert Oracle PL/SQL*, Oracle Press.

6. Steven Feuerstein, Bill Pribyl, (2014). *Oracle PL/SQL Programming*, (6th ed.), O'Reilly Media.

Semester – V

16CAU501B PROGRAMMING IN PYTHON 3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 Marks: Int : 40 Ext : 60 Total: 100

Course Objectives

- To Learn Syntax and Semantics and create Functions in Python.
- To Understand the basic logic statements in Python
- To Handle Strings in Python.
- To Understand Lists, Dictionaries in Python.
- To Build GUI applications
- To Use Python interactively

Course Outcomes (COs)

Upon completion of this the course students will be able to:

1. Develop algorithmic solutions to simple computational problems
2. Structure simple Python programs for solving problems.
3. Decompose a Python program into functions.
4. Represent compound data using Python lists, tuples, dictionaries.
5. Read and write data from/to files in Python Programs.
6. Implement database and GUI applications

Unit-I

Planning the Computer Program: Concept of problem solving-Problem definition-Program design-Debugging-Types of errors in programming-Documentation.

Unit-II

Techniques of Problem Solving: Flowcharting-decision table-algorithms-Structured programming concepts-Programming methodologies: top-down and bottom-up Programming.

Unit-III

Overview of Programming: Structure of a Python Program-Elements of Python.

Unit-IV

Introduction to Python: Python Interpreter-Using Python as calculator-Python shell-Indentation. Atoms-Identifiers and keywords-Literals-Strings-Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator).

Unit-V

Creating Python Programs: Input and Output Statements-Control statements(Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.). Defining Functions-Default arguments.

Suggested Readings

1. Allen Downey, Jeffrey Elkner, Chris Meyers, (2012). How to think like a computer scientist : learning with Python , Freely available online.

2. Budd,T.,(2011). *Exploring Python*, (1st ed.) TMH

Websites

1. http://docs.python.org/3/tutorial/index.html.
2. http://interactivepython.org/courselib/static/pythonds.
3. http://www.ibiblio.org/g2swap/byteofpython/read/.

Semester – V

16CAU502A **INFORMATION SECURITY** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To provides an overview of Information Security and Assurance.
- To provide an exposure to the spectrum of security activities methods methodologies and procedures with emphasis on practical aspects of Information Security.
- Gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
- Understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.
- To examine secure software development practices.
- To incorporate approaches for incident analysis and response.
- To incorporate approaches for risk management and best practices.

Course Outcomes(COs)

A student who successfully completes this course should at a minimum be able to:

1. State the basic concepts in information security
2. Explain concepts related to applied cryptography including the four techniques for crypto-analysis symmetric and asymmetric cryptography, digital signature, message authentication code, hash functions and modes of encryption operations.
3. Explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
4. The learner will gain an understanding of cryptography, how it has evolved, and some key encryption techniques used today.
5. The learner will develop an understanding of security policies (such as confidentiality, integrity, and availability), as well as protocols to implement such policies.
6. The learner will gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.

Unit -I

Introduction: Security, Attacks, Computer Criminals, Security Services, Security Mechanisms.

Cryptography : Substitution ciphers, Transpositions Cipher, Confusion, diffusion.

Unit – II

Symmetric, Asymmetric Encryption. DES Modes of DES, Uses of Encryption, Hash function, key exchange, Digital Signatures, Digital Certificates

Unit – III

Program Security: Secure programs, Non malicious Program errors, Malicious codes virus, Trap doors, Salami attacks, Covert channels, Control against program.
Threats: Protection in OS: Memory and Address Protection, Access control, File Protection, User Authentication**.**

Unit – IV

Database Security: Requirements, Reliability, Integrity, Sensitive data, Inference, Multilevel Security**.**
Security in Networks : Threats in Networks, Security Controls, firewalls, Intrusion detection systems, Secure e-mails

Unit -V

Administrating Security: Security Planning, Risk Analysis, Organizational Security Policy, Physical Security. Ethical issues in Security: Protecting Programs and data. Information and law.

Suggested Readings

1. Pfleeger, C. P. , Pfleeger, S. L.,(2006). Security in Computing, Prentice Hall of India.

2. Stallings,W., (2010).Network Security Essentials: Applications and Standards, (4^{th} ed.).

Semester – V

6CAU502B **DATA MINING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Understand Data Mining fundamentals and Characterize the kinds of patterns that can be discovered by association rule mining
- To Compare and evaluate different data mining techniques like classification, prediction.
- To Cluster the high dimensional data for better organization of the data
- To describe complex data types with respect to spatial and web mining
- To Design data warehouse with dimensional modelling and apply OLAP operations.
- To program using available data mining tools and general-purpose languages.

Course Outcomes(COs)

Upon completion of this course the students will be able to:

1. Extract knowledge using data mining techniques and Implement Preprocess the data for mining applications and apply the association rules for mining the data
2. Design and deploy appropriate classification techniques and decision trees.
3. Understand the concept of clustering and its real time applications
4. Explore recent trends in data mining such as web mining, spatial-temporal mining
5. Able to know the basic concepts of data warehouse and OLAP operations
6. Organize and Prepare the data needed for data mining using pre preprocessing techniques

Unit- I

Introduction : Fundamentals of data mining – Data Mining Functionalities – Classification of Data Mining systems – Major issues in Data Mining.
Data Warehouse and OLAP Technology: An Overview – Data Warehouse – Multidimensional Data Model – Data Warehouse Architecture

Unit-II

Data Preprocessing: Needs Preprocessing the Data – Data Cleaning – Data Integration and Transformation – Data Reduction – Discretization and Concept Hierarchy Generation – Online Data Storage.
Preparing Data for Mining: Variable Measures.

Unit-III

Mining Frequent Patterns, Associations and Correlations: Basic Concepts – Efficient and Scalable Frequent item set Mining Methods – From Association Mining to Correlation Analysis.

Unit-IV

Predictive and descriptive data mining techniques, supervised and unsupervised learning techniques, process of knowledge discovery in databases, pre-processing methods

Unit-V

Data Mining Techniques: Association Rule Mining, classification and regression techniques, clustering, Scalability and data management issues in data mining algorithms, measures of interestingness

Suggested Readings

1. Gupta, G.K., (2006). *Introduction to Data Mining with Case Studies*, PHI.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, (2005). *Introduction to Data Mining*, Pearson Education.
3. Richard Roiger, Michael Geatz, (2003). *Data Mining: A Tutorial Based Primer*, Pearson Education.
4. Soman,K.P., Diwakar Shyam, Ajay,V.,(2006*). Insight Into Data Mining: Theory And Practice,* PHI.

Semester – V

16CAU503A **MICROPROCESSOR** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Int : **40** Ext : **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives:

Enable the student

- To become familiar with the architecture and the instruction set of an Intel microprocessor
- To illustrate the architecture of 8085 and 8086 microprocessors.
- To introduce the programming and interfacing techniques of 8086 microprocessor.
- To analyse the basic concepts and programming of 8051 microcontroller
- To understand the interfacing circuits for various applications of 8051 microcontroller.
- To introduce the architecture of advanced microprocessors and microcontrollers.

Course Outcomes:

Upon the completion of the course, the student will able to:

1. Design and implement programs on 8086, ARM, PIC. CO2 Design I/O circuits.
2. The program prepares students to successfully compete for employment in Electronics, Manufacturing and Embedded fields.
3. Design Memory Interfacing circuits.
4. Design and implement 8051 microcontroller based systems.
5. Describe the architecture and instruction set of ARM microcontroller
6. Assembly language programming will be studied as well as the design of various types of digital and analog interfaces

Unit – I

Introduction to Microprocessor: Introduction to 8085 – Pin Diagram – Microprocessor architecture and its operations– Demultiplexing the Bus – Generation of Control Signals – Fetching, Decoding and Execution of Instruction – Instruction Timing and Status Flag.

Unit – II

Addressing Modes: Instruction Set – Addressing Modes – Instruction Format – Simple Program – Memory and Machine Cycle – Memory Units Machine Cycle.

Unit – III

Interfacing Concepts: Peripheral I/O Instructions – Device Selection and Data Transfer – Types of Data Transfer – Input Interfacing – Input Interfacing using Decoders – Output Interfacing – LED and 7 Segment Display – Interfacing Memory.

Unit – IV

Peripheral Devices: Introduction to Programmable Peripheral Interface 8255 – Pin Diagram – Architecture – Modes of Operation: I/O and BSR – Architecture and Operation of 8251 (USART)

Architecture and Operation of Programmable Interrupt Controller (8259) – Architecture of 254(8253) Programmable Interval Timer/ Counter – DMA Controller(8259).

Unit – V - Applications

Delay Program – Traffic Light Control System – Water Level Controller – Stepper Motor Control – Interfacing DAC – Interfacing ADC – Temperature Measurement.

Suggested Readings:

1. Barry B. Brey, (2009). *The Intel Microprocessors : Architecture, Programming and Interfacing*. (6^{th} ed.)Pearson Education.
2. Gupta,M.K.,(2006). *Microprocessor Microcomputer, Microcontroller and Interfacing*, (1^{st} ed.), New Delhi , Paragon International Publisher.
3. Ramesh S.Gaonkar, (2000). *Microprocessor Architecture, Programming and Application with 8085*, (4^{th} ed.), New Delhi, Penram International Publishing.
4. Walter A Triebel, Avtar Singh, (2005). *The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware, and Applications*. (4^{th} ed.)PHI,

16CAU503B PC HARDWARE AND TROUBLE SHOOTING 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives:

Enable the student

- to assemble/setup and upgrade personal computer systems
- perform installation, configuration,
- upgrading of hardware and software,
- install/connect associated peripherals
- diagnose in hardware and software and other peripheral equipment.
- Troubleshoot the problem

Course Outcomes:

Upon the completion of the course, the student will be able to

1. assemble/setup and upgrade personal computer systems
2. perform installation, configuration,
3. upgrading of hardware and software,
4. install/connect associated peripherals
5. diagnose in hardware and software and other peripheral equipment.
6. Troubleshoot the problem

Unit-I

Micro Computer System: Introduction to Micro Computer System – Computer Organization – Number Systems and Codes Memory – Arithmetic and Logic Unit – Control Unit.

Unit-II

Peripheral Devices: Introduction to Peripheral Devices – Keyboard – CRT Display monitor – Printer – Magnetic Storage Devices – Floppy Disk Drive – Hard Disk Drive – Peripherals Interfaces and Controller – Keyboard Interface

16CAU503B PC HARDWARE AND TROUBLE SHOOTING 4H – 4C

Unit-III

Display Adapter: CRT Display — CRT Controller –Auxiliary Subsystems – Data Communication fundamentals – Serial Port in PC – Real time clock (RTC) – Magnetic Tape Subsystems – LAN – Memory Expansion Options

Unit-IV

Installation and Preventive Maintenance: Pre Installation Planning – Installation Practice – Routine Checks – Special Configurations – Memory Up Gradation

Unit-V

Trouble shooting: Troubleshooting – Computer faults – Nature of faults – Types of Faults Diagnostic Programs and Tools — Faults in Elimination Process – Systematic Troubleshooting – POST (Power on Self Test)

Suggested Readings

1. Govindarajalu,B.,(2011). *IBM PC and Clones*,(2nd ed.)Tata McGraw Hill Publishing Company. [UNIT I & II]
2. Michael Meyers, (2003). *Introduction to PC Hardware and Troubleshooting, The Mike Meyers' Computer Skills*, (1st ed.)McGraw Hill, [UNIT III - V]
3. Sanjay K. Bose, (1999). *Hardware and Software of Personal Computers*, New Age International Publishers.

Semester – V

16CAU504A **DIGITAL IMAGE PROCESSING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To apply knowledge of mathematics, science, and engineering
- To design and conduct experiments, as well as to analyze and interpret data

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation techniques.

Unit-I

Introduction: Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization. Spatial Domain Filtering: Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian.

Unit-II

Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

Unit-III

Image Restoration, Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections, Image Compression-Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, DCT implementation using FFT, Run length coding.

Unit – IV

FAX compression (CSUITT Group-3 and Group-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG, Lossless predictive coding, Lossy predictive coding, Motion Compensation
Wavelet based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT),Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking

Unit-V

Morphological Image Processing: Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion. Image Segmentation: Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation

Suggested Readings

1. Castleman, K R., (1996). *Digital Image Processing*, Pearson Education.
2. Gonzalez, R C., Woods, R E.,(2008). *Digital Image Processing*, (3rd ed.)Pearson Education.
3. Jain,A.K.,(1989). *Fundamentals of Digital image Processing*, Prentice Hall of India.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, (2004). *Digital Image Processing using* MATLAB', Pearson Education, Inc..
5. Schalkoff, (1989). *Digital Image Processing and Computer Vision*, John Wiley and Sons.

16CAU504B	OPEN SOURCE TECHNOLOGIES	Semester – V 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- To introduce open source technology for development of web applications.
- For Study the problems with traditional commercial software.
- To understand open source scripting language for programming in web environment i.e. PHP.
- To study the open source management system and connection with database.
- To learn open source web server, software tools.
- To learn the open source ideals in order to apply those principles

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Leaned the need of open source technology, open source development model, application of open sources, aspects of open source movement
2. The students will be aware about the problems with traditional commercial software.
3. The student will be familiar with basis syntax of PHP, common PHP scripts elements.
4. The student will be familiar with creating of the server side scripting using PHP, implement PHP database connectivity, perform operation on database and open source database management system.
5. The students will be familiar with Working of different web Servers.
6. The students will be aware about the software tool and process like Eclipse IDE, Selenium ID

Unit-I

Why open source, what is Open source, open source principles, open standards requirements for software, open source successes, free software, some example of free software, free software license provider, free software Vs Open source software, Public Domain , FOSS DOES not Mean any cost, proprietary Vs Open Source Licensing Model. Principles and Open Source Methodology: History, open source initiatives, open standards principles-methodologies, philosophy, software freedom, open source software, development, Licenses, copyright.

Unit-II

Open source projects: Starting and maintaining an open source project, open source hardware- open source design-open source teaching (OST).Open Source Ethics: Open Source Vs Closed Source-Open source Government-The ethics of open source-social and financial impacts of open source technology-shared software, shared source.

Unit-III

Apache Web Server: Introduction-Starting, Stopping, and Restarting Apache-Configuration-Securing Apache Create the Web Site-Apache Log Files

Unit-IV

MySQL: Introduction-Tutorial-Database Independent Interface-Table Joins-Loading and Dumping a Database

Unit-V

Perl: Introduction-Perl Documentation-Perl Syntax Rules-A Quick Introduction To Object-Oriented Programming-What We Didn't Talk About

Suggested Readings

1. Andrew M. St. Laurent, (2004). *Understanding Open Source and Free Software Licensing*, O'Reilly Media.
2. Dan Woods, Gautam Guliani, (2005). Open Source for the Enterprise, O'Reilly Media.
3. Fadi P. Deek and James A. M. McHugh,(2007). *Open Source Technology and Policy*, Cambridge University Press.
4. James Lee, Brent Ware,2002. *Open Source Web Development with LAMP: Using Linux, Apache, MySQL, Perl, and PHP*, , Publisher: Addison Wesley Date [UNIT III – V]
5. Kailashvadera, Vhavyesh Gandhi, (2009). *Open source Technologies, Lakshmi Publications*,(1^{st} ed.). [UNIT I – II]
6. Nick Wells,(2012). *The Complete Guide to Linux System Administration*, Delmar Cengage Learning.

Semester – V

16CAU511A **Oracle (SQL/PL-SQL) (PRACTICAL)** **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- create and use table, column, primary key, foreign key,
- Use constraint, data type and view.
- Use SQL DDL commands to on a very basic level create and edit an Oracle database.
- Use SQL DML commands to select, update and delete data in an Oracle database.
- Use built-in functions and dynamic SQL in an Oracle 10g database.
- Use PL/SQL to build procedures, functions and triggers with variables, cursors, flow control and error management in Oracle 10g database

Course Outcomes:

Upon the completion of the course, student able to

1. Develop efficient PL/SQL programs to access Oracle databases
2. Use some of the Oracle supplied PL/SQL packages to generate screen and file outputs
3. Design modular applications using packages
4. Invoke native dynamic SQL to build runtime SQL statements
5. Manage data retrieval with cursors and cursor variables
6. Enhance performance using collection datatypes and bulk operations

[SQL COMMANDS]

1) SQL* formatting commands
2) To create a table, alter and drop table.
3) To perform select, update, insert and delete operation in a table.
4) To make use of different clauses viz where, group by, having, order by, union and intersection,
5) To study different constraints.

[SQL FUNCTION]

6) To use oracle function viz aggregate, numeric, conversion, string function.
7) To understand use and working with joins.
8) To make use of transaction control statement viz rollback, commit and save point.
9) To make views of a table.
10) To make indexes of a table.

[PL/SQL]

11) To understand working with PL/SQL
12) To implement Cursor on a table.
13) To implement trigger on a table

Semester – V

16CAU511B PROGRAMMING IN PYTHON (PRACTICAL) 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To Learn Syntax and Semantics and create Functions in Python.
- To Understand the basic logic statements in Python
- To Handle Strings in Python.
- To Understand Lists, Dictionaries in Python.
- To Build GUI applications
- To Use Python interactively

Course Outcomes (COs)

Upon completion of this the course students will be able to:

1. Develop algorithmic solutions to simple computational problems
2. Structure simple Python programs for solving problems.
3. Decompose a Python program into functions.
4. Represent compound data using Python lists, tuples, dictionaries.
5. Read and write data from/to files in Python Programs.
6. Implement database and GUI applications

List of Programs:

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades aCSUording to the following criteria :
   Grade A: Percentage >=80
   Grade B: Percentage>=70 and <80
   Grade C: Percentage>=60 and <70
   Grade D: Percentage>=40 and <60
   Grade E: Percentage<40
3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by aCSUepting suitable input parameters from user.
4. Write a program in python to display the first n terms of Fibonacci series.
5. Write a program in python to find factorial of the given number.
6. Write a program in python to find sum of the following series for n terms: 1 – 2/2! + 3/3! - - - - - n/n!
7. Write a program in python to calculate the sum and product of two compatible matrices.

Semester – V

16CAU512A INFORMATION SECURITY PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 2 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To provides an overview of Information Security and Assurance.
- To provide an exposure to the spectrum of security activities methods methodologies and procedures with emphasis on practical aspects of Information Security.
- Gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
- Understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.
- To examine secure software development practices.
- To incorporate approaches for incident analysis and response.
- To incorporate approaches for risk management and best practices.

Course Outcomes(COs)

A student who successfully completes this course should at a minimum be able to:

1. State the basic concepts in information security
2. Explain concepts related to applied cryptography including the four techniques for crypto-analysis symmetric and asymmetric cryptography, digital signature, message authentication code, hash functions and modes of encryption operations.
3. Explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
4. The learner will gain an understanding of cryptography, how it has evolved, and some key encryption techniques used today.
5. The learner will develop an understanding of security policies (such as confidentiality, integrity, and availability), as well as protocols to implement such policies.
6. The learner will gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.

List of Programs:

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois
2. Use of Password cracking tools : John the Ripper, Ophcrack. Verify the trength of passwords using these tools.
3. Perform encryption and decryption of Caesar cipher. Write a script for performing these operations.
4. Perform encryption and decryption of a Rail fence cipher. Write a script for

performing these operations.

5. Use nmap/zenmap to analyse a remote machine.
6. Use Burp proxy to capture and modify the message.
7. Demonstrate sending of a protected word document.
8. Demonstrate sending of a digitally signed document.
9. Demonstrate sending of a protected worksheet.
10. Demonstrate use of steganography tools.
11. Demonstrate use of gpg utility for signing and encrypting purposes.

Semester – V

16CAU512B **DATA MINING PRACTICAL** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Enable the student

- To Understand Data Mining fundamentals and Characterize the kinds of patterns that can be discovered by association rule mining
- To Compare and evaluate different data mining techniques like classification, prediction.
- To Cluster the high dimensional data for better organization of the data
- To describe complex data types with respect to spatial and web mining
- To Design data warehouse with dimensional modelling and apply OLAP operations.
- To program using available data mining tools and general-purpose languages.

Course Outcomes(COs)

Upon completion of this course the students will be able to:

1. Extract knowledge using data mining techniques and Implement Preprocess the data for mining applications and apply the association rules for mining the data
2. Design and deploy appropriate classification techniques and decision trees.
3. Understand the concept of clustering and its real time applications
4. Explore recent trends in data mining such as web mining, spatial-temporal mining
5. Able to know the basic concepts of data warehouse and OLAP operations
6. Organize and Prepare the data needed for data mining using pre preprocessing techniques

List of Programs:

1. Use the following learning schemes, with the default settings to analyze the weather data (in weather.arff). For test options, first choose "Use training set", then choose "Percentage Split" using default 66% percentage split. Report model percent error rate
2. Using iris dataset preprocess and classify it with J4.8 and Naïve Bayes Classifier. examine the tree in the Classifier output panel
3. Using the datasets *ReutersCorn-Train* and *ReutersGrain-Train*. Classify articles using binary attributes and word count attributes.
4. Apply any two association rule based algorithm for the supermarket analysis

5. Using weka Experimenter perform comparison analysis of J48, oneR and ID3 for vote dataset
6. Using Weka Experimenter perform comparison analysis of Naïve Bayes with different datasets
7. Apply ZeroR, OneR, and J48, to classify the Iris data in an experiment using 10 train and test runs, with 66% of the data used for training and 34% used for testing.
8. Using Weka Knowledge flow Sett up a flow to load an ARFF file (batch mode) and perform a cross-validation using J48 (WEKA's C4.5 implementation).

Semester – V

16CAU513A **MICROPROCESSOR PRACTICAL** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- To become familiar with the architecture and the instruction set of an Intel microprocessor
- To illustrate the architecture of 8085 and 8086 microprocessors.
- To introduce the programming and interfacing techniques of 8086 microprocessor.
- To analyse the basic concepts and programming of 8051 microcontroller
- To understand the interfacing circuits for various applications of 8051 microcontroller.
- To introduce the architecture of advanced microprocessors and microcontrollers.

Course Outcomes:

Upon the completion of the course, the student will able to:

1. Design and implement programs on 8086, ARM, PIC. CO2 Design I/O circuits.
2. The program prepares students to successfully compete for employment in Electronics, Manufacturing and Embedded fields.
3. Design Memory Interfacing circuits.
4. Design and implement 8051 microcontroller based systems.
5. Describe the architecture and instruction set of ARM microcontroller
6. Assembly language programming will be studied as well as the design of various types of digital and analog interfaces

Assembly Language Programming

1. Addition of 8/16 bit and array of Data

2. Subtraction of 8/16 bit and array of Data

3. Multiplication of 8-bit Number

4. Division of 8-bit Number Write a program for 32-bit binary division and multiplication

5. Fill and Transfer an Array of Data

6. Ascending and Descending of an array

7. Data Transfer using Parallel Ports

8. Stepper Motor Interface

9. Traffic Light Interface

10. A/D and D/A Converter

Semester – V

16CAU513B **PC HARDWARE & TROUBLE SHOOTING PRACTICAL** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- to assemble/setup and upgrade personal computer systems
- perform installation, configuration,
- upgrading of hardware and software,
- install/connect associated peripherals
- diagnose in hardware and software and other peripheral equipment.
- Troubleshoot the problem

Course Outcomes:

Upon the completion of the course, the student will be able to

1. assemble/setup and upgrade personal computer systems
2. perform installation, configuration,
3. upgrading of hardware and software,
4. install/connect associated peripherals
5. diagnose in hardware and software and other peripheral equipment.
6. Troubleshoot the problem

List of Programs:

1. Identifying External Ports and Interfacing
2. Identifying PC cards and Interfacing.
3. Assembling of PC
4. Preventive Maintenance of a PC
5. Trouble Shooting of SMPS
6. Keyboard Servicing
7. Study of CRT
8. Communication and Bus Interfacing
9. Partitioning and Formatting Hard disks.
10. Installing System And Application Software

Semester – V

16CAU514A DIGITAL IMAGE PROCESSING PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To apply knowledge of mathematics, science, and engineering
- To design and conduct experiments, as well as to analyze and interpret data

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation techniques

List of Programs:

1. Write program to read and display digital image using MATLAB or SCILAB
    a. Become familiar with SCILAB/MATLAB Basic commands
    b. Read and display image in SCILAB/MATLAB
    c. Resize given image
    d. Convert given color image into gray-scale image
    e. Convert given color/gray-scale image into black & white image
    f. Draw image profile
    g. Separate color image in three R G & B planes
    h. Create color image using R, G and B three separate planes
    i. Flow control and LOOP in SCILAB
    j. Write given 2-D data in image file
2. To write and execute image processing programs using point processing method
    a. Obtain Negative image b. Obtain Flip image
    b. Thresholding d. Contrast stretching
3. To write and execute programs for image arithmetic operations
    a. Addition of two images
    b. Subtract one image from other image
    c. Calculate mean value of image
    d. Different Brightness by changing mean value
4. To write and execute programs for image logical operations
    a. AND operation between two images

a. OR operation between two images
b. Calculate intersection of two images
c. Water Marking using EX-OR operation
d. NOT operation (Negative image)

5. To write a program for histogram calculation and equalization using
    a. Standard MATLAB function
    b. Program without using standard MATLAB functions
    c. C Program
6. To write and execute program for geometric transformation of image
    a. Translation
    b. Scaling
    c. Rotation
    d. Shrinking
    e. Zooming
7. To understand various image noise models and to write programs for
    a. image restoration
    b. Remove Salt and Pepper Noise
    c. Minimize Gaussian noise
    d. Median filter and Weiner filter
8. Write and execute programs to remove noise using spatial filters
    a. Understand 1-D and 2-D convolution process
    b. Use 3x3 Mask for low pass filter and high pass filter
    c. To write and execute program for wavelet transform on given image and perform inverse wavelet transform to reconstruct image.
9. Write and execute programs for image frequency domain filtering
    a. Apply FFT on given image
    b. Perform low pass and high pass filtering in frequency domain
    c. Apply IFFT to reconstruct image
10. Write a program in C and MATLAB/SCILAB for edge detection using different edge detection mask
11. Write and execute program for image morphological operations erosion and dilation.

Semester – V

16CAU514B OPEN SOURCE TECHNOLOGIES PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives:

Enable the student

- To introduce open source technology for development of web applications.
- For Study the problems with traditional commercial software.
- To understand open source scripting language for programming in web environment i.e. PHP.
- To study the open source management system and connection with database.
- To learn open source web server, software tools.
- To learn the open source ideals in order to apply those principles

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Leaned the need of open source technology, open source development model, application of open sources, aspects of open source movement
2. The students will be aware about the problems with traditional commercial software.
3. The student will be familiar with basis syntax of PHP, common PHP scripts elements.
4. The student will be familiar with creating of the server side scripting using PHP, implement PHP database connectivity, perform operation on database and open source database management system.
5. The students will be familiar with Working of different web Servers.
6. The students will be aware about the software tool and process like Eclipse IDE, Selenium ID

16CAU514B OPEN SOURCE TECHNOLOGIES PRACTICAL 4H – 2C

List of Programs:

1. Create ―Hello World application. That will display ―Hello World in the middle of the screen in the emulator. Also display ―Hello World in the middle of the screen in the Android Phone.
2. Create an application with login module. (Check username and password).
3. Create spinner with strings taken from resource folder and on changing the spinner value, Image will change.
4. Create a menu with 5 options and selected option should appear in text box.
5. Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen.
6. Create an application with three option buttons, on selecting a button colour of the screen will change.
7. Create and Login application as above. On successful login, pop up the message.
8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.

		Semester – VI
16CAU601A	**PHP PROGRAMMING**	**3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To write basic PHP syntax using various operators.
- To write PHP scripts to handle HTML forms.
- To analyze different tasks using PHP functions.
- To understand the regular expressions in PHP.
- To learn array data structure using PHP scripts.
- To Create conditional structures

Course Outcomes (COs)

Upon completion of this course, students will be able to:

1. Write PHP scripts using operators to perform various functions
2. Design PHP scripts to handle HTML forms.
3. Implement different types of PHP functions.
4. Write regular expressions including modifiers, operators, and metacharacters.
5. Create PHP scripts using array.
6. Analyze and solve various database tasks using the PHP language.

Unit-I

Introduction to PHP: PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.) -PHP with other technologies, scope of PHP -Basic Syntax, PHP variables and constants -Types of data in PHP , Expressions, scopes of a variable (local, global)-PHP Operators: Arithmetic, Assignment, Relational, Logical operators, Bitwise , ternary and MOD operator-PHP operator Precedence and associativity

UNIT-II

Handling HTML form with PHP: Capturing Form Data-GET and POST form methods-Dealing with multi value fields Redirecting a form after submission -**PHP conditional events and Loops:** PHP IF Else conditional statements (Nested IF and Else) -Switch case, while ,For and Do While Loop -Goto , Break ,Continue and exit

UNIT-III

PHP Functions: Function, Need of Function , declaration and calling of a function -PHP Function with arguments, Default Arguments in Function -Function argument with call by value, call by reference -Scope of Function Global and Local

UNIT-IV

String Manipulation and Regular Expression: Creating and accessing String, Searching & Replacing String -Formatting, joining and splitting String , String Related Library functions-Use and advantage of regular expression over inbuilt function -Use of preg_match(), preg_replace(), preg_split()-functions in regular expression

UNIT-V

Array: Anatomy of an Array ,Creating index based and Associative array ,Accessing array-Looping with Index based array, with associative array using each() and foreach()-Some useful Library function

Suggested Readings

1. David Sklar, Adam Trachtenberg, (2014). *PHP Cookbook: Solutions & Examples for PHP*.
2. Luke Welling, Laura Thompson,(2008). *PHP and MySQL Web Development*, (4th ed.), Addition Paperback, Addison-Wesley Professsional.
3. Robin Nixon,(2014). *Learning PHP, MySQL, JavaScript, CSS & HTML5, (3rd ed.) Paperback*, O'reilly.
4. Steven Holzner, (2007). *PHP: The Complete Reference Paperback*, McGraw Hill Education (India), 2007.
5. Timothy Boronczyk, Martin E. Psinas, (2008). *PHP and MYSQL (Create-Modify-Reuse)*, Wiley India Private Limited.

16CAU601B	UNIX / LINUX PROGRAMMING	Semester – VI 3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student to

- Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.
- Understand how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions
- Understand how the operating system abstractions can be implemented
- Understand the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software
- Understand basic resource management techniques (scheduling or time management, space management) and principles and how they can be implemented. These also include issues of performance and fairness objectives, avoiding deadlocks, as well as security and protection.
- provide introduction to UNIX Operating System and its File System
- gain an understanding of important aspects related to the SHELL and the process
- develop the ability to formulate regular expressions and use them for pattern matching.

Course Outcome

Upon completion of this course, students will be able to:

1. Describe the architecture and features of UNIX Operating System and distinguish it from other Operating System
2. Demonstrate UNIX commands for file handling and process control
3. Write Regular expressions for pattern matching and apply them to various filters for a specific task
4. Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem
5. Implement various file processing commands used in UNIX.
6. Construct various shell scripts for simple applications.

Unit-I

Introduction What is Linux/Unix Operating systems, Difference between linux/unix and other operating systems , Features and Architecture, Various Distributions available in the market, Installation, Booting and shutdown process

Unit-II

System processes (an overview), External and internal commands, Creation of partitions in OS, Processes and its creation phases – Fork, Exec, wait

Unit-III

User Management and the File System Types of Users, Creating users, Granting rights User management commands, File quota and various file systems available, File System Management and Layout, File permissions, Login process, Managing Disk Quotas, Links (hard links, symbolic links)

Unit-IV

Shell introduction and Shell Scripting What is shell and various type of shell, Various editors present in Linux Different modes of operation in vi editor, What is shell script, Writing and executing the shell script , Shell variable (user defined and system variables)

Unit-V

System calls, Using system calls Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell, Functions, Utility programs (cut, paste, join, tr, uniq utilities), Pattern matching utility (grep)

Suggested Readings

1. Michael Jang, (2011). *RHCSA/ RHCE Red Hat Linux Certification: Exams (Ex200 & Ex300)* ,Certification Press.
2. Nemeth Synder & Hein,(2010). *Linux Administration Handbook*, (2nd ed.) Pearson Education
3. Richard Stevens,W., Bill Fenner, Andrew M. Rudoff, (2014). *Unix Network Programming, The sockets Networking*, Vol. 1, 3rd ed.) API.
4. Sumitabha, Das, (2006). *Unix Concepts And Applications*, Tata McGraw-Hill Education.

Semester – VI

16CAU602A **CLOUD COMPUTING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int: **40** Ext: **60** Total: **100**

Course Objectives

Enable the student to

- Basics of cloud computing.
- Key concepts of virtualization.
- Different Cloud Computing services
- Cloud Implementation, Programming and Mobile cloud computing
- Key components of Amazon Web Services
- Cloud Backup and solution

Course Outcomes (COs)

Upon completion of this course, the students will be able to:

1. Define Cloud Computing and memorize the different Cloud service and deployment models
2. Describe importance of virtualization along with their technologies.
3. Use and Examine different cloud computing services
4. Analyze the components of open stack & Google Cloud platform and understand Mobile Cloud Computing
5. Describe the key components of Amazon web Service
6. Design & develop backup strategies for cloud data based on features

Unit-I

Overview of Computing Paradigm: Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. **Introduction to Cloud Computing:** Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing.

Unit-II

Cloud Computing Architecture: Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.

Unit-III

Case Studies: Case study of Service model using Google App Engine, Microsoft Azure, Amazon EC2 , Eucalyptus.

Unit-IV

Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling.

Unit-V

Cloud Security: Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing.

Suggested Readings

1. Barrie Sosinsky,(2010). *Cloud Computing Bible*,Wiley-India.
2. Dimitris N. Chorafas,(2010). Cloud Computing Strategies ,CRC Press.
3. Gautam Shroff, (2010). *Enterprise Cloud Computing Technology Architecture Application*s, Cambridge University Press.
4. Gautam Shroff, (2010). Enterprise Cloud Computing Technology Architecture Applications, Cambridge University Press.
5. Nikos Antonopoulos, Lee Gillam,(2012). *Cloud Computing: Principles, Systems and Applications*, Springer Publications.
6. Ronald L. Krutz, Russell Dean Vines,(2010). Cloud Security: A Comprehensive Guide to Secure Cloud Computing, , Wiley-India.
7. Toby Velte, Anthony Velte, Robert Elsenpeter,(2010). Cloud Computing, A Practical Approach ,McGraw Hills.

Websites

1. en.wikipedia.org/wiki/Cloud_computing
2. www.ibm.com/cloud-computing/in/en/
3. www.oracle.com/CloudComputing
4. www.microsoft.com/en-us/cloud/default.aspx

16CAU602B **DATABASE ADMINISTRATION** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student to

- Installing Oracle Software
- Creating an Oracle Database Using DBCA
- Managing Database instances and ASM instances
- Managing and controlling database network environment
- Define and devise transaction management, concurrency control, crash recovery components
- Managing storage structures

Course Outcomes (COs)

Upon completion of this course, the students will be able to:

1. Design, model and install any database management systems by using Oracle database as sample.
2. Plan, design, construct, control and manage database instances, database network environment, storage structures, user security, database backup and recovery, database maintenance
3. Define and devise transaction management, concurrency control, crash recovery components
4. Examine and perform data base administration roles and operations by using Oracle database system as a sample
5. Compare and contrast by examining the database systems and new trends in data storage, data retrieval and maintenance techniques.
6. Configure, manage and maintain database, to audit and improve database performances and to use tools for database administration.

Unit I

Oracle DBA's: The Oracle DBA's Role- Oracle Database 11g Architecture: Oracle Databases and instances- Oracle Logical Storage structures – Oracle Logical Database structures – Oracle Physical Storage structures- Multiplexing Database Files - Oracle Memory Structures-Oracle Backup and Recovery – Security Capabilities – Tablespace Architecture – Oracle Tablespace installation – Traditional Disk Space Storage – Automatic Storage Management

Unit II

Common Space Management Problems – Oracle Segments, Extents and Blocks – Space Management Methodologies – SYSAUX monitoring and usage – Archived Redo Log

File Management – Built in Space Management Tools: Segment Advisor – Undo Advisor and the Automatic Workload Repository – Index usage – Space Usage Warning Levels – Reusable space allocation – Managing alert and Trace Files with ADR – Transaction Basics – Undo Basics – Managing Undo Tablespaces – Flashback features

Unit III

Tuning Application Design – Tuning SQL – Tuning Memory Usage – Tuning Data Access – Tuning Data Manipulation – Tuning Physical Storage – Reducing Network Security – Database Authentication Methods

Unit IV

Database Authorization Methods – Auditing: Auditing Locations – Statement Auditing – Privilege Auditing Schema Object Auditing – Auditing Related Data Dictionary Views – Logical Backups – Physical Backups – Using Data Pump Export and Import – Data Pump Import Options – Integration of Backup Procedures
Overview of Oracle Net – Using the Oracle Net Configuration Assistant – Using the Oracle Net Manager – Starting the Listener Server Process – Controlling the Listener Server Process Using Data links

Unit-V

Creating Tablespaces in a VLDB Environment: Bigfile Tablespace Basics – Creating and Modifying Bigfile Tablespace – Bigfile Tablespace ROWID format – DBMS_ROWID and Bigfile Tablespaces.- Advanced Oracle Table Types – Using Bitmap Indexes – Oracle Data Pump
Remote queries – Remote Data Manipulation: Two Phase Commit – Managing Distributed Data – Managing Distributed Transactions – Monitoring and Tuning Distributed Database

Suggested Readings

1. Bob Bryla, Kevin Loney 2008 Oracle Database 11g DBA Handbook McGraw-Hill Osborne
2. Saikat Basak. 2010. Oracle DBA Concise Handbook ,Ensel Software

Websites :

1. www.oracle.com/technology/software/products/database/oracle10g/index.html
2. www.oracle-base.com/articles/10g/
3. www.adp-gmbh.ch/ora/misc/10g.html

16CAU603A **BIG DATA ANALYTICS** **4H- 4C**

Instruction Hours / week: L: 4T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3Hours

Course Objectives

Enable the student

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability

Course Outcomes (COs)

Upon completion of this course, the students will be able to:

1. Work with big data tools and its analysis techniques
2. Analyze data by utilizing clustering and classification algorithms
3. Learn and apply different mining algorithms and recommendation systems for large volumes of data
4. Perform analytics on data streams
5. Learn NoSQL databases and management.
6. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing

Unit-I

Fundamentals of Big Data - The Evolution of Data Management Understanding the Waves of Managing Data- Defining Big Data - Big Data Management Architecture- The Big Data Journey -Big Data Types-Defining Structured Data-Defining Unstructured Data-Putting Big Data Together.

Unit-II

Big Data Stack- Basics of Virtualization - The importance of virtualization to big data - Server virtualization - Application virtualization - Network virtualization -Processor and memory virtualization - Data and storage virtualization-Abstraction and Virtualization-Implementing Virtualization to Work with Big Data.

Unit-III
Hadoop - Hadoop Distributed File System - Hadoop MapReduce- The Hadoop foundation and Ecosystem.

Unit-IV
Big Data Analytics-Text Analytics and Big Data-Customized Approaches for Analysis of Big Data

Unit-V
Integrating Data Sources-Real-Time Data Streams and Complex Event Processing-Operationalizing Big Data.

Suggested readings

1. Judith Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, (2013). Big Data For Dummies, Wiley India,New Delhi.

2. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan,(2012). Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, New Delhi.

3. Michael Minelli, Michele Chambers, Ambiga Dhiraj,(2013). Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications, New Delhi.

4. Zikopoulos, Paul, Chris Eaton, (2011). Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, New Delhi.

Websites

1. www.oracle.com/BigData
2. www.planet-data.eu/sites/default/files/Big_Data_Tutorial_part4.pdf
3. www.ibm.com/developerworks/data
4. www.solacesystems.com
5. en.wikipedia.org/wiki/Big_data
6. www.sap.com/solution/big-data.html

Semester – VI

16CAU603B **SYSTEM PROGRAMMING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To introduce students the concepts and principles of system programming
- To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.
- Describe the utility of different system programs & system tools.
- Familiarize with the tradeoffs between run-time and compile-time processing (Linking & Loading techniques).
- Explore the use of compiler with its phases.
- Use of Syntax directed scheme for intermediate code generation.
- Construct & use of different compiler tools as LeX, Yacc for code generation & optimization.

Course Outcomes

Upon completion of this course, students will be able to:

1. Organize the functionalities & components of system software & tools into different layers for efficient code generation.
2. Apply the knowledge & technique to develop solutions to real world problems by compiling application programs.
3. ability to identify, formulate, and solve computer engineering problems with proper systematic & semantic approach.
4. Develop possible program constructs for further code generation with Type checking & memory management strategy
5. Design a simple compiler with tools & different with optimized techniques
6. Design and implement system utility programs.

Unit-I

Assemblers & Loaders, Linkers: One pass and two pass assembler design of an assembler, Absolute loader, relocation and linking concepts, relocating loader and Dynamic Linking., overview of compilation, Phases of a compiler.

Unit-II

Lexical Analysis: Role of a Lexical analyzer, Specification and recognition of tokens, Symbol table, lexical

Unit-III

Parsing: Bottom up parsing- LR parser, yacc. **Intermediate representations: Three** address code generation, syntax directed translation, translation of types, control Statements.

UNIT-IV

Storage organization: Activation records stack allocation.

UNIT-V

Code Generation: Object code generation

Suggested Readings

1. Santanu Chattopadhyaya,(2011). Systems Programming, PHI.
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, (2006). Compilers: Principles, Techniques, and Tools, Second edition, Prentice Hall.
3. Dhamdhere, D. M.,(2011). Systems Programming, Tata McGraw Hill.
4. Leland Beck, D.Manjula, (2008). System Software: An Introduction to System Programming, Third edition, Pearson Education.
5. Grune D, Van Reeuwijk . K, Bal H. E, Jacobs C J H, Langendoen K, (2012). Modern Compiler Design, Second edition, Springer.

Semester – VI

16CAU611A PHP PROGRAMMING PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives
Enable the student

- To write basic PHP syntax using various operators.
- To write PHP scripts to handle HTML forms.
- To analyze different tasks using PHP functions.
- To understand the regular expressions in PHP.
- To learn array data structure using PHP scripts.
- To Create conditional structures

Course Outcomes (COs)
Upon completion of this course, students will be able to:

1. Write PHP scripts using operators to perform various functions
2. Design PHP scripts to handle HTML forms.
3. Implement different types of PHP functions.
4. Write regular expressions including modifiers, operators, and metacharacters.
5. Create PHP scripts using array.
6. Analyze and solve various database tasks using the PHP language.

List of Programs:

1. Create a PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
3. Write a simple PHP program to check whether the given number is prime or not.
4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
5. Write a PHP function that checks if a string is all lower case.
6. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)
7. WAP to sort an array.
8. Write a PHP script that removes the whitespaces from a string.

Sample string : 'The quick " " brown fox' Expected Output : Thequick""brownfox

9. Write a PHP script that finds out the sum of first n odd numbers.
10. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.
11. Write a PHP script that checks if a string contains another string.
12. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.
13. Create a script to construct the following pattern, using nested for loop.

```
*
* *
* * *
* * * *
* * * * *
```

14. Write a simple PHP program to check that emails are valid.
15. Write a simple PHP program to print first n even numbers.
16. $color = array('white', 'green', 'red")

    Write a PHP script which will display the colors in the following way : Output :

    white, green, red,
17. Using switch case and dropdown list display a ―Hello‖ message depending on the language selected in drop down list.
18. Write a PHP program to print FibonaCSUi series using recursion.
19. Write a PHP script to replace the first 'the' of the following string with 'That'.

Sample : 'the quick brown fox jumps over the lazy dog.'

Expected Result : That quick brown fox jumps over the lazy dog.

Semester – VI

16CAU611B UNIX / LINUX PROGRAMMING PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student to

- Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.
- Understand how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions
- Understand how the operating system abstractions can be implemented
- Understand the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software
- Understand basic resource management techniques (scheduling or time management, space management) and principles and how they can be implemented. These also include issues of performance and fairness objectives, avoiding deadlocks, as well as security and protection.
- provide introduction to UNIX Operating System and its File System
- gain an understanding of important aspects related to the SHELL and the process
- develop the ability to formulate regular expressions and use them for pattern matching.

Course Outcome

Upon completion of this course, students will be able to:

1. Describe the architecture and features of UNIX Operating System and distinguish it from other Operating System
2. Demonstrate UNIX commands for file handling and process control
3. Write Regular expressions for pattern matching and apply them to various filters for a specific task
4. Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem
5. Implement various file processing commands used in UNIX.
6. Construct various shell scripts for simple applications.

List of Programs:

1. Write a shell script to check if the number entered at the command line is prime or not.
2. Write a shell script to modify ―call command to display calendars of the specified months.
3. Write a shell script to modify ―call command to display calendars of the specified range of months.

4. Write a shell script to accept a login name. If not a valid login name display message –
   ―Entered login name is invalid.
5. Write a shell script to display date in the mm/dd/yy format.
6. Write a shell script to display on the screen sorted output of ―who command along
   with the total number of users .
7. Write a shell script to display the multiplication table any number,
8. Write a shell script to compare two files and if found equal asks the user to delete the
   duplicate file.
9. Write a shell script to find the sum of digits of a given number.
10. Write a shell script to merge the contents of three files, sort the contents and then
    display them page by page.
11. Write a shell script to find the LCD (least common divisor) of two numbers.
12. Write a shell script to perform the tasks of basic calculator.
13. Write a shell script to find the power of a given number.
14. Write a shell script to find the binomial coefficient C(n , x).
15. Write a shell script to find the permutation P(n,x).
16. Write a shell script to find the greatest number among the three numbers.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not

16CAU612A	**CLOUD COMPUTING PRACTICAL**	**Semester – VI** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student to

- Basics of cloud computing.
- Key concepts of virtualization.
- Different Cloud Computing services
- Cloud Implementation, Programming and Mobile cloud computing
- Key components of Amazon Web Services
- Cloud Backup and solution

Course Outcomes (COs)

Upon completion of this course, the students will be able to:

1. Define Cloud Computing and memorize the different Cloud service and deployment models
2. Describe importance of virtualization along with their technologies.
3. Use and Examine different cloud computing services
4. Analyze the components of open stack & Google Cloud platform and understand Mobile Cloud Computing
5. Describe the key components of Amazon web Service
6. Design & develop backup strategies for cloud data based on features

List of Programs:

1. Create virtual machines that aCSUess different programs on same platform.

2. Create virtual machines that aCSUess different programs on different platforms.

3. Working on tools used in cloud computing online-

    a) Storage

    b) Sharing of data

    c) Manage your calendar, to-do lists,

    d) A document editing tool

4. Exploring Google cloud

5. Exploring Microsoft cloud

6. Exploring Amazon cloud

SEMESTER-VI

16CAU612B DATABASEADMINISTRATIONPRACTICAL 4H-2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: 40 External: 60 Total: 100

End Semester Exam: 3 Hours

Course Objectives

Enable the student to

- Installing Oracle Software
- Creating an Oracle Database Using DBCA
- Managing Database instances and ASM instances
- Managing and controlling database network environment
- Define and devise transaction management, concurrency control, crash recovery components
- Managing storage structures
- Controlling user security
- Designing Database backup and recovery procedures
- Take Decisions related with Database Maintenance

Course Outcomes (COs)

Upon completion of this course, the students will be able to:

1. Design, model and install any database management systems by using Oracle database as sample.
2. Plan, design, construct, control and manage database instances, database network environment, storage structures, user security, database backup and recovery, database maintenance
3. Define and devise transaction management, concurrency control, crash recovery components
4. Examine and perform data base administration roles and operations by using Oracle database system as a sample
5. Compare and contrast by examining the database systems and new trends in data storage, data retrieval and maintenance techniques.
6. Configure, manage and maintain database, to audit and improve database performances and to use tools for database administration.

List of Programs:

1. Demo for Globalization Support
2. Setup Listener Security
3. Configuring Recovery Manager
4. Write a program Using Recovery Manager
5. Write a program for Managing Diagnostic Sources
6. Implement Database Recovery

16CAU612B DATABASEADMINISTRATIONPRACTICAL 4H-2C

7. Demo for Flashback Database
8. Implement User Error Recovery
9. Write a program for Dealing with Corruption
10. Show the demo for Automated Management
11. Creating a database and do the manipulation.
12. Managing index tables

Semester – VI

16CAU613A BIG DATA ANALYTIC PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

Enable the student

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability

Course Outcomes (COs)

Upon completion of this course, the students will be able to:

1. Work with big data tools and its analysis techniques
2. Analyze data by utilizing clustering and classification algorithms
3. Learn and apply different mining algorithms and recommendation systems for large volumes of data
4. Perform analytics on data streams
5. Learn NoSQL databases and management.
6. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing

List of Programs:

1. Implement a quicksort using scala.
2. Implement a auction service using scala.
3. Write a scala function to perform any 10 arithmetic operations.
4. Write a program to find the factorial of a given number using recursion.
5. Write a program for string manipulations.
6. Write a program for alphabetic order arrangement of a set of names.
7. Write a program for student records using scala list.
8. Implement any 5 map methods for maintaining customer details.
9. Implement employee records using Files
10. Write a program to copy the files using command line arguments.

Semester – VI

16CAU613B SYSTEM PROGRAMMING PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To introduce students the concepts and principles of system programming
- To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.
- Describe the utility of different system programs & system tools.
- Familiarize with the tradeoffs between run-time and compile-time processing (Linking & Loading techniques).
- Explore the use of compiler with its phases.
- Use of Syntax directed scheme for intermediate code generation.
- Construct & use of different compiler tools as LeX, Yacc for code generation & optimization.

Course Outcome

Upon completion of this course, students will be able to:

1. Organize the functionalities & components of system software & tools into different layers for efficient code generation.
2. Apply the knowledge & technique to develop solutions to real world problems by compiling application programs.
3. ability to identify, formulate, and solve computer engineering problems with proper systematic & semantic approach.
4. Develop possible program constructs for further code generation with Type checking & memory management strategy
5. Design a simple compiler with tools & different with optimized techniques
6. Design and implement system utility programs.

List of Programs:

1. To implement an assembler for a hypothetical language.
2. To get familiar with lex: write a program to recognize numbers, identifiers.
3. To get familiar with yaCSU: write a desk calculator.

Semester-I

16CAP101 **INFORMATION TECHNOLOGY** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To familiarize the students with PC, MS DOS and MS WINDOWS commands such as file creation, editing and directory creation.
- To learn the usage of MS office: MS WORD, use of database and spread sheet, slide creation with PowerPoint.
- To understand about information integrity and security
- To use of a visual programming language such as Visual Basic for various applications.
- To understand the role of hardware components
- To know about client server technology

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Understand the meaning and basic components of a computer system.
2. Define and distinguish Hardware and Software components of computer system.
3. Identify different computing machines during the evolution of computer system.
4. Gain knowledge about five generations of computer system.
5. Identify and discuss the functional units of a computer system.
6. Gain the knowledge on Network security

UNIT I - INFORMATION CONCEPTS AND PROCESSING

Evolution of information processing, data information language and communication.Elements of a computer processing system: Hardware - CPU, storage devices and media, VDU, input-output devices, data communication equipment Software- system software, application software.

UNIT II - PROGRAMMING LANGUAGES

Classification, machine code, assembly language, higher level languages, fourth generation languages. Operating systems: Concept as resource manager and coordinator of processor, devices and memory. Concept of priorities, protection and parallelism. Command interpreter, Typical commands of DOS/ UNIX/Network, GUI- Windows.

UNIT III - COMPUTERS AND COMMUNICATION

Single user, multi-user, work station, client server systems, Computer networks, network protocols, LAN, WAN, Internet facilities through WWW, Mosaic, Gopher, html, elements of Java.

UNIT IV - SECURITY

Information integrity definition, ensuring integrity, Computer security: Perverse software, concepts and components of security, Preventive measures and treatment.

UNIT V - RANGE OF APPLICATION

Scientific, business, educational, industrial, national level weather forecasting, remote sensing, planning, multilingual applications.

SUGGESTED READINGS

1. Rajaraman V. (1996). Fundamental of Computers, 2nd edition, Prentice Hall of India, New Delhi.
2. Sanders, D.H. (1998) .Computers Today, McGraw Hill. India.
3. Trainer T., et al. (1994).Computers, 4th edition, McGraw Hill.
4. V. Rajaraman, Neeharika Adabala. (2014).Fundamentals of Computers, 6th edition, Prentice Hall of India, New Delhi.

Semester-I

16CAP102 **C PROGRAMMING AND DATA STRUCTURES** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3Hours

COURSE OBJECTIVE

Enable the student

- To understand the concept of programming (i.e., computer following a series of instructions)
- To exercise various features of C programs (looping, branching, pointers and structures)
- To write well-structured modular and readable programs with good documentation.
- To understand the concept of a program in a high-level language being translated by a compiler into machine language program and then executed.
- To know about various data structures such as stacks, Queues, linked lists and trees
- To know about pointers and arrays

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Can learn the fundamentals of C programming.
2. Choose the loops and decision making statements to solve the problem.
3. Implement different Operations on arrays.
4. Understand pointers, structures and unions.
5. Implement file Operations in C programming for a given application.
6. Implement the program using pointers and arrays

UNIT I - INTRODUCTION

Introduction to algorithms, Flow charts, Tracing flow charts, Problem solving methods, Need for computer languages, Reading programs written in C language, C character set, Identifiers and keywords, Data types, Declarations, Expressions, statements and symbolic constants, Input-Output: getchar, putchar, scanf, printf, gets, puts, functions, Pre-processor command: # include, define, ifdef. Preparing and running a complete C program.

UNIT II - OPERATORS AND EXPRESSIONS

Arithmetic, unary, logical, bit-wise, assignment and conditional operators, Library functions, Control statements: while, do-while, for statements, nested loops. Ifelse, switch, break, continue and goto statements, comma operator.

UNIT III - FUNCTIONS

Defining and accessing: passing arguments, Function prototypes, Recursion, Use of library functions, Storage classes: automatic, external and static variables, Arrays: Defining and processing, Passing to a function, Multi dimensional arrays. Strings, operations on strings.

UNIT IV - POINTERS

Declarations. Passing to a function. Operations on pointers. Pointers and arrays. Arrays of pointers. Structures: Defining and processing. Passing to a function. Unions. Data files: Open, close, create, process. Unformatted data files.

UNIT V- DATA STRUCTURES

Data Structures: Stacks, queues, lists, trees and their application

SUGGESTED READINGS

1. Hutchison, R. (1990). Programming in C. McGraw Hill, New York.
2. Johnson Baugh. R and Kalin. M (1989). Applications Programming in C, Prentice Hall of India.
3. Rajaraman.V. (1995).Computer Programming in C, Prentice Hall of India, New Delhi.
4. Nanjesh Bennur. (2016). Programming in C and Data Structures , Second edition IPH, India.

SEMESTER-I

16CAP103 COMPUTER ORGANIZATION AND ARCHITECTURE 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To understand the architecture of the basic functional units of the computer such as the input output system, memory systems and secondary storage systems.
- To acquire basic understanding about the hardware and software interaction.
- To acquire knowledge about the Instruction Set used
- To know how the benchmarks that help in evaluating the performance of computer systems.
- To acquire knowledge about the Addressing modes used
- To know about I/O interruption

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Design digital circuits by simplifying the Boolean functions
2. Understand the organization and working principle of computer hardware components
3. Understand mapping between virtual and physical memory
4. Acquire knowledge about multiprocessor organization and parallel processing
5. Trace the execution sequence of an instruction through the processor
6. Understand the data transfer techniques

UNIT I - INTRODUCTION

Principles of Computer design - Software, hardware interaction layers in computer architecture. Central processing unit. Machine language instructions, Addressing modes, instruction types, Instruction set selection, Instruction cycle and execution cycle.

UNIT II - CONTROL UNIT

Control unit, Data path and control path design, Microprogramming Vs hardwired control, RISC Vs CISC, Pipelining in CPU design: Superscalar processors.

UNIT III – MEMORY SYSTEM

Memory system, Storage technologies, Memory array organization, Memory hierarchy, interleaving, cache and virtual memories and architectural aids to implement these.

UNIT IV – I/O DEVICES

Input-output devices and characteristics. Input-output processing, bus interface, data transfer techniques, I/O interrupts, channels.

UNIT V - PERFORMANCE EVALUATION

Performance evaluation - SPEC marks Transaction Processing benchmarks.

SUGGESTED READINGS

1. Mano. M (1994). Computer System and Architecture, 3rd edition, Prentice Hall of India, New Delhi.
2. Pal Chauduri, P. (1994). Computer Organisation and Design, Prentice Hall of India, New Delhi.
3. Rajaraman,V. and Radhakrishnan. T. (1997). Introduction to Digital Computer Design , 4th edition, Prentice Hall of India, New Delhi.
4. Stallings. W. (1999). Computer Organization and Architecture, 2nd edition, Prentice Hall of India, New Delhi.
5. William Stallings.(2016).Computer Organization and Architecture : Designing for Performance, 10th Edition, PEARSON.

SEMESTER-I

16CAP104 **MATHEMATICAL FOUNDATIONS** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3Hours

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COURSE OBJECTIVES

Enable the student

- To understanding the basics of mathematical logics
- Know about the Predicate and relational calculus
- To enhance the knowledge about the algebraic structures
- To make the fundamental idea of applying Graph theory for data representation on computers
- To apply the acquired knowledge of problem solving in Computers
- To understand the storage representation and manipulation of graphs

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Acquire the basic knowledge of matrix, set theory, functions and relations concepts needed for designing and solving problems
2. Acquire the knowledge of logical operations and predicate calculus needed for computing skill
3. Able to design and solve Boolean functions for defined problems
4. Apply the acquired knowledge of formal languages to the engineering areas like Compiler Design
5. Apply the acquired knowledge of finite automata theory
6. Design discrete problems to solve by computers.

UNIT I - MATHEMATICAL LOGIC

Mathematical logic: Notation, Connectives Normal forms, Theory of inference for statement calculus.

UNIT II - PREDICATE CALCULUS

Predicate calculus, Inference theory of the predicate calculus, Relations and ordering, Functions, Recursion.

UNIT III - ALGEBRAIC STRUCTURES

Algebraic Structures: Groups, Application of residue arithmetic to computers, Group codes.

UNIT IV - GRAPH THEORY

Graph theory: Definition, Paths, reachability, connectedness- Matrix representation of graphs-Trees.

UNIT V - STORAGE REPRESENTATION

Storage representation and manipulation of graphs: Trees- List structures and graphs-Pert and related techniques.

SUGGESTED READINGS

1. Kolman, B., and Busby. R. (1987). Discrete Mathematical Structures for ComJ;luter Science , Prentice Hall.
2. Sahni, S. (1981). Concepts in Discrete Mathematics. Camelot Publisher. U.S.A.
3. Tremblay, J.P., el. al. (1987). Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill.
4. Gerard O'Regan. (2016). Guide to Discrete Mathematics: An Accessible Introduction to the History, Theory, Logic and Applications 1st Edition, Springer.

SEMESTER-I

16CAP105 INTRODUCTION TO MANAGEMENT FUNCTIONS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To know about the Selection training and appraisal of Human Resource.
- To learn about various Marketing strategies.
- To understand financial management and analysis.
- To apply their knowledge in Manufacturing and Strategic management.
- To understand the implementation of business strategy for running the business firms successfully.
- To apply their knowledge in Strategic management.

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Develop a responsible attitude towards the use of computer as well as the technology.
2. Able to envision the societal impact on the products/ projects they develop in their career
3. Understanding the code of ethics and standards of computer professionals.
4. Analyze the professional responsibility and empowering access to information in the work place.
5. Assess the quality of organization
6. Implement marketing plans for running the companies to make profit

UNIT I - HRD

HRD: selection, appraisal, training and information systems.

UNIT II - MARKETING

Understand the concept of marketing mix. These marketing mix elements consist of product policy and design, pricing, choice of marketing intermediaries, methods of physical distribution, use of personal selling, advertising and sales promotion, marketing research, and marketing organization.

UNIT III - FINANCE

Finance function (concept, scope, and its relationship with other functions) : tools of financial analysis (funds and cash flow analysis, ratio, analysis, risk-return trade-of): financial forecasting (profonna income statement and balance sheet, cash flow forecasting under uncertainty, financial planning): estimation and management of working capital (operating cycle concept, inventory, accounts receivables, cash and accounts payables, working capital requirements).

UNIT IV - MANUFACTURING

Operations Planning and Control (aggregate planning, multiple product batch, production cycles, short term scheduling of job shop, setting production rate in continuous production systems, activity scheduling in projects, introduction to project time calculations through PERT/CPM): Management of supply chain, materials management (introduction to materials management, systems and procedures for inventory management planning, and procurement of materials): quality management (quality concept and planning. standardizations, quality circles).

UNIT V - STRATEGY

Firm and its Environment: strategies and resources; industry structure and analysis; evaluation of corporate strategy; strategies for growth and diversification; process of strategic planning.

SUGGESTED READINGS

1. Agarwal, R.D. (1986). Organization and Management, Tata McGraw Hill, New Delhi.
2. Massie. (1996). Essentials of Management. 4th edition, Prentice Hall of India.
3. Stephen P. Robbins. (2016).Organizational Behavior, Sixteenth edition, Pearson Education

SEMESTER-I

16CAP111 INFORMATION TECHNOLOGY - PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To familiarize the students with PC, MS DOS and MS WINDOWS commands such as file creation, editing and directory creation.
- To learn the usage of MS office: MS WORD, use of database and spread sheet, slide creation with PowerPoint.
- To understand about information integrity and security
- To use of a visual programming language such as Visual Basic for various applications.
- To understand the role of hardware components
- To know about client server technology

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Understand the meaning and basic components of a computer system.
2. Define and distinguish Hardware and Software components of computer system.
3. Identify different computing machines during the evolution of computer system.
4. Gain knowledge about five generations of computer system.
5. Identify and discuss the functional units of a computer system.
6. Gain the knowledge on Network security

List of Practicals

1. MS DOS Commands – create file, copy, move, and rename files
2. Design a Word document containing an advertisement/ notification column
3. Create a table in word to show student marks and calculate the total and average using formulas
4. Create a word document to show Mail merge
5. Illustrate the use of Review Tools to track changes made in a document
6. Create an Excel sheet illustrate sorting and filtering of data
7. Create MS-Excel sheets showing conditional formatting
8. Create an Excel applications to demonstrate Chart tools
9. Demonstrate Data validation with an example

10. Create a Power point Presentations for your profile

11. Create a Power point Presentations for an Advertisement with Animations
12. Write a Visual Basic program to perform arithmetic operations
13. Write a Visual Basic program to design and code the user Registration form

SUGGESTED READINGS

1. Rajaraman V. (1996). Fundamental of Computers, 2^{nd} edition, Prentice Hall of India, New Delhi.
2. Sanders, D.H. (1998) .Computers Today, McGraw Hill. India.
3. Trainer T., et al. (1994).Computers, 4^{th} edition, McGraw Hill.
4. V. Rajaraman, Neeharika Adabala. (2014).Fundamentals of Computers, 6^{th} edition, Prentice Hall of India, New Delhi.

SEMESTER-I

16CAP112 **PROGRAMMING IN C - PRACTICAL** **5H - 2C**

Instruction Hours / week: L: 0 T: 0 P: 5 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVE

Enable the student

- To understand the concept of programming (i.e., computer following a series of instructions)
- To exercise various features of C programs (looping, branching, pointers and structures)
- To write well-structured modular and readable programs with good documentation.
- To understand the concept of a program in a high-level language being translated by a compiler into machine language program and then executed.
- To know about various data structures such as stacks, Queues, linked lists and trees
- To know about pointers and arrays

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Can learn the fundamentals of C programming.
2. Choose the loops and decision making statements to solve the problem.
3. Implement different Operations on arrays.
4. Understand pointers, structures and unions.
5. Implement file Operations in C programming for a given application.
6. Implement the program using pointers and arrays

List of Practical

1. SIN and COS Series
2. Array Operations (Insert, Delete and Display)
3. Bubble Sorting.
4. Stack
5. Queue.
6. Implement String functions
7. Pointers and Arrays, Pointers and function
8. Recursive function
9. Dynamic Memory Allocation
10. Matrix Operations (Addition, Subtraction and Multiplication)

11. Linked List Operations.
12. Mark sheet preparation using array of structures
13. Electricity Bill Preparation using Files (Use structures)
14. Implement TWO Dos commands using Command line arguments
15. Design an application using VRAM
16. Display a message every 5 minutes using TSR programming

SUGGESTED READINGS

1. Hutchison, R. (1990). Programming in C. McGraw Hill, New York.
2. Johnson Baugh. R and Kalin. M (1989). Applications Programming in C, Prentice Hall of India.
3. Rajaraman.V. (1995).Computer Programming in C, Prentice Hall of India, New Delhi.
4. Nanjesh Bennur. (2016). Programming in C and Data Structures , Second edition IPH, India.

SEMESTER-I

16CAP113 **TALLY - PRACTICAL** **4H - 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- Designed to impart knowledge regarding concepts of Financial Accounting
- Tally is an accounting package which is used for learning to maintain accounts.
- Useful for students to get placements in different offices as well as companies in Accounts departments.
- To gain the hands-on experience on creating the balance sheets
- To understand the management of accounts in any organization
- To apply their knowledge in Strategic management.

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. To maintain accounts with and without inventory.
2. To help in maintaining accounts in the different languages that are supported by Tally.
3. To understand the Point of Sale and Payroll features of Tally.
4. To implement the account ledgering process of any organization
5. To gain the knowledge of the maintenance of account vouchers in an organization
6. To assess the flow management

List of Practical

1. Create a new company in integrate accounts mode and account with inventory mode
2. Create a primary and sub groups using single or multiple ledger mode
3. Create minimum 10 ledgers using single or multiple ledger, and alter and delete any 2 ledger
4. Create a new company, ledger and record minimum 10 transactions without adjustment
5. Create a new company, ledger and record minimum 10 transactions with any five adjustments and display the relevant results

6. Enter the following voucher
    - Payment vouchers
    - Receipt
    - Purchase
    - Sales
    - Credit note
    - Debit note
    - Journals
    - Memo
    - Optional
7. Prepare trail balance for the company
8. Prepare profit & loss a/c and balance sheet

SUGGESTED READINGS

1. Shraddha Singh,Navneet Mehra. (2014).Tally ERP 9, Latest Revised Edition edition , V&S Publishers

SEMESTER-II

16CAP201 OBJECT-ORIENTED PROGRAMMING WITH C++ 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To understand the Object Oriented Programming concepts and techniques
- To understand the fundamentals of programming in C++
- To understand and utilize the concepts of procedural abstraction, data abstraction and encapsulation, polymorphism and inheritance with respect to C++ programming language
- To apply their programming knowledge for real time software development
- To apply the extensible Class types, User-defined operators and function Overloading in C++
- To know about preprocessor in C++

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Understand and design the solution to a problem using object-oriented programming concepts.
2. Use proper class protection mechanism to provide security.
3. Demonstrate the use of virtual functions to implement polymorphism.
4. Understand and implement the features of C++ including templates, exceptions and file handling
5. Solve complex problems in Object oriented programming
6. Use preprocessor in the object oriented programming

UNIT I - Introduction to Computers and C++ Programming:

Introduction to Computers and C++ Programming: Computer Organization – History of C and C++ - C++ standard Library – Arithmetic- Decision making: Equality and Relational Operators. Control Structures: Pseudocode- if, if/else selection structures – while, for, do while repetition structure- Assignment, Increment, Decrement operators – switch Multiple selection structure – break and continue statements – Logical, Equality, Assignment operators.

Functions: Function Definitions, Prototypes – Storage classes- Recursion- Functions with Empty Parameter Lists – Inline functions- SUGGESTED READINGS and Reference Parameters – Default Arguments – Unary Scope Resolution Operator- Function overloading – Function Templates.

UNIT II – Arrays, Pointers and Strings and Classes and Data Abstraction

Arrays: Declaring Arrays – Passing Arrays to Functions – Sorting Arrays – Linear Search and Binary Search.

Pointers and Strings **:** Pointer variable declaration and initialization- Pointer Operators- Calling functions by reference –Pointer expression and Pointer arithmetic- relationships between Pointer and Arrays – Arrays of Pointers – Function Pointers – Introduction to character and String Processing.

Classes and Data Abstraction : Structure Definitions- Class Scope and Accessing Class Members – Access Functions and Utility Functions- Constructors- Destructors.

UNIT III – Classes & Operator Overloading

Classes **:** Part II : Introduction- friend functions and friend classes- this pointer- new, delete operator- static class members- Data abstraction and Information hiding- Container Classes and Iterators.

Operator Overloading **:** Fundamentals and restriction of operator overloading –Overloading Stream Insertion, Stream Extraction, Unary, Binary, ++ and – operators. Inheritance : Base Classes and derived Classes – Protected Members- casting base class pointers to derived class pointers- Using member Functions- public, protected, private inheritance – Direct Base classes and Indirect Base classes- Using constructors and Destructors in Derived Classes.

UNIT IV - Virtual Functions, Polymorphism and Templates

Virtual Functions and Polymorphism **:** Type Fields and switch statement – virtual functions- abstract base classes and concrete classes- polymorphism- New classes and Dynamic binding – virtual destructors. C++ Stream Input/output : Introduction- Streams- Stream Output- Stream Input- Stream Manipulators- Stream Format states- Stream error states.

Templates **:** Function, Class templates – Overloading template functions- Templates and Inheritance, friends, static members.

UNIT V - Exception Handling, File Processing, The Preprocessor and Standard C++ Language Additions

Exception Handling : Basics of C++ Exception handling: try, throw, and catch – Throwing, catching, and rethrowing an exception, Exception specifications.

File Processing: Data Hierarchy- files and streams- Creating, Reading, Updating sequential Access files and Random Access files.

The Preprocessor **:** #include, # define, #error, # pragma preprocessor directives.

Standard C++ Language Additions : Boolean data type- static_cast, const_cast, reinterpret_cast operator, namespaces.

SUGGESTED READINGS

1. Deitel. H.M & P.J.Deitel. (2006). C++ How to Program, 5th Edition, Pearson Education Asia, New Delhi.
2. Bjarne Stroustroup. (2013). The C++ Programming Language, Thirteenth Impression,Addison Wesley, New Delhi.

3. Herbert Scheildt. (2001). Teach Yourself C++, 3rd Edition, Tata McGraw Hill ,New Delhi.
4. Robert Lafore. (2000). Object-Oriented Programming in Turbo C++, Galgotia Publications, New Delhi.
5. E.Balagurusamy. (2017), object-oriented programming with c++, 7th edition, McGraw Hill Education, New Delhi

WEB SITES

1. http://www.cplusplus.com/doc/tutorial/
2. www.cplusplus.com/
3. www.cppreference.com/

SEMESTER-II

16CAP202 **OPERATING SYSTEM** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To provide students with Extensive knowledge of principles and modules of operating systems
- To learn about the fundamental operating system abstractions such as processes, threads, files, Semaphores, IPC abstractions, shared memory regions, etc.
- To understand the principles of concurrency and synchronization, and apply them to write correct Concurrent programs/software.
- To learn the Basic resource management techniques (scheduling or time management, space management) and principles and how they can be implemented.
- To understand the working of MS-Windows, UNIX and LINUX Operating Systems
- To know about distributed file system

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. To understand the operating system components and i ts services
2. To implement the algorithms in process management and solving the issues of IPC
3. To demonstrate the mapping between the physical memory and virtual memory
4. To understand file handling concepts in OS perspective
5. To understand the operating system components and services with the recent OS
6. To understand the concept of paging and segmentation

UNIT I - Introduction

Introduction: Evolution of operating systems. Types of operating systems. Different views of the operating system, operating system concepts and structure.
Processes: The Process concept, systems programmer's view of processes. The operating system services for process management. Scheduling algorithms. Performance evaluation.

UNIT II - Memory Management

Memory Management :Memory management without swapping or paging, swapping, virtual memory, page replacement algorithms, modeling paging algorithms, design issues for paging systems, segmentation.

UNIT III – Inter process Communication and synchronization and File Systems

Interprocess Communication and synchronization: The need for interprocess synchronization, mutual exclusion, semaphores, hardware sport for mutual exclusion. Queuing implementation of semaphores, classical problems in concurrent programming, critical region and conditional critical region, monitors, messages, deadlocks.
File Systems: File systems, directories, file system implementation, security protection mechanisms.

UNIT IV - Input/Output, Disks, Clocks and Distributed File System
Principles of I/O Hardware: I/O devices, device controllers, direct memory access.
Principles of I/O Software: Goals interrupt handlers, device drivers, device independent I/O software. User space I/O software.
Disks: Disk hardware, .scheduling algorithms, Error handling, trac-at-a-time caching, RAM Disks.
Clocks: Clock hardware, memory mapped terminals, I/O software. Terminals: Terminal hardware, memory mapped terminals, I/O software.
Processes and Processors in Distributed Systems: Threads, system models, processor allocation, scheduling.
Distributed File Systems: Design, implementation, trends.

UNIT V – Case Studies
Performance Measurement, monitoring and evaluation
Introduction, important trends affecting performance issues, why performance monitoring and evaluation are needed, performance measures, evaluation techniques, bottlenecks and saturation, feedback loops.
Case Studies: MS.DOS, MS WINDOWS, LINUX (UNIX) operating system.

SUGGESTED READINGS

1. Deitel. H.M. (1984).An Introduction to Operating Systems. Addison Wesley Publishing Company.

2. Milenkovic, M.(1992).Operating Systems• Concepts and Design. McGraw Hill International Edition Computer Science series.

3. Peterson, J.L. Abraham Silberschatz. (1989).Operating System Concepts. Addison Wesley Publishing Company.

4. Tanenbaum. A.S. (1995).Modem Operating Systems, Prentice Hall of India Pvt. Ltd.

5. Tanenbaum. A.S.(2015). Modern Operating Systems. Prentice Hall of India Pvt. Ltd.

SEMESTER-II

16CAP203 INFORMATION SYSTEMS: ANALYSIS, DESIGN AND IMPLEMENTATION 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0

Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To understand about complex system development
- To know the importance of classes and objects and their interrelationships
- To analyze and evaluate complex design structures
- To use Unified Modeling Language to construct various UML models
- To implement class diagrams, interaction diagrams, state chart diagrams, activity diagrams for implementing Object oriented Software designs
- To know the basics of software market

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Get an insight into the processes of software development
2. Able to understand the problem domain for developing SRS and various models of software engineering
3. Able to Model software projects into high level design using DFD,UML diagrams
4. Able to Measure the product and process performance using various metrics
5. Able to Evaluate the system with various testing techniques and strategies
6. Know about Object oriented analysis and design through object modeling technique

UNIT I - Overview of Systems Analysis and Design

Overview of Systems Analysis and Design: Systems Development Life Cycle. Concept and Models: requirements determination. Logical design. Physical design, test planning implementation planning and performance evaluation; communication, interviewing, presentation skills; group dynamics; risk and feasibility analysis; group-based approaches. JAD, structures walkthroughs, and design and code reviews; prototyping; database design; software quality metrics; application categories software package evaluation and acquisition.

UNIT II - Information requirement Analysis

Information requirement Analysis: Process modelling with physical and logical data flow diagrams, data modelling with logical entity relationship diagrams; Developing a Proposal: Feasibility study and cost estimation. System Design: Design of input and control, design of output and control, file design/database design, Process design, user interface design; prototyping; software constructions; documentation.

UNIT III - Application Development Methodologies and CASE tools

Application Development Methodologies and CASE tools: Information engineering, structured systems analysis and design and object oriented methodologies for application development data modeling, process modeling, user interface design and prototyping; use of computer aided Software engineering (CASE) tools in the analysis, design and implementation of information systems.

UNIT IV - Design and Implementation of platforms

Design and Implementation of platforms: Object oriented analysis and design through object modeling technique, object modeling, dynamic modeling and functional modeling, object oriented design and object oriented programming systems for implementation, object oriented data bases.

UNIT V - Managerial Issues in Software Projects

Managerial Issues in Software Projects: Introduction to software markets; planning of software projects, size and cost estimations; project scheduling; measurement of software quality and productivity; ISO and capability maturity models for organizational growth. The course should be based on lectures, case analysis and laboratory work. Cases should be used to illustrate each major topic in the course.

SUGGESTED READINGS

1. Haryszkiewycz, LT. (1989). Introduction of Systems Analysis and Design, Prentice Hall of India.
2. Rajaraman.V. (1991).Analysis and Design of Information Systems, Prentice Hall of India.
3. Senn, LA. (1986).Analysis and Design of Information Systems, Tata McGraw Hill Book Company.
4. Whiten, 1.K., Bentley, L.D., Beslow, V.M. (1994).Systems Analysis and Design Methods, Galgotia Publications Pvt. Ltd.
5. Kenneth E.Kendal and Julie.(2013). System Analysis and Design. 9th edition, Pearson.

SEMESTER-II

16CAP204 **ACCOUNTING AND MANAGEMENT CONTROL** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To acquaint students with the accounting concepts, tools and techniques for managerial decision.
- To understand the relation of accounting to economic activity
- To organize information for decision-making and the resource acquisition decision
- To manage the uses of cash and non-cash resources
- To apply a range of models and methods in different contexts
- To analyze an organization's activities.

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. To analyze the reasons and consequences of management accounting and control
2. To understand the relationship between strategy development in management accounting and control
3. To maintain the trial balance and financial statements
4. To obtain knowledge and understanding of models and methods in management accounting and control
5. To identify and analyze problems and solutions in real-life situations
6. To develop budgeting and control for any organization

UNIT I - Introduction

Basic Accounting and conventions underlying preparation of Financial Statements (balance sheet highlighting accounting equation. profit and loss statement; accounting processes; basic accounts, trial balance and financial statements; issues such as provisions for bad debts tax, dividends, losses such as bad debts, missing information, classification effect, cost of assets, rentals, etc);

UNIT II - Income

Income Measurement (revenue; recognition and matching costs and revenues; inventory valuation); Depreciation Accounting; Intangible Assets Accounting; Understanding published annual accounts including funds flow statement.

UNIT III - Cost

Basic Cost Concepts: (introduction; cost classification; allocation, appointment and absorption; cost centers); Cost Analysis for Managerial Decisions (direct costing, break-even analysis; relevant costs; pricing; pricing-joint costs; make or buy; relevant fixed costs and sunk costs) Cost Analysis for Control (standard costing; variances; material, labour, overhead, sales, and profit); Standard Cost Accounting (budgeting and control; elements of budgeting; control of manufacturing and manufacturing expenses; performances appraisal, evaluation of cost control systems).

UNIT IV - Introduction to Management Control Systems

Introduction to Management Control Systems; Goals, Strategies, and Key Variables; Performance Measures; Responsibility Centers and Transfer Price; Investment Centers; Reporting Systems; Management by Objectives;

UNIT V - Budgeting and Control

Budgeting and Control; Organizational Relationships in Control; Control Dynamics; Top Management and Control; Strategic and Long-Range Planning; Control of Service Organizations; Control of Projects; Control of Non-Profit Organizations; Control of Multinational Companies.

SUGGESTED READINGS

1. Bhattacharya, S.K., and Dearden, John.(2009) Accounting for Management, Prentice Hall of India, New Delhi.
2. Chadwick. (1996). The Essence of Financial Accounting, Prentice Hall of India Pvt. Ltd., New Delhi.
3. Homgren, Sundem and Selto. Introduction to Management Accounting,(1993). 9th Edition, Prentice Hall of India Pvt. Ltd.
4. Welch, Hilton and Gordon. Budgeting: Profit Planning and Control,(1998). 5th Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
5. Peter Harish, Profit Planning (2010), 2nd Edition, Butterworth Hannemann publications.

SEMESTER-II

16CAP205 **PROBABILITY AND COMBINATIONS** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To equip the students with the fundamental principle of counting.
- To find the permutation when the all objects are distinct or non distinct.
- To find the combination of objects.
- To understand Connection between Permutations & Combinations.
- To distinguish between Permutations & Combinations
- To know about Recurrence relations

COURSE OUTCOMES (COs)

Upon successful completion of the course, the student will be able to:

1. Demonstrate knowledge of statistical terms.
2. Analyze the four basic sampling techniques for implementing in Statistics
3. Explain the difference between an observational
4. Explain an experimental study in statistics
5. To modify the statistical data in frequency distributions using histograms
6. To summarize data using the measures of central tendency such as mean, median, mode and midrange

UNIT I - Probability
Probability: Sample space. Events. Axioms. Conditional probability. Bayes rule. Random variables: Discrete and continuous.

UNIT II - Distribution and density functions
Distribution and density functions. Marginal and conditional distributions. Stochastic independence.

UNIT III - Expectation
Expectation: Expectation of a function. Conditional expectation and variance. Moment generating function. Cumulant generating functions. Characteristic functions. Distributions: Discrete and continuous distributions.

UNIT IV - Permutations and combinations
Permutations and combinations. Distinct and non-distinct objects. Generating functions for combinations. Enumerators for permutations. Distribution of distinct objects.

UNIT V - Recurrence relations

Recurrence relations: Linear and with two indices. Principles of inclusion and exclusion. Formula derangement. Restrictions on relative positions.

SUGGESTED READINGS

1. Liu, C.L. (1996). Introduction to Combinatorial Mathematics. McGraw Hill.
2. Ross. S .(1976). A First Course in Probability, Collier Macmillan, New York.
3. Duo code.(2017). Probability: Mastering Permutations And Combinations. CreateSpace Independent Publishing Platform; 2 edition

SEMESTER-II

16CAP211 OBJECT ORIENTED PROGRAMMING WITH C++ - PRACTICAL 5H - 2C

Instruction Hours / week: L: 0 T: 0 P: 5 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To understand the Object Oriented Programming concepts and techniques
- To understand the fundamentals of programming in C++
- To understand and utilize the concepts of procedural abstraction, data abstraction and encapsulation, polymorphism and inheritance with respect to C++ programming language
- To apply their programming knowledge for real time software development
- To apply the extensible Class types, User-defined operators and function Overloading in C++
- To know about preprocessor in C++

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Understand and design the solution to a problem using object-oriented programming concepts.
2. Use proper class protection mechanism to provide security.
3. Demonstrate the use of virtual functions to implement polymorphism.
4. Understand and implement the features of C++ including templates, exceptions and file handling
5. Solve complex problems in Object oriented programming
6. Use preprocessor in the object oriented programming

List of Practical

1. Create a class Date whose data members are Day, month, and Year. Write necessary member functions and perform the following operations using overload operators
   Increment a date by a day
2. Compares two dates
3. Create a class String that has a character array as a data member and perform the following operations using overloaded operators.
   - '+' To add two strings
   - '+=' To concatenate one string with the other
   - '==' To compare two strings

4. Create a class Computer and derive two classes Client and Server from it. Have the data members of the classes as follows.
   In the main () program, get the data about n clients and servers and print it back in a neat format.
5. Create four classes with the relationship and data members as in shown in the diagram.
   In the main () program, have the facility to
   - Store the details of n inpatients and outpatients
   - Display the details in a neat format
6. Create a class staff that contains the name, designation, and years of experience of a staff member of a college. Using containership, create two more classes Teaching Staff and Non-Teaching Staff according to the following specifications. In addition to the properties of the staff class, the Teaching Staff class should contain the highest qualification the staff member possesses and the departments he belongs to. The Staff class needs to contain the properties of Staff only. In the main (), get data about some of the teaching and NonTeachingStaff members of your college and print the details in neat format.
7. Create a class Address as whose data members are Name, Street, City, Pin code and Phone Number of a person. In the main () program, using array of pointers, get addresses of n persons, sort it in alphabetical order of names and display it back in a neat format.
8. Create a class Shape that contains two data members of type double to hold the two dimensions of the shape.
   Derive 3 more classes' circle, rectangle, And Triangle from the class Shape. Using appropriate member functions, get the values, calculate and print the area of different shapes using dynamic binding.
   Hint:- write 2 member functions in all the derived classes: one to set the data and the other to calculate and display the area.
9. Create two classes British and Metric to store the measurements of distance in the British (feet and inches) and Metric (meters and centimeters) systems respectively.
   In the main () program, perform the following:
   - Get two measurements: one in British and the other in Metric
   - Ask the user in which system (British or Metric) (s) he wants the output.
   - Add two input measurements and print the result according to the user's choice.
10. Create a class that copies the content of a text file into another file. Write the program in such a way that the program accepts command line arguments and make the program to execute in a way exactly the copy command in Dos works.
11. Sort an integer and a floating –point array using function template.
12. Create a class template stack that accepts a generic data type as a parameter and performs the basic operations of a stack. Using the above class in the main () program, implement stacks for integer and floating point data types separately and perform the operations on the stack.

SUGGESTED READINGS

1. Deitel. H.M & P.J.Deitel. (2006). C++ How to Program, 5th Edition, Pearson Education Asia, New Delhi.

2. Bjarne Stroustroup. (2013). The C++ Programming Language, Thirteenth Impression,Addison Wesley, New Delhi.
3. Herbert Scheildt. (2001). Teach Yourself C++, 3rd Edition, Tata McGraw Hill ,New Delhi.
4. Robert Lafore. (2000). Object-Oriented Programming in Turbo C++, Galgotia Publications, New Delhi.
5. E.Balagurusamy. (2017), object-oriented programming with c++, 7th edition, McGraw Hill Education, New Delhi

SEMESTER-II

16CAP212 OPERATING SYSTEM - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To provide students with Extensive knowledge of principles and modules of operating systems
- To learn about the fundamental operating system abstractions such as processes, threads, files, Semaphores, IPC abstractions, shared memory regions, etc.
- To understand the principles of concurrency and synchronization, and apply them to write correct Concurrent programs/software
- To learn the Basic resource management techniques (scheduling or time management, space management) and principles and how they can be implemented.
- To understand the working of MS-Windows, UNIX and LINUX Operating Systems
- To know about distributed file system

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. To understand the operating system components and i ts services
2. To implement the algorithms in process management and solving the issues of IPC
3. To demonstrate the mapping between the physical memory and virtual memory
4. To understand file handling concepts in OS perspective
5. To understand the operating system components and services with the recent OS
6. To understand the concept of paging and segmentation

List of Programs:

1. To write a Linux program to display process deadlock state.
2. To write a program to implement signal handling.
3. Write a Shell program to handle student data base with options given below:

   a) Create data base. b) View Data Base. c) Insert a record d) Delete a record.

   e) Modify a record. f) Result of a particular student. g) Exit.
4. To write a simple Linux program using thread.
5. Deadlock avoidance using Banker's Algorithm.
6. To write a program to display the date & time using TCP Sockets.

7. To write a program to display the date & time using UDP Sockets.
8. Simulation of following CPU scheduling algorithms:
   A. FCFS
   B. SJF (preemptive and non-preemptive)
   C. Priority scheduling (preemptive and non-preemptive)
   D. Round Robin Scheduling
9. To write a Linux program to create a lock file.
10. To write a program to display the user information

SUGGESTED READINGS

1. Deitel. H.M. (1984).An Introduction to Operating Systems. Addison Wesley Publishing Company.
2. Milenkovic, M.(1992).Operating Systems• Concepts and Design. McGraw Hill International Edition Computer Science series.
3. Peterson, J.L. Abraham Silberschatz. (1989).Operating System Concepts. Addison Wesley Publishing Company.
4. Tanenbaum. A.S. (1995).Modem Operating Systems, Prentice Hall of India Pvt. Ltd.
5. Tanenbaum. A.S.(2015). Modern Operating Systems. Prentice Hall of India Pvt. Ltd.

SEMESTER-II

16CAP213 CASE TOOLS - PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To provide students with Extensive knowledge of case tools
- To learn about the relational database design
- To learn about the fundamental application development tools
- To understand the principles of management tools
- To learn about the selenium tool.
- To know about Revision control system

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Outline the history of CASE tools.
2. Outline the cost of using and building CASE tools.
3. Use at least two CASE tools for each software development phase.
4. Evaluate existing CASE Tools.
5. Compare and contrast the fitness of existing CASE Tools to the needs of specific software development context.
6. Know to manage the process of software development

List of Practical

1. CASE tools

Use of diagramming tools for system analysis, such as Turbo analyst, for preparing Data Flow diagrams and E-R diagrams. Use of tools for relational database design such as relational Designer.

2. Application Development Tools:

Use of toots such as Power Builder, Delphi, Magic etc. in developing application software including interactive data-entry screens, transaction processing, report generations, etc.

3. Management Tools:

Use of tools for managing the process of software development such as Source Code Control System (SCCS), Revision Control System (RCS), Make etc.

4. **Program Using Selenium Tool: [web: http://docs.seleniumhq.org]**

i. Using seleniumhq tool perform single webpage test case

ii. Using seleniumhq tool perform testing for multiple webpage

SUGGESTED READINGS

1. Alan W. Brown, David J. Carney, Edwin J. Morris, Dennis B. Smith, Paul Zarrella.(1994). Principles of CASE Tool Integration, Oxford University Press
2. Storr, A., Jarvis, D.H. (1996). Software Engineering for Manufacturing Systems Methods and CASE tools. Springer.

SEMESTER-III

16CAP301 DATABASE MANAGEMENT SYSTEMS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To able to understand the role and nature of relational database management systems (RDBMS) in today's IT environment.
- To translate written business requirements into conceptual entity-relationship data models.
- To convert conceptual data models into relational database schemas using the SQL Data Definition Language (DDL).
- To manipulate databases using the SQL Data Manipulation Language (DML).
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- To take backup and perform recovery.

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Define the terminology, features, classifications, and characteristics embodied in database systems.
2. Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
3. Demonstrate an understanding of the relational data model.
4. Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
5. Formulate, using relational algebra, solutions to a broad range of query problems.
6. Perform Database backup and recovery from catastrophic failure

UNIT I – DATABASE CONCEPTS

Basic concepts - Database & Database Users - Characteristics of the Database - Database Systems. Concepts & Architecture-Date Models. Schemas & Instances - DBMS Architecture & Data Independence - Data Base languages & Interfaces – Data Modelling using the Entity - Relationship Approach

UNIT II – RELATIONAL MODEL

Relational Model. Languages & Systems - Relational Data Model & Relational Algebra - Relational Model Concepts - Relational Model Constraints-Relational Algebra - SQL - A Relational Database Language - Date Definition in SQL - View & Queries in SQL - Specifying Constraints & Indexes in SQL - Specifying Constraints & Indexes in SQL - a Relational Database Management Systems - ORACLE/INGRES

UNIT III – HIERARCHICAL MODEL

Conventional Data Models & Systems - Network, Data Model & IDMS Systems - Membership types & options in a set - DML for the network model - Navigation within a network database - Hierarchical Data Model & IMS System - Hierarchical Database structure - HSAM, HISAM, HDAM & HIDAM organization - DML for hierarchical model - Overview of IMS

UNIT IV - NORMALIZATION

Relational Data Base Design - Function Dependencies & Normalization for Relational Databases - Functional Dependencies - Normal forms based on primary keys - (INF, 2NF, 3NF & BCNF) - Lossless join & Dependency preserving decomposition

UNIT V – CONCURRENCY CONTROL

Concurrency Control & Recovery Techniques - Concurrency Control Techniques - Locking Techniques - Time stamp ordering - Granularity of Data items - Recovery Techniques -Recovery concepts - Database backup and recovery from catastrophic failures - Concepts of Object oriented data base management systems.

SUGGESTED READINGS

1. Date, C.J., A.Kannan, S.Swamynathan (2012). An Introduction to Database Systems, Pearson education.
2. Desai. B. (2005). An Introduction to Database Concepts, Galgotia Publications. New Delhi.
3. Elmsari and Navathe.(2011). Fundamentals of Database Systems, Addison Wesley, New York.
4. Ullman. J.D. (2008). Principles of Database Systems, Galgotia Publications. New Delhi.
5. Carolyn E. Begg and Thomas M. Connolly (2005). Database Systems: A Practical. Pearson education.

SEMESTER-III

16CAP302 COMPUTER NETWORKS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To become familiar with layered communication architectures (OSI and TCP/IP).
- To understand the client/server model and key application layer protocols.
- To learn sockets programming and how to implement client/server programs.
- To understand the concepts of reliable data transfer and how TCP implements these concepts.
- To learn the principles of routing and the semantics and syntax of IP.
- To learn the various network protocols

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able :

1. To master the terminology and concepts of the OSI reference model and the TCP- IP reference model.
2. To master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks,
3. To be familiar with wireless networking concepts,
4. To be familiar with contemporary issues in networking technologies
5. To understand the functionalities needed for data communication into layers
6. To know the various security methodology in network

UNIT I – INTRODUCTION TO COMPUTER NETWORK

Introduction to computer network

Advantages of networks - Structure of the communications network - point-to-point and multidrop circuits - data flow and physical circuits - network topologies - topologies and design goals - Hierarchical topology - horizontal topology (Bus) - star topology - ring topology - mesh topology. The telephone network, switched and non-switched options - fundamentals of communications theory - channel speed and bit rate - voice communications and analog waveforms - bandwidth and the frequency spectrum - connecting the analog and digital worlds - digital worlds - digital signals- the modem, asynchronous and synchronous transmission.

Wide area and local networks, connection oriented and connectionless networks, classification of communications protocols, time division multiple access (TDMA), time division multiplexing (TDM), carrier sense (Collision) systems, token passing, peer-to-peer priority systems; priority slot, carrier sense (collision free) systems, token passing (priority) systems.

UNIT II – LAYERED PROTOCOLS & LAN

Layered Protocols and the OSI model
Goals of Layered Protocols, network design problems" communication between layers, introduction to standard organizations and the OSI model, standards organizations, Layers of OSI, OSI status.

Local Area Networks: Why LANs?, Primary attributes of a LAN, Broadband and baseband and base LANs, IEEE LAN standards, e1ationship of the 802 standards to the ISO/CCITT model., connection options with LANs, LLC and MAC protocol data units, LAN topologies and protocols., token ring (Priority), token bus and IEEE 802.4, metropolitan area networks (MANs), ANSI fiber distributed data interface.

UNIT III – NETWORK PROTOCOLS

Network Protocols: TCP, UDP, IP, ICMP, SNMP, and RMON.**TCP/IP:** TCP/IP and internetworking, example of TCP/IP operations, related protocols ports and sockets. The IP address structure, major features of IP, IP datagram. Major IP services. IP source routing, value of the transport layer, TCP, Major features of TCP, passive and active operation, the transmission control block (TCP), route discovery protocols, examples of route discovery protocols, application layer protocols.

UNIT IV- PROTOCOLS

Polling/Selection Protocols: Character and bit protocols, binary synchronous control (BSC) HDLC; HOLC options, HDLC frame format, code transparency and synchronization, HDLC transmission process, HDLC subsets, SDLC, Protocol conversion.
Switching and Routing in Networks: Message switching, packet switching, when and when not to use packet switching, packet routing, packet switching support to circuit switching networks.
The X.25 Network and Supporting Protocols: Features of X.25, Layers of X.25 and the Physical layer, X.25 and the data link layer. Companion standards to X.25, features of X.25, X.25 channel options, flow control principles, other packet types, X.25 logical channel states, packet formats. Internetworking, connectionless mode networks, the frame relay and X.25 stacks.

UNIT V – NETWORK SECURITY
Network Security: IP Security: Architecture, Authentication header, Encapsulating security payloads, combines security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems

SUGGESTED READINGS
1. Black. V (1996). Computer Networks Protocols, Standards and Interfaces, Prentice Hall of India.
2. Stallings. W 2007). Computer Communication Networks, 4^{th} edition, Prentice Hall of India.
3. Tanneabaum. A.S (2003). Computer Networks, 4^{th} edition ,Prentice Hall of India.
4. B. Forouzan, Debdeep Mukhopadhyay (2015). Cryptography and Network Security, TMH

SEMESTER-III

16CAP303 ADVANCED JAVA AND SPRINGS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To develop the code with various Java data types, conditions and loops.
- To implement arrays, functions and string handling techniques.
- To understand object oriented programming through Java using Classes, Objects and various Java concepts like Abstract, Final etc.
- To implement multi-threading and exception handling.
- To write a code in JDBC to communicate with Database.
- To know about files and streams in Java

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Able to implement, compile, test and run Java program,
2. Able to make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API
3. Able to understand the components and patterns that constitute a suitable architecture for a web application using java servlets
4. Able to demonstrate systematic knowledge of backend and front end by developing an appropriate application.
5. Write code with spring framework components.
6. Use collection such as list, set, map in java programming

UNIT I – Exception Handling

Exception Handling, Exception-Handling Fundamentals, Exception Types- checked & unchecked, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws and finally. Multithreaded Programming: Introduction to Threads, Creating and Running Threads, Volatile Variables, Life Cycle of a Thread, Thread Priorities and Thread Scheduling – Creating and Executing Thread – Thread Synchronization Runnable Interface

UNIT II – Files and Streams

Files and Streams: Advanced Input/output Streams, Readers and Writers, Character and Byte Streams, Print Writer, Reading Text, Scanner Class, Reading and Writing Files, Copying a File, Class File, Creating a Sequential, Access File, Reading Data from a Sequential, Access File, Random-Access Files, Creating/Writing/Reading Random-Access Files, New I/O APIs for the Java Platform.

UNIT III - Collections

Collections Framework: Overview, Generics Fundamentals, Auto boxing, The Collection Interfaces-List Interface, Set Interface, Sorted Set Interface, Navigable Set Interface, The Collection Classes- Array List, Linked List, Hash Set, Linked Hash Set, Tree Set, Accessing a Collection via an Iterator, Enumeration Interface, Vector, Hash Table, Properties, String Tokenizer and Date Class. Serialization: Serializable, Externalizable.

UNIT IV – Spring Framework

Introducing the Spring Framework, Spring Framework Run Time & architecture, Inversion of Control (IoC), Dependency Injection, Different Forms of Dependency Injection, Dependency Injection variants, DI classes & Parameter in Spring framework, Bean naming, @Auto wired annotation, The Bean Factory, XML Bean Configuration, Managing the Bean Lifecycle, Basics of Aspect-Oriented Programming (AOP), AOP concepts - Join point, Point cut, Advice, Types of advice, @AspectJ support

UNIT V - JDBC

DAO Support and JDBC Framework, Operations with JdbcTemplate, JdbcTemplate Convenience Methods, Basic Queries Using the JdbcTemplate, Batch Updates, Transaction and Resource Management, Global transaction vs. local transaction, Declarative transaction management, XML-based, Annotation-based, Object/Relational Mapping, Basic O/R Mapping, Object Query Languages, Data Access Objects, Setup in a Spring Context, Introduction to Spring MVC, Dispatch Servlet, Context configuration, Identify the design goals and core concepts of Spring MVC, Spring MVC controllers & Views

SUGGESTED READINGS

1. Deitel & Deitel. (2014). Java How to Program, 10th Edition, Pearson Education Asia, New Delhi.
2. Craig Walls. (2014). Spring in Action, 4th Edition
3. Herbert Schildt (2014). Java Complete Reference, 9th edition. Tata McGraw Hill, New Delhi.
4. Balagurusamy.E. (2012). Programming with Java, 3rd edition ,Tata Mc-Graw Hill, New Delhi.
5. ISRD Group. (2012). Introduction to Object Oriented Programming through Java, 1st Edition, Tata Mc- Graw Hill, New Delhi.
6. Aaron walsh, Justin couch & Daniel H.Steinberg. (2000). Java 2 Programming, IDG Books India (P) Ltd., New Delhi.
7. Rod Johnson, Jurgen Holler & Alef Arendsen. (2013) Professional Java Development with the Spring Framework

WEB SITES

1. java.sun.com/docs/books/tutorial/
2. www.java.net/

SEMESTER-III

16CAP304 STATISTICAL COMPUTING 4H -4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To define concepts of statistical measures, relationship between variables,
- To explain the hypothesis of statistical testing, theory of estimation
- To explain Statistical Quality Control methodologies
- To enter and manipulate data within SAS and R
- To perform basic statistical analyses using SAS and R and interpret the output
- To find information on how to perform advanced statistical analyses using SAS and R, and then undertake such analyses.

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

UNIT I – INTRODUCTION TO STATISTICS

Statistical Measures: Introduction to descriptive Statistics-basic definitions, frequency distribution, Measure of Central Tendency: Mean Median and Mode. Measure of Dispersion: Absolute and relative measure of dispersion: Range, Mean deviation, Quartile deviation, Standard deviation and corresponding relative measures.

UNIT II – CORRELATION AND REGRESSION

Correlation and Regression: Types of Correlation – Simple and Multiple, Positive and Negative, Linear and Non-Linear, Partial and Total. Methods of calculating correlation coefficient: Scatter diagram, Karl Pearson and Spearmen (Rank) correlation coefficient, Regression: Types, lines and equations, Linear Regression - least square method of solving regression equations, X on Y and Y on X.

UNIT III - HYPOTHESIS

Testing of Hypothesis: Introduction to Inferential Statistics: Null and alternative hypothesis, Type I and Type II errors, Standard error, level of significance, acceptance and rejection regions and procedure for testing hypothesis. Large sample test - Z test - tests for means, variances and proportions, Small sample tests based on t, F and Chi- square distributions.

UNITIV - ESTIMATIONS

Estimation and Design of Experiment: Point Estimation - characteristics of estimation - interval estimation -interval estimates of mean, standard deviation and\proportion. Design of Experiments: Completely Randomized Design (CRD), Randomized Block Design (RBD) and Latin Square design (LSD) Models

UNIT V - SQC

Statistical Quality Control (SQC): Statistical basis for control charts, control limits. Controlcharts for variables - $\overline{X}$, R charts. Charts for defectives – p and np charts. Chart for defects – C chart. Acceptance Sampling – single and double sampling plans.

SUGGESTED READINGS

1. R.S.N.Pillai, Bagavathy. (2002). Statistics, S. Chand & Company Ltd, New Delhi.
2. T N Srivastava and ShailajaRego., (2012). Statistics for Management, McGraw Hill Education, New Delhi.
3. Steven K Thompson., (2012). Sampling, John wiley and sons inc.
4. Montgomery Douglas C.,(2008). Introduction to Quality Control, Sixth Edition, John Wiley and Sons.
5. T.Veerarajan. (2017). Fundamentals of Mathematical Statistics, Yesdee Publishing Pvt Ltd.

SEMESTER-III

16CAP305 MANAGEMENT SUPPORT SYSTEMS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To build knowledge about decision support system (DSS) which is a computer program application
- To analyze business data and presents it so that they can make business decisions more easily
- To help the students to distinguish it from an "operational application" that collects the data in the course of normal business operation
- To know about expert system in management
- To identify Group Decision in Support Systems (GDSS) and Decision Conferencing.
- To manage the organization in an efficient way

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Discuss today's turbulent business environment and describe how organizations survive and even excel in such an environment.
2. Discuss the need for computerized support of managerial decision making.
3. Describe the conceptual foundation of the decision support system (DSS)
4. Describe the business intelligence (BI) methodology and relate them each other.
5. List the major tools of computerized decision support and major issues in implementing computerized decision support systems.
6. Define the conceptual foundations of decision making.

UNIT I - INTRODUCTION
Introduction to the concept of Decision Support System: Components of DSS: Dialogue Management.

UNIT II – DECISION SUPPORT SYSTEMS
Data Management and Model Management for DSS; Examples of different type of DSS; Systems Analysis and Design for DSS.

UNIT III – MODELS AND ALGORITHMS
Models in the context of DSS; Algorithms and Heuristics; DSS Applications in different functions.

UNIT VI – DESIGN OF INTERFACES

Design of interfaces in DSS; An overview of DSS generators; Group Decision in Support Systems (GDSS) and Decision Conferencing.

UNIT V – EXPERT SYSTEMS

Introduction of Expert Systems. Expert Systems in Management; Case Study on Expert System. Introduction to GlS; MSS based on GIS; Case Studies; Executive Information Systems (EIS).

SUGGESTED READINGS

1. Bhatnagar, S.C. and Ramani K. V.(1992). Computers and Information Management, Prentice Hall of India. New Delhi.
2. David M. Kroenke, Richard Hatch.(1994). Management information systems, 3rd edition, Mitchell McGraw Hill, New York.
3. Lucas, H.C.(1994).Information system concepts for management,5th edition, McGraw Hill.. New York.
4. Maryam Alvi. Group Decision support Systems, Info. Sys. Mgt (ISM)", Vol. 8. No.3 Summer 91 .
5. Sprauge, R.H., and McNurlin, B.C (2004). Information Systems Management in Practice, 6th ed. Prentice Hall international. New Jersey.
6. Sprague. R.H. and Carlson, E.D (1982). Building Effective Decision Support Systems, Prentice Hall. New Jersey.
7. Maeve Cummings, Stephen Haag (2012). Management Information Systems for the Information Age, Barnes & Noble, Edition 9.

SEMESTER-III

16CAP311 DATABASE MANAGEMENT SYSTEMS - PRACTICAL 5H -2C

Instruction Hours / week: L: 0 T: 0 P: 5 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To able to understand the role and nature of relational database management systems (RDBMS) in today's IT environment.
- To translate written business requirements into conceptual entity-relationship data models.
- To convert conceptual data models into relational database schemas using the SQL Data Definition Language (DDL).
- To manipulate databases using the SQL Data Manipulation Language (DML).
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- To take backup and perform recovery.

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Define the terminology, features, classifications, and characteristics embodied in database systems.
2. Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
3. Demonstrate an understanding of the relational data model.
4. Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
5. Formulate, using relational algebra, solutions to a broad range of query problems.
6. Perform Database backup and recovery from catastrophic failure

List of Practical

Tool: MySQL

Some sample applications which may be programmed, are given below

I Create following tables with appropriate constraints.

1. Write SQL statement for following queries.
   a. Age of employees.

  b. Employees whose take home salary is in the range Rs10,000 and 15,000
  c. Employees whose has put 10 years of service.
  d. Employees working under the department head RAGURAMAN
  e. Senior and youngest employee in each department.
  f. Employees who retires after one year.

2. Write cursors
  a. To raise the basic salaries by 25 percent
  b. To retain male employee in the existing employee table and to move female employees to a new table.
3. Create following views
  a. For male employees of age more than 45 years.
  b. For operator with the CHECK OPTION.
  c. For Female employees working under the department head RAJARAMAN.
  d. For male employees with the CHECK OPTION.
4. Create a trigger which fires when one tries
  a. To update records in employee table on Sundays.
  b. To insert records in salary table with basic >30000
5. Generate a pay slip where 40 percent, 20 percent and 15 percent of basic is given as HRA, TA and DA for the employees.

6. Write SQL statement selects all employees and all basic salaries using FULL OUTER JOIN

II Create following tables with appropriate constraints.

1. Take a stock report and list of books in circulation.

2. Write SQL statements for following queries.
  a. Authors of C and C++ books.
  b. List of books issued for UG student
  c. Title of books in computer science department.
  d. Titles of book by the author 'DIETEL'.
  e. Publishers of C and C++ books.
  f. Number of book issued to each student
  g. Publisher details of Commerce Department.

III Write a cursor

  a. To move books costing more than Rs.1500 into a separate table, Reference table.
  b. To move damaged books into a separate table damaged table.

Some sample PL/SQL Programs

1. Write a recursive program for finding the factorial of a given number.
2. Write a recursive program for finding the first n Fibonacci number.
3. Write a PL/SQL program for multiplication tables 3, 4, 5 and 6.
4. Write a recursive program for finding the reverse of a given number.

5. Write SQL queries to illustrate the string functions mathematical functions.
6. Write a program for finding the reverse of a given string.
7. Write a program using triggers, joins and SQL developer programs

SUGGESTED READINGS

1. Date, C.J., A.Kannan, S.Swamynathan (2012). An Introduction to Database Systems, Pearson education.
2. Desai. B. (2005). An Introduction to Database Concepts, Galgotia Publications. New Delhi.
3. Elmsari and Navathe.(2011). Fundamentals of Database Systems, Addison Wesley, New York.
4. Ullman. J.D. (2008). Principles of Database Systems, Galgotia Publications. New Delhi.
5. Carolyn E. Begg and Thomas M. Connolly (2005). Database Systems: A Practical. Pearson education

SEMESTER-III

16CAP312 **COMPUTER NETWORK - PRACTICAL** **4H -2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To become familiar with layered communication architectures (OSI and TCP/IP).
- To understand the client/server model and key application layer protocols.
- To learn sockets programming and how to implement client/server programs.
- To understand the concepts of reliable data transfer and how TCP implements these concepts.
- To learn the principles of routing and the semantics and syntax of IP.
- To learn the various network protocols

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able :

1. To master the terminology and concepts of the OSI reference model and the TCP- IP reference model.
2. To master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks,
3. To be familiar with wireless networking concepts,
4. To be familiar with contemporary issues in networking technologies
5. To understand the functionalities needed for data communication into layers
6. To know the various security methodology in network

List of Practical

1. Write a networking program in Java to implement a TCP server that provides services for a TCP Client.
2. Write a networking program to implement socket programming using User datagram Protocol in Java.
3. Implement an FTP server using socket programming.
4. Implement a chat server using socket programming.
5. Implement an ECHO server using socket programming.
6. Implement Address Resolution Protocol using socket programming.
7. Implement Ping server and Ping client using socket programming.

8. Using UDP to transfer a text file from one host to another.
9. Implement Remote Command Execution using network programming.
10. Simulate simple Web Browser.
11. Write a Java program to check whether the given DNS is found in the internet or not.
12. Write a network program using HTTP to print the document for the given URL.

SUGGESTED READINGS

1. Black. V (1996). Computer Networks Protocols, Standards and Interfaces, Prentice Hall of India.
2. Stallings. W 2007). Computer Communication Networks, 4^{th} edition, Prentice Hall of India.
3. Tanneabaum. A.S (2003). Computer Networks, 4^{th} edition ,Prentice Hall of India.
4. B. Forouzan, Debdeep Mukhopadhyay (2015). Cryptography and Network Security, TMH

SEMESTER-III

16CAP313 ADVANCED JAVA AND SPRINGS - PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To develop the code with various Java data types, conditions and loops.
- To implement arrays, functions and string handling techniques.
- To understand object oriented programming through Java using Classes, Objects and various Java concepts like Abstract, Final etc.
- To implement multi-threading and exception handling.
- To write a code in JDBC to communicate with Database.
- To know about files and streams in Java

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Able to implement, compile, test and run Java program,
2. Able to make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API
3. Able to understand the components and patterns that constitute a suitable architecture for a web application using java servlets
4. Able to demonstrate systematic knowledge of backend and front end by developing an appropriate application.
5. Write code with spring framework components.
6. Use collection such as list, set, map in java programming

List of Practical

1. Write a java Thread java program by Extending thread Class
2. Write a java program to get file list from a folder filtered by Extensions
3. Write a java program to sort Linked List Using Comparator
4. Write a java program to read all elements in Array L[1]ist by using Iterator
5. Write a java program to copy Map content to another Hash Table
6. Write a java program to compare two sets and retain elements which are same on both sides

7. Write a java program to get spring Application Context Object Reference
8. Write a java program to load multiple java based configuration in the spring using IMPORT @ Annotation
9. Write a java spring AOC Advice using PointCuts concept – to check the name match
10. Write a java program to update customer Information Using JDBC Connection
11. Write a java program to Execute select Query Using JDBC Connection
12. Write a java program to get IP Address of a Host in Java

SUGGESTED READINGS

1. Deitel & Deitel. (2014). Java How to Program, 10^{th} Edition, Pearson Education Asia, New Delhi.
2. Craig Walls. (2014). Spring in Action, 4^{th} Edition
3. Herbert Schildt (2014). Java Complete Reference, 9^{th} edition. Tata McGraw Hill, New Delhi.
4. Balagurusamy.E. (2012). Programming with Java, 3^{rd} edition ,Tata Mc-Graw Hill, New Delhi.
5. ISRD Group. (2012). Introduction to Object Oriented Programming through Java, 1^{st} Edition, Tata Mc- Graw Hill, New Delhi.
6. Aaron walsh, Justin couch & Daniel H.Steinberg. (2000). Java 2 Programming, IDG Books India (P) Ltd., New Delhi.
7. Rod Johnson, Jurgen Holler & Alef Arendsen. (2013) Professional Java Development with the Spring Framework

WEB SITES

1. java.sun.com/docs/books/tutorial/
2. www.java.net/

SEMESTER-IV

16CAP401 J2EE 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3Hours

Course Objectives

Enable the student

- To understand J2EE as an architecture and platform for building
- To deploy web-based, n-tier, transactional, component-based enterprise applications
- To understand the fundamental concepts of XML and related technologies
- To acquire knowledge on how XML is currently being used in various application areas
- To know how to parse and transform XML documents via tools and through programming APIs
- To understand the EJB architecture and have a good grasp on when to use and how to use various EJB bean types and acquire relevant Java programming experience

Course Outcomes (COs)

Upon completion of this course, Students will be able to :

1. Characterize the concepts J2SE and J2EE
2. Develop Enterprise Applications using Session Bean, Entity Bean and MDB
3. Demonstrate the hierarchy of Java classes to provide software solutions using Java APIs
4. Analyze the components and patterns of Java Servlet architecture for webapplications
5. Apply systematic Java programming knowledge to connect backend and front end
6. Implement the Java Servlet to transfer data

UNIT I – J2EE OVERVIEW

J2EE Overview – Beginning of Java – Java Byte code – Advantages of Java –J2EE and J2SE. J2EE Multi Tier Architecture – Distributive Systems – The Tier – Multi Tier Architecture – Client Tier, Web Tier, Enterprise Java Beans Tier, Enterprise Information Systems Tier Implementation.

UNIT II - J2EE DATABASE CONCEPTS

J2EE Database Concepts:Data – Database – Database Schema. JDBC Objects: Driver Types – Packages – JDBC Process – Database Connection – Statement Objects – Result Set – Meta Data.

UNIT III - JAVA SERVLETS

Java Servlets: Benefits – Anatomy – Reading Data from Client –Reading HTTP Request Headers – Sending Data to client – Working with Cookies.

UNIT IV – ENTERPRISE JAVA BEANS

Enterprise Java Beans – Deployment Descriptors – Session Java Bean –Entity Java Bean – Message Driven Bean.

UNIT V – JAVA SERVER PAGES

Java Server Pages – Java Remote Method Invocation.

SUGGESTED READINGS

1. Joseph J Bambaraetal. (2001). J2EE Unleashed, 1st Edition, Tech Media.
2. Paul J Perrone, Venkata S R R Chaganti, S .R.Venkata Krishna, R Chaganti and Tom Schwenk. (2003). J2EE Developer's Handbook, Sams Publications.
3. Rod Johnson. (2004). J2EE Development without EJB, 1st Edition, Wiley Dream Tech India, New Delhi.
4. Rod Johnson. (2004). Expert One-On-One J2ee Design and Development , John Wiley & Sons, Incorporated.
5. Jim Keogh. (2017). The Complete Reference J2EE, 1st Edition, Tata MGraw Hill Edition, New Delhi .

WEB SITES

1. java.sun.com/javaee/
2. java.sun.com/j2ee/1.4/docs/tutorial/doc/
3. www.j2eebrain.com/
4. http://www.codejava.net/java-se/jdbc/connect-to-oracle-database-via-jdbc
5. http://mrbool.com/how-to-create-rmi-client-and-server-to-invoke-remove-method-of-rmi-server-in-java/28320

SEMESTER-IV

16CAP402 MOBILE COMPUTING 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To introduce an advanced element of learning in the field of wireless communication and the concepts of wireless devices and mobile computing.
- To introduce wireless communication and networking principles, that support connectivity to cellular networks, wireless internet and sensor devices.
- To understand the use of transaction and e-commerce principles over devices to support mobile business concepts
- To learn the basic concepts, aware of the GSM, SMS, GPRS Architecture.
- To understand the mobile operating system development environment such as android.
- To demonstrate the features of Android Mobile Operating System for developing Android Applications

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Gain the knowledge about various types of Wireless Data Networks and Wireless Voice Networks.
2. Analyze the architectures and the challenges of Wireless Networks.
3. Analyze the role of Wireless Protocols in Wireless Networks.
4. Know about different types of Wireless Communication Networks and their functionalities.
5. Develop Mobile Applications Using Android
6. Identify the features involved in Bluetooth technology.

UNIT I - INTRODUCTION

Mobile Computing- Middleware and Gateways-Developing Mobile Computing Applications-Security in Mobile Computing – Architecture of Mobile Computing-Three-Tier Architecture-Design Consideration for Mobile Computing-Mobile Computing through Internet- Mobile Computing through Telephone-Developing an IVR Applications

UNIT II – BLUETOOTH AND GSM

Bluetooth- Features and working of RFID - Wireless Broadband (WiMax)- Mobile IP – IPV6- Java Card –Global System for Mobile Communications – GSM Architecture – Call Routing in GSM – GSM Addresses and Identifiers – Network Aspects in GSM – GSM Frequency Allocation – Authentication and Security- Mobile Computing Over SMS – SMS-Value Added Services through SMS.

UNIT III – GPRS, 3G AND 4G NETWORKS
GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS- Applications for GPRS – Limitations of GPRS- Spread Spectrum Technology- CDMA Versus GSM – – Features of 3G Networks –Architecture of 3G- Applications of 3G - Features of 4G- Architecture of 4G - Wireless Technologies Used in 4G- Merits and Demerits of 4G

UNIT IV – MOBILE AD-HOC NETWORKS
MOBILE Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc Networks (VANET) – MANET Vs VANET – Security

UNIT V – ANDROID OPERATING SYSTEM
History of Android -Introduction to Android Operating Systems -Android Architecture - Android Virtual Device Manager - Features of Eclipse and Android Studio-Comparison of Kotlin Language to Java- User Interface Architecture of Android: Application context, intents, Activity life cycle, User Interface Design of Android –Features of Android SQLite Database

SUGGESTED READINGS

1. Asoke K. Talukder, Roopa R. (2011). Mobile Computing: technology, applications, and service creation, New Delhi ,Tata McGraw Hill.
2. R.Roger, J Lombarddo, Z Mednieks and B. Meike (2010). Android Applications Development, O'Reilly, Shroft Publishers & Distributors Pvt Ltd, New Delhi.
3. JochenSchiller (2000). Mobile Communication, Addison Wesley.
4. Brian Fling (2009). Mobile Design and Deevelopment, O'Reilly Media, Inc
5. William C.Y.Lee (1993). Mobile Communication Design Fundamentals, John Wiley.
6. Ivan Stojmenovic, (2002). Handbook Of wireless Networks And Mobile Computing, A Wiley-Interscience Publication.
7. Charles E.Perkins, (2008).Ad Hoc Networking, Addison-Wesley Publications

WEBSITES:
1. en.wikipedia.org/wiki/Mobile_computing
2. www.cse.iitk.ac.in/users/rkg/Talks/mobile_main.pdf
3. www.tutorialspoint.com/android/
4. pl.cs.jhu.edu/oose/resources/android/Android-Tutorial.pdf

SEMESTER-IV

16CAP403 ORGANIZATIONAL BEHAVIOUR 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

1. To make the students familiar with basic concepts of management & human behavior in an Organizational context and application of these concepts to managerial problems.
2. To integrate the relevant knowledge drawn from related disciplines like psychology, sociology and anthropology to make them applicable for studying and analyzing organizational behavior.
3. To gain a solid understanding of human behavior in the workplace from an individual, group, and organizational perspective and frameworks and tools to effectively analyze and approach various organizational situations.
4. To maintain decision making
5. To know about perception
6. To gain knowledge on conflict management

COURSE OUTCOMES (COs)

Upon completion of this course, the student will have reliably demonstrated the ability to:

1. Analyze individual and group behavior, and understand the implications of organizational behavior on the process of management.
2. Identify different motivational theories and evaluate motivational strategies used in a variety of organizational settings.
3. Evaluate the appropriateness of various leadership styles and conflict management strategies used in organizations.
4. Describe and assess the basic design elements of organizational structure
5. Evaluate their impact on employees.
6. Explain how organizational change and culture affect working relationships within organizations.

UNIT I - MANAGEMENT OVERVIEW

Management overview: – evolution of management - functions - characteristics and Importance of management - management vs administration - role of manager - planning: Meaning - steps in planning - objectives - management by objectives.

UNIT II - DECISION MAKING

Decision making: meaning, process. Organization – departmentalization - manpower planning - Process of recruitment and selection, placement and orientation - directing – motivation – Communication. Control – need, process, steps in control.

UNIT III – INTRODUCTION TO ORGANIZATION BEHAVIOR

Organization behavior: meaning and definition - fundamental concepts of ob – contributing Disciplines to the ob field - learning – theories of learning - personality – determinants of Personality - theories of personality - psycho-analytical, social learning, job-fit, and trait Theories.

UNIT IV - PERCEPTION

Perception – factors influencing perception – attribution theory – frequently used shortcuts in Judging others - perceptual process - organization errors of perception - attitudes – types of Attitudes - functions of attitudes. Values – types of values- value across cultures – groups - Stages of group development - group norms - group cohesiveness.

UNIT V – CONFLICT MANAGEMENT

Conflict – meaning – functional vs. Dysfunctional conflict - levels of conflict – conflict Management. Stress – causes of stress – effects of occupational stress - coping strategies for Stress. Organizational change - forces for change - resistance to change- overcoming resistance To change.

SUGGESTED READINGS

1. Koontz and weirich.(2010). Essentials of management, Tata mcgraw hill, New Delhi.
2. Stephen robbins (2012). Organizational behavior, Prentice hall of India.
3. Vsp rao, V.Hari Krishna. (2009). Management: text and cases, excel books, New Delhi.
4. Robbins.S.P.(2006). Fundamentals of management, Pearson publications, New Delhi.
5. Gilbert. (2008). Management today principles and practice, tata mcgraw hill,
6. Fred luthans(1995),"organizational behavior", 7th edition, Tata mcgraw hill, New Delhi.
7. Steven. Lmc shane and mary ann Von glinow. (2001). Organizational behavior, 2nd edition, tata Mcgraw hill.
8. Stephen p robbins and timothy a judge (2007). Organizational behavior, Prentice hall of India.
9. L .m. Prasad(2001).Organizational behaviour, 3rd edition, sultan chand and sons.
10. L.m.prasad. (2013). Principles and practice of management, sultan chand & sons,

SEMESTER-IV

16CAP404D DATABASE ADMINISTRATION 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

Course Objective

Enable the student

- To install and configure database
- To create users and assign roles
- To optimize schemas, tables, indexes and views
- To manage database services and clients
- To move the data from one database to another database.
- To take backup and perform recovery.

Course Outcomes(COs)

Upon completion of this course, students will be able to:

1. Design, model and install any database management systems by using Oracle database as sample.
2. Plan, design, construct, control and manage database instances, database network environment, storage structures, user security, database backup and recovery, database maintenance
3. Define and devise transaction management, concurrency control, crash recovery components
4. Examine and perform data base administration roles
5. Examine the database operations by using Oracle database system as a sample.
6. Apply the knowledge of VLDB to control the distributed databases

UNIT I - INTRODUCTION TO ORACLE DBA

Oracle DBA's: The Oracle DBA's Role- Oracle Database 10g Architecture: Oracle Databases and instances- Oracle Logical Storage structures – Oracle Logical Database structures – Oracle Physical Storage structures- Multiplexing Database Files - Oracle Memory Structures-Oracle Backup and Recovery – Security Capabilities – Tablespace Architecture – Oracle Tablespace installation – Traditional Disk Space Storage – Automatic Storage Management

UNIT II – INTRODUCTION TO SPACE MANAGEMENT

Common Space Management Problems – Oracle Segments, Extents and Blocks – Space Management Methodologies – SYSAUX monitoring and usage – Archived Redo Log File Management – Built in Space Management Tools: Segment Advisor – Undo Advisor and the Automatic Workload Repository – Index usage – Space Usage Warning Levels – Reusable space allocation – Managing alert and Trace Files with ADR – Transaction Basics – Undo Basics – Managing Undo Tablespaces – Flashback features

UNIT III – INTRODUCTION TO TUNING APPLICATION
Tuning Application Design – Tuning SQL – Tuning Memory Usage – Tuning Data Access – Tuning Data Manipulation – Tuning Physical Storage – Reducing Network Security – Database Authentication Methods

UNIT IV – AUTHORIZATION METHODS
Database Authorization Methods – Auditing: Auditing Locations – Statement Auditing – Privilege Auditing Schema Object Auditing – Auditing Related Data Dictionary Views – Logical Backups – Physical Backups – Using Data Pump Export and Import – Data Pump Import Options – Integration of Backup Procedures
Overview of Oracle Net – Using the Oracle Net Configuration Assistant – Using the Oracle Net Manager – Starting the Listener Server Process – Controlling the Listener Server Process Using Data links

UNIT-V - CREATING TABLE SPACES IN A VLDB ENVIRONMENT
Creating Table spaces in a VLDB Environment: Big file Table space Basics – Creating and Modifying Big file Tablespace – Big file Tablespace ROWID format – DBMS_ROWID and Big file Tablespaces.- Advanced Oracle Table Types – Using Bitmap Indexes – Oracle Data Pump Remote queries – Remote Data Manipulation: Two Phase Commit – Managing Distributed Data – Managing Distributed Transactions – Monitoring and Tuning Distributed Database

SUGGESTED READINGS

1. Bob Bryla, Kevin Loney. (2008). Oracle Database 11g DBA Handbook, McGraw-Hill Osborne.
2. Saikat Basak .(2010), Oracle DBA Concise Handbook , Ensel Software.
3. Amarnath Reddy. (2018) ,Oracle DBA 11g/12c – Database Administration for junior DBA.

WEB SITES:
1. www.oracle.com/technology/software/products/database/oracle10g/index.html
2. www.oracle-base.com/articles/10g/
3. www.adp-gmbh.ch/ora/misc/10g.html

SEMESTER-IV

16CAP404N CRYPTOGRAPHY AND NETWORK SECURITY 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3Hours

Course Objectives

Enable the student

- To teach fundamental aspects of security in a modern networked environment with the focus on system design aspects and cryptography in the specific context of network.
- To build protection mechanisms in order to secure computer networks.
- To write coding to encrypt "Plain Text" into "Cipher Text" and vice versa, using different encryption algorithms.
- To choose a suitable ciphering algorithm according to the required security level.
- To build cryptosystems by applying encryption algorithms,
- To build secure authentication systems by use of message authentication techniques.
- To know about the blockchain technology

Course Outcomes (Cos)

Upon completion of this course, students will be able to:

1. Classify the symmetric encryption techniques
2. Illustrate various Public key cryptographic techniques
3. Evaluate the authentication and hash algorithms.
4. Summarize the intrusion detection and its solutions to overcome the attacks.
5. Demonstrate the basic concepts of system level security
6. Apply the block chain technology for security

UNIT I - INTRODUCTION TO CRYPTOGRAPHY

Introduction to Cryptography – Security Attacks – Security Services – Security Algorithm – Stream cipher and Block cipher – Symmetric and Asymmetric – Key Cryptosystem; Symmetric Key Algorithms: Introduction – DES – Triple DES – AES – IDEA – Blowfish – RC5.

UNIT II - PUBLIC KEY CRYPTOSYSTEM

Public Key Cryptosystem: Introduction to Number Theory – RSA Algorithm – Key Management – Diffie-Hell man key exchange – Introduction to Elliptic Curve Cryptography; Message Authentication and Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.

UNIT III - NETWORK SECURITY PRACTICE

Network Security Practice: Authentication Applications – Kerberos – X.509 Authentication Services and Encryption Techniques:; E-mail security – PGP – s/MIME – IP Security.

UNIT IV - WEB SECURITY

Web Security – Secure Socket Layer – Secure Electronic Transaction; System Security – Intruders and Viruses – Firewalls – Password Security.

UNIT V – CRYPTOGRAPHIC ALGORITHMS, SECURITYAND STEGNOGRAPHY

Case Study: Implementation of Cryptographic Algorithms – RSA – DSA – ECC (C / JAVA Programming). Network Forensic – Security Audit; Other Security Mechanism: Introduction to Stenography – Quantum Cryptography – Water Marking – DNA Cryptography.

SUGGESTED READINGS

1. Bruce Schneir .(2006). Applied Cryptography, 2nd Edition. CRC Press, New Delhi.
2. A.Menezes, P.Van Oorschot and Vanstone. (2010). Hand Book of Applied Cryptography, 2nd Edition. CRC Press, New Delhi.
3. Ankit Fadia. (2010), Network Security, 2nd Edition. McMillan India Ltd, New Delhi.
4. William Stallings. (2013). Cryptography and Network Security, 6th Edition. Pearson Education, New Delhi.

WEB SITES

1. williamstallings.com/Crypto3e.html
2. u.cs.biu.ac.il/~herzbea/book.html
3. www.flipkart.com/search-books/cryptography+and+network+security+William+stallings+ebook

SEMESTER-IV

16CAP404S SOFTWARE TESTING 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3Hours

Course Objectives

Enable the student

- To perform test each time they are run, thereby eliminating human error.
- To test how the software reacts under repeated execution of the same operations.
- To program sophisticated tests which bring out hidden information from the application.
- To reuse tests on different versions of an application, even if the user interfaces changes.
- To know the risks in project management system
- To know about various testing

Course Outcomes (COs)

Upon completion of this course, students will be able to

1. Test the software by applying testing techniques to deliver a product free from bugs
2. Evaluate the web applications using bug tracking tools.
3. Investigate the scenario and the able to select the proper testing technique
4. Explore the test automation concepts and tools
5. Deliver quality product to the clients by way of applying standards such as TQM, Six Sigma
6. Evaluate the estimation of cost, schedule based on standard metrics

UNIT I – INTRODUCTION TO TESTING

Introduction: Purpose of Testing – Dichotomies - Model for Testing – consequences of bugs-Taxonomy for bugs

UNIT II – FLOW GRAPHS AND PATH TESTING

Flow/Graphs and Path Testing: Path testing basics-predicates, path predicates and Achievable paths – Path sensitizing– path instrumentation-implementation and application of path testing

UNIT III - INTRODUCTION TO FLOW TESTING

Transaction flow testing: – Transaction flow - Transaction flow testing techniques – implementation comments – testability tips -Data flow testing basics- Data flow testing strategies.

UNIT IV – DOMAINS AND PATHS

Domains and paths-Nice Domains and Ugly Domains-Domain testing-Domains and interface testing-Domains and testability-Metrics-Linguistic metrics-structural metrics-Hybrid metrics-metrics implementations-Testability tips

UNIT V – RISK ANALYSIS

Risk Analysis: Benefits of Risk analysis – Project Management Strategies and Risk – MITs risk Analysis – MITs Ranking Criteria - Using Risk Ranking in Forensics –Test estimation process-MIT totals worksheet-Sizing worksheet

SUGGESTED READINGS

1. Boris Beizer. (2003). Software Testing Techniques, II Edn., DreamTech India, New Delhi. (UNIT – I, II, III, IV)
2. Marnie L Hutcheson. (2003). Software testing fundamentals, 1st Edison, Wiley, DreamTech India, New Delhi. (UNIT – V)
3. Burnstein. (2003).Practical Software Testing, Springer International Edison.
4. E. Kit. (1995). Software Testing in the Real World: Improving the Process, Pearson Education, Delhi.
5. R.Rajani, and P.P.Oak.(2004). Software Testing, Tata Mcgraw Hill, New Delhi.
6. Dorothy Graham,Rex Black, and et.al(2011). Foundations of Software Testing - ISTQB Certification. 3rd Edition, Cengage Learning

WEB SITES

1. http://my.safaribooksonline.com
2. http://www2.sas.com
3. http://www.softwaretesting fundamentals.com
4. www.cs.cmu.edu
5. www.softwaretesting management.con
6. http://www.java2novice.com/junit-examples/test-list-objects/

SEMESTER-IV

16CAP404W **XML** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To be aware of a range of XML tools (Many of them are free).
- To know how to set out an XML document
- To define custom markup language
- To understand the purpose of using DTDs and Schemas to validate XML
- To use XSLT to write a style sheet for XML document to produce multiple output
- To know about DOM

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Learn the basics of creating XML documents, transforming XML documents, and validating XML documents.
2. More specifically, you will learn the basics and history of XML and how to write your own XML documents.
3. Learn how to transform XML documents into documents of other types using XSLT.
4. Learn how to write valid XML documents based on a DTD.
5. Combine XML with existing web technologies.
6. Implement using XML Path language

UNIT I - INTRODUCTION

World Wide Web: Introduction to the Internet and World Wide Web: W3C – History of Internet-World Wide Web- SGML – XML Resources – Internet and World Wide Web resources. Creating Mark up with XML: Introduction – Parsers and well formed XML Documents – Parsing an XML Document - Characters – Mark up – CDATA Sections – XML Namespaces

UNIT II – INTRODUCTION TO DTD

Document Type Definition – Parsers, Well formed and valid XML documents – Element type declarations – Attribute declarations- Attributes Types. Schemas:– Schemas VS DTD's – MSXML Schemas, W3C XML Schema –Declaring Types and Elements –Attribute constraints and Defaults - Simple type - Empty elements -Mixed content elements – Creating Attribute Groups

UNIT III – INTRODUCTION TO DOM

Document Object Model: DOM implementations – DOM with JavaScript – Components-Creating nodes – Traversing the DOM. Simple API for XML: DOM vs SAX – SAX based Parsers.

UNIT IV –XML PATH LANGUAGE

XML Path Language: Nodes – Location Paths; XSLT: Templates - Creating Elements and attributes – Iteration and Sorting – Conditional Processing – Copying Nodes – Combining style sheets – variables. XLink, XPointer, XInclude and XBase.

UNIT V - XML TECHNOLOGIES AND APPLICATIONS

XML Technologies and Applications: XML Query Language – Directory Services Markup Language – Resources Definition Framework – XML topic Maps – Virtual Hyper Glossary – Channel Definition Format – Information and Content Exchange Protocol – Platform for Privacy preferences – XML Metadata Interchange.

SUGGESTED READINGS

1. Ann Novarro, Chuck white, Linda Burman. (2000). Mastering XML, 1st Edition, BPB Publi, New Delhi.
2. Steve Holzner.(2001). Inside XML, 1st Edition, TechMedia, New Delhi.
3. Deitel & Deitel. (2008), XML How to Program . 1st Edition, Pearson Education, New Delhi.

WEB SITES

1. en.wikipedia.org/wiki/XML
2. www.w3.org/XML/
3. www.w3schools.com/xml/default.asp
4. http://www.cs.nmsu.edu/~epontell/courses/XML/material/xmlparsers.html#shapes_SAX

SEMESTER-IV

16CAP404B MANAGERIAL ECONOMICS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To provide students with a basic understanding of the economic theory and analytical tools that can be used in decision making problems.
- To have a good understanding of economic concepts and tools, that have direct managerial applications.
- To sharpen their analytical skills through integrating their knowledge of the economic theory with decision making techniques.
- To provide a basic introduction to econometric analysis and its role in managerial decision making.
- Make optimal business decisions by integrating the concepts of economics, mathematics and statistics.
- To know about demand analysis

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Understand the roles of managers in firms
2. Understand the internal and external decisions to be made by managers
3. Analyze the demand and supply conditions and assess the position of a company
4. Design competition strategies, including costing, pricing, product differentiation, and market environment according to the natures of products and the structures of the markets.
5. Analyze real-world business problems with a systematic theoretical framework.
6. Maintain product and cost analysis

UNIT I - NATURE AND SCOPE OF MANAGERIAL ECONOMICS

Nature and scope of managerial economics. Objectives of the firm. Managerial and behavioral theories of the firm.

UNIT II - DEMAND ANALYSIS

Concepts of opportunity cost, incremental, time perspective. Principles of discounting and equimargins. Demand analysis - purposes and concepts. Elasticity of demand. Methods of demand forecasting.

UNIT III - PRODUCT AND COST ANALYSIS

Product and cost analysis: short run and long run average cost curves. Law of supply. Economies and diseconomies of scale. Law of variable proportions. Production function - single output isoquants.

UNIT IV – CONCEPT OF PRICING

Pricing: Prescriptive approach. Price determination under perfect competition. Monopoly, oligopoly and monopolistic competition. Full cost pricing, product line pricing. Pricing strategies.

UNIT V – INTRODUCTION TO PROFIT

Profits: Nature and. measurement policy. Break-even analysis. Case study.

SUGGESTED READINGS

1. Dean. J. (1982). Management Economics. Prentice Hall of India, New Delhi.
2. Mote. V.L.. et al,(1980). Managerial Economics: Concepts and Cases. Tata McGraw Hill. New Delhi.
3.Dominick Salvatore. (2016). Managerial Economics: Principles and Worldwide Applications, Seventh Edition, Adapted version

WEB SITES

1. http://www.pondiuni.edu.in/sites/default/files/Managerial%20Economics.pdf
2. http://www.comp.nus.edu.sg/~ipng/mecon/sg/01int_sg.pdf
3. http://www.li.suu.edu/library/circulation/Tufte/econ6200dtManagerialEconomicsFa12Ch1.pdf
4. http://www.bput.ac.in/lecture_notes/ME%20Managerial%20Economics.pdf

SEMESTER-IV

16CAP405D DISTRIBUTED DATABASE MANAGEMENT SYSTEM 4H -4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To design good performing distributed database schemas.
- To create optimized query execution plan.
- To efficiently distribute and manage the data.
- To manage distributed access control
- To know how to make secure the databases.
- To know how to deployment of DDBE Software

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. The physical structure of the database to handle data
2. Students would be able to implement the logic by using tools like ERD
3. Ability to normalize the database & understand the internal data structure
4. Students would clearly understand the transaction system
5. Extract the data efficiently
6. Detect or Avoid deadlock using the deadlock handling method

UNIT I – INTRODUCTION TO DATABASE CONCEPTS

Database concepts: Data Models- Database Operations- Database Management-DB Clients, Servers, and Environments. DBE Architecture**:** Services- Components and Subsystems- Sites - Expected Services-Expected Subsystems- Typical DBMS Services**–** DBE Taxonomy**:** COS Distribution and Deployment- COS Closeness or Openness-Schema and Data Visibility- Schema and Data Control.

UNIT II – DESIGN ALTERNATIVES AND FRAGMENTATION

Data Distribution Alternatives: Design Alternatives- Localized Data- Distributed Data. Fragmentation: Vertical Fragmentation- Horizontal Fragmentation. Distribution Transparency: Location Transparency-Fragmentation Transparency-Replication Transparency-Location, Fragmentation, and Replication Transparencies.

UNIT III - QUERY OPTIMIZATION

Query Optimization: Sample Database- Query Processing in Centralized Systems: Query Parsing and Translation - Query Optimization- Query Processing in Distributed Systems- Heterogeneous Database Systems - Concurrency Control in Distributed Database Systems.

UNIT IV - DEADLOCK HANDLING

Deadlock Handling: Deadlock Definition- Deadlocks in Centralized Systems- Deadlocks in Distributed Systems- Distributed Deadlock Detection. Replication Control: Replication Control Scenarios. Failure and Commit Protocols: Terminology- Commit Protocols.

UNIT V - DDBE SECURITY

DDBE Security: Cryptography- Securing Data. Traditional DDBE Architectures: Classifying the Traditional DDBMS Architecture- The MDBS Architecture Classifications- Approaches for Developing A DDBE- Deployment of DDBE Software.

SUGGESTED READINGS

1. Ceri.(1985). Distributed Databases Principles and Systems , 1st Edition Mchraw Hill Pub.
2. Tamer Ozus M,Patrick Valduriez,S.Sridhar. (2006). Principle Of Distributed Database Systems, 1st Edition , Pearson Education.
3. William M.NewMan, Robort F.Sproull. (2004). Principles of Interactive Computer Graphics, 1st Edition , Pearson Education.
4. Saeed K. Rahimi And Frank S. Haug.(2010). Distributed Database Management Systems :A Practical Approach, 1st Edition, A John Wiley & Sons, Inc., Publication.

WEB SITES

1. en.wikipedia.org/wiki/Distributed_computing
2. www.webopedia.com/TERM/D/distributed_computing.html
3. www.tech-faq.com/distributed-computing.shtml
4. http://www.inf.unibz.it/dis/teaching/DDB/ln/ddb01.pdf

Semester-IV

16CAP405N	**TCP/IP**	**4H- 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To learn about IPv4 forwarding and routing.
- To learn about host name resolution and the Domain Name System (DNS).
- To learn about IPv6 addresses.
- To know the Architectural Overview of the TCP/IP Protocol Suite
- Describe the DHCP discovery process
- To know about UDP operation

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Configure subnets using IP classes B and C
2. Explain TCP/IP protocols, ports, sockets, and data encapsulation
3. Describe the process of packet fragmentation and reassembly
4. Explain the key features and functions of TCP and UDP
5. Use Wireshark to identify ICMP request and reply packets
6. Know the operation of DHCP

UNIT I - INTRODUCTION
Introduction: WAN, WAN technologies - Internetworking concepts - Protocols and Standards - TCP/IP protocol suite - Internetworking Devices – Routing Concept - Classful IP Addressing – Subnetting – Supernetting – Classless Addressing

UNIT II – ARP & RARP
ARP & RARP – Proxy ARP – ARP over ATM – ARP and RARP Protocol Format. IP Datagram – Fragmentation – Options – IP Datagram Format – Routing IP Datagrams – Checksum. ICMP: Types of Messages - Message Format – Error Reporting – Query – Checksum - ICMP Package

UNIT III - ROUTING AND ROUTED PROTOCOLS
Routing and Routed Protocols - Autonomous Systems – Routing Table - Interior Gateway Protocols – Exterior Gateway Protocols – Routing in Internet. Group Management – IGMP Message – IGMP Operation – Process to Process Communication.

UNIT IV - UDP OPERATION

UDP Operation – TCP Services - Flow Control – Multicast Routing – Multicast Routing Protocols. BOOTP - DHCP – Address Discovery and Binding. DNS – Name Space – DNS in Internet – Resolution – Resource Records.

UNIT V – REMOTE LOGIN

Remote Login - FTP – SMTP – SNMP. IP over ATM Wan – Cells – Routing the Cells. Mobile IP: Addressing – Agents – Agent discovery – Registration – Data Transfer – VPN.

SUGGESTED READINGS

1. Douglas E. Comer. (2000). Internetworking With TCP/IP, Vol 1: Principles Protocols and Architecture. 4th Edition. New Delhi: Pearson Education.
2. William Stallings. (1997). Data and Computer Communication, 5th Edition. New Delhi: Prentice Hall of India.
3. Behrouz A. Forouzan. (2010). TCP/IP Protocol Suite, 4th Edition. New Delhi: Tata McGraw Hill Publication.

WEB SITES

1. en.wikipedia.org/wiki/Internet_protocol_suite
2. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
3. www.yale.edu/pclt/COMM/TCPIP.HTM
4. www.w3schools.com/tcpip/default.asp

SEMESTER-IV

16CAP405S OBJECT ORIENTED ANALYSIS AND DESIGN WITH UML 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3Hours

Course Objectives

Enable the student

- To use object-oriented technologies and Unified Modeling Language 2.2
- To perform object-oriented analysis and design
- To explain how the Unified Modeling Language (UML) represents an object-oriented system using a number of modeling views.
- To know about class diagrams
- To design the application using interaction diagram
- To construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation.

Course Outcomes (Cos)

Upon Completion of this course, student will be able to

1. Understand of programming language concepts;
2. Demonstrate the software engineering principles
3. Apply the principles of software engineering to software design;
4. Apply the knowledge of OOAD to complete large software project
5. Analyze the deployment of UML diagrams for software design
6. Apply the principles of software engineering quality principles for developing quality software

UNIT I - STRUCTURE OF COMPLEX SYSTEMS

Complexity: The structure of complex systems-the inherent complexity of software-The five attributes of a complex system-Organized and Disorganized complexity-Bringing order to Chaos-On Designing complex systems. The Object model: The evolution of the object model-Foundations of the object model-Elements of the object model-Applying the object model.

UNIT II – INTRODUCTION OF CLASSES AND OBJECTS

Classes and Objects: The nature of an object-Relationship among objects-The nature of a class-Relationships among classes-The interplay of classes and objects-On building quality classes and objects.

UNIT III – CLASSIFICATION AND NOTATION

Classification: The importance of proper classification-Identifying classes and objects-Key abstraction and mechanisms. Notation: The unified modeling language-Package diagrams-Component diagrams.

UNIT IV - DEPLOYMENT DIAGRAMS
Deployment diagrams-Use case diagrams-Activity diagrams-Class diagrams-Sequence diagrams-Interaction overview diagrams-Composite structure diagrams -State machine diagrams-Timing diagrams-Object diagrams-communication diagrams.

UNIT V - PROCESS AND PRAGMATICS
Process: First principles-The Macro Process: The software development lifestyle- The Micro Process: The analysis and design process. Pragmatics: Management and planning-Staffing-Release management-Reuse-Quality assurance and metrics-

SUGGESTED READINGS

1. Martin Fowler, Kendall Scott. (2004). UML Distilled, 2nd Edition, Pearson Education, New Delhi. [UNIT 5]
2. James Rumbaugh, Ivar Jcobson and Grady Booch.(2003). The Unified Modeling Language Reference Manual, 1st Edition, Addison Wesley, New Delhi.
3. Boar (2004).Xml Web Services In The Organization, Wppublisher
4. Grady Booch. (2007). Object Oriented Analysis and Design, 3rd Edition, Addison Wesley, New Delhi. [UNIT 1 to 4]

WEB SITES

1. uml-tutorials.trireme.com/
2. http://www.devshed.com/c/a/Practices/Introducing-UMLObjectOriented-Analysis-and-Design/
3. http://community.sparxsystems.com/tutorials/object-oriented-analysis-and-design

SEMESTER-IV

16CAP405W **WEB SERVICES** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3Hours

Course Objectives

Enable the student

- To be able to describe the interoperable web services architecture, including the roles of SOAP and WSDL.
- To use lower-level SOAP and XML APIs for services and/or clients.
- To build and Host Web Services.
- To apply the web service security
- To know the basic WSDL structure
- To develop the web service application

Course Outcomes (Cos)

Upon completion of the course, students will be able to

1. Understand the use of web services in B2C and B2B applications.
2. Understand the design principles and application of SOAP
3. To know the principles of REST based web services.
4. Design collaborating web services according to a specification.
5. Implement an application that uses multiple web services in a realistic business scenario.
6. Use industry standard open source tools such as Apache Axis2, Tomcat, Derby and Eclipse to build, test, deploy and execute web services and web applications that consume them.

UNIT I – INTRODUCTION TO WEB SERVICES

Introduction: What are Web Services – Importance of web services – Web services and enterprises; XML Fundamentals:: XML Documents - Namespaces – Schema – Processing XML.

UNIT II – SOAP AND WSDL

SOAP: SOAP Model – messages – Encoding – RPC – Alternative SOAP encodings – Document, RPC, Literal, Encoded – SOAP, Web Services and the REST Architecture
WSDL: Structure – Using SOAP and WSDL. UDDI- UDDI Business Registry – Specification – Data Structures – Life cycle Management – Dynamic Access Point Management.

UNIT III – INTRODUCTION TO WEB SERVICES AND WORKFLOW

Advanced Web Services Technologies and Standards: Conversation – Overview – Web Services Conversation Language – WSCL Interface Components- Workflow-Business Process

Management – Workflow and Workflow Management systems – BPEL. Transaction –ACID transaction – Distributed Transaction – OASIS Business Transaction Protocol.

UNIT IV - WEB SERVICE SECURITY

Security – Security Basics – Security Issues – Types of Security Attacks – WS –Security.
Mobile and Wireless – Mobile Web Services – Challenges with mobile – Proxy Based Mobile Systems -Direct Mobile Web service access - J2ME Web Services

UNIT V - WEB SERVICE APPLICATIONS

Building Real World Enterprise Web Service and Applications: Real World Web Service Application Development – Development of Web services and Applications onto Tomcat application Server and Axis Soap Server.

SUGGESTED READINGS

1. Martin Kalin. (2013). Java Web Services: Up and Running, 2nd Edition, O'Reilly Media,USA.
2. Vikram Ramchand, Sonal Mukhi. (2008). XML Web Services and SOAP , 1st Edition, BPB Publications, New Delhi.
3. Eric A Marks and Mark J Werrell. (2003). Executive Guide to Web Services, 1st Edition, John Wiley and Sons, New Delhi
4. Sandeep Chatterjee, James Webber. (2009). Developing Enterprise Web Services: An Architect's Guide, 4th Edition, Pearson Education, New Delhi.

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WEB SITES

1. www.w3schools.com/webservices/default.asp
2. en.wikipedia.org/wiki/Web_service
3. www.webservices.org/
4. https://www.cl.cam.ac.uk/~ib249/teaching/Lecture1.handout.pdf
5. http://www.codejava.net/java-ee/web-services/create-client-server-application-for-web-service-in-java

SEMESTER-IV

16CAP405B **CORPORATE PLANNING** **4H -4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To explain the relationship between planning and organizational performance.
- To define corporate planning.
- To explain why corporate plan do fail and what can be done to ensure its success.
- To explain when should a strategic plan be made?
- To define objectives and why are they considered the foundation of planning
- To describe the organization behaviour

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Understand the strategic decisions that organizations make and have an ability to engage in strategic planning.
2. Explain the basic concepts, principles and practices associated with strategy formulation and implementation.
3. Integrate and apply knowledge gained in basic courses to the formulation and implementation of strategy from holistic and multi-functional perspectives.
4. Analyze and evaluate critically real life company situations
5. Develop creative solutions, using a strategic management perspective.
6. Conduct and present a credible business analysis in a team setting.

UNIT I - SIGNIFICANCE OF PLANNING

Significance of Planning: Types. Needs. Requisites. Corporate planning: system approach. Role of the planner. Corporate planning and budgeting.

UNIT II - SOCIAL RESPONSIBILITIES

Social responsibilities: Scope, contents, cooperation and society, consumers, corporation and democracy, community and government.

UNIT III - PROFITABILITY AND PRODUCTIVITY

Social responsibility versus profitability and productivity. Growth. Professionalism as a means of social behavior.

UNIT IV - BUSINESS OBJECTIVES AND GOALS

Mission and purpose: Business definitions - objectives and goals. Environment appraisal: Concepts, components-Scanning and appraising the environment.

UNIT V - APPRAISAL

Organization appraisal: Dynamics. Capability factors. Considerations. Methods and techniques. Structuring. Planning gaps: Gap analysis. Manager audit: Significance of gaps.

SUGGESTED READINGS

1.Kazni. A . (1992). Business Policy. Tata McGraw Hill. New Delhi.

2.Johnson. G.. etal. (1994). Exploring corporate Strategy, 3rd edition. Prentice Hall of India, New Delhi.

3. Peter Lorange. (2013). Corporate Planning: An Executive Viewpoint, Primary source edition. Nabu Press

SEMESTER-IV

16CAP411 J2EE - PRACTICAL 5H - 2C

Instruction Hours / week: L: 0 T: 0 P: 5 Marks: Internal: 40 External: 60 Total: 100

End Semester Exam: 3 Hours

Course Objectives

Enable the student

- To understand J2EE as an architecture and platform for building
- To deploy web-based, n-tier, transactional, component-based enterprise applications
- To understand the fundamental concepts of XML and related technologies
- To acquire knowledge on how XML is currently being used in various application areas
- To know how to parse and transform XML documents via tools and through programming APIs
- To understand the EJB architecture and have a good grasp on when to use and how to use various EJB bean types and acquire relevant Java programming experience

Course Outcomes (COs)

Upon completion of this course, Students will be able to :

1. Characterize the concepts J2SE and J2EE
2. Develop Enterprise Applications using Session Bean, Entity Bean and MDB
3. Demonstrate the hierarchy of Java classes to provide software solutions using Java APIs
4. Analyze the components and patterns of Java Servlet architecture for webapplications
5. Apply systematic Java programming knowledge to connect backend and front end
6. Implement the Java Servlet to transfer data

List of Practical

1. Create a sign in form in servlets.
2. Write a servlet Program to lock a server.
3. Write a servlet program that returns list of information in table format.
4. Design a counter that counts number of times user has visited the site in current browsing session.
5. Write a program to create JDBC connectivity with Oracle Database.
6. Build a JAVA Bean for opening an applet from JAR file.
7. Write a program to create RMI client and server to invoke remove method of RMI server.
8. Design a counter in JAVA BEAN.
9. Write a program to stream contents of a file using JSP.
10. Write a program to insert a menu applet into JSP page.

SUGGESTED READINGS

1. Joseph J Bambaraetal. (2001). J2EE Unleashed, 1st Edition, Tech Media.
2. Paul J Perrone, Venkata S R R Chaganti, S .R.Venkata Krishna, R Chaganti and Tom Schwenk. (2003). J2EE Developer's Handbook, Sams Publications.
3. Rod Johnson. (2004). J2EE Development without EJB, 1st Edition, Wiley Dream Tech India, New Delhi.

4. Rod Johnson. (2004). Expert One-On-One J2ee Design and Development , John Wiley & Sons, Incorporated.
5. Jim Keogh. (2017). The Complete Reference J2EE, 1st Edition, Tata MGraw Hill Edition, New Delhi .

SEMESTER-IV

16CAP412 MOBILE COMPUTING - PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To introduce an advanced element of learning in the field of wireless communication and the concepts of wireless devices and mobile computing.
- To introduce wireless communication and networking principles, that support connectivity to cellular networks, wireless internet and sensor devices.
- To understand the use of transaction and e-commerce principles over devices to support mobile business concepts
- To learn the basic concepts, aware of the GSM, SMS, GPRS Architecture.
- To understand the mobile operating system development environment such as android.
- To demonstrate the features of Android Mobile Operating System for developing Android Applications

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Gain the knowledge about various types of Wireless Data Networks and Wireless Voice Networks.
2. Analyze the architectures and the challenges of Wireless Networks.
3. Analyze the role of Wireless Protocols in Wireless Networks.
4. Know about different types of Wireless Communication Networks and their functionalities.
5. Develop Mobile Applications Using Android
6. Identify the features involved in Bluetooth technology.

List of Practical

1. Write a program to build your first Android Application “Hello World” with common activity.
2. Write a program which will implement Sub menu in android application.
3. Write a program which will implement Context menu (Floating List of Menu Items) in android application.
4. Write a program to displays the use of Relative Layout Views with different attributes.
5. Write a program to displays the use of Linear Layout Views with different attributes.

6. Write a program to implement a Custom Button and handle the display message on button press.
7. Write a program to implement the List View in your android application.
8. Write a program to implement between animations and rotate the text in your android application.
9. Write a sample program to create a progress bar for your android applications.
10. Write a program to show how to use Date picker control of ADK in your android applications.
11. Write a program which enables you to draw an image using bitmap class object.
12. Write a program which allows you to get image from web and displayed them using the Image View.

SUGGESTED READINGS

1. Ashok K Talukder and Roopa R Yuuvagal, (2005). Mobile Computing, Tata McGraw Hill
2. Publishing Company Limited.
3. R.Roger, J Lombarddo, Z Mednieks and B. Meike (2010). Android Applications Development, O'Reilly, Shroft Publishers & Distributors Pvt Ltd, New Delhi.
4. JochenSchiller (2000). Mobile Communication, Addison Wesley.
5. Brian Fling (2009). Mobile Design and Deevelopment, O'Reilly Media, Inc
6. William C.Y.Lee (1993). Mobile Communication Design Fundamentals, John Wiley.
7. Ivan Stojmenovic, (2002). Handbook Of wireless Networks And Mobile Computing, A
8. Wiley-Interscience Publication.
9. Asoke K. Talukder, Roopa R. (2011). Mobile Computing: technology, applications, and
10. service creation, New Delhi ,Tata McGraw Hill.

SEMESTER-IV

16CAP413D DBA - PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

Course Objective

Enable the student

- To install and configure database
- To create users and assign roles
- To optimize schemas, tables, indexes and views
- To manage database services and clients
- To move the data from one database to another database.
- To take backup and perform recovery.

Course Outcomes(COs)

Upon completion of this course, students will be able to:

1. Design, model and install any database management systems by using Oracle database as sample.
2. Plan, design, construct, control and manage database instances, database network environment, storage structures, user security, database backup and recovery, database maintenance
3. Define and devise transaction management, concurrency control, crash recovery components
4. Examine and perform data base administration roles
5. Examine the database operations by using Oracle database system as a sample.
6. Apply the knowledge of VLDB to control the distributed databases

List of Practical

1. Demo for Globalization Support
2. Setup Listener Security
3. Configuring Recovery Manager
4. Write a program Using Recovery Manager
5. Write a program for Managing Diagnostic Sources
6. Implement Database Recovery
7. Demo for Flashback Database
8. Implement User Error Recovery
9. Write a program for Dealing with Corruption

10. Show the demo for Automated Management
11. Creating a database and do the manipulation.
12. Managing index tables

SUGGESTED READINGS

1. Bob Bryla, Kevin Loney. (2008). Oracle Database 11g DBA Handbook, McGraw-Hill Osborne.
2. Saikat Basak .(2010), Oracle DBA Concise Handbook , Ensel Software.
3. Amarnath Reddy. (2018), Oracle DBA 11g/12c – Database Administration for junior DBA.

SEMESTER-IV

16CAP413N NETWORK SECURITY - PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Enable the student

- To teach fundamental aspects of security in a modern networked environment with the focus on system design aspects and cryptography in the specific context of network.
- To build protection mechanisms in order to secure computer networks.
- To write coding to encrypt "Plain Text" into "Cipher Text" and vice versa, using different encryption algorithms.
- To choose a suitable ciphering algorithm according to the required security level.
- To build cryptosystems by applying encryption algorithms,
- To build secure authentication systems by use of message authentication techniques.
- To know about the blockchain technology

Course Outcomes (Cos)

Upon completion of this course, students will be able to:

1. Classify the symmetric encryption techniques
2. Illustrate various Public key cryptographic techniques
3. Evaluate the authentication and hash algorithms.
4. Summarize the intrusion detection and its solutions to overcome the attacks.
5. Demonstrate the basic concepts of system level security
6. Apply the block chain technology for security

List of Practical

1. Write a program to convert your college name from plain text to cipher text using Transposition cipher method of encryption.
2. Write a program to convert your name from plain text to cipher text using the One Time Pads method of encryption.
3. Write a program to encrypt a paragraph using the Data Encryption Standard Algorithm.
4. Write a program to encrypt your biodata using the Advanced Encryption Standard Algorithm.
5. Write a program to decrypt the "Network Security" theory syllabus using the RSA Algorithm.

6. Write a program that takes a binary file as input and performs bit stuffing and Cyclic Redundancy Check Computation.
7. Write a program to simulate the working of Sliding-Window protocol.
8. Write a program to find the shortest path in a network using Dijkstra's Algorithm.

9. Write a program for the following chat application:
   One to One: Open a Socket connection and display what is written by one to another.
   Many to Many: Each Client Opens a Socket connection to the client server and writes to the socket. Whatever is written by one can be seen by all. Implement symmetric key cryptography.
10. Write a program to implement *International Data Encryption* Algorithm (*IDEA*).

SUGGESTED READINGS

1. Bruce Schneir .(2006). Applied Cryptography, 2nd Edition. CRC Press, New Delhi.
2. A.Menezes, P.Van Oorschot and Vanstone. (2010). Hand Book of Applied Cryptography, 2nd Edition. CRC Press, New Delhi.
3. Ankit Fadia. (2010), Network Security, 2nd Edition. McMillan India Ltd, New Delhi.
4. William Stallings. (2013). Cryptography and Network Security, 6th Edition. Pearson Education, New Delhi.

WEB SITES

1. williamstallings.com/Crypto3e.html
2. u.cs.biu.ac.il/~herzbea/book.html
3. www.flipkart.com/search-books/cryptography+and+network+security+William+stallings+ebook

SEMESTER-IV

16CAP413S SOFTWARE TESTING – PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Enable the student

- To perform test each time they are run, thereby eliminating human error.
- To test how the software reacts under repeated execution of the same operations.
- To program sophisticated tests which bring out hidden information from the application.
- To reuse tests on different versions of an application, even if the user interfaces changes.
- To know the risks in project management system
- To know about various testing

Course Outcomes (COs)

Upon completion of this course, students will be able to

1. Test the software by applying testing techniques to deliver a product free from bugs
2. Evaluate the web applications using bug tracking tools.
3. Investigate the scenario and the able to select the proper testing technique
4. Explore the test automation concepts and tools
5. Deliver quality product to the clients by way of applying standards such as TQM, Six Sigma
6. Evaluate the estimation of cost, schedule based on standard metrics

List of Practical

1. Create a VB form with the following fields and create the database also for them. Insert 3 records. Using Win Runner tool record the above 3 transaction and test them and produce the Report. (Black box Testing).

2. Create a VB form and then add login dialog form. Using Win Runner tool check the Username and Password and produce the Report. (Security testing).

3. Create a VB form with the following fields and check the calculation is correct or not by using the test toll Win Runner. (Functional Testing) Fields – Name, Designation, Department, Basic, HRA, DA, PF and netsal.

4. Using Win Runner test tool check the database values after changing. Using Flight database. (Regression testing).

5. Write a C program for Boundary Testing.

6. Write a C program for Loop Testing.

7. Write a C program for Integration Testing.

8. Write a C program for Interface Testing.

9. Write a C program for Unit testing.

10. Write a program to do JUnit test for comparing two list of user defined objects.

Software Quality Assurance

1. To develop a banking application, perform the requirement analysis and give a quality status report.
2. Perform the system testing to develop an electricity application and give a quality status report.
3. Perform the report design and give a quality status report.
4. Develop a library management system and give a quality status report.
5. Develop a hospital management system and a quality status report and give a comparison performance report in Linux and windows operating system.

SUGGESTED READINGS

1. Boris Beizer. (2003). Software Testing Techniques, II Edn., DreamTech India, New Delhi. (UNIT – I, II, III, IV)
2. Marnie L Hutcheson. (2003). Software testing fundamentals, 1st Edison, Wiley, DreamTech India, New Delhi. (UNIT – V)
3. Burnstein. (2003).Practical Software Testing, Springer International Edison.
4. E. Kit. (1995). Software Testing in the Real World: Improving the Process, Pearson Education, Delhi.
5. R.Rajani, and P.P.Oak.(2004). Software Testing, Tata Mcgraw Hill, New Delhi.
6. Dorothy Graham,Rex Black, and et.al(2011). Foundations of Software Testing - ISTQB Certification. 3rd Edition, Cengage Learning

SEMESTER-IV

16CAP413W XML - PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To be aware of a range of XML tools (Many of them are free).
- To know how to set out an XML document
- To define custom markup language
- To understand the purpose of using DTDs and Schemas to validate XML
- To use XSLT to write a style sheet for XML document to produce multiple output
- To know about DOM

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Learn the basics of creating XML documents, transforming XML documents, and validating XML documents.
2. More specifically, you will learn the basics and history of XML and how to write your own XML documents.
3. Learn how to transform XML documents into documents of other types using XSLT.
4. Learn how to write valid XML documents based on a DTD.
5. Combine XML with existing web technologies.
6. Implement using XML Path language

List of Practical

1. Create a menu in XML.
2. Create a demo for XSLT.
3. Display XML information in Tree structure format.
4. Integrate XML in Web Applications
5. Write a program to navigate the records in the file.
6. Write a database access with XML.
7. Write a program to extract all the information about circles which are elements in a given XML document using DOM parser.
8. Write a program to extract all the information about circles which are elements in a given XML document using SAX parser.
9. Write a program to show the function of CDATA.
10. Write a program to generate XML file on the server.

11. Write a program to generate XML file from the Database
12. Write a program to load a text file into a div element with XML HTTP.
13. Write a program to create a simple application for web services.

SUGGESTED READINGS

1. Deitel & Deitel. (2008), XML How to Program . 1st Edition, Pearson Education, New Delhi.
2. Ann Novarro, Chuck white, Linda Burman. (2000). Mastering XML, 1st Edition, BPB Publi, New Delhi.
3. Steve Holzner.(2001). Inside XML, 1st Edition, TechMedia, New Delhi.

SEMESTER-IV

16CAP413B **WAP- PRACTICAL** **4H -2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To understand the basics of wireless voice and data communication technologies
- To build skills in working with Wireless application Protocols to develop mobile content applications.
- To understand the various wireless topology
- To describe the various routing
- To know the basic knowledge about Xgraph
- To identify the QOS parameters

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Able to understand the infrastructure to develop mobile communication systems
2. Able to characterize of different multiple access techniques in mobile communication.
3. Know about NS2 script
4. Simulate the network traffic and routing
5. Measure the performance
6. Demonstrate the OSPF routing

List of Practical

1. Demonstrate the creation of output files for Xgraph.
2. Illustrate NS2 script to send data between two nodes.
3. Create a simple simulation topology to generate TCP and UDP traffic
4. Simulate a NS2 scenario to handle link failures.
5. Write a NS2 script to handle Multicast traffic.
6. Demonstrate OSPF routing.
7. Create a simulation topology and analyze QOS parameters.
8. Demonstrate the creation of wireless topology.

SUGGESTED READINGS

1. Kamlesh N Agarwala. (2001).WAP the Net: An Introduction to Wireless Application Protocol, Laxmi Publications; First edition
2. Issariyakul, Teerawat, Hossain, Ekram . (2009).Introduction to Network Simulator NS2,Springer.

SEMESTER-V

16CAP501 PHP5 / MYSQL 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3Hours

Course Objectives

To help the students

- To get hands-on experience in scripting, debugging, testing.
- To establish a working environment for PHP web page development
- To learn to create dynamic interactive pages with PHP.
- To learn to manipulate files with PHP.
- To learn to use SQL to output reports with MySQL
- To write pseudo code for an application

Course Outcomes (Cos)

Upon completion of this course, student will be able to

1. Implement regular expressions in PHP programming including modifiers, operators, and meta characters.
2. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
3. Analyze and solve various database tasks using the PHP language.
4. Create server side web applications using PHP and MySQL.
5. Analyze the structure of an E-Mail message
6. Develop the files and directories management operation

UNIT I

Creating a Simple PHP Programs: How PHP Code Works- How Online PHP Programs Run Web; Communications: Internet Protocols and HTTP: TCP/IP- The HTTP Protocol; Using Variable in PHP Issues concerning Creating Variables-Defined Constants; Operators and Expressions: PHP Operators – PHP Expressions- Operators Types- Arrays

HTML Primer: The HTML Document type definition- The Form and Input Elements; Accessing PHP and HTTP Data: Predefined Variables- Variables in HTTP Request and Response- Super Global Arrays; Links; Query Strings; HTML(Web) Forms; HTML Form Elements-HTML Form Fields(Controls) and PHP; The Concept Of State: State Maintenance-Native Sessions in PHP.

Designing PHP Program Logic: Problem Statement- Writing Pseudo Code- Boolean Logic; Conditional Or Branching Statements: if statements- Switch statements- Loops and Arrays: Loops- Arrays.

UNIT II

Testing and Debugging: Values that break your code- Basic error types; Debugging PHP Script: Understanding PHP error Massages- Syntax Errors- Logic Errors-Runtime Errors; Debugging and Handling Errors in PHP5: Preventing the display of private information-Roll your-Own Debugging tools; Form Validation: Using the Exit statement- string validation and regular expressions- validating data entry- using reg exps to check file path parameters; Handling Errors: Gracefully- Configuring PHP for error handling- Try/Catch-New in PHP5.
Development planning: Formal software Development processes – optimizing your code- Using Coding standard; Writing user-defined functions in PHP: The Structure of Functions- Switching Functions – How Values Get Inside functions; Scope of variables: Global and Local Variables- Creating Static Function Variable-Nesting-Recursion-The Include and Require Statements- Things to be careful about with include and require.

UNIT III

Files and Directories: Files and Directory Handling- Working with Files- Opening and Closing files-Getting Information about a file-reading and writing to files-Reading and writing characters in files-Reading Entire files-Random Access to file data-Getting Information on Files-Ownership and permissions; Working with files you own: Splitting the Name and path from a file-copying ,renaming and deleting files; Working with Directories: other Directory Functions –Traversing a directory hierarchy-creating a directory navigator-Building a Text Editor-Uploading Files.
Classes- Objects: Creating class- Adding a Method- Adding a Property- Protecting Access to Member Variables- Using _get and _set- Initializing objects- Destroying Objects- Inheritance- Overriding Methods- Interfaces- Encapsulation

UNIT IV

The SQL Framework- Managing databases-Creating & Managing tables- Managing indexes; Inserting & Updating data in a MYSQL database-Deleting & Retrieving data from a MySQL database; SELECT statement- Optional clauses of a SELECT statement; Creating MySQL Expressions-using operators in expressions-Comparing and Converting Data; Managing different types of data: String functions-Numeric function- Date/Time functions- Summarizing date- Summary functions.
Performing System Operations: Encryption functions- System related Functions- Query and Insert Functions; Accessing data from Multiple tables: Creating joins in your SQL statement- Creating subqueries in your SQL statements; Creating Unions that join SELECT statements.
Exporting, Copying and importing data; Managing transactions: Introducing transactions- Performing a transaction- Setting the auto commit mode and transaction isolation level- Locking Nontransactional tables

UNIT V

Connecting to MySQL from a PHP application- Inserting and updating records in table- Deleting and retrieving data from table- Creating a user Registration Script. Structure of an E-Mail Message-sending E-mail with PHP- Working with Raster Images- Manipulating Raster Images- Using Text in Images

SUGGESTED READINGS

1. Dave W.Mercer, Allan Kent, Steven D.Nowicki, Davd Mercer, Dan Squie, Wankyu Choi.(2009), Beginning PHP5. Wiley India (P) Ltd, New Delhi
2. Luke welling, Laura Thomson (2010), PHP and MySQL Web Development, 4th Edition, Pearson Education.
3. Julie Meloni (2012), Sams Teach Yourself PHP, MySQL and Apache All in One, 5th Edition, Pearson Education India.
4. Paul Dubois (2006), MySQL, 1st Edition, Tech Media, New Delhi.
5. Tim Converse & Joyce Park with Clark Morgan (2006), PHP5 & MySQL Bible, 1st Edition, John Wily, India.
6. Baron Schwartz, Peter Zaitsev, Vadim Tkachenko (2012), High Performance MySQL: Optimization, Backups, 3rd Edition, O'REILLY.

WEB SITES

1. www.php.net/
2. en.wikipedia.org/wiki/PHP
3. www.w3schools.com/PHP/DEfaULT.asP

SEMESTER-V

16CAP502 **.NET PROGRAMMING** **4H -4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3Hours

Course Objective

Enable the student

- Create windows forms using arrays and flow control statements.
- Learn to use the classes and namespaces in the .NET Framework class library.
- Develop Web Applications using Microsoft ASP.NET programming.
- Learn to use Basic windows controls using Visual Basic.Net
- Understand the concept of Multiple Document Interface
- Learn the architecture of .NET

Course Outcomes (Cos)

Upon completion of the course, students will be able to

1. Develop Windows based applications using Visual Basic.Net
2. Implement ADO.Net concept in VB.Net and ASP.Net applications
3. Create server side web applications using ASP.NET
4. Analyze the concept of data sources and data bound controls in VB.NET and ASP.NET
5. Demonstrate the working of ADO.Net controls for developing ASP.Net web applications
6. Design the application using ASP.NET Web Server Control

UNIT I
Introduction: Getting Started With VB.NET: The Integrated Development Environment-IDE Components-Environment Options.Visual Basic: The Language Variables-Constants-Arrays – Variables as Objects-Flow Control Statements.Working with forms: The appearance of Forms-Loading and Showing Forms-Designing Menus.

UNIT II
Basic Windows Controls: Textbox Control- ListBox, CheckedListBox-Scrollbar and TrackBar Controls-More Windows Control-The common Dialog Controls-The Rich TextBox Control - Handling Strings, characters and Dates. The TreeView and ListView Controls: Examining the Advanced Controls-The TreeView Control-The ListView Control

UNIT III
The Multiple Document Interface-Databases: Architecture and Basic Concepts-Building Database Application with ADO.NET-Programming with ADO.NET

UNIT IV

Goal of ASP.NET –ASP.NET Web Server Control-Validation Server Controls-Themes and Skins -Content Page Holder

UNIT V

Data Binding in ASP.Net: Data source Controls – Configuring data source control caching – storing connection information-Using Bound list controls with Data Source Controls – Other Data bound Controls-Data Management with ADO.Net.

SUGGESTED READINGS

1. Evangelos Petroutsos, Mastering Visual Basic.Net, BPB Publications, New Delhi.
2. Bill Evjen, Scott Hanselman, Devin Rader, Farhan Muhammad and S.Srinivasa Sivakumar (2006), Professional ASP.net 2.0, Special Edition.
3. Dave Mercer, ASP.Net Beginner's Gudie (2003), 2nd Edition McGraw Hill, New Delhi.
4. Duncan Mackenzie Kent Sharkey (2006), Sams Teach yourself Visual Basic.JNet, 1st Edtion, McGraw Hill, NewDelhi.
5. Shirish Chavan. (2007), Visual Basic.Net, 1st Edition, Pearson Education, New Delhi.

WEB SITES

1. www.microsoft.com/NET/
2. www.en.wikipedia.org/wiki/.net
3. www.w3schools.com/ngws/default.asp
4. www.vbtutot.com

SEMESTER-V

16CAP503 OPTIMIZATION TECHNIQUES 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To formulate, analyze, and solve mathematical models that represent real-world problems.
- Linear programming, network flow problems, integer programs and queuing models.
- Implement PERT concept in Computer Project Management optimization problems
- To know the optimization techniques for various management system
- To know the basic Inventoy theory
- To know about transportation model

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Formulate a real-world problem as a mathematical programming model.
2. Understand the theoretical workings of the simple method for linear programming and perform iterations of it by hand.
3. Understand the relationship between a linear program and its dual, including strong duality and complementary slackness
4. Understand the importance of optimization techniques in industrial process management
5. Understand the concept of Inventory theory in solving industry based optimization problems
6. Estimate the time and cost for the process

UNIT-I

Optimization Techniques Linear Programming: Graphical method for two dimensional problems - Central problem of linear programming various definitions - statements of basic theorems and properties - Phase I and Phase II of the simplex method - - primal and dual - dual simplex method.

UNIT-II

Transportation model: Introduction – Mathematical Formulation –Finding initial Basic Feasible solutions – Optimum solution for non degeneracy and degeneracy model - Unbalanced Transportation problems and Maximization case in Transportation problem.

The Assignment problem - Mathematical formulation of the problem – Hungarian method – Unbalanced Assignment problem- Maximization case in Assignment problem.

UNIT-III

Integer Programming: Gomory cutting plane methods - Branch and Bound method.

QueueingTheory: Introduction – Characteristics of queuing system. Poisson process and Exponential Distribution – Classification of Queues. Single server – Infinite Capacity (M/M/1):(□/FIFO), Single server – Finite Capacity (M/M/1):(N/FIFO), Multi server – Infinite Capacity (M/M/C):(□/FIFO) and Multi server – Finite Capacity (M/M/C):(N/FIFO) models

UNIT-IV

Inventory theory: Costs involved in inventory problems - single item deterministic models-economic lot size models without shortages and with shortages having production rate infinite and finite.

UNIT-V

PERT and CPM: Arrow networks - time estimates- earliest expected time, latest allowable occurrence time and slack - critical path - probability of meeting scheduled date of completion of project calculations on CPM network - various floats for activities - critical path - updating project - operation time cost trade off curve - project time cost trade off curve - selection of schedule based on cost analysis.
(Remarks: No mathematical derivations included).

SUGGESTED READINGS

1. Gillet, B.E.,(1994), "Introduction to Operations Research : A Computer Oriented Algorithmic Approach". Tata McGraw Hill, New York.
2. Gross D., and Harris. C.M (2018), "Fundamentals of Queueing Theory"(5th ed.), John Wiley and Sons, New York.
3. Hillier F., and Lieberman. GJ.(1986), "Introduction to Operations Research"(4th ed.), Holden Day, New York.
4. Karnbo, N.S., .(1985) "Mathematical Programming Techniques", McGraw Hill, New York.
5. KantiSwarup, Gupta, P.K., and Man Mohan (2014), "Operations Research", Sultan Chand & Sons. New Delhi.
6. Mital K. V.(2004), "Optimization Methods In Operations Research and System Analysis", New Age International (P) Ltd., New Delhi.
7. Saffer, L.R., Fitter J.B., and MeyerW.L.,(1990), The Critical Path Method,McGraw Hill. New York.

SEMESTER-V

16CAP504D DATA MINING AND DATA WAREHOUSING 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3Hours

Course Objectives

Enable the student

- To gain the knowledge of the concepts and techniques in data mining
- To understand the data mining functionalities and pattern classification.
- To understand the cleaning and clustering process of data mining.
- To gain the knowledge of data warehouse architecture in data mining process
- To know about the Multimedia database
- To know about data warehouse

Course Outcomes (Cos)

Upon completion of this course, student will be able to :

1. To understand the data mining process of voluminous data using OLAP
2. To implement the preprocessing concept in data mining applications
3. To apply the data mining algorithms on big data to extract useful data
4. To implement data mining techniques for complex data types
5. To implement Decision Support System concept in data mining for developing intelligence business applications
6. To apply the web data mining

UNIT I
Introduction to Data Mining: Motivation and importance, Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Pattern Classification of Data Mining Systems, Major issues in Data Mining. Pre-process the Data- Data Cleaning, Data Integration and Transformation.

UNIT II
Classification and Regression Algorithms : Naïve Bayes – Multiple Regression Analysis – Logistic Regression – k-Nearest Neighbour Classification – GMDH –Computing and Genetic Algorithms. Support Vector Machines : Linear SVM - SVM with soft margin – Linear kernel – Proximal SVM – Generating Datasets.
Cluster Analysis : Partitional Clusterings – k-medoids – Birch – DBSCAN – Optics – Graph Partitioning – CHAMELEON – COBWEB – GCLuto.

UNIT III
Mining Association rule in large Databases Association Rule Mining, Mining Single - Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel

Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Dataware houses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

UNIT IV

Mining Complex Types of Data : Mining Spatial Databases – Multimedia Databases – Time-series and Sequence Data – Text Databases – Web Data Mining – Search Engines.

UNIT V

Data Warehouse and OLAP Technology for Data Mining. What is a Data Warehouse? Multi-Dimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Development of Data Cube Technology, Data Ware housing to Data Mining Data Preprocessing Data Warehousing: Failures of past Decision Support System- Operational vs. DSS- Building blocks: features- Data warehouse and Data Mart- Overview of the Components- Metadata Architectural Components: Distinguishing Characteristics- Architectural Framework- Technical Architecture.

SUGGESTED READINGS:

1. Jiawei Han and Micheline Kamber.(2011), Data Mining Concepts and Techniques, 3rd Edition, Elsivier,India (Unit I, III, IV, V)
2. G.K.Gupta (2006), Introduction to Data Mining with Case Studies, Prentice Hall India, New Delhi (Unit – IV)
3. Soman.K.P, Shyam Divakar and V. Ajay. (2008), Insight to Data Mining- Theory and Practical, Prentice Hall India, New Delhi. (Unit – II).
4. Gupta.G.K. (2006), Introduction to Data Mining with Case Studies, Prentice Hall India, New Delhi .
5. Kantardzic, Mining Concepts, Models, Methods and Algorithms, IEEE Press – A John Wiley & Sons.
6. Paulraj Ponniah. (2008), Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, John Wiley & Sons, New Delhi.

WEB SITES:

1. www.wikipedia.org/wiki/Data_mining
2. www.anderson.ucla.edu/faculty/jason.frand/teacher/technologies/palace/datamining.ht
3. www.thearling.com/text/dmwhite/dmwhite.htm

SEMESTER-V

16CAP504N NETWORK ARCHITECTURE AND MANAGEMENT 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3Hours

Course Objectives
Enable the student

- Understand the concepts and terminology associated with SNMP and TMN
- Understand the working of routing protocol in complex computer networks
- Gain knowledge the internal architecture of routers
- Understand the fundamentals and requirements for packet routing in computer communication network.
- Analyze the security mechanism in Computer routing process
- Understand the design metrics

Course Outcomes (Cos)
Upon completion of this course, student will be able :

1. To solve the problems in computer network system management
2. To analyze the challenges in the implementation of ATM networks
3. To implement SNMP Model in the management of computer networks
4. To configure routers using computer network software tools
5. To implement service level agreement in Computer Network management systems
6. To know the Network Management Tools and Systems

UNIT I
Introduction: Objectives - Component architectures – Reference architecture – Architectural models; Addressing and Routing Architecture: Addressing mechanisms – Routing mechanisms – Addressing strategies – Routing strategies – Architectural considerations; Network Management Architecture: Defining Network Management – Network Management Mechanism - Architectural considerations; Performance Architecture; Developing goals – Performance mechanisms – Architectural considerations

UNIT-II
Security And Private Architecture: Developing a security and privacy plan – Security and privacy Administration & Mechanism - Architectural considerations; Selecting Technologies for the Network Design: Goals – Design Concepts – Design Process – Vendor, Equipment and Service-Provider Evaluations – Network Layout – Design Traceability - Design Metrics.

UNIT-III

Case history of Networking and Management: Challenges of Information Technology Managers – Goals, organization and functions – Network and System Management – Network Management System Platform; SNMP, Broadband and TMN Management: Network Management Standards & Model – Organization, Information and Communication Model – ASN.1 – Encoding structure – Macros – Functional model; Organization and Information Model: Managed Networks – The History of Network Management – Internet Organization and standards – SNMP Model – The Organization and Information Model; Communication and Functional Model: The SNMP Communication Model – Functional Model.

UNIT-IV

SNMPv2 Management: Major changes – System architecture – Structure of Management Information – Management Information Base – SNMPv2 protocol – Compatibility; RMON: Remote monitoring – RMON1 – RMON2 – ATM remote monitoring; Broadband Network Management: ATM Networks - Network and Services – ATM Technology – ATM Network Management; Telecommunication Management Network: Operations systems – Conceptual model – Standards – Architecture – TMN Management service architecture – Integrated view of TMN – Implementation issues.

UNIT-V

Network Management Tools and Systems: Network management tools – Network statistics measurement system – Network Management Systems – System Management; Network Management Applications: Configuration Management - Fault Management - Performance Management – Security Management – Accounting Management – Report Management - Policy Based Management – Service Level Management.

SUGGESTED READINGS

1. James D. Mc CABE. (2010), Network Analysis, Architecture and Design, 3rd Edition, Morgan Kaufmann Publishers.
2. Mani Subramanian. (2012), Network Management Principles and Practice, 2nd Edition, Pearson Education Asia Pvt. Ltd.,.
3. William Stallings. (2002), SNMP, SNMPv2, SNMPv3 and RMON 1 and 2, 3rd Edition, Pearson Education Asia Pvt. Ltd.

SEMESTER-V

16CAP504S SOFTWARE PROJECT MANAGEMENT 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

End Semester Exam: 3Hours

Course Objective

Enable the student

- To design, select and apply the most appropriate software engineering process for developing any software project
- To implement planning for a software project and identify the risks in software planning.
- To analyze the software requirements for developing any software.
- To understand the importance of negotiation, effective work habits, leadership in the software development process.
- To identify the risks involved in software project management
- To know the organization structure to develop the software project

Course Outcomes (Cos)

Upon Completion of this course, the student Will be able to

1. Implement the concept of software effort estimation in developing software project.
2. Develop a responsible attitude towards the use of computer as well as the technology.
3. Evaluate the risks during the development of software projects
4. Understand the organization behavior in software project management.
5. Implement team management process in developing quality software
6. Monitor the software project management in various ways such as cost control, performance control, etc.,

UNIT I

Introduction-Software Project Management -Project evaluation and programme Management-An overview of Project planning- Stepwise planning-Selection of an appropriate project Approach.

UNIT II

Software effort estimation: Problems with over- and underestimates-Software effort estimation Techniques - Estimating by analogy -Albrecht function point analysis -Function points Mark II – COSMIC full function points - COCOMO 13: a parametric productivity model. Activity planning: The objectives of activity Planning-Project schedules - Projects and activities -

Sequencing and scheduling activities - Network planning models - Formulating a network model - Adding the time dimension - The forward pass - The backward pass - Identifying the critical path.

UNIT III

Risk management: Introduction to Risk - Categories of risk - A framework for dealing with risk - Risk identification - Risk assessment - Risk planning - Risk management - Evaluating risks to the schedule - Applying the PERT technique - Monte Carlo simulation - Critical chain concepts. Resource allocation :-Introduction -The nature of resources - Identifying resource requirements - Scheduling resources -Creating critical paths -Counting the cost - Being specific -Publishing the resource schedule - Cost schedules -The scheduling sequence.

UNIT IV

Monitoring and control: Creating the framework-Collecting the data- Visualizing progress- Cost monitoring -Earned value analysis-Prioritizing monitoring - Getting the project back to target - Change control. Managing people in software environments: Understanding behavior - Organization behavior: a background - Selecting the right person for the job - Instruction in the best methods - Motivation - Stress -Health and safety -Some ethical and professional concern

UNIT V

Working in teams: Becoming a team - Decision making - Organizational structures - Coordination dependencies - Dispersed and virtual teams - Communication genres - Communication plans - Leadership. Software quality: Introduction -The place of software quality in project planning - The importance of software quality - Defining software quality - ISO 9126 -Product versus process quality management -Quality management systems -Process capability models -Techniques to help enhance software quality -Testing -Quality plans

SUGGESTED READINGS

1. Bob Hughes and Mike Cotterell (2011), Software Project Management, 5th Edition, New Delhi: Tata McGraw Hill
2. Royce.(2000), Software Project Management, 1st Edition, New Delhi: Addisions Wesley.
3. Kelkar (2012), “Software Project Management”, 3rd edition, Prentice Hall India,2012

WEB SITES

1. http://en.wikipedia.org/wiki/Software_project_management
2. http://www.onesmartclick.com/engineering/software-engineering.html
3. http://www.cc.gatech.edu/classes/AY2000/cs3802_fall/

SEMESTER-V

16CAP504W RUBY PROGRAMMING 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- Develop server-side Ruby scripts for publishing on the Web
- Employ control structures, methods, procs, arrays and hashes to create Ruby programs
- Distinguish and use various Ruby datatypes
- Master the use of arrays and hashes
- Use the extensive pre bundled classes
- Implement the web application using exception handling, thread, etc.,

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Use the I/O facilities of Ruby to read and write binary and text files
2. Master the use of Iterators to loop through various data structures
3. Use Exceptions in handling various run time errors
4. Create Ruby modules
5. Use the wide variety of Ruby Modules that come with the Ruby distribution
6. Use object-oriented programming conventions to develop dynamic interactive Ruby applications

UNIT I

Introduction to Ruby: Installing Ruby - THE STRUCTURE AND EXECUTION OF RUBY PROGRAMS: Lexical Structure- Syntactic Structure - Block Structure in Ruby- File Structure - Program Execution. DATA TYPES: Numbers - Text - String Literals - Character Literals - String Operators - Accessing Characters and Substrings - Iterating Strings – Arrays – Hashes – Ranges – Symbols – True & False – Ruby Documentation: RDoc and ri.

UNIT II

STATEMENTS AND CONTROL STRUCTURES: Conditionals – Loops - Iterators and Enumerable objects: custom iterators – enumerators – External iterators – Blocks: Variable scope – passing argument to blacks. Flow-altering statements like return and break- The special-case BEGIN and END statements. CLASSES : Creating and initializing class – Accessor and attributes – class methods – class variables – Defining operators. SUBCLASSING AND INHERITANCE: visibility – Overriding methods. OBJECTS: Object creation and initialization.

UNIT III

METHODS: Defining a Method, Calling a Method; Undefining methods – Methods with Exception – Operator methods and names – Method Arguments – Method objects - Defining

Attribute Accessor Methods - Dynamically Creating Methods. EXCEPTIONS AND EXCEPTION HANDLING: Hierarchy – Exception classes and objects – Raising Exception with raise – Handling Exception with rescue – Exception propagation – Else clause and ensure class.

UNIT IV

MODULES: Namespaces - Modules as Mixins - Includable Namespace Modules - Loading and Requiring Modules - Executing Loaded Code. Reflection and Meta programming: Evaluating Strings and Blocks - Querying, Setting, and Testing Variables – Regular Expressions. FILES AND DIRECTORIES: Listing and manipulating Directories and testing files. BASIC INPUT AND OUTPUT: Opening Stream – Reading from a Stream – Writing to a stream – Random Access Methods – Closing, Flusing and testing streams.

UNIT V

THREADS AND PROCESSES: Thread Life Cycle – Thread scheduling – Thread Exclusion – Deadlock. Ruby Tk: Introduction- Widgets and classes. Networks: A Very Simple Client - A Very Simple Server – Datagram - A Multiplexing Server - Fetching Web Pages. Ruby on Rails: Building a development Environment: Installation – Installing Databases – Code editors – web server Configuration – Creating an web application.

SUGGESTED READINGS:

1. Dave Thomas, Andrew Hunt (2013), Programming Ruby 1.9 & 2.0: The Pragmatic Programmers Guide, 2nd Edition, The Pragmatic Bookshelf.
2. David Flanagan, (2008), "The Ruby Programming Language", 1st Edition, O'Reilly Media.
3. Eldon Alameda (2011), "Practical Rails Projects" Apress, Berkeley, CA, USA.
4. David Black, (2006), "Ruby for Rails", Manning Publications.

WEB SITES :

1. http://www.tutorialspoint.com/ruby/ruby_tk_guide.htm
2. www.fincher.org/tips/Languages/Ruby
3. www.troubleshooters.com/codecorn/ruby/basictutorial.htm
4. www.ruby-lang.org/en/documentation/quickstart

SEMESTER-V

16CAP504B MIS FRAMEWORK 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To understand the frameworks for identifying information technology applications
- To understand the benefits of information technology applications in an organization
- To analyze the impact of information systems on organizations markets
- To understand the concept of Business Process Engineering in the Management Information System
- To understand about Socio-economic environment
- To identify the role of security systems in IT

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Analyze the major technological, organizational, behavioral, and ethical issues facing today's information systems professional.
2. Implement IT strategy in managing the information system of any organization.
3. Analyze the emerging technologies
4. Impact of emerging technologies on corporate performance.
5. Implement the principles of Business Process Engineering in improving the business of any organization
6. Analyze the critical success factors in implementing IT applications

UNIT I
Frameworks for identifying information technology applications.- Management Information System-Decision Support System- Executive Information System and Expert System.

UNIT II
Benefits of information technology applications in an organization through transaction processing, management and operational control, decision support systems, office automation, organizational communications and group work support.

UNIT III
Socio-economic environment and information systems in organization and the impact of information systems on organizations markets; frameworks for information systems planning.

information systems and competitive advantage; the new strategic role of information systems: methodologies for evaluating investments in IT; frameworks and methodologies -case studies.

UNIT IV

Design of reporting system including a discussion of principles in indicator design; managing information support activity in organizations; concept of the business process re-engineering (BPR) and how IT can enable BPR.

UNIT V

Critical success factor in implementing IT applications including the need for managing the process of change illustrated through case studies of successful/failed IT projects. Critical role of security in implementing IT applications should be discussed.

SUGGESTED READINGS

1. L.M. Applegate, R.D. Austin and F.W. McFarlan.(2007), Corporate Information Strategy and Management: Text and Cases ,7th Edition, McGraw Hill.
2. P. Bocij, A. Greasley and S. Hickie(2008), Business Information Systems: Technology, Development and Management for the E-Business ,4th Edition, Prentice Hall.
3. D. Boddy, A. Boonstra and G. Kennedy(2008), Managing Information Systems: Strategy and Organisation ,3rd Edition, Prentice Hall.
4. K.C. Laudon and J.P. Laudon.(2007), Management Information Systems: Managing the Digital Firm ,10th Edition, Prentice Hall.
5. W. Robson(1997), Strategic Management and Information Systems: An Integrated Approach ,2nd Edition, Financial Times,
6. R.M. Stair and G. Reynolds (2007),Principles of Information Systems: A Managerial Approach ,International Edition, Delmar Cengage Learning.

SEMESTER-V

16CAP505D BIG DATA ANALYTICS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3Hours

Course Objective

Enable the student

- To understand the evolution and architecture of Big Data
- To learn the virtualization concept of big data
- To learn the Hadoop framework in processing big data
- To understand the concepts of big data analytics
- To define the concept of data source integration for big data processing
- To learn Hadoop distributed file system

Course Outcomes (Cos)

Upon completion of this course, the students will be able to

1. Analyze the big data analytic techniques for useful business applications.
2. Implement the concept of virtualization and abstraction in analyzing big data
3. Analyze the HADOOP and Map Reduce technologies associated with big data analytics
4. Understand the fundamentals of various bigdata analysis techniques
5. Implement the integration of data sources in operationalizing Big Data
6. Implement the text analytics using Hadoop

UNIT-I
Fundamentals of Big Data - The Evolution of Data Management Understanding the Waves of Managing Data- Defining Big Data - Big Data Management Architecture- The Big Data Journey -Big Data Types-Defining Structured Data-Defining Unstructured Data-Putting Big Data Together.

UNIT-II
Big Data Stack- Basics of Virtualization - The importance of virtualization to big data -Server virtualization - Application virtualization - Network virtualization -Processor and memory virtualization - Data and storage virtualization-Abstraction and Virtualization-Implementing Virtualization to Work with Big Data.

UNIT-III
Hadoop - Hadoop Distributed File System - Hadoop MapReduce- The Hadoop foundation and Ecosystem.

UNIT-IV
Big Data Analytics-Text Analytics and Big Data-Customized Approaches for Analysis of Big Data

UNIT-V
Integrating Data Sources-Real-Time Data Streams and Complex Event Processing-Operationalizing Big Data.

SUGGESTED READINGS

1. Judith Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman (2013), Big Data For Dummies, Wiley India,New Delhi.
2. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan (2012), Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, New Delhi.
3. Michael Minelli, Michele Chambers, Ambiga Dhiraj (2013). Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications, New Delhi.
4. Zikopoulos, Paul, Chris Eaton (2011), Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, New Delhi.

WEB SITES

1. Www.oracle.com/bigdata
2. Www.planet-data.eu/sites/default/files/Big_Data_Tutorial_part4.pdf
3. Www.ibm.com/developerworks/data
4. Www.solacesystems.com
5. En.wikipedia.org/wiki/Big_data
6. Www.sap.com/solution/big-data.html

SEMESTER-V

16CAP505N DISTRIBUTED COMPUTING 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- Understand the architecture and topology of network
- Understand the design process of a distributed systems
- Examine distributed and parallel computing operating system
- Understand the need and challenges of distributed database
- Differentiate the centralized database with distributed database
- Know about distributed shared memory

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able :

1. To develop and apply knowledge of parallel and distributed computing techniques and methodologies.
2. To Apply design, development, and performance analysis on parallel and distributed applications
3. To implement the application of fundamental Computer Science methods
4. To implement the algorithms in the development of parallel applications.
5. Implement distributed shared memory concepts in distributed computing.
6. To apply Authentication methods in distributed application

UNIT – I
Introduction: Distributed Computing – Relation to multiprocessor and multi computer systems-message passing systems versus shared memory systems – primitives for distributed computing. Distributed Computations: distributed program – global state of a distributed system – models of process communications.

UNIT – II
Message ordering and Group Communication: message ordering paradigm – Asynchronous execution with synchronous communication – classification of application level multicast algorithm – distributed multicast algorithm at the network layer.

UNIT – III
System model for distributed computation – termination detection using distributed snapshots – termination detection in a faulty distributed system – Distributed mutual execution algorithm : Lamport’s algorithm – Token Based algorithm – Raymond’s tree-based algorithm.

UNIT – IV

DeadLock : system model – models of deadlocks – knapp's classification of distributed deadlock detection algorithms – chandy model – stable and unstable predicates – distributed algorithms for conjunctive predicates .

UNIT – V

Distributed shred memory: Abstraction – memory consistency – shared memory mutual execlution – register hierarchy and wait free simulations- issues in failure recovery – check point based recovery – Authentication: protocols – password-based authentication- authentication protocol failures.

SUGGESTED READINGS

1. Ajay. D. Kshemkalyani and Mukesh Singhal. Distributed Computing: Principles, Algorithms and Systems.

2. Uyless D. Black, (2004), "Data Communication and Distributed Networks", 3rd Edition, Prentice hall of India, New Delhi.

3. Joel M Crichlow, (1998), "An Introduction to Distributed and Parallel Computing", 1st Edition, Prentice – Hall Publication, New Delhi.

WEB SITES

1. Wikipedia.org/wiki/Distributed_computing
2. Www.webopedia.com/TERM/D/distributed_computing.html
3. Www.tech-faq.com/distributed-computing.shtml

SEMESTER-V

16CAP505S SOFTWARE METRICS 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3 Hours

Course Objective

Enable the student

- To understand the basic terminology and state fundamental facts about software metrics and process models.
- To identify the essential elements of a given metric or model, describe the interrelationships among its various elements
- To understand software process assessment cycles, complexity metrics and models.
- To measure and analyze customer satisfaction in development of software
- To know the techniques to improve the software process development
- To identify how to remove the defects in the software project

Course Outcomes (COs)

Upon Completion of this course, student will be able to

1. To analyze the importance of modeling and modeling languages
2. To apply the basic quality tools in software development
3. Analyze the software process metrics in the process of software testing
4. Implement function point metrics to measure software process improvement
5. Explain the business requirements pertaining to software development
6. Assess the software project using the metrics

UNIT I

Introduction:- software quality-popular views-the role of the customer-software quality- Total quality management.Software development process models-the spiral model-itrative Devalopment process-The Cleanroom Methodology-Process Maturity Framework and Quality standards. Fundamentals of Measurement theory-Level of measurement-Reliability and validity-Measurement Errors

UNIT-II

Applying the seven basic quality tools in software development-Defact removal effectivenes-The rayaleigh model-Exponential distribution and reliability growth models-Quality management models

UNIT-III

In-process metrics for software testing-Complexity metrics and models-Metrics and lessons learned for object oriented projects-Availability metrics

UNIT-IV

Measuring and analyzing customer satisfaction-Conducting in-process quality assessments

UNIT-V

Software project assessments-Dos and Don’t of software process improvement-Using function point metrics to measure software process improvement-Concluding remarks

SUGGESTED READINGS:

1. Stephen H.Kan . Metrics and Models in Software Quality Engineering (2013), Second Edition, Pearson India.
2. Norman Fenton(2014), Software Metrics: A Rigorous and Practical Approach, Third Edition (Chapman & Hall/CRC Innovations in Software Engineering and Software Development Series)
3. C. Ravindranath Pandian.(2003), Software Metrics: A Guide to Planning, Analysis, and Application,

SEMESTER-V

16CAP505W **SEMANTIC WEB** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To represent data from a chosen problem in XML with appropriate semantic tags obtained or derived from the ontology.
- To understand the semantic relationships among these data elements using Resource.
- To design and implement a web services application that "discovers" the data and/or other Description Framework (RDF).web services via the semantic web
- To understand the capabilities and limitations of semantic web technology for many applications.
- To know about Web ontology language
- To aggregate and reasoning social network data

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Analyze fundamental concepts, advantages and limits of the semantic web
2. Implement ontologies in the context of developing semantic web
3. Implement RDF framework and associated technologies for developing semantic web
4. Implement semantic Web Tools like Jena and SPARL for developing architecture for semantic web
5. Analyze the social network data
6. Implement the problem using the web ontology language

UNIT I

Introduction : Introduction to the Syntactic web and Semantic Web – Evolution of the Web – The visual and syntactic web – Levels of Semantics – Metadata for web information - The semantic web architecture and technologies –Contrasting Semantic with Conventional Technologies –Semantic Modeling - Potential of semantic web solutions and challenges of adoption

UNIT II

Ontological Engineering: Ontologies – Taxonomies –Topic Maps – Classifying Ontologies – Terminological aspects: concepts, terms, relations between them – Complex Objects –Subclasses and Sub-properties definitions – Upper Ontologies – Quality – Uses - Types of terminological resources for ontology building – Methods and methodologies for building ontologies – Multilingual Ontologies -Ontology Development process and Life cycle – Methods for Ontology Learning – Ontology Evolution – Versioning

UNIT III

Structuring And Describing Web Resources :Structured Web Documents - XML – Structuring – Namespaces – Addressing – Querying – Processing - RDF – RDF Data Model – Serialization Formats- RDF Vocabulary –Inferencing - RDFS – basic Idea – Classes – Properties- Utility Properties – RDFS Modeling for Combinations and Patterns- Transitivity

UNIT IV

Web Ontology Language :OWL – Sub-Languages – Basic Notions -Classes- Defining and Using Properties – Domain and Range – Describing Properties - Data Types – Counting and Sets- Negative Property Assertions – Advanced Class Description – Equivalence – Owl Logic.

UNIT V

Semantic Web Tools And Applications :Development Tools for Semantic Web – Jena Framework – SPARL –Querying semantic web - Semantic Wikis - Semantic Web Services – Modeling and aggregating social network data - Ontological representation of social relationships, Aggregating and reasoning with social network data Understand semantic web basics, architecture and technologies

SUGGESTED READINGS

1. Grigoris Antoniou, Frank van Harmelen. 3rd Edition (2012), A Semantic Web Primer.,MIT Press, USA
2. Liyang Yu (2011), “A Developer's Guide to the Semantic Web”, First Edition ,Springer.
3. John Hebeler, Matthew Fisher, Ryan Blace and Andrew Perez-Lopez (2009), “Semantic Web Programming”, First Edition Wiley.
4. Robert M. Colomb(2007), “Ontology and the Semantic Web”, Volume 156 Frontiers in Artificial Intelligence and Applications (Frontier in Artificial Intelligence and Applications), IOS Press.
5. Dean Allemang and James Hendler(2011), “Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL, Second Edition, Morgan Kaufmann..
6. Karin Breitman, Marco Antonio Casanova and Walt Truszkowski,(2010), “Semantic Web: Concepts, Technologies and Applications (NASA Monographs in Systems and Software Engineering)”, Springer.

SEMESTER-V

16CAP505B TAXATION PRACTICES 4H - 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: **40** External: **60 Total: 100**
End Semester Exam: 3Hours

COURSE OBJECTIVES

Enable the student

- To learn the concept of various taxation practices
- To understand Excise duty, VAT, Service tax etc. and tax planning for reducing tax liability legally.
- To understand the procedures of collection and recovery of tax
- To learn the central sales calculation in India
- To understand the wealth tax
- To define the various tax

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Analyze the procedures in Assessing firms and associations
2. Analyze the need for assessing the undivided families
3. Apply the advance payment procedures in the taxation practices
4. Apply the procedure for registration and cancellation in central sales taxation
5. Learn various components related to the theme of tax liability determination
6. Analyze the wealth tax

UNIT I
Assessment of undivided families: Meaning. Basic conditions. Taxable income. Partitions. Tax planning. Assessment of firms and associations: Scheme of taxation, types, treatment of losses. Tax planning.

UNIT II
Assessment of companies: Types, profits, depreciation, tax planning, Section 80. Bonus issues, dividend policy. Return of income and assessment procedure: Types of assessment. Time limits. Reassessment. Cooperatives.

UNIT III
Collection and recovery of tax: Deduction at source, rates, advance payment. Modes of recovery. Refund. Appeals and revision. Penalties.

UNIT IV

Wealth Tax: Chargeability, valuation, return, appeals, revisions, payment and recovery, gift tax: chargeability, rebate, assessment, appeals, revisions, payment and recovery.

UNIT V

Central sales tax: Concept of sale and purchase. Inter-state trade. Inter-state export and import trade. State sale tax: Assessing authority. Single, multiple point tax. Procedure for registration and cancellation. Returns, payment, appeals and revisions.

SUGGESTED READINGS

1. Central and State tax acts.
2. Singhania, VK.(1996), **"Taxman Direct** Taxes", Taxman, New Delhi.

SEMESTER-V

16CAP511 PHP5/MYSQL -PRACTICAL 5H - 2C

Instruction Hours / week: L: 0 T: 0 P: 5 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

To help the students

- To get hands-on experience in scripting, debugging, testing.
- To establish a working environment for PHP web page development
- To learn to create dynamic interactive pages with PHP.
- To learn to manipulate files with PHP.
- To learn to use SQL to output reports with MySQL
- To write pseudo code for an application

Course Outcomes (Cos)

Upon completion of this course, student will be able to

1. Implement regular expressions in PHP programming including modifiers, operators, and meta characters.
2. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
3. Analyze and solve various database tasks using the PHP language.
4. Create server side web applications using PHP and MySQL.
5. Analyze the structure of an E-Mail message
6. Develop the files and directories management operation

List of Practical

1. Design an online loan application form.
2. Design a form to submit your resume in net.
3. Design an application for Library Management System
4. Design form for online reservation in air ways.
5. Design form for online shopping
6. Design an application for creating an online Advertisement.
7. Design an application for student Information System.

8. Design an application to display cookies information.
9. Write a program for display environment variables in MySQL.
10. Write a program to count web page hits.
11. Design an email form that validates the inputs, produces errors when inputs are typed incorrectly, and send an email to you when submitted.
12. Design an application to upload multiple files

SUGGESTED READINGS

1. Dave W.Mercer, Allan Kent, Steven D.Nowicki, Davd Mercer, Dan Squie, Wankyu Choi.(2009), Beginning PHP5. Wiley India (P) Ltd, New Delhi
2. Luke welling, Laura Thomson (2010), PHP and MySQL Web Development, 4th Edition, Pearson Education.
3. Julie Meloni (2012), Sams Teach Yourself PHP, MySQL and Apache All in One, 5th Edition, Pearson Education India.
4. Paul Dubois (2006), MySQL, 1st Edition, Tech Media, New Delhi.
5. Tim Converse & Joyce Park with Clark Morgan (2006), PHP5 & MySQL Bible, 1st Edition, John Wily, India.
6. Baron Schwartz, Peter Zaitsev, Vadim Tkachenko (2012), High Performance MySQL: Optimization, Backups, 3rd Edition, O'REILLY.

SEMESTER-V

16CAP512 .NET PROGRAMMING - PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3 Hours

Course Objective

Enable the student

- Create windows forms using arrays and flow control statements.
- Learn to use the classes and namespaces in the .NET Framework class library.
- Develop Web Applications using Microsoft ASP.NET programming.
- Learn to use Basic windows controls using Visual Basic.Net
- Understand the concept of Multiple Document Interface
- Learn the architecture of .NET

Course Outcomes (Cos)

Upon completion of the course, students will be able to

1. Develop Windows based applications using Visual Basic.Net
2. Implement ADO.Net concept in VB.Net and ASP.Net applications
3. Create server side web applications using ASP.NET
4. Analyze the concept of data sources and data bound controls in VB.NET and ASP.NET
5. Demonstrate the working of ADO.Net controls for developing ASP.Net web applications
6. Design the application using ASP.NET Web Server Control

List of Practical
VB.Net

1. Write a Program to perform various string manipulation functions.
2. Using windows application form, create a form, place controls and manipulate data.
3. Write a program to create inventory control using class library.
4. Write a program to create Web Services Using Vb.Net.
5. Write a program to create a screen saver using controls
6. Create an ActiveX program with simple example.
7. Using windows Application: Design Employee Details, use Sql Server as back end and also use checked list box.

ASP.Net

1. Write a program to create an on-line quiz using content page holder.
2. Write a program to retrieve Cookies information.
3. Write a program to count web page hits.
4. Write program to retrieve environment variables browser capability information.
5. Write a program for database connectivity to retrieve student information

SUGGESTED READINGS

1. Evangelos Petroutsos, Mastering Visual Basic.Net, BPB Publications, New Delhi.
2. Bill Evjen, Scott Hanselman, Devin Rader, Farhan Muhammad and S.Srinivasa Sivakumar (2006), Professional ASP.net 2.0, Special Edition.
3. Dave Mercer, ASP.Net Beginner's Gudie (2003), 2nd Edition McGraw Hill, New Delhi.
4. Duncan Mackenzie Kent Sharkey (2006), Sams Teach yourself Visual Basic.JNet, 1st Edtion, McGraw Hill, NewDelhi.
5. Shirish Chavan. (2007), Visual Basic.Net, 1st Edition, Pearson Education, New Delhi.

SEMESTER-V

16CAP513D DATA MINING - PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives

Enable the student

- To gain the knowledge of the concepts and techniques in data mining
- To understand the data mining functionalities and pattern classification.
- To understand the cleaning and clustering process of data mining.
- To gain the knowledge of data warehouse architecture in data mining process
- To know about the Multimedia database
- To know about data warehouse

Course Outcomes (Cos)

Upon completion of this course, student will be able to :

1. To understand the data mining process of voluminous data using OLAP
2. To implement the preprocessing concept in data mining applications
3. To apply the data mining algorithms on big data to extract useful data
4. To implement data mining techniques for complex data types
5. To implement Decision Support System concept in data mining for developing intelligence business applications
6. To apply the web data mining

List of Practical

1. Use the following learning schemes, with the default settings to analyze the weather data (in weather.arff). For test options, first choose "Use training set", then choose "Percentage Split" using default 66% percentage split. Report model percent error rate

2. Using iris dataset preprocess and classify it with J4.8 and Naïve Bayes Classifier. examine the tree in the Classifier output panel

3. Using the datasets *ReutersCorn-Train* and *ReutersGrain-Train*. Classify articles using binary attributes and word count attributes.

4. Apply any two association rule based algorithm for the supermarket analysis

5. Using weka Experimenter perform comparison analysis of J48, oneR and ID3 for vote dataset

6. Using Weka Experimenter perform comparison analysis of Naïve Bayes with different datasets

7. Apply ZeroR, OneR, and J48, to classify the Iris data in an experiment using 10 train and test runs, with 66% of the data used for training and 34% used for testing.

8. Using Weka Knowledge flow Sett up a flow to load an ARFF file (batch mode) and perform a cross-validation using J48 (WEKA’s C4.5 implementation).

9. Draw multiple ROC curves in the same plot window, using J48 and RandomForest as classifiers.

10. Use any three clustering algorithm on Vehicle data set and find best among them

11. Perform Preprocessing, feature selection and apply any one of the algorithm each from clustering, Association and classification to find their performance

12. Examine the performance of different filters for the breast cancer dataset

SUGGESTED READINGS:

1. Jiawei Han and Micheline Kamber.(2011), Data Mining Concepts and Techniques, 3rd Edition, Elsivier,India (Unit I, III, IV, V)
2. G.K.Gupta (2006), Introduction to Data Mining with Case Studies, Prentice Hall India, New Delhi (Unit – IV)
3. Soman.K.P, Shyam Divakar and V. Ajay. (2008), Insight to Data Mining- Theory and Practical, Prentice Hall India, New Delhi. (Unit – II).
4. Gupta.G.K. (2006), Introduction to Data Mining with Case Studies, Prentice Hall India, New Delhi .
5. Kantardzic, Mining Concepts, Models, Methods and Algorithms, IEEE Press – A John Wiley & Sons.
6. Paulraj Ponniah. (2008), Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, John Wiley & Sons, New Delhi.

SEMESTER-V

16CAP513N NETWORK SIMULATOR - PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3 Hours

Course Objectives
Enable the student

- Understand the concepts and terminology associated with SNMP and TMN
- Understand the working of routing protocol in complex computer networks
- Gain knowledge the internal architecture of routers
- Understand the fundamentals and requirements for packet routing in computer communication network.
- Analyze the security mechanism in Computer routing process
- Understand the design metrics

Course Outcomes (Cos)
Upon completion of this course, student will be able :

1. To solve the problems in computer network system management
2. To analyze the challenges in the implementation of ATM networks
3. To implement SNMP Model in the management of computer networks
4. To configure routers using computer network software tools
5. To implement service level agreement in Computer Network management systems
6. To know the Network Management Tools and Systems

List of Practical
1. Simple router configuration.
2. Access and utilize the router to set basic parameters.
3. Connect, configure, and verify operation status of a device interface.
4. Implement static and dynamic addressing services for hosts in a LAN environment.
5. Identify and correct common problems associated with IP addressing and host configurations.
6. Describe basic routing concepts (including: packet forwarding, router lookup process).
7. Configure, verify, and troubleshoot RIPv2.
8. Perform and verify routing configuration tasks for a static or default route given.
9. Configure, verify and troubleshoot DHCP and DNS operation on a router.
10. Configure and verify a PPP connection between routers.

SUGGESTED READINGS

1. James D. Mc CABE. (2010), Network Analysis, Architecture and Design, 3rd Edition, Morgan Kaufmann Publishers.
2. Mani Subramanian. (2012), Network Management Principles and Practice, 2nd Edition, Pearson Education Asia Pvt. Ltd.,.
3. William Stallings. (2002), SNMP, SNMPv2, SNMPv3 and RMON 1 and 2, 3rd Edition, Pearson Education Asia Pvt. Ltd.

SEMESTER-V

16CAP513S SOFTWARE DEVELOPMENT PRACTICAL USING MOODLE 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3 Hours

Course Objective

Enable the student

- To design, select and apply the most appropriate software engineering process for developing any software project
- To implement planning for a software project and identify the risks in software planning.
- To analyze the software requirements for developing any software.
- To understand the importance of negotiation, effective work habits, leadership in the software development process.
- To identify the risks involved in software project management
- To know the organization structure to develop the software project

Course Outcomes (Cos)

Upon Completion of this course, the student Will be able to

1. Implement the concept of software effort estimation in developing software project.
2. Develop a responsible attitude towards the use of computer as well as the technology.
3. Evaluate the risks during the development of software projects
4. Understand the organization behavior in software project management.
5. Implement team management process in developing quality software
6. Monitor the software project management in various ways such as cost control, performance control, etc.,

List of Practical

Prepare a more detailed, organized and easy-to-read documentation, for any application software, which should describe the following using Moodle tool:

1. User Requirement Documentation (USD)
2. Requirement Analysis Documentation. (RAD)
3. User Interfaces Specification. (UIS)
4. Object Oriented Design (OOD) or Low Level Design (LLD)
5. Code Documentation (CD)
6. Testing Documentation (TD)
7. User's Guide (UG)

SUGGESTED READINGS

1. Bob Hughes and Mike Cotterell (2011), Software Project Management, 5^{th} Edition, New Delhi: Tata McGraw Hill
2. Royce.(2000), Software Project Management, 1st Edition, New Delhi: Addisions Wesley.
3. Kelkar (2012), “Software Project Management”, 3^{rd} edition, Prentice Hall India,2012

SEMESTER-V

16CAP513W RUBY ON RAILS (PRACTICAL) 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- Develop server-side Ruby scripts for publishing on the Web
- Employ control structures, methods, procs, arrays and hashes to create Ruby programs
- Distinguish and use various Ruby datatypes
- Master the use of arrays and hashes
- Use the extensive pre bundled classes
- Implement the web application using exception handling, thread, etc.,

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Use the I/O facilities of Ruby to read and write binary and text files
2. Master the use of Iterators to loop through various data structures
3. Use Exceptions in handling various run time errors
4. Create Ruby modules
5. Use the wide variety of Ruby Modules that come with the Ruby distribution
6. Use object-oriented programming conventions to develop dynamic interactive Ruby applications

List of Practical

1. Write a ruby program to perform basic array and hash operations
2. Write a code to choose random numbers and find the behaviour of the number
3. Develop a program which gets raised when you handle an exception
4. Write a ruby code to display grade sheet of students using case.
5. Write a ruby program to evaluate polynomial.
6. Write a ruby program to draw box and fill with special characters.
7. Write a program to copy each line from input file to output file.
8. Write a program to create a button and fill the button with colors.
9. Write a program to create different color balls and make it bounce on window.
10. Write ruby program to display notebook widget.

11. Develop a ruby program to manipulate text with font color and images.
12. Write ruby program to create a main thread and execute multiple process through the main thread.
13. Write a ruby code to display color pallet and open dialog with the help of tk controls.
14. Design an application form using tk classes and validate all fields on Rails framework.

SUGGESTED READINGS:

1. Dave Thomas, Andrew Hunt (2013), Programming Ruby 1.9 & 2.0: The Pragmatic Programmers Guide, 2nd Edition, The Pragmatic Bookshelf.
2. David Flanagan, (2008), "The Ruby Programming Language", 1st Edition, O'Reilly Media.
3. Eldon Alameda (2011), "Practical Rails Projects" Apress, Berkeley, CA, USA.
4. David Black, (2006), "Ruby for Rails", Manning Publications.

WEB SITES :

1. http://www.tutorialspoint.com/ruby/ruby_tk_guide.htm
2. www.fincher.org/tips/Languages/Ruby
3. www.troubleshooters.com/codecorn/ruby/basictutorial.htm
4. www.ruby-lang.org/en/documentation/quickstart

SEMESTER-V

16CAP513B MIS - PRACTICAL 4H - 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: 40 External: 60 Total: 100

End Semester Exam: 3 Hours

COURSE OBJECTIVES

Enable the student

- To build knowledge about decision support system (DSS) which is a computer program application
- To analyze business data and presents it so that they can make business decisions more easily
- To help the students to distinguish it from an "operational application" that collects the data in the course of normal business operation
- To know about expert system in management
- To identify Group Decision in Support Systems (GDSS) and Decision Conferencing.
- To manage the organization in an efficient way

COURSE OUTCOMES (COs)

Upon completion of this course, student will be able to :

1. Discuss today's turbulent business environment and describe how organizations survive and even excel in such an environment.
2. Discuss the need for computerized support of managerial decision making.
3. Describe the conceptual foundation of the decision support system (DSS)
4. Describe the business intelligence (BI) methodology and relate them each other.
5. List the major tools of computerized decision support and major issues in implementing computerized decision support systems.
6. Define the conceptual foundations of decision making.

List of Practical

1. Create a set of slides with sound and animation using power point and to select various styles of slides from slide template.

2. Prepare an organization chart for a company and a college using power point.

3. To perform comparative study of your UG degree subject marks and create a various styles of graph using excel.

4. To perform student and hostel fee particulars in a worksheet. Analysis the results using excel.

5. To create a word document for salary preparation and access the calculation, graph from excel using OLE.

6. Apply the mail merge concept using word.
7. Design organizational hierarchy chart
8. Design power point Presentation to market a product
9. Create Tables for Inventory Control
10. Design Animation power point Presentation with audio and video to advertise a product.

SUGGESTED READINGS

1. L.M. Applegate, R.D. Austin and F.W. McFarlan.(2007), Corporate Information Strategy and Management: Text and Cases ,7th Edition, McGraw Hill.
2. P. Bocij, A. Greasley and S. Hickie(2008), Business Information Systems: Technology, Development and Management for the E-Business ,4th Edition, Prentice Hall.
3. D. Boddy, A. Boonstra and G. Kennedy(2008), Managing Information Systems: Strategy and Organisation ,3rd Edition, Prentice Hall.
4. K.C. Laudon and J.P. Laudon.(2007), Management Information Systems: Managing the Digital Firm ,10th Edition, Prentice Hall.
5. W. Robson(1997), Strategic Management and Information Systems: An Integrated Approach ,2nd Edition, Financial Times,
6. R.M. Stair and G. Reynolds (2007),Principles of Information Systems: A Managerial Approach ,International Edition, Delmar Cengage Learning.

B.Sc. COMPUTER SCIENCE

CHOICE BASED CREDIT SYSTEM (CBCS)

Curriculum and Syllabus
Regular (2016 – 2017)

DEPARTMENT OF COMPUTER SCIENCE

FACULTY OF ARTS, SCIENCE AND HUMANITIES

KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)
Eachanari (Post), Coimbatore – 641 021.
Tamilnadu, India

Phone No. 0422-2980011 - 15 Fax No: 0422-2980022-23
E mail ID: info@karpagam.com
Web: www.kahedu.edu.in

PROGRAM OUTCOMES (POs): The program must enable students to attain by the time of graduation

a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline
b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
c) An ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs.
d) An ability to function effectively on teams to accomplish a common goal
e) An understanding of professional, ethical, legal, security and social issues and responsibilities
f) An ability to communicate effectively with a range of audiences
g) An ability to use current techniques, skills and tools necessary for computing practice
h) An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking and web systems and technologies
i) An ability to effectively integrate IT-based solutions into the user environment
j) An understanding of best practices and standards and their application

PROGRAM SPECIFIC OUTCOME (PSOs)

k) Understand analyze and develop computer programs in the areas related to Database systems and Big data Analytics, cloud computing, soft computing, IoT, Image processing, Green computing, web designing, mobile computing and networking for efficient design of computer based system of varying complexity.
l) Apply standard software Engineering practices and strategies in software project development using open-source programming environment to deliver a quality for business success.
m) Be acquainted with the contemporary issues, latest trends in technological development and thereby innovate new ideas and solutions to existing problems.
n) An ability to produce cost effective, quality and maintainable software products and solutions (services) meeting the global standards and requirements with the knowledge acquired and using the emerging techniques, tools and software engineering methodologies and principles and able to comprehend and write effective project reports in multidisciplinary environment in the context of changing technologies.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO I : To be a working Information Technology (IT) professional with core competencies that can be used on multi-disciplinary projects

PEO II : To understand the importance of relationship building within the IT industry

PEO III : To understand the need for lifelong learning in the exploration and journey in IT

PEO IV : To understand, evaluate and practice ethical behavior within the IT industry

PEO V : To be cognizant of security issues and their impacts on industry

MAPPING of PEOs and POs

POs	a	b	C	d	e	f	f	h	i	j	k	l	m	n
PEO I	X	X	X				X	X	X				X	
PEO II				X	X	X								X
PEO III	X	X						X		X	X			
PEO IV			X	X	X				X			X		
PEO V					X					X		X		

KARPAGAM ACADEMY OF HIGHER EDUCATION
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Coimbatore - 641 021, India
FACULTY OF ARTS, SCIENCE AND HUMANITIES (FASH)
B.Sc Computer Science - Curriculum (CBCS)
(2016 – 2019 Batch)

Course code	Name of the course	Objectives and out comes		Instruction hours / week			Credit(s)	Maximum Marks		
		PEOs	POs	L	T	P		CIA	ESE	Total
								40	60	100
SEMESTER - I										
16LSU101	Language-I	IV	d,e	04	-	-	4	40	60	100
16CSU101	Programming Fundamentals using C / C++-	I	a,b,c	05	-	-	5	40	60	100
16CSU102	Computer System Architecture	I	b,c,g	04	-	-	4	40	60	100
16CSU103	Computer Fundamentals	III	h,j	04	-	-	4	40	60	100
16CSU111	Programming Fundamentals using C / C++ - Practical	I	a,b,c,g	-	-	04	2	40	60	100
16CSU112	Computer System Architecture – Practical	I	a,c,g	-	-	03	2	40	60	100
16CSU113	Computer Fundamentals – Practical	III	b,h,j	-	-	03	2	40	60	100
16AEC101	Environmental Studies	IV	d,e	03	-	-	3	40	60	100
Semester Total				**20**	**-**	**10**	**26**	**320**	**480**	**800**
SEMESTER – II										
16LSU201	Language – II	IV	d,e	04	-	-	4	40	60	100
16ENU201	English – I	II	d,f	04	-	-	4	40	60	100
16CSU201	Programming in JAVA	I	c,h,i	04	-	-	4	40	60	100
16CSU202	Discrete Structures	III	a,b	04	-	-	4	40	60	100
16CSU203	Multimedia and Applications	IV	e,i	04	-	-	4	40	60	100
16CSU211	Programming in JAVA – Practical	I	a,c,h,i	-	-	04	2	40	60	100
16CSU212	Discrete Structures – Practical	III	a,b,j	-	-	03	2	40	60	100
16CSU213	Multimedia and Applications - Practical	IV	c,e	-	-	03	2	40	60	100
Semester Total				**20**	**-**	**10**	**26**	**320**	**480**	**800**
SEMESTER - III										
16CSU301	Data Structures	I	a,b,g, h	04	-	-	4	40	60	100
16CSU302	Operating Systems	III	a,b,h, k	04	-	-	4	40	60	100

16CSU303	Computer Networks	III	a,b,j,k	04	-	-	4	40	60	100
16CSU304A	Android Programming	I	a,b,c, m	03	-	-	3	40	60	100
16CSU304B	Programming in MATLAB	IV	c,d,e,i					40	60	100
16CSU311	Data Structures – Practical	I	a,b,g, h	-	-	04	2	40	60	100
16CSU312	Operating Systems – Practical	III	a,b,h, k	-	-	04	2	40	60	100
16CSU313	Computer Networks – Practical	III	a,b,j,k	-	-	04	2	40	60	100
16CSU314A	Android Programming – Practical	I	a,b,c, m	-	-	03	1	40	60	100
16CSU314B	Programming in MATLAB - Practical	IV	c,d,e,i	-	-	03		40	60	100
Semester Total				**15**	**-**	**15**	**22**	**320**	**480**	**800**
SEMESTER – IV										
16CSU401	Design and Analysis of Algorithms	I	a,b,c, m	04	-	-	4	40	60	100
16CSU402	Software Engineering	IV	c,d,e,l	04	-	-	4	40	60	100
16CSU403	Database Management Systems	I	a,b,g, h	04	-	-	4	40	60	100
16CSU404A	HTML Programming	III	a,b,h,j ,k	03	-	-	3	40	60	100
16CSU404B	XML Programming	III	a,b,h,j ,k							
16CSU411	Design and Analysis of Algorithms – Practical	I	a,b,c, m	-	-	04	2	40	60	100
16CSU412	Software Engineering – Practical	IV	c,d,e,l	-	-	04	2	40	60	100
16CSU413	Database Management Systems – Practical	I	a,b,g, h	-	-	04	2	40	60	100
16CSU414A	HTML Programming – Practical	III	a,b,h,j ,k			03	1	40	60	100
16CSU414B	XML Programming – Practical	III	a,b,h,j ,k							
Semester Total				**15**	**-**	**15**	**22**	**320**	**480**	**800**
SEMESTER –V										
16CSU501A	Information Security	I	b,e,m	04	-	-	4	40	60	100
16CSU501B	Network Programming	I	c,g		-	-				
16CSU502A	Microprocessor	III	a,b,h,j	04	-	-	4	40	60	100
16CSU502B	Digital Image Processing	I	a,b,h							
16CSU503A	Machine Learning	III	A,b,h, k	04	-	-	4	40	60	100
16CSU503B	Introduction to Data Sciences	II	d,e,f		-	-				
16CSU504A	Oracle (SQL/PL-SQL)	IV	c,e,i,l	03	-	-	3	40	60	100
16CSU504B	Programming in Python	III	b,h,j,k							

16CSU511A	Information Security – Practical	I	b,e,m	-	-	04	2	40	60	100
16CSU511B	Network Programming – Practical	I	c,g	-	-					
16CSU512A	Microprocessor – Practical	III	a,b,h,j	-	-	04	2	40	60	100
16CSU512B	Digital Image Processing – Practical	I	a,b,h							
16CSU513A	Machine Learning – Practical	III	a,b,h, k	-	-	04	2	40	60	100
16CSU513B	Introduction to Data Sciences – Practical	II	d,e,f	-	-					
16CSU514A	Oracle (SQL/PL-SQL) – Practical	IV	c,e,i,l	-	-	03	1	40	60	100
16CSU514B	Programming in Python – Practical	III	b,h,j,k							
	Semester Total			**15**	**-**	**15**	**22**	**320**	**480**	**800**
SEMESTER –VI										
16CSU601A	Cloud Computing	V	e,j,l	04	-	-	4	40	60	100
16CSU601B	System Programming	I	a,b,h,i							
16CSU602A	Data Mining	I	a,d,g, m	04	-	-	4	40	60	100
16CSU602B	Computer Graphics	I	a,c,g, m							
16CSU603A	PHP Programming	III	a,b,h,j ,k	03	-	-	3	40	60	100
16CSU603B	Unix / Linux Programming	IV	c,d,e							
16CSU611A	Cloud Computing – Practical	V	e,j,l	-	-	04	2	40	60	100
16CSU611B	System Programming – Practical	I	a,b,h,i							
16CSU612A	Data Mining – Practical	I	a,d,g, m	-	-	04	2	40	60	100
16CSU612B	Computer Graphics – Practical	I	a,c,g, m	-	-					
16CSU613A	PHP Programming –Practical	III	a,b,h,j ,k	-	-	03	1	40	60	100
16CSU613B	Unix / Linux Programming – Practical	IV	c,d,e							
16CSU691	Project	II	d,e,f,n	08	-	-	6	40	60	100
	ECA / NCC / NSS / Sports / General interest etc	Good								
	Semester Total			**19**	**-**	**11**	**22**	**280**	**420**	**700**
	Grand Total			**104**	**-**	**76**	**140**	**1880**	**2820**	**4700**

Entrepreneur Oriented Courses -Green
Employability Oriented Courses -Blue
Skill Development Oriented Courses -Red

Skill Enhancement Course (SEC)		
	Course Code	**Name of the Course**
SEM-III	16CSU304A /16CSU304B	Android Programming / Programming in MATLAB
	16CSU314A /16CSU314B	Android Programming – Practical / Programming in MATLAB – P
SEM-IV	16CSU404A / 16CSU404B	HTML Programming / XML Programming
	16CSU414A / 16CSU414B	HTML Programming - Practical / XML Programming – Practical
SEM-V	16CSU504A / 16CSU504B	Oracle (SQL/PL-SQL) / Programming in Python
	16CSU514A /16CSU514B	Oracle (SQL/PL-SQL) – Practical / Programming in Python – Practical
SEM-VI	16CSU603A/16CSU603B	PHP Programming / Unix / Linux Programming
	16CSU613A/16CSU613B	PHP Programming – Practical / Unix / Linux Programming - Pract

Discipline Specific Course (DSC)		
	Course Code	**Name of the Course**
SEM-V	16CSU501A/16CSU501B	Information Security / Network Programming
	16CSU511A/16CSU511B	Information Security – Practical / Network Programming – Practical
SEM-V	16CSU502A/16CSU502B	Microprocessor / Digital Image Processing
	16CSU512A/16CSU512B	Microprocessor- Practical / Digital Image Processing – Practical
SEM-V	16CSU503A/16CSU503B	Machine Learning / Introduction to Data Sciences
	16CSU513A/16CSU513B	Machine Learning -Practical / Introduction to Data Sciences – Practical
SEM-VI	16CSU601A/16CSU601B	Cloud Computing / System Programming
	16CSU611A/16CSU611B	Cloud Computing – Practical / System Programming - Practical
SEM-VI	16CSU602A/16CSU602B	Data Mining / Computer Graphics

	16CSU612A/16CSU612B	Data Mining - Practical / Computer Graphics – Practical
SEM-VI	16CSU691	Project

கற்பகம்உயர்கல்விகலைக்கழகம்

தமிழ்த்துறை

பகுதி - I தமிழ்ப்பாடத்திட்டம் (2016 - 2017)

முதல்பருவம்

(இளநிலை அறிவியல் பட்டவகுப்புகளுக்குரியது)

(For I-UG Science Degree Classes) 16LSU101

பாடத்திட்டப்பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

- இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக்குரியஆய்வுமனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
- தமிழின்வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்' ; 'இணையதமிழ்' குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைமேம்பாடு.
- வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
- சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
- மொழிபெயப்புத்துறைசார்ந்தவேலைவாய்புத்திறன்பெற்றிருத்தல்

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு

ஒன்று	I	4	3	40 / 60	100	4

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016-2017)

பகுதி – I, தமிழ் **பருவம் I**

16LAU101 : **தமிழ் முதல் தாள்** 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது**)**

அலகு – I : இக்கால இலக்கியம்: **(10 மணிநேரம்)**

கல்வி : மகாகவி பாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணி தேசிக விநாயகம் பிள்ளை – ஒற்றுமையே உயிர்நிலை.
மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் –மலையாளக் காற்று.
சூழலியல் : கவிஞர் வைதீஸ்வரன் - விரல் மீட்டிய மழை.
பெண்ணியம் : கவிஞர் சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை.

அலகு – II : அற இலக்கியம்: **(10 மணிநேரம்)**

கொன்றை வேந்தன்: 1-50 பாடல்கள்

திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்

பழமொழி நானூறு: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: **(10 மணிநேரம்)**

மூவருலா: 1-26 கண்ணிகள்

திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்

கலிங்கத்துப் பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV : கட்டுரை: **(10 மணிநேரம்)**

1. **உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்**
2. **கட்டிடக்கலை** - அ. இராசமாணிக்கனார்
3. **வாழ்க்கை** - இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: **(8 மணிநேரம்)**

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Semester – I

16CSU101 PROGRAMMING FUNDAMENTALS USING C / C++ 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To impart adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basics of C and C++ Languages
- To enable effective usage of arrays, structures, functions
- To learn effective usage of pointers and to implement the memory management concepts.
- To teach the issues in file organization and the usage of file systems.
- To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to do the following:

1. Develop programs using the basic elements like control statements, Arrays and Strings .
2. understand about the dynamic memory allocation using pointers which is essential for utilizing memory
3. Understand about the code reusability with the help of user defined functions.
4. Learn the basics of file handling mechanism that is essential for understanding the concepts in database management systems.
5. Use the characteristics of an object-oriented programming language in a program.
6. Use the basic object-oriented design principles in computer problem solving.

UNIT-I

Introduction to C and C++:

History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++. **Data Types, Variables, Constants, Operators and Basic I/O:** Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putcharetc), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.hetc).**Expressions, Conditional Statements and Iterative Statements:**Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

UNIT-II

Functions and Arrays: Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.

Creating and Using One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays.

UNIT-III

Derived Data Types (Structures and Unions): Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members. **Pointers and References in C++:** Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, using references as function arguments and function return values

UNIT-IV

Memory Allocation in C++: Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation.**File I/O, Preprocessor Directives:** Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random aCSUess in files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros.

UNIT-V

Using Classes in C++: Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors, Constructor Overloading, Function overloading in classes, Class Variables &Functions, Objects as parameters, Specifying the Protected and

Private Access, Copy Constructors, Overview of Template classes and their use. **Overview of Function Overloading and Operator Overloading:** Need of Overloading functions and operators, Overloading functions by number and type of arguments, Looking at an operator as a function call, Overloading Operators (including assignment operators, unary operators) **Inheritance, Polymorphism and Exception Handling:** Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism (Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch and throw, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowing exceptions.

Suggested Readings

1. Herbtz Schildt. (2003). C++: The Complete Reference (4th ed.) New Delhi: McGraw Hill.

2. Bjarne Stroustrup. (2013). The C++ Programming Language(4th ed.). New Delhi: Addison-Wesley.

3. Bjarne Stroustrup. (2014). Programming, Principles and Practice using C++(2^{nd} ed.). New Delhi: Addison-Wesley.

4. Balaguruswamy, E. (2008). Object Oriented Programming with C++. New Delhi: Tata McGraw-Hill Education.

5. Paul Deitel., & Harvey Deitel. (2011). C++ How to Program (8th ed.). New Delhi: Prentice Hall.

6. John, R. Hubbard. (2000). Programming with C++- (2nd ed.). Schaum's Series.

7. Andrew Koeni., Barbara, E. Moo. (2000). Accelerated C++. Addison-Wesley.

8. Scott Meyers. (2005). Effective C++ (3rd ed.).Addison-Wesley,.

9. Harry, H. Chaudhary. (2014). Head First C++ Programming: The Definitive Beginner's Guide. LLC USA: First Create space Inc, O-D Publishing,.

10. Walter Savitch.(2007) Problem Solving with C++, Pearson Education,.

11. Stanley, B. Lippman., Josee Lajoie., & Barbara, E. Moo. (2012). C++ Primer, 5th ed.). Addison-Wesley

WEB SITES

1. http://www.cs.cf.ac.uk/Dave/C/CE.html
2. http://www2.its.strath.ac.uk/courses/c/
3. http://www.iu.hio.no/~mark/CTutorial/CTutorial.html
4. http://www.cplusplus.com/doc/tutorial/

5. www.cplusplus.com/
6. www.cppreference.com/

16CSU102	**COMPUTER SYSTEM ARCHITECTURE**	**Semester – I** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To enable the students to gain knowledge on the architecture of modern computer.
- To understand how computer stores positive and negative numbers and to perform arithmetic operation of positive and negative numbers.
- To learn about logic gates and solve problems using Boolean algebra.
- To understand the simplification of circuits like adders, subtractors, multiplexers, encoders.
- To understand the basic computer organization and design.
- To learn Cache memory and its importance

Course Outcomes (COs)

1. Students will acquire a basic knowledge about computer system architecture, digital circuits and the low - level programming skills.
2. Understand the inner workings and performance capabilities of advanced microprocessors.
3. Solve the problems using Boolean algebra
4. Understand the basic computer organization and design.
5. learn about Cache memory and its importance
6. Solve the binary arithmetic problems and conversion among the number systems

UNIT -I Introduction

Logic gates, Boolean algebra, circuit simplification, combinational circuits: Adders and Subtractors –Multiplexers and De multiplexers – Encoders and Decoders- sequential circuits: Flip Flop's, registers, counters and memory units.

UNIT -II Data Representation and Basic Computer Arithmetic

Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

UNIT –III Basic Computer Organization and Design

Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

UNIT-IV Central Processing Unit

Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

UNIT –V Memory and Input-Output Organization

Cache memory, Associative memory, mapping Input / Output: External Devices, I/O Modules , Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

Suggested Readings:

1. Dos Reis, A. J. (2009). Assembly Language and Computer Architecture using C++ and JAVA. Course Technology
2. Stallings, W. (2010). Computer Organization and Architecture Designing for Performance (8th ed.) New Delhi: Prentice Hall of India,
3. Mano, M.M. (2013). Digital Design, New Delhi: Pearson Education Asia.
4. Carl Hamacher. (2012). Computer Organization (5th ed.). New Delhi: McGrawHill.

16CSU103	COMPUTER FUNDAMENTALS	Semester – I 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To identify types of computers, how they process information and how individual computers interact with other computing systems and devices.
- To identify the function of computer hardware components.
- To identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.
- To identify fundamental concepts relating to database applications.
- To manipulate and control the Windows desktop, files and disks.
- To understand the emerging technologies and their uses.

Course Outcomes (COs)

1. Understand the meaning and basic components of a computer system,
2. Gain knowledge about five generations and classification of computer system,
3. Explain the functions of a computer,
4. Identify and discuss the functional units of a computer system,
5. Identify the various input and output units and explain their purposes
6. Understand the emerging technologies and their uses.

UNIT-I

Introduction: Introduction to computer system, uses, types. **Data Representation:** Number systems and character representation, binary arithmetic. **Human Computer Interface:** Types of software, Operating system as user interface, utility programs.

UNIT-II

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter.

UNIT-III

Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks.

UNIT-IV

Computer Organisation and Architecture: C.P.U., registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.

UNIT-V

Overview of Emerging Technologies: Bluetooth, cloud computing, big data, data mining, mobile computing and embedded systems.

Suggested Readings:

1. Goel, A. (2010). Computer Fundamentals. New Delhi: Pearson Education.
2. Aksoy, P., & DeNardis, L. (2006).Introduction to Information Technology. New Delhi: Cengage Learning
3. Sinha, P. K., & Sinha, P. (2007). Fundamentals of Computers. New Delhi: BPB Publishers.

Semester – I

16CSU111 PROGRAMMING FUNDAMENTALS USING C / C++ - PRACTICAL **3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To impart adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basics of C and C++ Languages
- To enable effective usage of arrays, structures, functions
- To learn effective usage of pointers and to implement the memory management concepts.
- To teach the issues in file organization and the usage of file systems.
- To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to do the following:

1. Develop programs using the basic elements like control statements, Arrays and Strings .
2. understand about the dynamic memory allocation using pointers which is essential for utilizing memory
3. Understand about the code reusability with the help of user defined functions.
4. Learn the basics of file handling mechanism that is essential for understanding the concepts in database management systems.
5. Use the characteristics of an object-oriented programming language in a program.
6. Use the basic object-oriented design principles in computer problem solving.

List of Programs

1. WAP to print the sum and product of digits of an integer.

2. WAP to reverse a number.

3. WAP to compute the sum of the first n terms of the following series S = 1+1/2+1/3+1/4+……

4. WAP to compute the sum of the first n terms of the following series S =1-2+3-4+5…………….

5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.

6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.

7.WAP to compute the factors of a given number.

8. Write a macro that swaps two numbers. WAP to use it.

9. WAP to print a triangle of stars as follows (take number of lines from user):

```
*
***
*****
*******
*********
```

10. WAP to perform following actions on an array entered by the user:
i) Print the even-valued elements

ii) Print the odd-valued elements

iii) Calculate and print the sum and average of the elements of array

iv) Print the maximum and minimum element of array

v) Remove the duplicates from the array

vi) Print the array in reverse order

The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.

11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12. Write a program that swaps two numbers using pointers.

13. Write a program in which a function is passed address of two variables and then alter its contents.

14. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.

15. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.

16. Write a menu driven program to perform following operations on strings:
a) Show address of each character in string

b) Concatenate two strings without using strcat function.

c) Concatenate two strings using strcat function.

d) Compare two strings

e) Calculate length of the string (use pointers)

f) Convert all lowercase characters to uppercase

g) Convert all uppercase characters to lowercase

h) Calculate number of vowels

i) Reverse the string

17. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.

18. WAP to display Fibonacci series (i)using recursion, (ii) using iteration

19. WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration

20. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.

21. Create Matrix class using templates. Write a menu-driven program to perform following Matrix operations (2-D array implementation):
a) Sum b) Difference c) Product d) Transpose

22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).

23. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.

24. Create a class Box containing length, breath and height. Include following methods in it:
a) Calculate surface Area
b) Calculate Volume
c) Increment, Overload ++ operator (both prefix & postfix)
d) Decrement, Overload -- operator (both prefix & postfix)
e) Overload operator == (to check equality of two boxes), as a friend function
f) Overload Assignment operator
g) Check if it is a Cube or cuboid
Write a program which takes input from the user for length, breath and height to test the above class.

25. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.

26. Write a program to retrieve the student information from file created in previous question and print it in following format:

Roll No. Name Marks

27. Copy the contents of one text file to another file, after removing all whitespaces.

28. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.

29. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers. The program will print the array elements in ascending and descending order.

Semester – I

16CSU112 COMPUTER SYSTEM ARCHITECTURE - PRACTICAL **3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To enable the students to gain knowledge on the architecture of modern computer.
- To understand how computer stores positive and negative numbers and to perform arithmetic operation of positive and negative numbers.
- To learn about logic gates and solve problems using Boolean algebra.
- To understand the simplification of circuits like adders, subtractors, multiplexers, encoders.
- To understand the basic computer organization and design.
- To learn Cache memory and its importance

Course Outcomes (COs)

1. Students will acquire a basic knowledge about computer system architecture, digital circuits and the low - level programming skills.
2. Understand the inner workings and performance capabilities of advanced microprocessors.
3. Solve the problems using Boolean algebra
4. Understand the basic computer organization and design.
5. learn about Cache memory and its importance
6. Solve the binary arithmetic problems and conversion among the number systems

List of Experiments

(Any 8 Experiments)

1. Verification of Logic Gates
2. Code converters
3. Realization of Multiplexer using basic gates
4. Encoder and Decoder
5. Realization Half and Full adders
6. Realization of Subtractor
7. Realization of Parity generator

8. Flip-Flop Circuits
9. Digital to analog Converters
10. Demonstrate a Basic Arithmetic Computing operations

Semester – I

16CSU113 COMPUTER FUNDAMENTALS - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- Create a document in Microsoft Word with formatting options.
- Create, edit, save, and print documents to include documents with lists and tables.
- Add a header and footer to a document and add a graphic to a document.
- .Write functions in Microsoft Excel to perform basic calculations and to convert number to text and text to number.
- Construct formulas, including the use of built-in functions, and relative and absolute references.
- Create and modify charts.

Course Outcomes (COs)

1. Modify text using various formatting options from the editing tools under the Home tab
2. Set up section breaks to create different headers and footers for the odd and even pages within the document sections.
3. Demonstrate the mechanics and uses of Word tables to organize and present data.
4. Demonstrate working knowledge of using Word's themes and clip art to create a variety of visual effects.
5. Create and design a spreadsheet for general office use.
6. Demonstrate the use of basic functions and formulas in Excel

Practical exercises based on MS Office/ Open Office tools using document preparation and spreadsheet handling packages.

MS Word

1. Prepare **a grocery list** having four columns (Serial number, The name of the product, quantity and price) for the month of April, 06.

• Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.

• The headings of the columns should be in 12-point and bold.

- The rest of the document should be in 10-point Times New Roman.
- Leave a gap of 12-points after the title.

2. Create a **telephone directory**.
    - The heading should be 16-point Arial Font in bold
    - The rest of the document should use 10-point font size
    - Other headings should use 10-point Courier New Font.
    - The footer should show the page number as well as the date last updated.

3. Design a **time-table form** for your college.

    - The first line should mention the name of the college in 16-point Arial Font and should be bold.
    - The second line should give the course name/teacher‘s name and the department in 14-point Arial.
    - Leave a gap of 12-points.
    - The rest of the document should use 10-point Times New Roman font.
    - The footer should contain your specifications as the designer and date of creation.

4. BPB Publications plans to release a new book designed as per your syllabus. Design the **first page of the book** as per the given specifications.
    - The title of the book should appear in bold using 20-point Arial font.
    - The name of the author and his qualifications should be in the center of the page in 16-point Arial font.
    - At the bottom of the document should be the name of the publisher and address in 16-point Times New Roman.
    - The details of the offices of the publisher (only location) should appear in the footer.

5. Create the following one page documents.
    a. Compose a note inviting friends to a get-together at your house, Including a list of things to bring with them.
    b. Design a certificate in landscape orientation with a border around the document.
    c. Design a Garage Sale sign.
    d. Make a sign outlining your rules for your bedroom at home, using a numbered list.

6. Create the following documents:
    (a) A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.
    (b) Use a newsletter format to promote upcoming projects or events in your classroom or college.

7. Convert following text to a table, using comma as delimiter

Type the following as shown (do not bold).
Color, Style, Item
Blue, A980, Van
Red, X023, Car
Green, YL724, Truck
Name, Age, Sex
Bob, 23, M
Linda, 46, F
Tom, 29, M

8. Enter the following data into a table given on the next page.

Salesperson	**Dolls**	**Trucks**	**Puzzles**
Kennedy, Sally	1327	1423	1193
White, Pete	1421	3863	2934
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067

Add a column Region (values: S, N, N,S,S,S) between the Salesperson and Dolls columns to the given table Sort your table data by Region and within Region by Salesperson in ascending order:
In this exercise, you will add a new row to your table, place the word Total at the bottom of the Salesperson column, and sum the Dolls, Trucks, and Puzzles columns.

9. Wrapping of text around the image.

10. Following features of menu option must be covered

FILE Complete menu
EDIT Complete menu
VIEW Complete menu
INSERT Complete menu
FORMAT Complete menu
TABLE Complete menu
WINDOW Complete menu
HELP Complete menu
TOOLS All options except Online collaboration, Tools on Macro, Templates

MS Excel

1. Enter the Following data in Excel Sheet

REGIONAL SALES PROJECTION						
State	**Qtr1**	**Qtr2**	**Qtr3**	**QTR4**	**Qtr Total**	**Rate Amount**
Delhi	2020	2400	2100	3000	15	
Punjab	1100	1300	1500	1400	20	
U.P.	3000	3200	2600	2800	17	
Haryana	1800	2000	2200	2700	15	
Rajasthan	2100	2000	1800	2200	20	

TOTAL
AVERAGE

(a) Apply Formatting as follow:

i. Title in TIMES NEW ROMAN

ii. Font Size - 14

iii. Remaining text - ARIAL, Font Size -10

iv. State names and Qtr. Heading Bold, Italic with Gray Fill Color.

v. Numbers in two decimal places.

vi. Qtr. Heading in center Alignment.

vii. Apply Border to whole data.

(b) Calculate State and Qtr. Total

(c) Calculate Average for each quarter

(d) Calculate Amount = Rate * Total .

2. Given the following worksheet

	A	**B**	**C**	**D**
1	Roll No.	Name	Marks	Grade
2	1001	Sachin	99	
3	1002	Sehwag	65	
4	1003	Rahul	41	
5	1004	Sourav	89	
6	1005	Har Bhajan	56	

Calculate the grade of these students on the basis of following guidelines:

If Marks	Then Grade
>= 80	A+
>= 60 < 80	A
>= 50 < 60	B
< 50	F

3. Given the following worksheet

	A	**B**	**C**	**D**	**E**	**F**	
1	**Salesman**			**Sales in (Rs.)**			
2	No.	Qtr1	Qtr2	Qtr3	Qtr4	Total	Commission
3	S001	5000	8500	12000	9000		
4	S002	7000	4000	7500	11000		
5	S003	4000	9000	6500	8200		
6	S004	5500	6900	4500	10500		
7	S005	7400	8500	9200	8300		
8	S006	5300	7600	9800	6100		

Calculate the commission earned by the salesmen on the basis of following Candidates:

If Total Sales	**Commission**
< 20000	0% of sales
> 20000 and < 25000	4% of sales
> 25000 and < 30000	5.5% of sales
> 30000 and < 35000	8% of sales
>= 35000	11% of sales

The total sales is sum of sales of all the four quarters.

4. A company XYZ Ltd. pays a monthly salary to its employees which consists of basic salary, allowances & deductions. The details of allowances and deductions are as follows:

Allowances

- HRA Dependent on Basic
  - 30% of Basic if Basic <=1000
  - 25% of Basic if Basic>1000 & Basic<=3000
  - 20% of Basic if Basic >3000
- DA Fixed for all employees, 30% of Basic
- Conveyance Allowance Rs. 50/- if Basic is <=1000

Rs. 75/- if Basic >1000 & Basic<=2000
Rs. 100 if Basic >2000

- Entertainment Allowance NIL if Basic is

<=1000 Rs. 100/- if Basic > 1000

Deductions

- Provident Fund 6% of Basic
- Group Insurance Premium Rs. 40/- if Basic is <=1500
  Rs. 60/- if Basic > 1500 & Basic<=3000
  Rs. 80/- if Basic >3000

Calculate the following:
Gross Salary = Basic + HRA + DA + Conveyance + Entertainment
Total deduction = Provident Fund + Group Insurance Premium
Net Salary = Gross Salary – Total Deduction.

5. Create Payment Table for a fixed Principal amount, variable rate of interests and time in the format below:

No. of Installments	**5%**	**6%**	**7%**	**8%**	**9%**
3	XX	XX	XX	XX	XX
4	XX	XX	XX	XX	XX
5	XX	XX	XX	XX	XX
6	XX	XX	XX	XX	XX

6. Use an array formula to calculate Simple Interest for given principal amounts given the rate o

Rate of Interest	8%
Time	5 Years
Principal	Simple Interest
1000	?
18000	?
5200	?

7. The following table gives year wise sale figure of five salesmen in Rs.

Salesman	2000	2001	2002	2003
S1	10000	12000	20000	50000
S2	15000	18000	50000	60000
S3	20000	22000	70000	70000
S4	30000	30000	100000	80000
S5	40000	45000	125000	90000

(*a*) Calculate total sale year wise.
(*b*) Calculate the net sale made by each salesman
(*c*) Calculate the maximum sale made by the salesman
(d) Calculate the commission for each salesman under the condition.
(*i*) If total sales >4,00,000 give 5% commission on total sale made by the salesman.
(*ii*) Otherwise give 2% commission.
(*e*) Draw a bar graph representing the sale made by each salesman.

(*f*) Draw a pie graph representing the sale made by salesman in 2000.

8. Enter the following data in Excel Sheet

PERSONAL BUDGET FOR FIRST QUARTER

Monthly Income (Net): 1,475

EXPENSES	**JAN**	**FEB**	**MARCH**	**QUARTER TOTAL**	**QUARTER AVERAGE**
Rent	600.00	600.00	600.00		
Telephone	48.25	43.50	60.00		
Utilities	67.27	110.00	70.00		
Credit Card	200.00	110.00	70.00		
Oil	100.00	150.00	90.00		
AV to Insurance	150.00				
Cable TV	40.75	40.75	40.75		
Monthly Total					

Calculate Quarter total and Quarter average.

(a) Calculate Monthly total.

(b) Surplus = Monthly income - Monthly total.

(c) What would be total surplus if monthly income is 1500.

(d) How much does telephone expense for March differ from quarter average.

(e) Create a 3D column graph for telephone and utilities. (f) Create a pie chart for monthly expenses.

9. Enter the following data in Excel Sheet

TOTAL REVENUE EARNED FOR SAM'S BOOKSTALL

Publisher name	**1997**	**1998**	**1999**	**2000**	**total**
A	Rs.1000.00	Rs.1100.00	Rs.1300.00	Rs.800.00	
B	Rs.1500.00	Rs.700.00	Rs.1000.00	Rs.2000.00	
C	Rs.700.00	Rs.900.00	Rs.1500.00	Rs.600.00	
D	Rs.1200.00	Rs.500.00	Rs.200.00	Rs.1100.00	
E	Rs.800.00	Rs.1000.00	Rs.3000.00	Rs.560.00	

(a) Compute the total revenue earned.

(b) Plot the line chart to compare the revenue of all publisher for 4 years.

(c) Chart Title should be _Total Revenue of sam's Bookstall (1997-2000)'

(d) Give appropriate categories and value axis title.

10. Generate 25 random numbers between 0 & 100 and find their sum, average and count. How many no. are in range 50-60.

		Semester – I
16AEC101	**ENVIRONMENTAL STUDIES**	**4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **100** Total: **100**

Course Objectives

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- To apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- To reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Course Outcomes (COs)

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

UNIT-I: Environment Definition, scope and importance, components, ECOsystem Definition, Concept, Scope, importance, Structure and functions of eCOsystem. Energy flow, Ecological succession Food chains and food webs. Classification of eCOsystem.

Unit II: Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources : Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fire works.

Unit III: Biodiversity and Its Conservation: Introduction, definition: genetic, species and eCOsystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV: Environmental Pollution - Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution , Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit V: Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear aCSUidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

Suggested Readings

T1: Tripathy. S.N., & Sunakar Panda. (2004). Fundamentals of Environmental Studies (2^{nd} ed.) . New Delhi: Vrianda Publications Private Ltd.

T2: Arvind Kumar. (2004). A Textbook of Environmental Science. New Delhi: APH Publishing Corporation.

T3:Verma, P.S., & Agarwal V.K. (2001). Environmental Biology (Principles of Ecology) . New Delhi: S.Chand and Company Ltd.

T4: Anubha Kaushik., & Kaushik, C.P. (2004). Perspectives in Environmental Studies. New Delhi: New Age International Pvt. Ltd. Publications.

R1: Singh, M.P., Singh, B.S., & Soma, S. Dey. (2004). Conservation of Biodiversity and Natural Resources. New Delhi: Daya Publishing House.

R2: Daniel, B. Botkin., & Edward, A. Keller. (1995). Environmental Science New York: John Wiley and Sons, Inc.,.

R3: Uberoi, N.K. (2005). Environmental Studies. New Delhi: Excel Books Publications.

கற்பகம்உயர்கல்விகலைக்கழகம்

தமிழ்த்துறை

பகுதி - I தமிழ்ப்பாடத்திட்டம் (2016 - 2017)

இரண்டாம்பருவம்

(இளநிலை அறிவியல் பட்டவகுப்புகளுக்குரியது)

(For I-UG Science Degree Classes) 16LSU201

பாடத்திட்டப்பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

- இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக்குரியஆய்வுமனப்பான்மை யுடன், இலக்கியங்களைஅணுகுதல்.
- தமிழின்வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்' ; 'இணையதமிழ்' குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைமேம்பாடு.
- வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
- சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.

- மொழிபெயப்புத்துறைசார்ந்தவேலைவாய்புத்திறன்பெற்றிருத்தல்

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
இரண்டு	II	4	3	40 / 60	100	4

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)

பகுதி – I, தமிழ் — பருவம் II

16LAU201 : **தமிழ்** இரண்டாம் **தாள்** 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

அலகு – I : பக்தி **இலக்கியம்** **(10 மணிநேரம்)**

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. **சைவம் -** பெரியபுராணம் - திருமூலநாயனார் புராணம்.
2. **வைணவம் -** பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

அலகு – II : சங்க இலக்கியம் : **(15 மணிநேரம்)**

சங்க இலக்கியங்கள் அறிமுகம்

அ). **எட்டுத்தொகை**

நற்றிணை : பிரசம் கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு –

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : சுடர்த்தொடீ கேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு : அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி - 48

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள் – 'சிறுதினை மலரொடு' என்பதிலிருந்துதொடங்கி, 'அறிந்தவாறே' என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – 'தெய்வம் சான்ற' என்பதிலிருந்து தொடங்கி, 'நல்குமதி' என்பது வரையிலான தொடர்கள்: 286-295.

அலகு - III : காப்பியம் (6 மணிநேரம்)

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: **(21-29) –** கண்ணகியின் சிறப்பு:

'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி,

'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: **(207-234) -** சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: **(482-485) -** செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

அலகு – IV : சிறுகதை (10 மணிநேரம்)

1. **குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்**
2. காட்டில் ஒரு மான் - அம்பை
3. நாற்காலி – கி.ராஜநாராயணன்
4. **நகரம் – சுஜாதா**

அலகு- V : மொழிப்பயிற்சி **(7 மணிநேரம்)**

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

16ENU201	**ENGLISH – 1**	**Semester – II** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

(For all undergraduate students admitted from 2016 onwards)

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcome:

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed.
6. Betterment of language competence

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan

One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT V

Short Story: The Bird – Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. *Spring* 2013**.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala, V. *English for Communication*. 2006. Emerald Publishers: Chennai

16CSU201	**PROGRAMMING IN JAVA**	**Semester – II** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To understand the fundamental of Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)

1. Student will obtain knowledge of the structure and model of the Java programming language.
2. How to use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

UNIT-I

Introduction to Java Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods),

UNIT-II

Arrays, Strings and I/O Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files. **Object-Oriented Programming Overview** Principles of Object-Oriented

Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

UNIT-III

Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata

Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

UNIT-IV

Exception Handling, Threading, Networking and Database Connectivity Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

UNIT-V

Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, textfields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Suggested Readings:

1. Ken Arnold., James Gosling., & David Homes. (2005). The Java Programming Language (4th ed.).
2. James Gosling., Bill Joy., Guy, L. Steele Jr., Gilad Bracha., & Alex Buckley. (2014).The Java Language Specification, Java SE (8 ed.). Addison Wesley.
3. Joshua Bloch. (2008). Effective Java (2nd ed.). Addison-Wesley.
4. Cay, S. Horstmann,. GaryCornell. (2012).Core Java 2 Volume 1 (9th ed.). . New Delhi: Prentice Hall.
5. Cay, S. Horstmann., Gary Cornell. (2013). Core Java 2 Volume 2 - Advanced Features(9th ed.). New Delhi: Printice Hall.
6. Bruce Eckel. (2002). Thinking in Java (3rd ed.). New Delhi: PHI.
7. Balaguruswamy, E. (2009). Programming with Java (4th ed.). New Delhi: McGraw Hill.
8. Paul Deitel., & Harvey Deitel. (2011). Java: How to Program (10th ed.). New Delhi: Prentice Hall.
9. (2005).Head First Java (2nd ed.). Orielly Media Inc.
10. David, J. Eck. (2009). Introduction to Programming Using Java. New Delhi: CreateSpace Independent Publishing Platform.
11. John , R. Hubbard. (2004). Programming with JAVA, Schaum's Series, (2nd ed.).

WEB SITES

1. java.sun.com/docs/books/tutorial/
2. www.en.wikipedia.org/wiki/Java
3. www.java.net/

Semester – II

16CSU202 **DISCRETE STRUCTURES** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

This course enables the students to

- To learn the basic concepts of sets, types of sets, functions and relations
- To understand about Pigeonhole principle, Permutation and Combination, Mathematical Induction
- To solve the problems using Recurrence relations and generating functions.
- To know the basic concepts of Logical Connectives, Graphs and Trees.
- To express ideas using mathematical notation
- To solve problems with the help of tools of mathematical analysis.

Course Outcomes

On successful completion of the course, students will be able to

1. Familiar with elementary algebraic set theory.
2. Acquire a fundamental understanding of the core concepts in growth of functions.
3. Describe the method of recurrence relations.
4. Get wide knowledge about graphs and trees
5. Initiate to knowledge from inference theory
6. Solve problems with the help of tools of mathematical analysis

UNIT I

Sets: Introduction, Sets , finite and infinite sets, uncountably infinite sets, functions, relations, properties of binary relations, closure, partial ordering relations, counting , Pigeonhole principle, Permutation and Combination, Mathematical Induction, Principle of inclusion and Exclusion.

UNIT II

Growth of Functions: Asymptotic Notations, Summation formulas and properties,Bounding Summations, approximation byIntegrals

UNIT III

Recurrences: Recurrence relations, generating functions, linear recurrence relations with constant coefficients and their solution, Substitution Method, recurrence trees, Master theorem.

UNIT IV

Graph Theory : Basic terminology, models and types, multigraphs and weighted graphs, graph representation, graph isomorphism, connectivity, Euler and Hamiltonian Paths and circuits, Planar graphs, graph coloring, trees, basic terminology and properties of trees, introduction to Spanning trees

UNIT V

Prepositional Logic: Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory.

SUGGESTED READINGS

1. Kenneth Rosen. (2006). Discrete Mathematics and Its Applications (6th ed.). New Delhi: McGraw Hill.
2. Tremblay , J .P. , & Manohar, R. (1997). Discrete Mathematical Structures with Applications to Computer Science. New Delhi: McGraw-Hill Book Company.
3. Coremen, T.H., Leiserson, C.E. , & R. L. Rivest. (2009). Introduction to algorithms, (3rd ed.). New Delhi: Prentice Hall on India.
4. Albertson, M. O.,& Hutchinson, J. P. (1988). Discrete Mathematics with Algorithms . New Delhi: John wiley Publication.
5. Hein, J. L. (2009). Discrete Structures, Logic, and Computability(3rd ed.). New Delhi: Jones and Bartlett Publishers.
6. Hunter, D.J. (2008). Essentials of Discrete Mathematics. New Delhi: Jones and Bartlett Publishers.

16CSU203	**MULTIMEDIA AND APPLICATIONS**	**Semester – II** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To learn and understand technical aspect of Multimedia Systems.
- To understand the standards available for different audio, video and text applications.
- To Design and develop various Multimedia Systems applicable in real time.
- To learn various multimedia authoring systems.
- To understand various networking aspects used for multimedia applications.
- To develop multimedia application and analyze the performance of the same.

Course Outcomes (COs)

1. Developed understanding of technical aspect of Multimedia Systems.
2. Understand various file formats for audio, video and text media.
3. Develop various Multimedia Systems applicable in real time.
4. Design interactive multimedia software.
5. Apply various networking protocols for multimedia applications.
6. To evaluate multimedia application for its optimum performance.

UNIT-I

Multimedia: Introduction to multimedia, components, uses of multimedia, multimedia applications, virtual reality. **Text:** Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools, Hypermedia & Hypertext.

UNIT-II

Images: Still Images – bitmaps, vector drawing, 3D drawing & rendering, natural light & colors, computerized colors, color palettes, image file formats. **Sound:** Digital Audio, MIDI Audio, MIDI vs Digital Audio, Audio File Formats.

UNIT-III

Video: How video works, analog video, digital video, video file formats, video shooting and editing. **Animation:** Principle of animations, animation techniques,

UNIT-IV

Animation: animation file formats. **Internet and Multimedia**: www and HTML, multimedia on the web – web servers, web browsers, web page makers and site builders.

UNIT-V

Making Multimedia: Stages of a multimedia project, Requirements to make good multimedia, Multimedia Hardware - Macintosh and Windows production Platforms, Hardware peripherals - Connections, Memory and storage devices, Multimedia software and Authoring tools.

Suggested Readings:

1. Tay Vaughan. (2011). Multimedia: Making it work (8th ed.). New Delhi: TMH,
2. Ralf Steinmetz., & Klara Naharstedt. (2012).Multimedia: Computing, Communications Applications. New Delhi: Pearson.
3. Keyes. (2000). Multimedia Handbook. New Delhi: TMH.
4. Andleigh, K., & Thakkar, K. (2013).Multimedia System Design. New Delhi: PHI.

WEB SITES

1. en.wikipedia.org/wiki/Multimedia
2. www.arena-multimedia.com/ -
3. www.nextwavemultimedia.com/

16CSU211	**PROGRAMMING IN JAVA - PRACTICAL**	**Semester – I** **3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To understand the fundamental of Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)

1. Student will obtain knowledge of the structure and model of the Java programming language.
2. How to use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

List of Programs

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of .lenth in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(, setLength(), append(), insert(), concat()and equals().

9. Write a program to create a ―distance‖ class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
10. Modify the ―distance‖ class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)
12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
13. Write a program to show the use of static functions and to pass variable length arguments in a function.
14. Write a program to demonstrate the concept of boxing and unboxing.
15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
16. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate fibonacii series is given in a different file belonging to the same package.
17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
18. Write a program ―DivideByZero‖ that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
21. Write a program to demonstrate priorities among multiple threads.
22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
23. Write a program to create URL object, create a URLConnection using the openConnection() method and then use it examine the different components of the URLand content.
24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
25. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet‘s window.
26. Write a program to get the URL/location of code (i.e. java code) and document(i.e. html file).

27. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
28. Write a program to demonstrate different keyboard handling events.
29. Write a program to generate a window without an applet window using main() function.
30. Write a program to demonstrate the use of push buttons.

Semester – II

16CSU212 **DISCRETE STRUCTURES - PRACTICAL** **3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

This course enables the students to

- To learn the basic concepts of sets, types of sets, functions and relations
- To understand about Pigeonhole principle, Permutation and Combination, Mathematical Induction
- To solve the problems using Recurrence relations and generating functions.
- To know the basic concepts of Logical Connectives, Graphs and Trees.
- To express ideas using mathematical notation
- To solve problems with the help of tools of mathematical analysis.

Course Outcomes

On successful completion of the course, students will be able to

1. Familiar with elementary algebraic set theory.
2. Acquire a fundamental understanding of the core concepts in growth of functions.
3. Describe the method of recurrence relations.
4. Get wide knowledge about graphs and trees
5. Initiate to knowledge from inference theory
6. Solve problems with the help of tools of mathematical analysis

List of programs

1. Write a C Program to find the number of subsets of a set contains n elements.
2. Write a C Program to find transitive closure of a relation.
3. Write a C Program to prove
$1/(1*2) + 1/(2*3) \dots\dots\dots + 1/(n(n+1)) = n/(n+1)$

4. Write a C Program to to perform the sum = $1+ (1+2) + (1+2+3) + \dots + (1+2\dots+n)$
5. Write a C program to print Fibonacci series till Nth term using recursion
6. Write a Cprogram in c to calculate factorial of a number using recursion
7. Write a C Program to find a minimum spanning tree using Prim's algorithm

8. Write a C program to find the shortest path with the lower COst in a graph using Dijkstra's Algorithm
9. Write a C Program to construct the truth table for the following formula.
(i) $P\wedge Q\wedge \neg R$ (ii) $P\wedge \neg Q\wedge R$ (iii) $P\wedge Q\wedge \neg R$

10. Write a C Program to prove De – Morgan's law.

Semester – II

16CSU213 MULTIMEDIA AND APPLICATIONS - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To learn and understand technical aspect of Multimedia Systems.
- To understand the standards available for different audio, video and text applications.
- To Design and develop various Multimedia Systems applicable in real time.
- To learn various multimedia authoring systems.
- To understand various networking aspects used for multimedia applications.
- To develop multimedia application and analyze the performance of the same.

Course Outcomes (COs)

1. Developed understanding of technical aspect of Multimedia Systems.
2. Understand various file formats for audio, video and text media.
3. Develop various Multimedia Systems applicable in real time.
4. Design interactive multimedia software.
5. To evaluate multimedia application for its optimum performance.
6. Design different application in M.M and use different tools like Adobe Photoshop and flash.

Practical exercises based on concepts listed in theory using Flash/ GIMP/ PhotoShop/ Animation Tools/ Image Editors/ Video Editors.

Implement the followings using Flash-

1. Create an animation using the tools panel and the properties panel to draw the following – Line, pe , oval, circle, rectangle , square, pencil , brush , lasso tool.
2. Create an animation using text tool to set the font, size, color etc.
3. Create an animation using **Free transform tool** that should use followings- Move Objects Skew Objects Stretch Objects Rotate Objects Stretch Objects while maintaining proportion Rotate Objects after relocating the center dot.
4. Create an animation using layers having following features-Insert layer, Delete layer, guide layer, Mask layer.
5. Modify the document (changing background color etc.)using the following tools Eraser tool, Hand tool, Ink bottle tool ,Zoom tool ,Paint Bucket tool ,Eyedropper tool.
6. Create an animation for bus car race in which both starts from the same point and car wins the race.
7. Create an animation in which text Hello gets converted into GoodBye (using motion/shape tweening).
8. Create an animation having five images having fade-in fade-out effect.
9. Create an scene to show the sunrise (using multiple layers and motion tweening) .
10. Create an animation to show the ripple effect.

11. Create an animation (using Shape tweening and shape hints) for transforming one shape into another.
12. Create an animation for bouncing ball (you may use motion guide layer).

16CSU301	**DATA STRUCTURES**	**Semester – III** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the fundamental concepts of data structures
- To Learn linear data structures – lists, stacks, and queues
- To apply Tree and Graph structures
- To understand and apply sorting, searching algorithms
- To know about hashing algorithms
- To develop application using data structures

Course Outcomes (COs)

Upon completion of this course, the student will be able to:

1. Implement abstract data types for linear data structures.
2. Apply the different linear and non-linear data structures to problem solutions.
3. Analyze the applications of tree.
4. Implement graph theory over various data structures.
5. Critically analyze the various sorting algorithms.
6. Apply searching algorithms over various data structures.

UNIT-I

Arrays-Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation).Stacks Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack

UNIT-II

Linked Lists Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular, representation of Stack in Lists; Self Organizing Lists; Skip Lists Queues, Array and Linked representation of Queue, De-queue, Priority Queues

UNIT-III

Trees - Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion , Recursive and Iterative Traversals on Binary Search Trees); Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees).

UNIT-IV

Searching and Sorting,Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Insertion Sort, Shell Sort, Comparison of Sorting Techniques

UNIT-V

Hashing - Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collusion by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing, Function

Suggested Readings

1. Adam Drozdek. (2012). Data Structures and algorithm in C++(3rd ed.). New Delhi: Cengage Learning.
2. Sartaj Sahni. (2011). Data Structures, Algorithms and applications in C++(2nd ed.). New Delhi: Universities Press.
3. Aaron, M. Tenenbaum., Moshe, J. Augenstein., & Yedidyah Langsam. (2009). Data Structures Using C and C++(2nd ed.). New Delhi: PHI.
4. Robert, L. Kruse. (1999). Data Structures and Program Design in C++. New Delhi: Pearson.
5. Malik, D.S. (2010). Data Structure using C++(2nd ed.). New Delhi: Cengage Learning,.
6. Mark Allen Weiss. (2011). Data Structures and Algorithms Analysis in Java (3rd ed.). New Delhi: Pearson Education.
7. Aaron, M. Tenenbaum., Moshe, J. Augenstein., & Yedidyah Langsam. (2003). Data Structures Using Java. New Delhi: PHI.
8. Robert Lafore. (2003). Data Structures and Algorithms in Java(2nd ed.). New Delhi: Pearson/ Macmillan Computer Pub.
9. John Hubbard. (2009). Data Structures with JAVA(2nd ed.) . New Delhi: McGraw Hill Education (India) Private Limited.
10. Goodrich, M., & Tamassia, R. (2013). Data Structures and Algorithms Analysis in Java(4th ed.). New Delhi: Wiley.
11.Herbert Schildt. (2014). Java The Complete Reference (English)(9th ed.). New Delhi: Tata McGraw Hill.
12. Malik, D. S., & Nair, P.S. (2003).Data Structures Using Java. New Delhi: Course Technology.

WEB SITES

http://en.wikipedia.org/wiki/Data_structure
http://www.cs.sunysb.edu/~skiena/214/lectures/
www.amazon.com/Teach-Yourself-Structures-Algorithms

16CSU302	OPERATING SYSTEMS	Semester – III 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Study the basic concepts and functions of operating systems.
- To understand the structure and functions of OS.
- To Learn about Processes, Threads and Scheduling algorithms.
- To Understand the principles of concurrency, Deadlocks and Memory Management
- To Learn about the Protection and Security Concepts.
- To provide experience on MS Windows and LINUX environment.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Design various Scheduling algorithms.
2. Apply the principles of concurrency.
3. Design deadlock, prevention and avoidance algorithms.
4. Compare and contrast various memory management schemes.
5. Apply the Security Concepts based on Authentication.
6. Work in MS Windows and LINUX environment.

UNIT-I

Introduction to Operating System: Basic OS Functions-Resource Abstraction-Types of Operating Systems–Multiprogramming Systems-Batch Systems-Time Sharing Systems-Operating Systems for Personal Computers & Workstations-Process Control & Real Time Systems.

UNIT-II

Operating System Organization: Processor and user modes-Kernels-System Calls and System Programs. **Process Management:** System view of the process and resources-Process abstraction-Process hierarchy-Threads-Threading issues-Thread libraries-Process Scheduling-Non pre-emptive and Preemptive scheduling algorithms-Concurrent and processes-Critical Section-Semaphores-Methods for inter-process communication-Deadlocks.

UNIT-III

Memory Management: Physical and Virtual address space-Memory Allocation strategies –Fixed and Variable partitions-Paging-Segmentation-Virtual memory.

UNIT-IV

File and I/O Management: Directory structure-File operations-File Allocation methods-Device management.

UNIT-V

Protection and Security: Policy mechanism-Authentication-Internal aCSUess Authorization.

Suggested Readings

1. Silberschatz, A ., Galvin, P.B. , & Gagne, G. (2008). Operating Systems Concepts, 8th ed.). New Delhi: John Wiley Publications.
2. Tanenbaum, A.S. (2007).Modern Operating Systems (3rd ed.). New Delhi: Pearson Education.
3. Stallings, W. (2008). Operating Systems, Internals & Design Principles (5th ed.). New Delhi: Prentice Hall of India.

WEB SITES

1. www.cs.columbia.edu/~nieh/teaching/e6118_s00/
2. www.clarkson.edu/~jnm/cs644
3. pages.cs.wisc.edu/~remzi/Classes/736/Fall2002/

16CSU303	**COMPUTER NETWORKS**	**Semester – III** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To master the fundamentals of data communications networks by gaining a working knowledge of data transmission concepts.
- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To read the fundamentals and basics concepts of Physical layer with real time examples
- To study data link layer concepts, design issues, and protocols.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer and Application layer.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Understand the functions of each layer in OSI and TCP/IP model.
2. Explain the multiplexing, switching concept and types of transmission media with real time examples.
3. Understand the error detection and correction methods and can implement the data link layer protocols
4. Understand channel error detection and correction, MAC protocols, Ethernet and WLAN.
5. Learn different medium access method to avoid collision and to learn about routing table.
6. Learn basic functionalities of transport layer and application layer.

Unit I

Introduction to Computer Networks : Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite. **Data Communication Fundamentals and Techniques**: Analog and digital signal; data-ratelimits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission;

Unit – II

(cont..)digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

Networks Switching Techniques and Access mechanisms: Circuit switching; packetswitching - connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

Unit – III

Data Link Layer Functions and Protocol: Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.

Unit – IV

Multiple Access Protocol and Networks: CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways; **Networks Layer Functions and Protocols**: Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols.

Unit V

Transport Layer Functions and Protocols: Transport services- error and flow control, Connection establishment and release- three way handshake; **Overview of Application layer protocol**: Overview of DNS protocol; overview of WWW &HTTP protocol.

Suggested Readings

1. Forouzan, B. A.(2007). Data Communications and Networking(4th ed.). New Delhi: THM.
2. Tanenbaum, A. S. (2002). Computer Networks (4th ed.). New Delhi: PHI.

WEB SITES

1. en.wikipedia.org/wiki/Internet_protocol_suite
2. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
3. www.yale.edu/pclt/COMM/**TCPIP**.HTM
4. www.w3schools.com/**tcpip**/default.asp

16CSU304A	**ANDROID PROGRAMMING**	**Semester – III** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To compare the differences between Android and other mobile development environments.
- To learn the Object-oriented features of Kotlin and APIs for Android Development.
- To describe the working of Android applications, life cycle, manifest, and Intents
- To demonstrate the implementation of Form widgets for Android App development.
- To learn the SQLite database connectivity and database operations with android
- To design, create, deploy, and test applications for the Android mobile phone platform.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Design and develop useful Android applications with compelling user interfaces by using, extending, and creating your own layouts and Views and using Menus.
2. Analyze the Architecture and features of Android with another Mobile Operating System.
3. Evaluate the standard of Kotlin language for developing Android Applications
4. Apply knowledge for creating user Interface and develop activity for Android App.
5. Evaluate the user interface architecture of Android for developing Android Apps
6. Understand the implementation of SQLite database operations with Android.

UNIT-I:

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.

UNIT-II:

Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

UNIT-III:

Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project– Hello Word, run on emulator, Deploy it on USB-connected Android device.

UNIT-IV

User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes. **User Interface Design:** Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners(Combo boxes),Images, Menu, Dialog.

UNIT-V

Database: Understanding of SQLite database, connecting with the database.

Suggested Readings

1. James, C. Sheusi.(2013). Android application development for java for java programmers. New Delhi: Cengage Learning.

REFERENCES

1. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html
4. http://docs.oracle.com/javase/tutorial/index.htm(Available in the form of free downloadable ebooks also).
5. http://developer.android.com/guide/components/activities.html
6. http://developer.android.com/guide/components/fundamentals.html
7. http://developer.android.com/guide/components/intents-filters.html.
8. http://developer.android.com/training/multiscreen/screensizes.html
9. http://developer.android.com/guide/topics/ui/controls.html
10. http://developer.android.com/guide/topics/ui/declaring-layout.html
11. http://developer.android.com/training/basics/data-storage/databases.html

16CSU304B	**PROGRAMMING IN MATLAB**	**Semester – III** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the need for simulation/implementation for the verification of mathematical functions.
- To understand the main features of the MATLAB program development environment to enable their usage in the higher learning.
- To implement simple mathematical functions/equations in numerical computing environment such as MATLAB.
- To interpret and visualize simple mathematical functions and operations thereon using plots/display.
- To analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using MATLAB tools.
- To apply MATLAB tools for implementation/simulation and visualization of basic mathematical functions

Course Outcomes (COs)

On successful completion of the course, the students should be able to

1. Understand the need for simulation/implementation for the verification of mathematical functions.
2. Understand the main features of the MATLAB program development environment to enable their usage in the higher learning.
3. Implement simple mathematical functions/equations in numerical computing environment such as MATLAB.
4. Interpret and visualize simple mathematical functions and operations thereon using plots/display.
5. Analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using MATLAB tools.
6. Apply MATLAB tools for implementation/simulation and visualization of basic mathematical functions

UNIT-I

Introduction to Programming: Components of a computer, working with numbers, Machine code, Software hierarchy.

UNIT-II

Programming Environment: MATLAB Windows, A First Program, Expressions, Constants, Variables and assignment statement, Arrays.

UNIT-III

Graph Plots: Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save. Procedures and Functions: Arguments and return values, M-files, Formatted console input-output , String handling,

UNIT-IV

Control Statements: Conditional statements: If, Else, Else-if, Repetition statements: While, for loop

UNIT-V

Manipulating Text: Writing to a text file, Reading from a text file, Randomising and sorting a list, searching a list. **GUI Interface**: Attaching buttons to actions, Getting Input, Setting Output

Suggested Readings

1. Amos Gilat. MATLAB: An Introduction with Applications(2nd ed). New Delhi: Wiley.

2. Moler, C.B. (2004). Numerical Computing with MATLAB. New Delhi: SIAM.

16CSU311	**DATA STRUCTURES - PRACTICAL**	**Semester – III** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the fundamental concepts of data structures
- To Learn linear data structures – lists, stacks, and queues
- To apply Tree and Graph structures
- To understand and apply sorting, searching algorithms
- To know about hashing algorithms
- To develop application using data structures

Course Outcomes (COs)

Upon completion of this course, the student will be able to:

1. Implement abstract data types for linear data structures.
2. Apply the different linear and non-linear data structures to problem solutions.
3. Analyze the applications of tree.
4. Implement graph theory over various data structures.
5. Critically analyze the various sorting algorithms.
6. Apply searching algorithms over various data structures.

List of programs

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.
2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.
3. Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).
4. Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
5. Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
6. Perform Stack operations using Linked List implementation.
7. Perform Stack operations using Array implementation. Use Templates.
8. Perform Queues operations using Circular Array implementation. Use Templates.
9. Create and perform different operations on Double-ended Queues using Linked List implementation.
10. WAP to scan a polynomial using linked list and add two polynomial.
11. WAP to calculate factorial and to compute the factors of a given no. (i)using recursion, (ii) using iteration
12. (ii) WAP to display Fibonacci series (i)using recursion, (ii) using iteration
13. WAP to calculate GCD of 2 number (i) with recursion (ii) without recursion

14. WAP to create a Binary Search Tree and include following operations in tree: (a) Insertion (Recursive and Iterative Implementation)
(b) Deletion by copying
(c) Deletion by Merging
(d) Search a no. in BST
(e) Display its preorder, postorder and inorder traversals Recursively
(f) Display its preorder, postorder and inorder traversals Iteratively
(g) Display its level-by-level traversals
(h) Count the non-leaf nodes and leaf nodes
(i) Display height of tree
(j) Create a mirror image of tree
(k) Check whether two BSTs are equal or not
15. WAP to convert the Sparse Matrix into non-zero form and vice-versa.
16. WAP to reverse the order of the elements in the stack using additional stack.
17. WAP to reverse the order of the elements in the stack using additional Queue.
18. WAP to implement Diagonal Matrix using one-dimensional array.
19. WAP to implement Lower Triangular Matrix using one-dimensional array.
20. WAP to implement Upper Triangular Matrix using one-dimensional array.
21. WAP to implement Symmetric Matrix using one-dimensional array.
22. WAP to create a Threaded Binary Tree as per inorder traversal, and implement operations like finding the successor / predecessor of an element, insert an element, inorder traversal.
23. WAP to implement various operations on AVL Tree.

Semester – III

16CSU312 OPERATING SYSTEMS - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Study the basic concepts and functions of operating systems.
- To understand the structure and functions of OS.
- To Learn about Processes, Threads and Scheduling algorithms.
- To Understand the principles of concurrency, Deadlocks and Memory Management
- To Learn about the Protection and Security Concepts.
- To provide experience on MS Windows and LINUX environment.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Design various Scheduling algorithms.
2. Apply the principles of concurrency.
3. Design deadlock, prevention and avoidance algorithms.
4. Compare and contrast various memory management schemes.
5. Apply the Security Concepts based on Authentication.
6. Work in MS Windows and LINUX environment.

List of programs

1. Write a program (using *fork()* and/or *exec()* commands) where parent and child execute:
   a) same program, same code.
   b) same program, different code.
   c) before terminating, the parent waits for the child to finish its task.
2. Write a program to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)
3. Write a program to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)
4. Write a program to print file details including owner access permissions, file access time, where file name is given as argument.
5. Write a program to copy files using system calls.
6. Write program to implement FCFS scheduling algorithm.
7. Write program to implement Round Robin scheduling algorithm.
8. Write program to implement SJF scheduling algorithm.
9. Write program to implement non-preemptive priority based scheduling algorithm.
10. Write program to implement preemptive priority based scheduling algorithm.
11. Write program to implement SRJF scheduling algorithm.
12. Write program to calculate sum of n numbers using *thread* library.
13. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

16CSU313	COMPUTER NETWORKS - PRACTICAL	Semester – III 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To master the fundamentals of data communications networks by gaining a working knowledge of data transmission concepts.
- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To read the fundamentals and basics concepts of Physical layer with real time examples
- To study data link layer concepts, design issues, and protocols.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer and Application layer.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Understand the functions of each layer in OSI and TCP/IP model.
2. Explain the multiplexing, switching concept and types of transmission media with real time examples.
3. Understand the error detection and correction methods and can implement the data link layer protocols
4. Understand channel error detection and correction, MAC protocols, Ethernet and WLAN.
5. Learn different medium access method to avoid collision and to learn about routing table.
6. Learn basic functionalities of transport layer and application layer.

List of Programs

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

Semester – III

16CSU314A ANDROID PROGRAMMING - PRACTICAL **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To compare the differences between Android and other mobile development environments.
- To learn the Object-oriented features of Kotlin and APIs for Android Development.
- To describe the working of Android applications, life cycle, manifest, and Intents
- To demonstrate the implementation of Form widgets for Android App development.
- To learn the SQLite database connectivity and database operations with android
- To design, create, deploy, and test applications for the Android mobile phone platform.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Design and develop useful Android applications with compelling user interfaces by using, extending, and creating your own layouts and Views and using Menus.
2. Analyze the Architecture and features of Android with another Mobile Operating System.
3. Evaluate the standard of Kotlin language for developing Android Applications
4. Apply knowledge for creating user Interface and develop activity for Android App.
5. Evaluate the user interface architecture of Android for developing Android Apps
6. Understand the implementation of SQLite database operations with Android.

List of Programs

1. Create ―Hello World‖ application. That will display ―Hello World‖ in the middle of the screen in the emulator. Also display ―Hello World in the middle of the screen in the Android Phone.
2. Create an application with login module. (Check username and password).
3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.
4. Create a menu with 5 options and and selected option should appear in text box.
5. Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen.
6. Create an application with three option buttons, on selecting a button colour of the screen will change.
7. Create and Login application as above. On successful login, pop up the message.
8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.

Semester – III

16CSU314B PROGRAMMING IN MATLAB - PRACTICAL **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the need for simulation/implementation for the verification of mathematical functions.
- To understand the main features of the MATLAB program development environment to enable their usage in the higher learning.
- To implement simple mathematical functions/equations in numerical computing environment such as MATLAB.
- To interpret and visualize simple mathematical functions and operations thereon using plots/display.
- To analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using MATLAB tools.
- To apply MATLAB tools for implementation/simulation and visualization of basic mathematical functions

Course Outcomes (COs)

On successful completion of the course, the students should be able to

1. Understand the need for simulation/implementation for the verification of mathematical functions.
2. Understand the main features of the MATLAB program development environment to enable their usage in the higher learning.
3. Implement simple mathematical functions/equations in numerical computing environment such as MATLAB.
4. Interpret and visualize simple mathematical functions and operations thereon using plots/display.
5. Analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using MATLAB tools.
6. Apply MATLAB tools for implementation/simulation and visualization of basic mathematical functions

List of programs

1. Write a program to assign the following expressions to a variable A and then to print out the value of A.

a. (3+4)/(5+6)

b. $2\Pi^2$

c. √2

d. (0.0000123 + 5.67×10-3) × 0.4567×10-4

2. Celsius temperatures can be converted to Fahrenheit by multiplying by 9, dividing by 5, and adding 32. Assign a variable called C the value 37, and implement this formula to assign a variable F the Fahrenheit equivalent of 37 Celsius.

3. Set up a vector called N with five elements having the values: 1, 2, 3, 4, 5. Using N, create assignment statements for a vector X which will result in X having these values:
a. 2, 4, 6, 8, 10
b. 1/2, 1, 3/2, 2, 5/2
c. 1, 1/2, 1/3, 1/4, 1/5
d. 1, 1/4, 1/9, 1/16, 1/25

4. A supermarket conveyor belt holds an array of groceries. The price of each product (in pounds) is [0.6, 1.2 ,0.5, 1.3] ; while the numbers of each product are [3, 2 ,1 ,5]. Use MATLAB to calculate the total bill.

5. The sortrows(x) function will sort a vector or matrix X into increasing row order. Use this function to sort a list of names into alphabetical order.

6. The ―identity‖ matrix is a square matrix that has ones on the diagonal and zeros elsewhere. You can generate one with the eye() function in MATLAB. Use MATLAB to find a matrix B, such that when multiplied by matrix A=[1 2; -1 0] the identity matrix I=[1 0; 0 1] is generated. That is A*B=I.

7. Create an array of N numbers. Now find a single MATLAB statement that picks out from that array the 1,4,9,16,…,√Nth entries, i.e. those numbers which have indices that are square numbers.

8. Draw a graph that joins the points (0,1), (4,3), (2,0) and (5,-2).

9. The seeds on a sunflower are distributed according to the formula below. Plot a small circle at each of the first 1000 co-ordinates :

$$r_n = \sqrt{n}$$

$$\theta_n = \frac{137.51}{180}\pi n$$

10. Calculate 10 approximate points from the function y=2x by using the formulae:
   i. xn = n
   ii. yn = 2n + rand - 0.5

Fit a line of best fit to these points using the function polyfit() with degree=1, and generate co-ordinates from the line of best fit using polyval(). Use the on-line help to find out how to use these functions. Plot the raw data and the line of best fit.

11. Calculate and replay 1 second of a sinewave at 500Hz with a sampling rate of 11025Hz. Save the sound to a file called ex35.wav. Plot the first 100 samples.

12. Calculate and replay a 2 second chirp. That is, a sinusoid that steadily increases in frequency with time, from say 250Hz at the start to 1000Hz at the end.

13. Build a square wave by adding together 10 odd harmonics: 1f, 3f, 5f, etc. The amplitude of the nth harmonic should be 1/n. Display a graph of one cycle of the result superimposed on the individual harmonics.

14. Write a function called FtoC (ftoc.m) to convert Fahrenheit temperatures into Celsius. Make sure the program has a title comment and a help page. Test from the command window with:
i. FtoC(96)
ii. lookfor Fahrenheit
iii. help FtoC

15. Write a program to input 2 strings from the user and to print out (i) the concatenation of the two strings with a space between them, (ii) a line of asterisks the same length as the concatenated strings, and (iii) the reversed concatenation. For example:
i. Enter string 1: Mark
ii. Enter string 2: Huckvale
iii. Mark Huckvale
iv. *************
v. elavkcuH kraM

16CSU401	**DESIGN AND ANALYSIS OF ALGORITHMS**	**Semester – IV** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To learn mathematical background for analysis of algorithm
- To learn various advanced data structures.
- To understand the concept of designing an algorithm.
- To learn dynamic programming and greedy method.
- To understand the concept of pattern matching
- To learn advanced tree and graph applications

Course Outcomes(COs)

1. Learn to choose appropriate advanced data structure for given problem
2. Knowledge to calculate complexity.
3. Select appropriate design techniques to solve real world problems.
4. Apply the dynamic programming technique to solve the problems.
5. Apply the greedy programming technique to solve the problems.
6. Select a proper pattern matching algorithm for given problem

UNIT-I

Introduction: Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm.

Algorithm Design Techniques: Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.

UNIT-II

Sorting and Searching Techniques: Elementary sorting techniques–Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques - Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Searching Techniques, Medians & Order Statistics, complexity analysis;

UNIT-III

Lower Bounding Techniques: Decision Trees **Balanced Trees:** Red-Black Trees

UNIT-IV

Advanced Analysis Technique: Amortized analysis **Graphs:** Graph Algorithms–Breadth First Search, Depth First Search and its Applications, Minimum Spanning Trees.

UNIT-V

String Processing: String Matching, KMP Technique.

Suggested Readings

1. Cormen, T.H., Charles, E. Leiserson., Ronald, L. Rivest. (2009). Clifford Stein Introduction to Algorithms(3rd ed.). New Delhi: PHI.
2. Sarabasse., Gelder, A.V. (1999). Computer Algorithm – Introduction to Design and Analysis (3rd ed.). New Delhi: Pearson

16CSU402	SOFTWARE ENGINEERING	Semester – IV 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Apply their knowledge of mathematics, sciences, and computer science to the modeling, analysis, and measurement of software artifacts.
- To Work effectively as leader/member of a development team to deliver quality software artifacts.
- To Analyze, specify and document software requirements for a software system.
- To Implement a given software design using sound development practices.
- To Verify, validate, assess and assure the quality of software artifacts.
- To Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its COst and time.

Course Outcomes(COs)

1. Identify suitable life cycle models to be used and translate a requirement specification to a design using an appropriate software engineering methodology.
2. Apply systematic procedure for software design and deployment.
3. Analyze a problem and identify and define the computing requirements to the problem.
4. Formulate appropriate testing strategy for the given software system.
5. Develop software projects based on current technology, and test the software using testing tools.
6. Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its COst and time.

UNIT-I

Introduction: The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

UNIT-II:

Requirement Analysis; Initiating Requirement EngineeringProcess- Requirement Analysis and Modeling Techniques- FlowOriented Modeling- Need for SRS- Characteristics and Components of SRS- Software Project Management: Estimation in Project Planning Process, Project Scheduling.

UNIT-III:

Risk Management: Software Risks, Risk Identification Risk Projection and Risk Refinement, RMMM plan, **Quality Management-** Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects

UNIT-IV:

Design Engineering-Design Concepts, Architectural Design Elements, Software Architecture,Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design

UNIT-V

Testing Strategies & Tactics: Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing Black-Box Testing, White-Box Testing and their type, Basis Path Testing

Suggested Readings

1. Pressman, R.S. (2009). Software Engineering: A Practitioner's Approach (7th ed.). New Delhi: McGraw-Hill.
2. Jalote, P. An Integrated Approach to Software Engineering (2nd ed.). New Delhi: New Age International Publishers.
3. Aggarwal, K.K., & Singh, Y. (2008). Software Engineering (2nd ed.). New Delhi: New Age International Publishers.
4. Sommerville, I. (2006). Software Engineering (8th ed.). New Delhi: Addison Wesley.
5. Bell, D. (2005). Software Engineering for Students (4th ed.) New Delhi: Addison-Wesley.
6. Mall, R. (2004). Fundamentals of Software Engineering (2nd ed.). New Delhi: Prentice-Hall of India.

WEB SITES

1. http://en.wikipedia.org/wiki/Software_engineering
2. http://www.onesmartclick.com/engineering/software-engineering.html
3. http://www.CSU.gatech.edu/classes/AY2000/cs3802_fall/

Semester – IV

16CSU403 DATA BASE MANAGEMENT SYSTEMS **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To describe a good introduction to the discipline of database management systems.
- To give a good formal foundation on the data models and E-R model.
- To demonstrate the principles database constraints behind systematic database design by covering normalization concept.
- To introduce the concepts of basic SQL as a universal Database language.
- To retrieve any type of information from a data base by formulating complex queries in SQL.
- To analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.

Course Outcomes (COs)

Upon completion of this course, students will be able to:

1. Demonstrate an understanding of the elementary features of RDBMS
2. Design conceptual models of a database using ER modeling for real life applications
3. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database
4. Able to develop structured query language (SQL) queries to create, read, update, and delete relational database
5. Retrieve any type of information from a data base by formulating complex queries in SQL.
6. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.

UNIT-I

Introduction: Characteristics of database approach, data models, database system architecture and data independence. **Entity Relationship(ER) Modeling:** Entity types, relationships, constraints.

UNIT-II

Relation data model: Relational model concepts, relational constraints, relational algebra.

UNIT-III

Relation data model: SQLqueries **Database design:** Mapping ER/EER model to relational database, functional dependencies, Lossless decomposition.

UNIT-IV

Database design: Normal forms (upto BCNF).**Transaction Processing :** ACID properties, concurrency control

UNIT-V

File Structure and Indexing (8 Lectures) Operations on files, File of Unordered and ordered records, overview of File organizations, Indexing structures for files(Primary index, secondary index, clustering index), Multilevel indexing using B and B+ trees.

References:

1. Elmasri, R., & Navathe, S.B. (2010). Fundamentals of Database Systems (6th ed.). New Delhi: Pearson Education,.

2. Ramakrishanan, R., & Gehrke, J. (2002). Database Management Systems (3rd ed.). New Delhi: McGraw-Hill.

3. Silberschatz, A., Korth, H.F., & Sudarshan, S. (2010).Database System Concepts (6th ed.). New Delhi: McGraw-Hill

4. Elmasri, R., & Navathe, S.B. (2013). Database Systems Models, Languages, Design and application Programming (6th ed.). New Delhi: Pearson Education.

WEB SITES

1. http://en.wikipedia.org/wiki/RDBMS
2. http://aspalliance.com/1211_Relational_Database_Management_Systems__Concepts_and_Terminologies
3. www.compinfo-center.com/apps/rdbms.html

16CSU404A	**HTML PROGRAMMING**	**Semester – IV** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Understand the fundamentals of HTML and use different formatting options
- To Create tables and frames
- To insert a graphic and links within a web page.
- To insert ordered and unordered lists within a web page.
- To use cascading style sheets.
- To validate and publish a web page.

Course Outcomes (COs)

1. Understand the fundamentals of HTML and use different formatting options
2. Create tables and frames
3. Insert a graphic and links within a web page.
4. Insert ordered and unordered lists within a web page.
5. Use cascading style sheets.
6. Validate and publish a web page.

Unit-I:
Introduction The Basics: The Head, the Body, Colors, Attributes, Lists, ordered and unordered

Unit-II
Links Introduction: Relative Links, Absolute Links ,Link Attributes ,Using the ID Attribute to Link Within a Document

Unit-III:
Images: Putting an Image on a Page ,Using Images as Links, Putting an Image in the Background

Unit IV:
Tables: Creating a Table, Table Headers, Captions, Spanning Multiple Columns ,Styling Table

Unit V :
Forms : Basic Input and Attributes ,Other Kinds of Inputs ,Styling forms with CSS ,Where To Go From Here

Suggested Readings

1. Virginia DeBolt. (2006). Integrated HTML and CSS A Smarter, Faster Way to Learn New Delhi: Wiley / Sybex.

2. Cassidy Williams., & Camryn Williams. (2015). Introduction to **HTML** and CSS, O'Reilly.

WEB SITES

1. www.w3schools.com/
2. alexle.net/archives/category/web-technolgy
3. jmarshall.com/easy/
4. www.php.net/
5. en.wikipedia.org/wiki/PHP
6. www.w3schools.com/PHP/DEfaULT.asP

16CSU404B	XML PROGRAMMING	Semester – IV 3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objective

- To learn rules and techniques to create well-formed XML documents, learning to use XML namespaces correctly.
- To Construct Document Type Definitions and XML Schema documents that can be used to validate XML documents (structure, content).
- To develop dynamic web pages using XSL, applying XSLT transformations and formatting to XML documents (XSL, XPath).
- To create valid HTML webpages and Cascading Style Sheets, based on the specifications of W3C.
- To learn to display XML documents using CSS.
- To construct of complex queries over XML documents using XPath and XQuery.

Course Outcomes(COs)

1. Learning rules and techniques to create well-formed XML documents, learning to use XML namespaces correctly.
2. Constructing Document Type Definitions and XML Schema documents that can be used to validate XML documents (structure, content).
3. Developing dynamic web pages using XSL, applying XSLT transformations and formatting to XML documents (XSL, XPath).
4. Creating valid HTML webpages and Cascading Style Sheets, based on the specifications of W3C.
5. Learning to display XML documents using CSS.
6. Construction of complex queries over XML documents using XPath and XQuery.

UNIT-I

Introduction: Understanding Mark-up Languages, Introduction to XML and its Goals.

UNIT-II

XML Basics: XML Structure and Syntax, Document classes and Rules.

UNIT-III

Other XML Concepts: Scripting XML

UNIT-IV

Other XML Concepts: XML as Data, Linking with XML

UNIT-V

XML with Style: XSL –Style Sheet Basics, XSL basics, XSL style sheets.

Suggested Readings

1. William, J. Pardi. XML in action web technology.
2. Michael, J. Young. Step by Step XML.

Semester – IV
4H – 2C

16CSU411 DESIGN AND ANALYSIS OF ALGORITHMS - PRACTICAL

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To learn mathematical background for analysis of algorithm
- To learn various advanced data structures.
- To understand the concept of designing an algorithm.
- To learn dynamic programming and greedy method.
- To understand the concept of pattern matching
- To learn advanced tree and graph applications

Course Outcomes(COs)

1. Learn to choose appropriate advanced data structure for given problem
2. Knowledge to calculate complexity.
3. Select appropriate design techniques to solve real world problems.
4. Apply the dynamic programming technique to solve the problems.
5. Apply the greedy programming technique to solve the problems.
6. Select a proper pattern matching algorithm for given problem

List of Programs

1. Implement Insertion Sort (The program should report the number of comparisons) ii. Implement Merge Sort(The program should report the number of comparisons)
2. Implement Heap Sort(The program should report the number of comparisons)
3. Implement Randomized Quick sort (The program should report the number of comparisons)
4. Implement Radix Sort
5. Create a Red-Black Tree and perform following operations on it: i. Insert a node
ii. Delete a node
iii. Search for a number & also report the color of the node containing this number.
6. Write a program to determine the LCS of two given sequences
7. Implement Breadth-First Search in a graph
8. Implement Depth-First Search in a graph
9. Write a program to determine the minimum spanning tree of a graph

For the algorithms at S.No 1 to 3 test run the algorithm on 100 different inputs of sizes varying from 30 to 1000. Count the number of comparisons and draw the graph. Compare it with a graph of nlogn.

16CSU412	**SOFTWARE ENGINEERING - PRACTICAL**	**Semester – IV** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Apply their knowledge of mathematics, sciences, and computer science to the modeling, analysis, and measurement of software artifacts.
- To Work effectively as leader/member of a development team to deliver quality software artifacts.
- To Analyze, specify and document software requirements for a software system.
- To Implement a given software design using sound development practices.
- To Verify, validate, assess and assure the quality of software artifacts.
- To Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its COst and time.

Course Outcomes(COs)

1. Identify suitable life cycle models to be used and translate a requirement specification to a design using an appropriate software engineering methodology.
2. Apply systematic procedure for software design and deployment.
3. Analyze a problem and identify and define the computing requirements to the problem.
4. Formulate appropriate testing strategy for the given software system.
5. Develop software projects based on current technology, and test the software using testing tools.
6. Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its COst and time.

S. No	Practical Title
1.	• Problem Statement • Process Model
2.	Requirement Analysis: • Creating a Data Flow • Data Dictionary, Use Cases
3.	Project Management: • Computing FP • Effort • Schedule, Risk Table, Timeline chart
4.	Design Engineering: • Architectural Design • Data Design, Component Level Design
5.	Testing: • Basis Path Testing

Sample Projects:

1. **Criminal Record Management**: Implement a criminal record management system for jailers, police officers and CBI officers
2. **DTC Route Information**: Online information about the bus routes and their frequency and fares
3. **Car Pooling**: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.
4. Patient Appointment and Prescription Management System
5. Organized Retail Shopping Management Software
6. Online Hotel Reservation Service System
7. Examination and Result computation system
8. Automatic Internal Assessment System
9. Parking Allocation System
10. Wholesale Management System

Semester – IV

16CSU413 DATA BASE MANAGEMENT SYSTEMS - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To describe a good introduction to the discipline of database management systems.
- To give a good formal foundation on the data models and E-R model.
- To demonstrate the principles database constraints behind systematic database design by covering normalization concept.
- To introduce the concepts of basic SQL as a universal Database language.
- To retrieve any type of information from a data base by formulating complex queries in SQL.
- To analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.

Course Outcomes (COs)

Upon completion of this course, students will be able to:

1. Demonstrate an understanding of the elementary features of RDBMS
2. Design conceptual models of a database using ER modeling for real life applications
3. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database
4. Able to develop structured query language (SQL) queries to create, read, update, and delete relational database
5. Retrieve any type of information from a data base by formulating complex queries in SQL.
6. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.

1.Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

Field	Type	NULL	KEY	DEFAULT
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
Job_type	Varchar(50)	NO		NIL
Manager	Char(3)	Yes	FK	NIL
Hire_date	Date	NO		NIL
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES		NIL
Salary	Decimal(7,2)	NO		NIL

DEPARTMENT Schema

Field	Type	NULL	KEY	DEFAULT
Dno	Integer	No	PRI	NULL
Dname	Varchar(50)	Yes		NULL
Location	Varchar(50)	Yes		New Delhi

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than $2850.
6. Query to display Employee Name and Department Number for the Employee No= 7900.
7. Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.
8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9. Query to display Name and Hire Date of every Employee who was hired in 1981.
10. Query to display Name and Job of all employees who don‘t have a current Manager.
11. Query to display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Query to display Name of all the employees where the third letter of their name is _A‘.
14. Query to display Name of all employees either have two _R‘s or have two _A‘s in their name and are either in Dept No = 30 or their Manger‘s Employee No = 7788.
15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Query to display the Current Date.
17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
18. Query to display Name and calculate the number of months between today and the date each employee was hired.
19. Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.
20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with _J‘, ‘A‘ and _M‘.
21. Query to display Name, Hire Date and Day of the week on which the employee started.
22. Query to display Name, Department Name and Department No for all the employees.
23. Query to display Unique Listing of all Jobs that are in Department # 30.
24. Query to display Name, Dept Name of all employees who have an _A‘ in their name.

25. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.
26. Query to display Name and Employee no. Along with their Manger‘s Name and the Manager‘s employee no; along with the Employees‘ Name who do not have a Manager.
27. Query to display Name, Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.
28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.
29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees
30. Query to display the number of employees performing the same Job type functions.
31. Query to display the no. of managers without listing their names.
32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
33. Query to display Name and Hire Date for all employees in the same dept. as Blake.
34. Query to display the Employee No. And Name for all employees who earn more than the average salary.
35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a ‗T‘.
36. Query to display the names and salaries of all employees who report to King.
37. Query to display the department no, name and job for all employees in the Sales department.

16CSU414A HTML PROGRAMMING - PRACTICAL **Semester – IV**
3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Understand the fundamentals of HTML and use different formatting options
- To Create tables and frames
- To insert a graphic and links within a web page.
- To insert ordered and unordered lists within a web page.
- To use cascading style sheets.
- To validate and publish a web page.

Course Outcomes (COs)

1. Understand the fundamentals of HTML and use different formatting options
2. Create tables and frames
3. Insert a graphic and links within a web page.
4. Insert ordered and unordered lists within a web page.
5. Use cascading style sheets.
6. Validate and publish a web page.

List of Programs

1. Create an HTML document with the following formatting options:
I. Bold
II. Italics
III.Underline
IV. Headings (Using H1 to H6 heading styles)
V. Font (Type, Size and Color)
VI. Background (Colored background/Image in background)
VII. Paragraph
VIII. Line Break
IX. Horizontal Rule
X. Pre tag

2. Create an HTML document which consists of:
I. Ordered List
II. Unordered List
III. Nested List
IV. Image

3 Create an HTML document which implements Internal linking as well as External linking.

4 Create a table using HTML which consists of columns for Roll No., Student‘s name and grade.

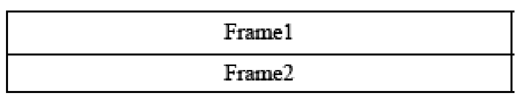
Result		
Roll No.	Name	Grade

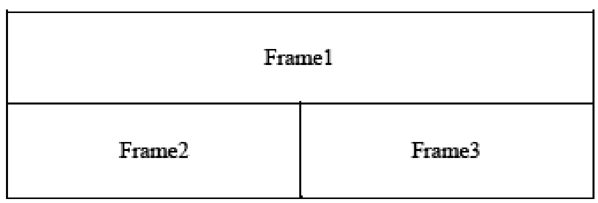
5 Create a Table with the following view:

6 Create a form using HTML which has the following types of controls:

I. Text Box
II. Option/radio buttons
III. Check boxes
IV. Reset and Submit buttons

Q.7 Create HTML documents (having multiple frames) in the following three formats:





Semester – IV

16CSU414B XML PROGRAMMING - PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objective

- To learn rules and techniques to create well-formed XML documents, learning to use XML namespaces correctly.
- To Construct Document Type Definitions and XML Schema documents that can be used to validate XML documents (structure, content).
- To develop dynamic web pages using XSL, applying XSLT transformations and formatting to XML documents (XSL, XPath).
- To create valid HTML webpages and Cascading Style Sheets, based on the specifications of W3C.
- To learn to display XML documents using CSS.
- To construct of complex queries over XML documents using XPath and XQuery.

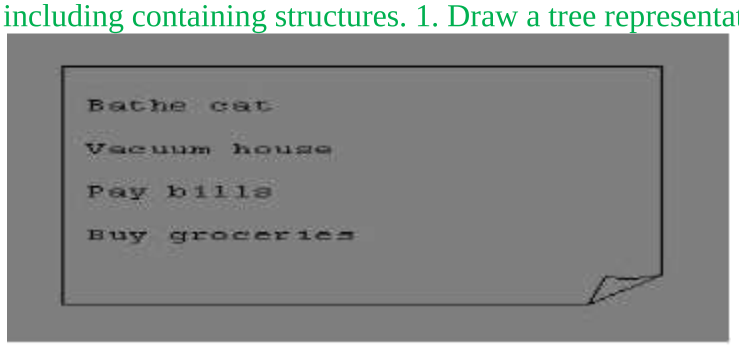
Course Outcomes(COs)

1. Learning rules and techniques to create well-formed XML documents, learning to use XML namespaces correctly.
2. Constructing Document Type Definitions and XML Schema documents that can be used to validate XML documents (structure, content).
3. Developing dynamic web pages using XSL, applying XSLT transformations and formatting to XML documents (XSL, XPath).
4. Creating valid HTML webpages and Cascading Style Sheets, based on the specifications of W3C.
5. Learning to display XML documents using CSS.
6. Construction of complex queries over XML documents using XPath and XQuery.

List of Programs

Exercise #1 – Information Structure

In this exercise, student will practice identifying the structure of an information object. For the sample document provided below: Label the information structures you see, including containing structures. 1. Draw a tree representation of the structure.



Exercise 2# Deconstructing an XML Document

In this exercise, student will practice identifying the explicit structure within an XML document. In a sense, this is the reverse of what you did in Exercise #1. For the sample

XML markup below, create a document-like representation (or a simple drawing) for the content contained within the XML tags:
<book>
<coverInfo>
<title>The XML Handbook</title>
<author>Charles F. Goldfarb</author>
<author>Paul Prescod</author>
<edition>Second</edition>
<description>The definitive XML resource: applications, products, and technologies. Revised and expanded—over 600 new pages. </description>
</coverInfo> </book>

Exercise #3 – Creating XML Markup
In this exercise, create some XML markup based on the tree representation from Exercise #1 above, and the content from the original sample document.

Exercise #4 – Well-Formedness
This exercise checks your understanding of the constraints for well-formedness. Are the following document instances well-formed? Explain any NO answers.
<list><title>The first list</title><item>An item</list>
<item>An item</item><item>Another item</item>
<para>Bathing a cat is a <emph>relatively</emph> easy task as long as the cat is willing.</para>
<bibl><title>How to Bathe a Cat<author></title>Merlin Bauer<author></bibl>

Exercise #5-Well Formedness
This exercise is a bit more challenging than the previous example. Here is a fragment of an XML document instance. Identify all the places where it fails to match the constraints for well-formedness.
<PROCEDURE><TITLEHow to Bathe a Cat</TITLE>
<OVERVIEW> This procedure tells you how to bathe a cat.
<WARNING></OVERVIEW>Cats don't like to take baths. You could get hurt doing this. Be sure to obtain all the required protective gear before you start.
</WARNING><EQUIPEMENT><ITEM>Hockey Mask <ITEM>Padded Full-body Kevlar Armor</ITEM><ITEM>Tub full of warm water</ITEM><ITEM>Towels </ITEM><ITEM>First Aid kit</ITEM><ITEM>Cat Shampoo</ITEM>
<EQUIPMENT><INSTRUCTIONS> <STEP> Locate the cat, who by now is hiding under the bed.</STEP><STEP>Place the cat in the tub of water.</STEP> <ITEM>Using the First Aid kit, repair the damage to your head and arms.</STEP> <STEP>Place the cat back in the tub and hold it down.</STEP> <STEP>Wash it really fast, then make an effort to dry it with the towels.</STEP> <STEP>Decide not to do this again. </STEP>
</INSTRUCTIONS>

Semester – V

16CSU501A **INFORMATION SECURITY** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To provides an overview of Information Security and Assurance.
- To provide an exposure to the spectrum of security activities methods methodologies and procedures with emphasis on practical aspects of Information Security.
- To explain concepts related to applied cryptography including the techniques for crypto-analysis symmetric and asymmetric cryptography.
- To understand the concepts of digital signature, message authentication code, hash functions and modes of encryption operations.
- To explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
- To understand the concepts of cryptographic utilities and authentication mechanisms to design secure applications

Course Outcomes(COs)

A student who successfully completes this course should at a minimum be able to:

1. Explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
2. State the basic concepts in information security
3. Explain concepts related to applied cryptography including the techniques for crypto-analysis symmetric and asymmetric cryptography.
4. Use digital signature, message authentication code, hash functions and modes of encryption operations.
5. Explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
6. Understand the concepts of cryptographic utilities and authentication mechanisms to design secure applications

Unit I

Introduction : Security, Attacks, Computer Criminals, Security Services, Security Mechanisms.

Cryptography : Substitution ciphers, Transpositions Cipher, Confusion, diffusion.

Unit – II

Symmetric, Asymmetric Encryption. DES Modes of DES, Uses of Encryption, Hash function, key exchange, Digital Signatures, Digital Certificates

Unit – III

Program Security: Secure programs, Non malicious Program errors, Malicious codes virus, Trap doors, Salami attacks, Covert channels, Control against program. **Threats:**

Protection in OS: Memory and Address Protection, ACSUess control, File Protection, User Authentication**.**

Unit – IV

Database Security: Requirements, Reliability, Integrity, Sensitive data, Inference, Multilevel Security**. Security in Networks :** Threats in Networks, Security Controls, firewalls, Intrusion detection systems, Secure e-mails

Unit V

Administrating Security

Security Planning, Risk Analysis, Organisational Security Policy, Physical Security. Ethical issues in Security: Protecting Programs and data. Information and law.

Suggested Readings

1. Pfleeger, C. P., & Pfleeger, S. L.(2006). Security in Computing. New Delhi: Prentice Hall of India
2. Stallings, W. (2010). Network Security Essentials: Applications and Standards(4th ed.).

Semester – IV

16CSU501B **NETWORK PROGRAMMING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To describe the fundamental concepts of networks
- To demonstrate mastery of main protocols comprising the Internet.
- To develop skills in network programming techniques.
- To implement network services that communicate through the Internet.
- To apply the client - server model in networking applications.
- To practice networking commands available through the operating systems

Course Outcomes(COs)

Having successfully completed this course, the student will be able to:

1. Understand the fundamental concepts of networks
2. Demonstrate mastery of main protocols comprising the Internet.
3. Develop skills in network programming techniques.
4. Implement network services that communicate through the Internet.
5. Apply the client - server model in networking applications.
6. Practice networking commands available through the operating systems

UNIT-I

Transport Layer Protocols: TCP, UDP, SCTP protocol.

UNIT-II

Socket Programming: Socket Introduction; TCP Sockets; TCP Client/Server Example ; signal handling

UNIT-III

I/O multiplexing using sockets; Socket Options; UDP Sockets; UDP client server example; Address lookup using sockets.

UNIT-IV

Network Applications: Remote logging; Email; WWW and HTTP.

UNIT-V

LAN administration: Linux and TCP/IP networking: Network Management and Debugging.

Suggested Readings

1. Richard Stevens, W., Bill Fenner., & Andrew, M. Rudoff. (2003). Unix Network Programming, The sockets Networking API, Vol. 1(3rd ed.). New Delhi: PHI.

2. Forouzan, B. A. (2003). Data Communications and Networking(4th ed.). New Delhi: THM Publishing Company Ltd.,
3. Nemeth Synder., & Hein. (2010). Linux Administration Handbook (2nd ed.), New Delhi: Pearson Education.
4. Steven, R. (1990). Unix Network Programming (2nd ed.). New Delhi: PHI.

Semester – V

16CSU502A **MICROPROCESSOR** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To apply the fundamentals of assembly level programming of microprocessors.
- To build a program on a microprocessor using arithmetic & logical instruction set of 8086.
- To develop the assembly level programming using 8086 loop instruction set.
- To write programs based on string and procedure for 8086 microprocessor.
- To analyze abstract problems and apply a combination of hardware and software to address the problem
- To make use of standard test and measurement equipment to evaluate digital interfaces

Course Outcomes(COs)

1. Apply the fundamentals of assembly level programming of microprocessors.
2. Build a program on a microprocessor using arithmetic & logical instruction set of 8086.
3. Develop the assembly level programming using 8086 loop instruction set.
4. Write programs based on string and procedure for 8086 microprocessor.
5. Analyze abstract problems and apply a combination of hardware and software to address the problem
6. Make use of standard test and measurement equipment to evaluate digital interfaces

Unit – I- Introduction to Microprocessor

Introduction to 8085 – Pin Diagram – Microprocessor architecture and its operations– Demultiplexing the Bus – Generation of Control Signals – Fetching, Decoding and Execution of Instruction – Instruction Timing and Status Flag.

Unit – II – Addressing Modes

Instruction Set – Addressing Modes – Instruction Format – Simple Program – Memory and Machine Cycle – Memory Units Machine Cycle.

Unit – III – Interfacing Concepts

Peripheral I/O Instructions – Device Selection and Data Transfer – Types of Data Transfer – Input Interfacing – Input Interfacing using Decoders – Output Interfacing – LED and 7 Segment Display – Interfacing Memory.

Unit – IV - Peripheral Devices

Introduction to Programmable Peripheral Interface 8255 – Pin Diagram – Architecture – Modes of Operation: I/O and BSR – Architecture and Operation of 8251 (USART) – Architecture and Operation of Programmable Interrupt Controller (8259) – Architecture of 254(8253) Programmable Interval Timer/ Counter – DMA Controller(8259).

Unit – V - Applications

Delay Program – Traffic Light Control System – Water Level Controller – Stepper Motor Control – Interfacing DAC – Interfacing ADC – Temperature Measurement.

Suggested Readings:

1. Barry, B. Brey. (2009).The Intel Microprocessors: Architecture, Programming and Interfacing (6th ed.). New Delhi: Pearson Education,

2..Gupta, M.K. (2006). Microprocessor Microcomputer, Microcontroller and Interfacing (First ed.). New Delhi: Paragon International Publisher.

3. Walter, A Triebel., & Avtar Singh.(2005). The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware, and Applications (4th ed.). New Delhi: PHI.

4. Ramesh, S.Gaonkar. (2000). Microprocessor Architecture, Programming and Application with 8085(4th ed.). New Delhi: Penram International Publishing.

Semester – V

16CSU502B **DIGITAL IMAGE PROCESSING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the fundamental concepts of a digital image processing system.
- To understand concepts of image enhancement techniques.
- To apply various Image Transforms.
- To analyze various Compression techniques and Morphological concepts
- To know various segmentation techniques, and object descriptors.
- To apply color models and various applications of image processing

Course Outcomes (COs)

1. Remember the fundamental concepts of image processing.
2. Explain different Image enhancement techniques
3. Understand and review image transforms
4. Analyze the basic algorithms used for image processing &image compression with morphological image processing.
5. Contrast Image Segmentation and Representation
6. Design & Synthesize Color image processing and its real world applications

UNIT-I

Introduction: Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization. Spatial Domain Filtering: Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian.

UNIT-II

Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete COsine Transform, Frequency domain filtering.

UNIT-III:

Image Restoration, Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections, Image Compression-Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, DCT implementation using FFT, Run length coding.

UNIT – IV

FAX compression (CSUITT Group-3 and Group-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG, Lossless predictive coding, Lossy predictive coding, Motion Compensation

Wavelet based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT),Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking

UNIT-V

Morphological Image Processing: Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons,pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion. Image Segmentation: Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding,Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation

Suggested Readings

1. Gonzalez, R. C., & Woods, R. E. (2008). Digital Image Processing(3rd ed.). New Delhi: Pearson Education.
2. Jain, A. K. (1989). Fundamentals of Digital image Processing. New Delhi: Prentice Hall of India.
3. Castleman, K. R. (1996). Digital Image Processing. New Delhi: Pearson Education.
4. Schalkoff. (1989). Digital Image Processing and Computer Vision. New York: John Wiley and Sons.
5. Rafael, C. Gonzalez., Richard, E. Woods.,& Steven Eddins. (2004). Digital Image Processing using MATLAB. New Delhi: Pearson Education.

Semester – V

16CSU503A **MACHINE LEARNING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To introduce students to the basic concepts and techniques of Machine Learning.
- To develop skills of using recent machine learning software for solving practical problems.
- To gain experience of doing independent study and research**.**
- To recognize the characteristics of machine learning that make it useful to real-world problems.
- To characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
- To effectively use machine learning toolboxes.

Course Outcomes(COs)
On successful completion of the course the student should be

1. Remember the basic concepts and techniques of Machine Learning.
2. Develop skills of using recent machine learning software for solving practical problems.
3. of doing independent study and research**.**
4. To recognize the characteristics of machine learning that make it useful to real-world problems.
5. To characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
6. To effectively use machine learning toolboxes.

UNIT-I
Introduction: Concept of Machine Learning, Applications of Machine Learning, Key elements of Machine Learning, Supervised vs. Unsupervised Learning, Statistical Learning: Bayesian Method, The Naive Bayes Classifier

UNIT-II

Softwares for Machine Learning and Linear Algebra Overview : Plotting of Data, Vectorization, Matrices and Vectors: Addition, Multiplication, Transpose and Inverse using available tool such as MATLAB.

UNIT-III
Linear Regression: Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, Linear Regression with multiple variables, Polynomial Regression, Feature Scaling/Selection.

Logistic Regression: Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables.

UNIT-IV

Regularization: Regularization and its utility: The problem of Overfitting, Application of Regularization in Linear and Logistic Regression, Regularization and Bias/Variance.

UNIT-V

Neural Networks: Introduction, Model Representation, Gradient Descent vs. Perceptron Training, Stochastic Gradient Descent, Multilayer Perceptrons, Multiclass Representation, Backpropagation Algorithm.

Suggested Readings

1. Santanu Chattopadhyaya. (2011). Systems Programming. New Delhi: PHI.
2. Alfred, V. Aho., Monica, S. Lam., Ravi Sethi.,& Jeffrey, D. Ullman. (2006). Compilers: Principles, Techniques, and Tools (2nd ed.). New Delhi: Prentice Hall.
3. Dhamdhere, D. M. (2011). Systems Programming. New Delhi: Tata McGraw Hill.
4. Leland Beck., & Manjula, D. (2008). System Software: An Introduction to System Programming (3rd ed.). New Delhi: Pearson Education.
5. Grune, D., Van Reeuwijk, K., Bal, H. E., Jacobs, C. J. H., & Langendoen, K.(2012). Modern Compiler Design (2nd ed.). Springer.

Semester – V

16CSU503B **INTRODUCTION TO DATA SCIENCES** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objective

- To provide an overview of a new language R used for data science.
- To introduce students to the R programming environment and related eco-system and thus provide them with an in-demand skill-set, in both the research and business environments
- To introduce the extended R eCOsystem of libraries and packages
- To demonstrate usage of as standard Programming Language.
- To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R
- To enable students to use R to conduct analytics on large real life datasets.

Course Outcomes (COs)

1. Install and use R for simple programming tasks.
2. Extend the functionality of R by using add-on packages
3. Extract data from files and other sources and perform various data manipulation tasks on them.
4. Code statistical functions in R.
5. Use R Graphics and Tables to visualize results of various statistical operations on data.
6. Apply the knowledge of R gained to data Analytics for real life applications.

UNIT- I

Data Scientist's Tool Box: Turning data into actionable knowledge, introduction to the tools that will be used in building data analysis software: version control, markdown, git, GitHub, R, and RStudio.

UNIT-II

R Programming Basics: Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools, Simulation, code profiling

UNIT-III

Getting and Cleaning Data: Obtaining data from the web, from APIs, from databases and from colleagues in various formats. basics of data cleaning and making data ―tidy.

UNIT-IV

Exploratory Data Analysis: Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about the world that can be addressed by the data, common multivariate statistical techniques used to visualize high-dimensional data.

UNIT-V

Reproducible Research: Concepts and tools behind reporting modern data analyses in a reproducible manner, To write a document using R markdown, integrate live R code into a literate statistical program, compile R markdown documents using knitr and related tools, and organize a data analysis so that it is reproducible and accessible to others.

Suggested Readings

1. Rachel Schutt., & Cathy O'Neil.(2013). Doing Data Science: Straight Talk from the Frontiline. Schroff/O'Reilly.
2. Foster Provost., & Tom Fawcett.(2013). Data Science for Business What You Need to Know About Data Mining and Data-Analytic Thinking. O'Reilly.
3. John, W. Foreman. (2013). Data Smart: Using data Science to Transform Information into Insight. John Wiley & Sons.
4. Ian Ayres. (2007). Super Crunchers: Why Thinking-by-Numbers Is the New Way to Be Smart (1st ed.). Bantam.
5. Eric Seigel. (2013). Predictive Analytics: The Power to Predict who Will Click, Buy Lie, or Die (1st ed.). Wiley.
6. Matthew, A. Russel. (2013). Mining the Social Web: Data mining Facebook, Twitter, Linkedln, Goole+, GitHub, and More (2nd ed.). O'Reilly Media.

16CSU504A	**Oracle (SQL/PL-SQL)**	**Semester – V** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0   **Marks:** Int : **40** Ext : **60**   Total: **100**

Course Objectives

- To gain knowledge about using ORACLE software for developing databases and using them.
- To know the SQL *plus interface and its commands.
- To create, alter tables, views, indexes ,synonyms and constraints using DDL statements.
- To Query the database using DML statements and write complex queries for information retrieval.
- To gain knowledge about transaction control in Oracle
- To write procedures and functions using PL/SQL.

Course Outcomes(COs)

1. Understand the ORACLE software for developing databases and using them.
2. Using the SQL *plus interface and its commands.
3. creating, altering tables, views, indexes ,synonyms and constraints using DDL statements.
4. Querying the database using DML statements and write complex queries for information retrieval.
5. Apply transaction controls statements in Oracle
6. Write procedures and functions using PL/SQL.

UNIT-I

Introduction to Oracle as RDBMS SQL Vs. SQL * Plus: SQL Commands and Data types, Operators and Expressions, Introduction to SQL * Plus.

UNIT-II

Managing Tables and Data: Creating and Altering Tables (Including constraints) ,Data Manipulation Command like Insert, update, delete, SELECT statement with WHERE, GROUP BY and HAVING, ORDER BY, DISTINCT, Special operator like IN, ANY, ALL BETWEEN, EXISTS, LIKE, Join, Built in functions

UNIT-III

Other Database Objects - View, Synonyms, Index

UNIT-IV

Transaction Control Statements - Commit, Rollback, Savepoint

UNIT-V

Introduction to PL/SQL SQL v/s PL/SQL, PL/SQL Block Structure, Language construct of PL/SQL (Variables, Basic and Composite Data type, Conditions looping etc.) TYPE and % ROWTYPE , Using Cursor (Implicit, Explicit)

Suggested Readings

1. Ivan Bayross. (2010). SQL, PL/SQL the Programming Language of Oracle. New Delhi: BPB Publications.
2. Steven Feuerstein., & Bill Pribyl. (2014). Oracle PL/SQL Programming (6th ed.). O'Reilly Media.
3. Rajeeb, C. Chatterjee. (2012). Learning Oracle SQL and PL/SQL: A simplified Guide. New Delhi: PHI.
4. Ron Hardman.,& Michael Mclaughlin. (2005). Expert Oracle PL/SQL. Oracle Press.
5. Michael Mclaughlin. (2008). Oracle Database 11g PL/SQL Programming. Oracle Press.
6. John Watson.,& Roopesh Ramklass. (2008). OCA Oracle Database11g SQL Fundamentals I Exam Guide. Oracle Press.

Semester – V

16CSU504B **PROGRAMMING IN PYTHON** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Learn Syntax and Semantics of Python
- To create Functions in Python.
- To Understand the basic logic statements in Python
- To Handle Strings in Python.
- To Understand Lists, Dictionaries in Python.
- To Build GUI applications

Course Outcomes (COs)

Upon completion of this the course students will be able to:

1. Develop algorithmic solutions to simple computational problems
2. Structure simple Python programs for solving problems.
3. Learn to use logical constructs in Python
4. Decompose a Python program into functions.
5. Represent compound data using Python lists, tuples, dictionaries.
6. Read and write data from/to files in Python Programs.

UNIT-I

Planning the Computer Program: Concept of problem solving-Problem definition-Program design-Debugging-Types of errors in programming-Documentation.

UNIT-II

Techniques of Problem Solving: Flowcharting-decision table-algorithms-Structured programming concepts-Programming methodologies: top-down and bottom-up Programming.

UNIT-III

Overview of Programming: Structure of a Python Program-Elements of Python.

UNIT-IV

Introduction to Python: Python Interpreter-Using Python as calculator-Python shell-Indentation. Atoms-Identifiers and keywords-Literals-Strings-Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator).

UNIT-V

Creating Python Programs: Input and Output Statements-Control statements(Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.). Defining Functions-Default arguments.

Suggested Readings

1. Budd, T. (2011). Exploring Python(1st ed.). New Delhi: TMH.
2. Python Tutorial/Documentation www.python.org 2015.
3. Allen Downey., Jeffrey Elkner., & Chris Meyers. (2012). How to think like a computer scientist : learning with Python. Freely available online.
4. http://docs.python.org/3/tutorial/index.html.
5. http://interactivepython.org/courselib/static/pythonds.
6. http://www.ibiblio.org/g2swap/byteofpython/read/.

		Semester – V
16CSU511A	**INFORMATION SECURITY - PRACTICAL**	**4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To provides an overview of Information Security and Assurance.
- To provide an exposure to the spectrum of security activities methods methodologies and procedures with emphasis on practical aspects of Information Security.
- To explain concepts related to applied cryptography including the techniques for crypto-analysis symmetric and asymmetric cryptography.
- To understand the concepts of digital signature, message authentication code, hash functions and modes of encryption operations.
- To explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
- To understand the concepts of cryptographic utilities and authentication mechanisms to design secure applications

Course Outcomes(COs)

A student who successfully completes this course should at a minimum be able to:

1. Explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
2. State the basic concepts in information security
3. Explain concepts related to applied cryptography including the techniques for crypto-analysis symmetric and asymmetric cryptography.
4. Use digital signature, message authentication code, hash functions and modes of encryption operations.
5. Explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
6. Understand the concepts of cryptographic utilities and authentication mechanisms to design secure applications

List of programs

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois
2. Use of Password cracking tools : John the Ripper, Ophcrack. Verify the trength of passwords using these tools.
3. Perform encryption and decryption of Caesar cipher. Write a script for performing these operations.
4. Perform encryption and decryption of a Rail fence cipher. Write a script for performing these operations.
5. Use nmap/zenmap to analyse a remote machine.
6. Use Burp proxy to capture and modify the message.
7. Demonstrate sending of a protected word document.

8. Demonstrate sending of a digitally signed document.
9. Demonstrate sending of a protected worksheet.
10. Demonstrate use of steganography tools.
11. Demonstrate use of gpg utility for signing and encrypting purposes.

Semester – V

16CSU511B NETWORK PROGRAMMING - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To describe the fundamental concepts of networks
- To demonstrate mastery of main protocols comprising the Internet.
- To develop skills in network programming techniques.
- To implement network services that communicate through the Internet.
- To apply the client - server model in networking applications.
- To practice networking commands available through the operating systems

Course Outcomes(COs)

Having successfully completed this course, the student will be able to:

1. Understand the fundamental concepts of networks
2. Demonstrate mastery of main protocols comprising the Internet.
3. Develop skills in network programming techniques.
4. Implement network services that communicate through the Internet.
5. Apply the client - server model in networking applications.
6. Practice networking commands available through the operating systems

List of programs

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

Semester – V

16CSU512A MICROPROCESSOR - PRACTICAL **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To apply the fundamentals of assembly level programming of microprocessors.
- To build a program on a microprocessor using arithmetic & logical instruction set of 8086.
- To develop the assembly level programming using 8086 loop instruction set.
- To write programs based on string and procedure for 8086 microprocessor.
- To analyze abstract problems and apply a combination of hardware and software to address the problem
- To make use of standard test and measurement equipment to evaluate digital interfaces

Course Outcomes(COs)

1. Apply the fundamentals of assembly level programming of microprocessors.
2. Build a program on a microprocessor using arithmetic & logical instruction set of 8086.
3. Develop the assembly level programming using 8086 loop instruction set.
4. Write programs based on string and procedure for 8086 microprocessor.
5. Analyze abstract problems and apply a combination of hardware and software to address the problem
6. Make use of standard test and measurement equipment to evaluate digital interfaces

Assembly Language Programming

1. Addition of 8/16 bit and array of Data
2. Subtraction of 8/16 bit and array of Data
3. Multiplication of 8-bit Number
4. Division of 8-bit Number Write a program for 32-bit binary division and multiplication
5. Fill and Transfer an Array of Data
6. Ascending and Descending of an array
7. Data Transfer using Parallel Ports
8. Stepper Motor Interface
9. Traffic Light Interface
10. A/D and D/A Converter

Semester – V

16CSU512B DIGITAL IMAGE PROCESSING - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the fundamental concepts of a digital image processing system.
- To understand concepts of image enhancement techniques.
- To apply various Image Transforms.
- To analyze various Compression techniques and Morphological concepts
- To know various segmentation techniques, and object descriptors.
- To apply color models and various applications of image processing

Course Outcomes (COs)

1. Remember the fundamental concepts of image processing.
2. Explain different Image enhancement techniques
3. Understand and review image transforms
4. Analyze the basic algorithms used for image processing &image compression with morphological image processing.
5. Contrast Image Segmentation and Representation
6. Design & Synthesize Color image processing and its real world applications

List of Programs

1. Write program to read and display digital image using MATLAB or SCILAB
   a. Become familiar with SCILAB/MATLAB Basic commands
   b. Read and display image in SCILAB/MATLAB
   c. Resize given image
   d. Convert given color image into gray-scale image
   e. Convert given color/gray-scale image into black & white image
   f. Draw image profile
   g. Separate color image in three R G & B planes
   h. Create color image using R, G and B three separate planes
   i. Flow control and LOOP in SCILAB
   j. Write given 2-D data in image file
2. To write and execute image processing programs using point processing method
   a. Obtain Negative image   b. Obtain Flip image
   b. Thresholding   d. Contrast stretching
3. To write and execute programs for image arithmetic operations
   a. Addition of two images
   b. Subtract one image from other image
   c. Calculate mean value of image
   d. Different Brightness by changing mean value
4. To write and execute programs for image logical operations
   a. AND operation between two images

b. OR operation between two images
c. Calculate intersection of two images
d. Water Marking using EX-OR operation
e. NOT operation (Negative image)

5. To write a program for histogram calculation and equalization using
    a. Standard MATLAB function
    b. Program without using standard MATLAB functions
    c. C Program
6. To write and execute program for geometric transformation of image
    a. Translation
    b. Scaling
    c. Rotation
    d. Shrinking
    e. Zooming
7. To understand various image noise models and to write programs for
    a. image restoration
    b. Remove Salt and Pepper Noise
    c. Minimize Gaussian noise
    d. Median filter and Weiner filter
8. Write and execute programs to remove noise using spatial filters
    a. Understand 1-D and 2-D convolution process
    b. Use 3x3 Mask for low pass filter and high pass filter
9. Write and execute programs for image frequency domain filtering
    a. Apply FFT on given image
    b. Perform low pass and high pass filtering in frequency domain
    c. Apply IFFT to reconstruct image
10. Write a program in C and MATLAB/SCILAB for edge detection using different edge detection mask
11. Write and execute program for image morphological operations erosion and dilation.
12. To write and execute program for wavelet transform on given image and perform inverse wavelet transform to reconstruct image.

16CSU513A	**MACHINE LEARNING - PRACTICAL**	**Semester – V** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To introduce students to the basic concepts and techniques of Machine Learning.
- To develop skills of using recent machine learning software for solving practical problems.
- To gain experience of doing independent study and research**.**
- To recognize the characteristics of machine learning that make it useful to real-world problems.
- To characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
- To effectively use machine learning toolboxes.

Course Outcomes(COs)
On successful completion of the course the student should be

1. Remember the basic concepts and techniques of Machine Learning.
2. Develop skills of using recent machine learning software for solving practical problems.
3. of doing independent study and research**.**
4. To recognize the characteristics of machine learning that make it useful to real-world problems.
5. To characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
6. To effectively use machine learning toolboxes.

List of programs

1. Perform elementary mathematical operations in Octave/MATLAB like addition, multiplication, division and exponentiation.

2. Perform elementary logical operations in Octave/MATLAB (like OR, AND, Checking for Equality, NOT, XOR).

3. Create, initialize and display simple variables and simple strings and use simple formatting for variable.

4. Create/Define single dimension / multi-dimension arrays, and arrays with specific values like array of all ones, all zeros, array with random values within a range, or a diagonal matrix.

5. Use command to compute the size of a matrix, size/length of a particular row/column, load data from a text file, store matrix data to a text file, finding out variables and their features in the current scope.

6. Perform basic operations on matrices (like addition, subtraction, multiplication) and display specific rows or columns of the matrix.

7. Perform other matrix operations like converting matrix data to absolute values, taking the negative of matrix values, additing/removing rows/columns from a matrix, finding the maximum or minimum values in a matrix or in a row/column, and finding the sum of some/all elements in a matrix.

8. Create various type of plots/charts like histograms, plot based on sine/COsine function based on data from a matrix. Further label different axes in a plot and data in a plot.

9. Generate different subplots from a given plot and color plot data.

10. Use conditional statements and different type of loops based on simple example/s.

11. Perform vectorized implementation of simple matrix operation like finding the transpose of a matrix, adding, subtracting or multiplying two matrices.

12. Implement Linear Regression problem. For example, based on a dataset comprising of existing set of prices and area/size of the houses, predict the estimated price of a given house.

13. Based on multiple features/variables perform Linear Regression. For example, based on a number of additional features like number of bedrooms, servant room, number of balconies, number of houses of years a house has been built – predict the price of a house.

14. Implement a classification/ logistic regression problem. For example based on different features of students data, classify, whether a student is suitable for a particular activity. Based on the available dataset, a student can also implement another classification problem like checking whether an email is spam or not.

15. Use some function for regularization of dataset based on problem 14.

16. Use some function for neural networks, like Stochastic Gradient Descent or back propagation - algorithm to predict the value of a variable based on the dataset of problem

16CSU513B **INTRODUCTION TO DATA SCIENCES – PRACTICAL** **Semester – V**
4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objective

- To provide an overview of a new language R used for data science.
- To introduce students to the R programming environment and related eco-system and thus provide them with an in-demand skill-set, in both the research and business environments
- To introduce the extended R eCOsystem of libraries and packages
- To demonstrate usage of as standard Programming Language.
- To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R
- To enable students to use R to conduct analytics on large real life datasets.

Course Outcomes (COs)

1. Install and use R for simple programming tasks.
2. Extend the functionality of R by using add-on packages
3. Extract data from files and other sources and perform various data manipulation tasks on them.
4. Code statistical functions in R.
5. Use R Graphics and Tables to visualize results of various statistical operations on data.
6. Apply the knowledge of R gained to data Analytics for real life applications.

List of Programs

1. Write a program that prints _hello World to the screen.
2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n
3. Write a program that prints a multiplication table for numbers up to 12.
4. Write a function that returns the largest element in a list.
5. Write a function that computes the running total of a list.
6. Write a function that tests whether a string is a palindrome.
7. Implement linear search.
8. Implement binary search.
9. Implement matrices addition , subtraction and Multiplication
10. Fifteen students were enrolled in a course.
    There ages were: 20 20 20 20 20 21 21 21
    22 22 22 22 23 23 23
    i. Find the median age of all
    students under 22 years ii. Find
    the median age of all students

iii. Find the mean
age of all students iv.
Find the modal age
for all students

v. Two more students enter the class. The age of both students is 23. What is now mean, mode and median ?

11. Following table gives a frequency distribution of systolic blood pressure. Compute all the measures of dispersion.

Midpoint	95.5	105.5	115.5	125.5	135.5	145.5	155.5	165.5	175.5
Number	5	8	22	27	17	9	5	5	2

12. Obtain probability distribution of , where X is number of spots showing when a six-sided symmetric die (i.e. all six faces of the die are equally likely) is rolled. Simulate random samples of sizes 40, 70 and 100 respectively and verify the frequency interpretation of probability.
13. Make visual representations of data using the base, lattice, and ggplot2 plotting systems in R, apply basic principles of data graphics to create rich analytic graphics from available datasets.
14. Use Git / Github software to create Github account. Also, create a repo using Github.

Semester – V

16CSU514A Oracle (SQL/PL-SQL) LAB - PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To gain knowledge about using ORACLE software for developing databases and using them.
- To know the SQL *plus interface and its commands.
- To create, alter tables, views, indexes ,synonyms and constraints using DDL statements.
- To Query the database using DML statements and write complex queries for information retrieval.
- To gain knowledge about transaction control in Oracle
- To write procedures and functions using PL/SQL.

Course Outcomes(COs)

1. Understand the ORACLE software for developing databases and using them.
2. Using the SQL *plus interface and its commands.
3. creating, altering tables, views, indexes ,synonyms and constraints using DDL statements.
4. Querying the database using DML statements and write complex queries for information retrieval.
5. Apply transaction controls statements in Oracle
6. Write procedures and functions using PL/SQL.

[SQL COMMANDS]

1) SQL* formatting commands
2) To create a table, alter and drop table.
3) To perform select, update, insert and delete operation in a table.
4) To make use of different clauses viz where, group by, having, order by, union and intersection,
5) To study different constraints.

[SQL FUNCTION]

6) To use oracle function viz aggregate, numeric, conversion, string function.
7) To understand use and working with joins.
8) To make use of transaction control statement viz rollback, commit and save point.
9) To make views of a table.
10) To make indexes of a table.

[PL/SQL]

11) To understand working with PL/SQL
12) To implement Cursor on a table.
13) To implement trigger on a table

Semester – V

16CSU514B PROGRAMMING IN PYTHON - PRACTICAL **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Learn Syntax and Semantics of Python
- To create Functions in Python.
- To Understand the basic logic statements in Python
- To Handle Strings in Python.
- To Understand Lists, Dictionaries in Python.
- To Build GUI applications

Course Outcomes (COs)

Upon completion of this the course students will be able to:

1. Develop algorithmic solutions to simple computational problems
2. Structure simple Python programs for solving problems.
3. Learn to use logical constructs in Python
4. Decompose a Python program into functions.
5. Represent compound data using Python lists, tuples, dictionaries.
6. Read and write data from/to files in Python Programs.

List of Programs

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria :
   Grade A: Percentage >=80
   Grade B: Percentage>=70 and <80
   Grade C: Percentage>=60 and <70
   Grade D: Percentage>=40 and <60
   Grade E: Percentage<40
3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. WAP to display the first n terms of Fibonacci series.
5. WAP to find factorial of the given number.
6. WAP to find sum of the following series for n terms: 1 – 2/2! + 3/3! - - - - - n/n!
7. WAP to calculate the sum and product of two compatible matrices.

16CSU601A	**CLOUD COMPUTING**	**Semester – VI** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Provide a good understanding of the concepts, standards in Cloud computing
- To make the student understand about the cloud service providers and their usage.
- To learn how to secure the data in cloud depending.
- To understand the various service level agreements.
- To understand the cloud using various case studies.
- to portray the recent trends in the field of cloud computing and providing exposures to some open source and commercial clouds.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Portray the recent trends in the field of cloud computing and providing exposures to some open source and commercial clouds.
2. Know the architecture of the cloud and the usage of clouds.
3. Secure their data from the security issues.
4. Make the students to work based on the various service level agreements.
5. Work with the traditional cloud and Microsoft azure, etc.
6. Provide a good understanding of the concepts, standards and protocols in Cloud computing

UNIT-I

Overview of Computing Paradigm: Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing.**Introduction to Cloud Computing:** Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing.

UNIT-II

Cloud Computing Architecture: Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.

UNIT-III

Case Studies: Case study of Service model using Google App Engine, Microsoft Azure, Amazon EC2 , Eucalyptus.

UNIT-IV

Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling.

UNIT-V

Cloud Security: Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing.

Suggested Readings

1. Barrie Sosinsky. (2010). Cloud Computing Bible. New Delhi: Wiley-India,
2. Rajkumar Buyya., James Broberg., & Andrzej, M. Goscinski Wile. Cloud Computing: Principles and Paradigms.
3. Nikos Antonopoulos., & Lee Gillam. (2012). Cloud Computing: Principles, Systems and Applications. Springer.
4. Ronald, L. Krutz., & Russell Dean Vines. (2010). Cloud Security: A Comprehensive Guide to Secure Cloud Computing.New Delhi: Wiley-India.
5. Gautam Shroff. (2010). Enterprise Cloud Computing Technology Architecture Applications. Adobe Reader ebooks available from eBooks.com.
6. Toby Velte., Anthony Velte., & Robert Elsenpeter.(2010). Cloud Computing, A Practical Approach. McGraw Hills.
7. Dimitris, N. Chorafas. (2010). Cloud Computing Strategies. CRC Press.

WEB SITES

1. en.wikipedia.org/wiki/Cloud_computing
2. www.ibm.com/cloud-computing/in/en/
3. www.oracle.com/CloudComputing
4. www.microsoft.com/en-us/cloud/default.aspx

16CSU601B	**SYSTEM PROGRAMMING**	**Semester – VI** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To introduce students the concepts and principles of system programming
- To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.
- To train students in developing skills for writing system software with the aid of sophisticated OS services, programming languages and utility tools.
- To understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter and debugger.
- To describe the various concepts of assemblers and macroprocessors.
- To understand how linker and loader create an executable program from an object module created by assembler and compiler.

Course Outcomes(COs)

1. Understand different components of system software.
2. This course enables for good understanding of the role of system programming and the scope of duties and tasks of a system programmer.
3. This course enables to learn the concepts and principles of developing system-level software (e.g., compiler, and networking software)
4. Understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter and debugger.
5. Describe the various concepts of assemblers and macroprocessors.
6. Understand how linker and loader create an executable program from an object module created by assembler and compiler.

UNIT-I

Assemblers & Loaders, Linkers: One pass and two pass assembler design of an assembler, Absolute loader, relocation and linking concepts, relocating loader and Dynamic Linking., overview of compilation, Phases of a compiler.

UNIT-II

Lexical Analysis:

Role of a Lexical analyzer, Specification and recognition of tokens, Symbol table, lexical

UNIT-III

Parsing:

Bottom up parsing- LR parser, yaccess. **Intermediate representations: Three** address code generation, syntax directed translation, translation of types, control Statements.

UNIT-IV

Storage organization: Activation records stack allocation.

UNIT-V

Code Generation: Object code generation

Suggested Readings

1. Santanu Chattopadhyaya. (2011). Systems Programming. New Delhi: PHI.
2. Alfred, V. Aho., Monica, S. Lam., Ravi Sethi.,& Jeffrey, D. Ullman. (2006). Compilers: Principles, Techniques, and Tools (2nd ed.). New Delhi: Prentice Hall.
3. Dhamdhere, D. M. (2011). Systems Programming. New Delhi: Tata McGraw Hill.
4. Leland Beck., & Manjula, D. (2008). System Software: An Introduction to System Programming (3rd ed.). New Delhi: Pearson Education.
5. Grune, D., Van Reeuwijk, K., Bal, H. E., Jacobs, C. J. H., & Langendoen, K.(2012). Modern Compiler Design (2nd ed.). Springer.

16CSU602A	**DATA MINING**	**Semester – VI** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To introduce students to the basic concepts and techniques of Data Mining.
- To understand data mining fundamentals and characterize the kinds of patterns that can be discovered by association rule mining
- To compare and evaluate different data mining techniques like classification, prediction, etc.
- To cluster the high dimensional data for better organization of the data
- To describe complex data types with respect to spatial and web mining
- To design data warehouse with dimensional modelling and apply OLAP operations.

Course Outcomes (COs)

Upon completion of this course students will be able to:

1. Understand the basic concepts and techniques of Data Mining
2. Extract knowledge using data mining techniques and Implement Preprocess the data for mining applications and apply the association rules for mining the data
3. Design and deploy appropriate classification techniques
4. Understand the concept of clustering and its real time applications
5. Explore recent trends in data mining such as web mining, spatial-temporal mining
6. Analyze the basic concepts of data warehouse and OLAP operations

UNIT-I

Overview: Predictive and descriptive data mining techniques

UNIT-II

Supervised and unsupervised learning techniques

UNIT-III

Process of knowledge discovery in databases, pre-processing methods

UNIT-IV

Data Mining Techniques: Association Rule Mining, classification and regression techniques, clustering

UNIT-V

Scalability and data management issues in data mining algorithms, measures of interestingness.

Suggested Readings

1. Pang-Ning Tan., Michael Steinbach.,& Vipin Kumar. (2005).

Introduction to Data Mining. New Delhi: Pearson Education.
2. Richard Roiger., & Michael Geatz. (2003). Data Mining: A Tutorial Based Primer. New Delhi: Pearson Education.
3. Gupta, G.K. (2006). Introduction to Data Mining with Case Studies. New Delhi: PHI.
4. Soman, K. P., Diwakar Shyam., & Ajay, V. (2006). Insight Into Data Mining: Theory And Practice. New Delhi: PHI.

WEB SITES

1. Thedacs.Com
2. Dwreview.Com
3. Pcai.Com
4. Eruditionhome.Com

16CSU602B	**COMPUTER GRAPHICS**	**Semester – VI** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To describe characteristics and functioning of common graphics input/output devices
- To learn the basic principles of 3- dimensional computer graphics
- To Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition
- To Provide an understanding of mapping from a world coordinates to device coordinates and projections.
- To extract scene with different clipping methods and its transformation to graphics display device.
- To explore projections and visible surface detection techniques for display of 3D scene on 2D screen

Course Outcomes(COs)

1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.
4. Extract scene with different clipping methods and its transformation to graphics display device.
5. Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.
6. Render projected objects to naturalize the scene in 2D view and use of illumination models for this..

UNIT-I

Introduction : Basic elements of Computer graphics, Applications of Computer Graphics.

UNIT-II

Graphics Hardware : Architecture of Raster and Random scan display devices, input/output devices.

UNIT-III

Fundamental Techniques in Graphics : Raster scan line, circle and ellipse drawing, thick primitives, Polygon filling, line and polygon clipping algorithms, 2D and 3D Geometric Transformations, 2D and 3D Viewing Transformations (Projections- Parallel and Perspective), Vanishing points.

UNIT-IV

Geometric Modeling : Representing curves & Surfaces.

UNIT V

Visible Surface determination : Hidden surface elimination. **Surface rendering :** Illumination and shading models. Basic color models and Computer Animation.

Suggested Readings

1. Foley, J.D., Van Dan, A.,& Feiner Hughes. (1990). Computer Graphics Principles & Practice (2nd ed.). Addison Wesley.

2. Hearn D. Baker. (2008). Computer Graphics. New Delhi: Prentice Hall of India.

3. Rogers, D.F. (1997). Procedural Elements for Computer Graphics. McGraw Hill.

4. Rogers, D.F. Adams. (1989). Mathematical Elements for Computer Graphics(2nd ed.). McGraw Hill.

16CSU603A	**PHP PROGRAMMING**	**Semester – VI** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To write basic PHP syntax using various operators.
- To write PHP scripts to handle HTML forms.
- To analyze different tasks using PHP functions.
- To understand the regular expressions in PHP.
- To learn array data structure using PHP scripts.
- To work with open source applications that deal with database and website development.

Course Outcomes (COs)

Upon completion of this course, students will be able to:

1. Write PHP scripts using operators to perform various functions
2. Design PHP scripts to handle HTML forms.
3. Implement different types of PHP functions.
4. Write regular expressions including modifiers, operators, and metacharacters.
5. Create PHP scripts using array.
6. Develop dynamic web pages.

UNIT-I

Introduction to PHP:

- PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.)
- PHP with other technologies, scope of PHP
- Basic Syntax, PHP variables and constants
- Types of data in PHP , Expressions, scopes of a variable (local, global)
- PHP Operators: Arithmetic, Assignment, Relational, Logical operators, Bitwis , ternary and MOD operator.
- PHP operator Precedence and associativity

UNIT-II

Handling HTML form with PHP:

- Capturing Form Data
- GET and POST form methods
- Dealing with multi value fields
- Redirecting a form after submission

PHP conditional events and Loops:

- PHP IF Else conditional statements (Nested IF and Else)
- Switch case, while ,For and Do While Loop
- Goto , Break ,Continue and exit

UNIT-III

PHP Functions:

- Function, Need of Function , declaration and calling of a function
- PHP Function with arguments, Default Arguments in Function
- Function argument with call by value, call by reference
- Scope of Function Global and Local

UNIT-IV

String Manipulation and Regular Expression:

- Creating and accessing String , Searching & Replacing String
- Formatting, joining and splitting String , String Related Library functions
- Use and advantage of regular expression over inbuilt function
- Use of preg_match(), preg_replace(), preg_split() functions in regular expression

UNIT-V

Array:

- Anatomy of an Array ,Creating index based and Associative array ,Accessing array
- Looping with Index based array, with associative array using each() and foreach()
- Some useful Library function

Suggested Readings

1. Steven Holzner. (2007). PHP: The Complete Reference. New Delhi: McGraw Hill Education (India).
2. Timothy Boronczyk., & Martin, E. Psinas. (2008). PHP and MYSQL (Create-Modify-Reuse). New Delhi: Wiley India Private Limited.
3. Robin Nixon. (2014). Learning PHP, MySQL, JavaScript, CSS & HTML5 (3rd ed.). O'reilly.
4. Luke Welling.,& Laura Thompson.(2008). PHP and MySQL Web Development (4th ed.). Addition Paperback, Addison-Wesley Professsional.
5. David Sklar., & Adam Trachtenberg. PHP Cookbook: Solutions & Examples for PHP.

16CSU603B **UNIX / LINUX PROGRAMMING** **Semester – VI**
3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objective

- To understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.
- To understand how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions
- To understand how the operating system abstractions can be implemented
- To understand the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software
- To understand basic resource management techniques like scheduling or time management, space management and principles and how they can be implemented.
- To know about the issues of performance and fairness objectives, avoiding deadlocks, as well as security and protection.

Course Outcomes(COs)

1. This course teaches the student the concepts and principles that underlie modern operating systems, and a practice component to relate theoretical principles with operating system implementation.
2. Implement operating system abstractions in the development of application programs
3. Apply the principles of concurrency and synchronization to write correct concurrent programs/software
4. Implement basic resource management techniques like scheduling or time management, space management
5. Learn about processes and processor management, memory management schemes, file system and secondary storage management.
6. Learn about issues of performance and fairness objectives, avoiding deadlocks, as well as security and protection

UNIT-I

Introduction What is Linux/Unix Operating systems, Difference between linux/unix and other operating systems , Features and Architecture, Various Distributions available in the market, Installation, Booting and shutdown process

UNIT-II

System processes (an overview), External and internal commands, Creation of partitions in OS, Processes and its creation phases – Fork, Exec, wait

UNIT-III

User Management and the File System Types of Users, Creating users, Granting rights

User management commands, File quota and various file systems available, File System Management and Layout, File permissions, Login process, Managing Disk Quotas, Links (hard links, symbolic links)

UNIT-IV

Shell introduction and Shell Scripting What is shell and various type of shell, Various editors present in Linux Different modes of operation in vi editor, What is shell script, Writing and executing the shell script , Shell variable (user defined and system variables)

UNIT-V

System calls, Using system calls Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell
Functions, Utility programs (cut, paste, join, tr, uniq utilities), Pattern matching utility (grep)

Suggested Readings

1. Sumitabha, Das.(2006). Unix Concepts And Applications. New Delhi: Tata McGraw-Hill Education.
2. Michael Jang. (2011). RHCSA/ RHCE Red Hat Linux Certification: Exams (Ex200 & Ex300). Certification Press.
3. Nemeth Synder., & Hein.(2010). Linux Administration Handbook (2nd ed.). Pearson Education.
4. Richard Stevens, W. Bill Fenner., & Andrew, M. Rudoff. (2014). Unix Network Programming, The sockets Networking API, Vol. 1, (3rd ed.).

16CSU611A **CLOUD COMPUTING -PRACTICAL** **Semester – VI**
4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Provide a good understanding of the concepts, standards in Cloud computing
- To make the student understand about the cloud service providers and their usage.
- To learn how to secure the data in cloud depending.
- To understand the various service level agreements.
- To understand the cloud using various case studies.
- to portray the recent trends in the field of cloud computing and providing exposures to some open source and commercial clouds.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Portray the recent trends in the field of cloud computing and providing exposures to some open source and commercial clouds.
2. Know the architecture of the cloud and the usage of clouds.
3. Secure their data from the security issues.
4. Make the students to work based on the various service level agreements.
5. Work with the traditional cloud and Microsoft azure, etc.
6. Provide a good understanding of the concepts, standards and protocols in Cloud computing

List of programs

1. Create virtual machines that access different programs on same platform.

2. Create virtual machines that access different programs on different platforms.

3. Working on tools used in cloud computing online-

   a) Storage

   b) Sharing of data

   c) Manage your calendar, to-do lists,

   d) A document editing tool

4. Exploring Google cloud

5. Exploring Microsoft cloud

6. Exploring Amazon cloud

16CSU611B	**SYSTEM PROGRAMMING - PRACTICAL**	**Semester – VI** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To introduce students the concepts and principles of system programming
- To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.
- To train students in developing skills for writing system software with the aid of sophisticated OS services, programming languages and utility tools.
- To understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter and debugger.
- To describe the various concepts of assemblers and macroprocessors.
- To understand how linker and loader create an executable program from an object module created by assembler and compiler.

Course Outcomes(COs)

1. Understand different components of system software.
2. This course enables for good understanding of the role of system programming and the scope of duties and tasks of a system programmer.
3. This course enables to learn the concepts and principles of developing system-level software (e.g., compiler, and networking software)
4. Understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter and debugger.
5. Describe the various concepts of assemblers and macroprocessors.
6. Understand how linker and loader create an executable program from an object module created by assembler and compiler.

List of Programs

1. To implement an assembler for a hypothetical language.
2. To get familiar with lex: write a program to recognize numbers, identifiers.
3. To get familiar with yacc: write a desk calculator.

16CSU612A **DATA MINING - PRACTICAL** **Semester – VI** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To introduce students to the basic concepts and techniques of Data Mining.
- To understand data mining fundamentals and characterize the kinds of patterns that can be discovered by association rule mining
- To compare and evaluate different data mining techniques like classification, prediction, etc.
- To cluster the high dimensional data for better organization of the data
- To describe complex data types with respect to spatial and web mining
- To design data warehouse with dimensional modelling and apply OLAP operations.

Course Outcomes (COs)

Upon completion of this course students will be able to:

1. Understand the basic concepts and techniques of Data Mining
2. Extract knowledge using data mining techniques and Implement Preprocess the data for mining applications and apply the association rules for mining the data
3. Design and deploy appropriate classification techniques
4. Understand the concept of clustering and its real time applications
5. Explore recent trends in data mining such as web mining, spatial-temporal mining
6. Analyze the basic concepts of data warehouse and OLAP operations

Practical exercises based on concepts listed in theory.

16CSU612B	**COMPUTER GRAPHICS - PRACTICAL**	**Semester – VI** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To describe characteristics and functioning of common graphics input/output devices
- To learn the basic principles of 3- dimensional computer graphics
- To Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition
- To Provide an understanding of mapping from a world coordinates to device coordinates and projections.
- To extract scene with different clipping methods and its transformation to graphics display device.
- To explore projections and visible surface detection techniques for display of 3D scene on 2D screen

Course Outcomes(COs)

1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.
4. Extract scene with different clipping methods and its transformation to graphics display device.
5. Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.
6. Render projected objects to naturalize the scene in 2D view and use of illumination models for this..

List of Programs

1. Write a program to implement Bresenham‘s line drawing algorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5. Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).
6. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.
7. Write a program to draw Hermite/Bezier curve.

16CSU613A	**PHP PROGRAMMING - PRACTICAL**	**Semester – V** **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To write basic PHP syntax using various operators.
- To write PHP scripts to handle HTML forms.
- To analyze different tasks using PHP functions.
- To understand the regular expressions in PHP.
- To learn array data structure using PHP scripts.
- To work with open source applications that deal with database and website development.

Course Outcomes (COs)

Upon completion of this course, students will be able to:

1. Write PHP scripts using operators to perform various functions
2. Design PHP scripts to handle HTML forms.
3. Implement different types of PHP functions.
4. Write regular expressions including modifiers, operators, and metacharacters.
5. Create PHP scripts using array.
6. Develop dynamic web pages.

List of programs

1. Create a PHP page using functions for comparing three integers and print the largest number.

2. Write a function to calculate the factorial of a number (non-negative integer). The function aCSUept the number as an argument.

3. WAP to check whether the given number is prime or not.

4. Create a PHP page which aCSUepts string from user. After submission that page displays the reverse of provided string.

5. Write a PHP function that checks if a string is all lower case.

6. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)

7. WAP to sort an array.

8. Write a PHP script that removes the whitespaces from a string.
Sample string : 'The quick   brown fox' Expected Output : Thequickbrownfox

9. Write a PHP script that finds out the sum of first n odd numbers.

10. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.

11. Write a PHP script that checks if a string contains another string.

12. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.

13. Create a script to construct the following pattern, using nested for loop.

```
*
* *
* * *
* * * *
* * * * *
```

14. Write a simple PHP program to check that emails are valid.

15. WAP to print first n even numbers.

16. $color = array('white', 'green', 'red'')

Write a PHP script which will display the colors in the following way : Output :
white, green, red,
• green • red
• white

17. Using switch case and dropdown list display a ―Hello‖ message depending on the language selected in drop down list.

18. Write a PHP program to print FibonaCSUi series using recursion.

19. Write a PHP script to replace the first 'the' of the following string with 'That'.

Sample : 'the quick brown fox jumps over the lazy dog.'
Expected Result : That quick brown fox jumps over the lazy dog.

Semester – V

16CSU613B UNIX / LINUX PROGRAMMING - PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objective

- To understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.
- To understand how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions
- To understand how the operating system abstractions can be implemented
- To understand the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software
- To understand basic resource management techniques like scheduling or time management, space management and principles and how they can be implemented.
- To know about the issues of performance and fairness objectives, avoiding deadlocks, as well as security and protection.

Course Outcomes(COs)

1. This course teaches the student the concepts and principles that underlie modern operating systems, and a practice component to relate theoretical principles with operating system implementation.
2. Implement operating system abstractions in the development of application programs
3. Apply the principles of concurrency and synchronization to write correct concurrent programs/software
4. Implement basic resource management techniques like scheduling or time management, space management
5. Learn about processes and processor management, memory management schemes, file system and secondary storage management.
6. Learn about issues of performance and fairness objectives, avoiding deadlocks, as well as security and protection

List of programs

1. Write a shell script to check if the number entered at the command line is prime or not.
2. Write a shell script to modify ―call command to display calendars of the specified months.
3. Write a shell script to modify ―call command to display calendars of the specified range of months.
4. Write a shell script to accept a login name. If not a valid login name display message –―Entered login name is invalid.
5. Write a shell script to display date in the mm/dd/yy format.
6. Write a shell script to display on the screen sorted output of ―who command along with the total number of users .

7. Write a shell script to display the multiplication table any number,
8. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
9. Write a shell script to find the sum of digits of a given number.
10. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.
11. Write a shell script to find the LCD (least common divisor) of two numbers.
12. Write a shell script to perform the tasks of basic calculator.
13. Write a shell script to find the power of a given number.
14. Write a shell script to find the binomial coefficient C(n , x).
15. Write a shell script to find the permutation P(n,x).
16. Write a shell script to find the greatest number among the three numbers.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not

Semester – VI

16CSU604 BIG DATA ANALYTICS 4H- 4C

Instruction Hours / week: L: 4T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

Course Objectives

- To provide an overview of an exciting growing field of Big Data analytics.
- To discuss the challenges traditional data mining algorithms face when analyzing Big Data.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- To introduce to the students several types of big data like social media, web graphs and data streams.
- To enable students to have skills that will help them to solve complex real-world problems in for decision support

Course Outcomes(COs)

1. Explain the motivation for big data systems and identify the main sources of Big Data in the real world.
2. Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store retrieve and process Big Data for Analytics.
3. Implement several Data Intensive tasks using the Map Reduce Paradigm
4. Apply several newer algorithms for Clustering Classifying and finding associations in Big Data
5. Design algorithms to analyze Big dat a like streams, Web Graphs and Social Media data.
6. Design and implement successful Recommendation engines for enterprises.

UNIT-I

Fundamentals of Big Data - The Evolution of Data Management Understanding the Waves of Managing Data- Defining Big Data - Big Data Management Architecture- The Big Data Journey -Big Data Types-Defining Structured Data-Defining Unstructured Data-Putting Big Data Together.

UNIT-II

Big Data Stack- Basics of Virtualization - The importance of virtualization to big data - Server virtualization - Application virtualization - Network virtualization -Processor and memory virtualization - Data and storage virtualization-Abstraction and Virtualization-Implementing Virtualization to Work with Big Data.

UNIT-III

Hadoop - Hadoop Distributed File System - Hadoop MapReduce- The Hadoop foundation and ECOsystem.

UNIT-IV

Big Data Analytics-Text Analytics and Big Data-Customized Approaches for Analysis of Big Data

UNIT-V

Integrating Data Sources-Real-Time Data Streams and Complex Event Processing-Operationalizing Big Data.

Suggested Readings :

1. Judith Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman (2013). Big Data For Dummies. New Delhi: Wiley India.
2. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan (2012). Harness the Power of Big Data The IBM Big Data Platform. New Delhi: Tata McGraw Hill Publications.
3. Michael Minelli, Michele Chambers, Ambiga Dhiraj (2013). Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses. New Delhi: Wiley Publications.
4. Zikopoulos, Paul, Chris Eaton (2011). Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data. New Delhi: Tata McGraw Hill Publications.

WEB SITES

1. www.oracle.com/BigData
2. www.planet-data.eu/sites/default/files/Big_Data_Tutorial_part4.pdf
3. www.ibm.com/developerworks/data
4. www.solacesystems.com
5. en.wikipedia.org/wiki/Big_data
6. www.sap.com/solution/big-data.html

Semester – VI

16CSU614 BIG DATA ANALYTICS - PRACTICAL **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To provide an overview of an exciting growing field of Big Data analytics.
- To discuss the challenges traditional data mining algorithms face when analyzing Big Data.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- To introduce to the students several types of big data like social media, web graphs and data streams.
- To enable students to have skills that will help them to solve complex real-world problems in for decision support

Course Outcomes(COs)

1. Explain the motivation for big data systems and identify the main sources of Big Data in the real world.
2. Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store retrieve and process Big Data for Analytics.
3. Implement several Data Intensive tasks using the Map Reduce Paradigm
4. Apply several newer algorithms for Clustering Classifying and finding associations in Big Data
5. Design algorithms to analyze Big dat a like streams, Web Graphs and Social Media data.
6. Design and implement successful Recommendation engines for enterprises.

List of Programs

1. Implement a quicksort using scala.
2. Implement a auction service using scala.
3. Write a scala function to perform any 10 arithmetic operations.
4. Write a program to find the factorial of a given number using recursion.
5. Write a program for string manipulations.
6. Write a program for alphabetic order arrangement of a set of names.
7. Write a program for student records using scala list.
8. Implement any 5 map methods for maintaining customer details.
9. Implement employee records using Files
10. Write a program to copy the files using command line arguments.

M.Sc. COMPUTER SCIENCE
CHOICE BASED CREDIT SYSTEM (CBCS)

Curriculum and Syllabus
Regular (2016 – 2017)

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ACADEMY OF HIGHER EDUCATION
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DEPARTMENT OF COMPUTER SCIENCE

FACULTY OF ARTS, SCIENCE AND HUMANITIES

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Semester-I

16CSP101 WEB TECHNOLOGY 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the fundamentals of JavaScript and use different objects
- To know the basics of ASP.NET, its objects and web forms
- To relate SQL Server and ASP.NET through database components
- To develop web application that deals with database and website development.
- To understand XML , Namespace and W3C XML Schema
- To get Familiar with Document Object Model for XML

Course Outcomes(COs)

1. Create a client side scripting web application using forms and Java Script
2. Understand the server side scripting of ASP.NET, its objects and web forms
3. Relate SQL Server and ASP.NET through database components
4. Develop web application that deals with database and website development.
5. Understand XML , Namespace and W3C XML Schema
6. Understand the Document Object Model for XML and JavaScript.

UNIT-I

JavaScript: Introduction to JavaScript – Programming fundamentals – Functions and objects – Navigator object model. Form and form elements – Scripting frames and multiple windows – Event object.

UNIT-II

ASP.NET: **ASP & ASP.NET**: An Overview – Programming ASP.NET with VB.NET: ASP Data types – operators- Request Object- Response Object – Server object - Web forms and ASP.NET: Web forms

.

UNIT-III

ASP.NET: ASP.NET Configuration Scope and State: Configuration – state- application – session object- ASP.NET Objects & Components: Scripting object models- ASP components and controls- ASP.NET and SQL server-Using SQL server using database in ASP.NET applications ActiveX data objects

UNIT-IV

Creating Mark up with XML: Introduction – Parsers and well formed XML Documents – Parsing an XML Document - Characters – Mark up – CDATA Sections – XML Namespaces. Document Type Definition – Parsers Well formed and valid XML documents – Element type declarations – Attribute declarations- Attributes Types. Schemas – Schemas VS DTD’s – W3C XML Schema

UNIT-V

Document Object Model: DOM implementations – DOM with JavaScript – Components- Creating nodes – Traversing the DOM. Simple API for XML: DOM vs SAX – SAX based Parsers. XLink XPointer XInclude and XBase

SUGGESTED READINGS

TEXT BOOKS

1. David Flanagan.(2011). Javascript: The Definitive Guide (6th ed.). O'Reilly Media.
2. Danny Goodman. (2000). Javascript Bible(3rd ed.). IDG Books India Pvt Ltd. (Page Nos.: 9-16 24-33 68-89 116-130 151-157 174-198 248-252 323-329 348-356)
3. Dave Mercer. 2010. ASP.NET – Beginner's Guide(2nd ed.). New Delhi: MCGraw Hill
4. Rohit Khurana. (2002). Javascript Professional ed.). (2nd ed.). NewDelhi: A.P.H. Publishing Company**.** (Page Nos.: 1-93 98-170)
5. Deitel & Deitel. (2001). XML How to Program(1st ed.). NewDelhi: Pearson Education.
   (Page Nos: 110-127 134-159 165-186 192-227 232-258 372-391 297-314 319-347 603-608)

REFERENCES

1. David Flanagan. (2006). Javascript: The Definitive Guide. O'Reilly Media.
2. Nicholas C. Zakas. Inc Ebrary & Ebrary. 2005. Professional JavaScript for Web Developers New Delhi: John Wiley & Sons Inc.
3. Russell Jones A. (2000). Mastering ActiveServerPages 3(1st ed.). New Delhi: BPB Publishing.
4. Thau. (2007). The Book of JavaScript: A Practical Guide to Interactive WebPages.
5. Ann Novarro Chuck White & Linda Burman. (2000). Mastering XML(1st ed.). New Delhi: BPB Publications.
6. Charles Ashbacher. (2000). XML in 24 hours(1st ed.). New Delhi: Techmedia Publication.
7. Manish Jain. (2001). XML Complete (1st ed.). New Delhi: BPB Publications.
8. Steve Holzner. (2000). Inside XML (1st ed.). New Delhi: TechMedia.
9. Matthew MacDonald. (2013). ASP.NET The Complete Reference. New Delhi: McGraw Hill Education.

WEB SITES

1. www.w3schools.com/
2. www.2createawebsite.com
3. www.javascriptkit.com
4. www.learn-javascript-tutorial.com
5. www.webteacher.com/javascript
6. www.asptutorial.info
7. www.aspfree.com
8. www.aspnettutorials.com

Semester-I

16CSP102 CRYPTOGRAPHY AND NETWORK SECURITY 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

This course will provide students with a theoretical knowledge to understand the fundamental principles of access control models and techniques and,

- To understand theory of fundamental cryptography, encryption and decryption algorithms
- To know about various encryption techniques.
- To understand various Block Ciphers, DES and AES algorithms
- To understand the concept of Public key cryptography.
- To study about message authentication and hash functions
- To impart knowledge on web security, electronic mail security, firewalls

Course Outcomes (COs)

On successful completion of the course the student should be able to:

1. Classify the symmetric encryption techniques
2. Illustrate various Public key cryptographic techniques
3. Evaluate the authentication and hash algorithms.
4. Summarize the intrusion detection and its solutions to overcome the attacks.
5. Understand basic concepts of system level security
6. Build secure authentication systems by use of message authentication techniques.

UNIT -I

Introduction – Security Trends - The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms – A Model for Network Security. Classical Encryption Techniques – Symmetric Cipher Model – Substitution Techniques - Transposition Techniques – Rotor Machines - Steganography.

UNIT -II

Block Ciphers and Data Encryption Standard –Block Cipher Principles – The Data Encryption Standard - The Strength of DES –Advanced Encryption Standard (AES) – Evaluation Criteria for AES – The AES Cipher – Multiple Encryption and Triple DES – Block Cipher Modes of Operation – Stream Ciphers and RC4- modular Arithmetic and Euclidean Algorithm.

UNIT-III

Confidentiality using Symmetric Encryption – Placement of Encryption Function – Traffic Confidentiality – Key Distribution – Public key Cryptography and RSA – Principles of Public Key Cryptosystems – The RSA Algorithm- Basic prime numbers and Discrete Logarithms **-**Key Management – Diffie Hellman Key Exchange.

UNIT-IV

Message Authentication and hash functions – Authentication Functions – Message Authentication Codes (MAC's) Functions – Security of Hash Functions and MAC's Digital Signatures and Authentication Protocols – Digital Signatures – Digital Signature Standard

UNIT-V

Network Security Applications - Authentication Applications – KERBEROS – X.509 Authentication Service – Public Key Infrastructure – Electronic Mail Security – Pretty Good Privacy – S/MIME – IP Security.

SUGGESTED READINGS

TEXT BOOKS

1. William Stallings. 2006. Cryptography and Network Security Principles and Practices(4th ed.). New Delhi: Pearson Education.
   (Page Nos. : 6-35 62-75 80-135 199-220 289-298 317-340 377-390 400-436 436-457 483-506)
2. Atul Kahate. 2003. Cryptography and Network Security (2nd ed.). Tata McGraw Hill New Delhi.

REFERENCES

1. Ankit Fadia. (19980. Network Security(1st ed.). New Delhi: McMillan Publications.
2. Bruce Schneir. (1998). Applied Cryptography (1st ed.). New Delhi: CRC Press.
3. Charlie Kaufman, Radia Perlman, & Mike Speciner. (2003). Network Security Private Communication in a Public World (2nd ed.). New Delhi: Prentice-Hall of India.
4. Menezes, A. Van Oorschot, & Vanstone, S. (1997). Hand Book of Applied Cryptography (1st ed.). New Delhi: CRC Press. (Free Downloadable)

WEB SITES

1. williamstallings.com/Crypto3e.html
2. u.cs.biu.ac.il/~herzbea/book.html
3. www.flipkart.com/search-books/cryptography+and+network+security +William+ stallings+ebook

Semester-I

16CSP103 DATA MINING AND WAREHOUSING 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To identify the scope and essentiality of Data Warehousing and Mining.
- To analyze data, choose relevant models and algorithms for respective applications.
- To study spatial and web data mining.
- To develop research interest towards advances in data mining.
- To introduce students to the basic concepts and techniques of Data Mining.
- To develop skills of using recent data mining software for solving practical problems.

Course Outcomes (COs)

1. Understand Data Warehouse fundamentals, Data Mining Principles
2. Design data warehouse with dimensional modelling and apply OLAP operations.
3. Identify appropriate data mining algorithms to solve real world problems
4. Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining
5. Describe complex data types with respect to spatial and web mining.
6. Benefit the user experiences towards research and innovation integration.

UNIT-I

Introduction: Fundamentals of data mining - Data Mining Functionalities - Classification of Data Mining systems - Major issues in Data Mining.

Data Warehouse and OLAP Technology: An Overview - Data Warehouse - Multidimensional Data Model - Data Warehouse Architecture - Data Warehouse Implementation - From Data Warehousing to Data Mining.

UNIT-II

Data Preprocessing: Needs Preprocessing the Data - Data Cleaning - Data Integration and Transformation - Data Reduction - Discretization and Concept Hierarchy Generation - Online Data Storage.

UNIT-III

Mining Frequent Patterns Associations and Correlations: Basic Concepts - Efficient and Scalable Frequent item set Mining Methods - Mining various kinds of Association rules – From Association Mining to Correlation Analysis - Constraint-Based Association Mining.

UNIT-IV

Classification and Prediction: Issues Regarding Classification and Prediction - Classification by Decision Tree Induction - Rule-based Classification – Prediction - Accuracy and Error Measures - Evaluating the Accuracy of a classifier or Predictor - Ensemble Methods - incrvveases the Accuracy - Model Selection.

UNIT-V

Cluster Analysis Introduction : Types of Data in Cluster Analysis - A Categorization of Major Clustering Methods - Partitioning Methods - Hierarchical Methods – Density-Based Methods Grid-Based Methods - Model-Based Clustering Methods - Clustering High-Dimensional Data – Constraint-Based Cluster Analysis - Outlier Analysis.

Applications and Trends in Data mining: Text Mining - Web Mining - Multimedia Mining-Spatial Mining - Visual data mining.

SUGGESTED READINGS

TEXT BOOK

1. Jiawei Han & Micheline Kamber. (2006). Data Mining – Concepts and Techniques(1st ed.). Mumbai: Morgan Kaufmann Publishers.
   (Page Nos: 1-36 47 -94 105-148 227 -267 289 -306 318- 322 354-372 386-458 600-640)

REFERENCES

1. Michael, J.A. , Berry Gordon, S. & Linoff. (2006). Data mining Techniques (2nd ed.). Wiley Publishing Inc.
2. Arun, K. Pujari. (2001). Data Mining Techniques (1st ed.). New Delhi:University Press
3. Gupta, G..K. (2000). Introduction to Data mining with case studies (1st ed.). New Delhi: Prentice Hall of India.
4. Hillol Kargupta ,Anupam Joshi, Krishnamoorthy Sivakumar ,& Yelena Yesha. (2005). Data Mining Next Generation Challenges and Future Directions(1st ed.). New Delhi: Prentice Hall of India .
5. Inmon, W. H. Building the DataWarehouse (1st ed.). New Delhi: Wiley Dreamtech India.
6. Michael, J.A., Berry Gordon, S., & Linoff. (2000). Mastering Data Mining (1st ed.). New Delhi: John Wiley & Sons Inc.
7. Margaret, H. Dunham. (2000). Data Mining Introductory and advanced topics (1st ed.). New Delhi:Pearson Education.
8. Paulraj Ponnaiah. (2002). Data Warehousing Fundamentals (1st ed.). New Delhi: Wiley Student ed.
9. Ralph Kimball. The Data Warehouse Life cycle Tool kit (1st ed.). New Delhi: Wiley Student ed.
10. Sam Anahory, & Dennis Murray. Data Warehousing in the Real World (1st ed.). Pearson Education Asia.
11. Soman, K.P., Shyam Diwakar, & Ajay,V. (2006). Insight into Data Mining Theory and Practice (1st ed.). New Delhi: Prentice Hall of India.

WEB SITES

1. Thedacs.Com
2. Dwreview.Com
3. Pcai.Com
4. Eruditionhome.Com

Semester-I

16CSP104 **CLOUD COMPUTING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Provide a good understanding of the concepts, standards in Cloud computing
- To make the student understand about the cloud service providers and their usage.
- To learn how to secure the data in cloud depending.
- To understand the various service level agreements.
- To understand the cloud using various case studies.
- To portray the recent trends in the field of cloud computing and providing exposures to some open source and commercial clouds.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Portray the recent trends in the field of cloud computing and providing exposures to some open source and commercial clouds.
2. Know the architecture of the cloud and the usage of clouds.
3. Secure their data from the security issues.
4. Make the students to work based on the various service level agreements.
5. Work with the traditional cloud and Microsoft azure, etc.
6. Provide a good understanding of the concepts, standards and protocols in Cloud computing

UNIT-I

Introduction to Cloud Computing -Characteristics of Cloud Computing -Paradigm shift -Benefits of cloud computing - Disadvantages of cloud computing- Role of Open Standards-Cloud Computing Architecture: Cloud computing stack-Public cloud -Private cloud -Hybrid cloud -Community cloud

UNIT –II

Infrastructure as a Service (IaaS) -Platform as a Service (PaaS) -Software as a Service (SaaS) -Identity as a Service (IDaaS) -Compliance as a Service (CaaS)- Cloud storage.

UNIT -III

Virtualization Technologies -Load Balancing and Virtualization -Advanced load balancing -The Google cloud - Hypervisors -Virtual machine types -VMware vSphere -Machine Imaging -Porting Applications -The Simple Cloud API - AppZero Virtual Application Appliance

UNIT-IV

Cloud Information Security Objectives -Confidentiality Integrity and Availability -Cloud Security Services - Relevant Cloud Security Design Principles -Cloud Computing Risk Issues -The CIA Triad

Privacy and Compliance Risks -Threats to Infrastructure Data and Access Control -Cloud Access Control Issues -Database Integrity Issues -Cloud Service Provider Risks Architectural Considerations
General Issues- Trusted Cloud Computing -Identity Management and Access Control

UNIT -V
Case Study on Open Source and Commercial Clouds: Microsoft Azure- Amazon EC2- Google Web services – Open Nebula.

SUGGESTED READINGS

TEXT BOOKS

1. Barrie Sosinsky .(2010). Cloud Computing Bible .New Delhi: Wiley- India
2. Rajkumar Buyya, James Broberg, & Andrzej, M. Goscinski. 2011. New Delhi: Tata Mc-Graw Hill.
3. Ronald, L. Krutz, Russell Dean Vines. (2010). Cloud Security: A Comprehensive Guide to Secure Cloud Computing. New Delhi: Wiley –India

REFERENCES

1. Dr Kumar Saurabh.(2012). Cloud Computing (2nd ed.). New Delhi: Wiley India.
2. Anthony T.Velte Toby J.Velte Robert Elsenpeter. (2010). Cloud Computing Practical Approach (1st ed.). New Delhi:Tata McGraw Hill.
3. Nikos Antonopoulos, Lee Gillam. (2012). Cloud Computing: Principles Systems and Applications . Springer.
4. Giovanni Toraldo. (2012). Open Nebula 3 Cloud Computing.

WEB SITES

1. en.wikipedia.org/wiki/Cloud_computing
2. www.ibm.com/cloud-computing/in/en/
3. www.oracle.com/CloudComputing
4. www.microsoft.com/en-us/cloud/default.aspx

Semester-I

16CSP105A WIRELESS AND MOBILE COMPUTING 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To learn about the concepts and principles of mobile computing;
- To explore both theoretical and practical issues of mobile computing;
- To develop skills of finding solutions and building software for mobile computing applications.
- To identify the use of mobile wireless technologies
- To know the types of mobile wireless technologies that are currently being used
- To understand the working of mobile wireless technologies access to network resources.

Course Outcomes (COs)

1. Grasp the concepts and features of mobile computing technologies and applications
2. Have a good understanding of how the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support
3. Identify the important issues of developing mobile computing systems and applications
4. Organize the functionalities and components of mobile computing systems into different layers and apply various techniques for realizing the functionalities;
5. Develop mobile computing applications by analyzing their characteristics and requirements, selecting the appropriate computing models and software architectures, and applying standard programming languages and tools;
6. Organize and manage software built for deployment and demonstration.

UNIT-I

Mobile computing applications and Platforms - Introduction – Strengths and Weakness of Wireless – Applications – Platforms to support Mobile Computing Applications –Wireless Networks – Wireless Architecture Security and Management – Wireless Business

UNIT-II

Mobile Computing Applications - Key Characteristics of Mobile Applications – Messaging for users – Mobile Portals – Special Applications – Mobile agent applications

UNIT-III

Wireless Internet Mobile IP and Wireless Web - Internet and Web – How it works – Mobile IP – WWW for wireless – Mobile Web Services - **Mobile Computing Platforms** - Introduction – Wireless Middleware – Wireless Gateways and Mobile Application Servers – WAP – I-MODE Wireless JAVA MMIT and BREW – Voice communication

UNIT-IV

Wireless LANs - IEEE 802.11 – MANET – HiperLAN2 - **Wireless Personal Area Networks** - IEEE 802.15 – Home Networks – Blue tooth LANs – Sensor Networks - **Cellular Networks** - Principles – First Generation(1G) Cellular – Paging networks – Second Generation(2G) Cellular – Data over Cellular Networks – Third Generation Cellular (3G) Networks – Beyond 3G

UNIT-V

WML: Formatting Output – Variables – Input Operations – WML Script – WML Libraries.

SUGGESTED READINGS

TEXT BOOKS

1. Amjad Umar. (2004). Mobile Computing and Wireless Communication – Applications Networks Platforms Architecture and Security New York: NGE Solutions INC.
   (Page Nos: 1.1- 1.52 2.3 – 2.51 3.2 – 3.37 4.3-4.51 6.16-6.36 7.3-7.33 8.4-8.39)
2. Kris Jamsa. (2001). WML & WML Script. New Delhi: Tata McGraw Hill Publishing.
   (Page Nos: 61-198 225-336)

REFERENCES

1. Ashok, K.Talukder,& Roopa, R. Yavagal. (2008). Mobile Computing New Delhi: Tata Mc-Graw Hill Publishing Company Pvt Ltd.
2. Jack, M. Holtzman, & David, J. Goodman. (1994). Wireless and Mobile Communications. Kluwer Academic Publishers.
3. Mischa Schwartz. (2005). Mobile Wireless Communications. Cambridge University Press.

WEB SITES

1. http://www.networkcomputing.com/netdesign/wireless1.html
2. http://www.homeandlearn.co.uk/bc/beginnerscomputing.html
3. http://compnetworking.about.com/
4. http://www.compinfo.co.uk/computer_books.htm#tele

Semester-I

16CSP105B **SOFTWARE TESTING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objective:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.
- To learn how to planning a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
- To expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.
- To gain software testing experience by applying software testing knowledge and methods to practice-oriented software testing projects.
- To gain the techniques and skills on how to use modern software testing tools to support software testing projects

Course Outcomes(COs)

1. Have the ability to understand the fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods
2. Have an ability to design and conduct a software test process for a software testing project.
3. Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.
4. Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.
5. Have an ability to use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.
6. Have an ability to use software testing methods and modern software testing tools for their testing projects.

UNIT-I

Introduction about testing Definition about software testing-Principles of testing-Phases of software project-Difference between QC and QA-Testing Verification and Validation. Life cycle models for Waterfall Spiral and V model.

UNIT-II

Types of testing-White box testing- Black box testing-Performance testing- Regression testing-Adhoc testing.

UNIT-III
Test planning-Test process-Test reporting-Best practices-Test planning check list-Test plan templates-Test case writing-Techniques for SRS document.

UNIT-IV
Software test automation-Skills needed for automation-What to automate-Scope of automation-Design and architecture for automation. Process model for automation-Selecting test tool.

UNIT-V
Test metrics – Types of metrics – Project metrics-progress metrics-productivity metrics. What is win runner-Methods of testing in win runner.

SUGGESTED READINGS

TEXT BOOK

1. Srinivasan Desikan , GopalaSwamy & Ramesh. (2008). Software testing –Principles and Practices (1st ed.). New Delhi : Pearson Education.
   (Page Nos: 3-22 25-43 47-68 73-104 169-190 193-207 228-248 351-385 388-416 420-456)

REFERENCES

1. Boris Beizer. (2000). Software Testing Techniques (2nd ed.). New Delhi: Wiley Dreamteach India.
2. Elfride Dustin. (2007). Effective software testing (1st ed.). New Delhi: Pearson Education.
3. Louise Tamres. (2002). Introduction to Software Testing (1st ed.). New Delhi: Pearson Education.
4. Ron Patton. (2004). Software Testing (2nd ed.). New Delhi: Pearson Education.
5. William, E. Perry. (2001). Effective methods for Software Testing (2nd ed.). New Delhi: John Wiley & Sons.

WEB SITES
1. en.wikipedia.org/wiki/Software_testing
2. www.onestoptesting.com/ -
3. www.ece.cmu.edu/~koopman/des_s99/sw_testing/
4. http://students.depaul.edu/~slouie/wr_tut.pdf (Unit V)

Semester-I

16CSP105C **SOFT COMPUTING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the scope and evolution of soft computing
- To learn the various soft computing frame works
- To be familiar with design of various neural networks
- To be exposed to fuzzy sets and fuzzy logic
- To understand fuzzy measures and reasoning
- To learn genetic programming.

Course Outcomes(COs)

1. Understand the scope and evolution of soft computing
2. Learn the various soft computing frame works
3. Be familiar with design of various neural networks
4. Be exposed to fuzzy sets and fuzzy logic
5. Understand fuzzy measures and reasoning
6. Learn genetic programming.

UNIT-I

Introduction : Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence – Neural Networks - Scope and Evolution– Models of Neural Networks – Feed forward Networks – Supervised Learning Neural Networks – Associative memory networks – Unsupervised learning networks – Special Networks.

UNIT-II

Fuzzy Sets and Fuzzy Logic : Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations - Fuzzy Rules Non – interactive fuzzy sets – Fuzzification– Intuition inference Rank ordering – Defuzzification – Max-membership principle centroid method center of sums center of largest area.

UNIT-III

Fuzzy Measures and Reasoning: Fuzzy arithmetic and measures – Fuzzy reasoning – approximate reasoning – categorical qualitative syllogistic dispositional – Fuzzy inference systems – fuzzy decision making – individual multiperson multi objective Bayesian – fuzzy logic control system – architecture model and application.

UNIT-IV

Machine Learning And Genetic Algorithm : Machine Learning Techniques – Machine Learning Using Neural Nets – Genetic Algorithms (GA) – Simple and General GA – Classification of Genetic Algorithm – Messy Adaptive Hybrid Parallel – Holland Classifier System.

UNIT-V

Application and Implementation Soft Computing: Genetic algorithms -. Traveling Salesperson Problem Internet Search Techniques – Fuzzy Controllers – Bayesian Belief networks for Rocket Engine Control – Neural Network Genetic algorithm and Fuzzy logic implementation in C++ and Matlab.

SUGGESTED READINGS

TEXT BOOK

1. Sivanandam , S.N.,& Deepa, S.N. (2007). Principles of Soft Computing (1st ed.). New Delhi: Wiley India Ltd.

REFERENCES

1.Jyh-Shing, Roger Jang, Chuen-Tsai, & Sun Eiji Mizutani. (2003). Neuro-Fuzzy and Soft Computing. New Delhi: Prentice-Hall of India

2. James, A. Freeman & David, M. Skapura. (2003).Neural Networks Algorithms Applications and Programming Techniques. New Delhi: Pearson Education.

3. George, J. Klir, & Bo Yuan. (1995). Fuzzy Sets and Fuzzy Logic-Theory and Applications. New Delhi: Prentice Hall.

4. Amit Konar. (2000). Artificial Intelligence and Soft Computing(1st ed.). New Delhi: CRC Press.

5. Simon Haykin. (1999). Neural Networks: A Comprehensive Foundation(2nd ed.). New Delhi: Prentice Hall.

6. Mitchell Melanie. (1998). An Introduction to Genetic Algorithm. New Delhi: Prentice Hall.

7. David, E. Goldberg. (1997). Genetic Algorithms in Search Optimization and Machine Learning. Addison Wesley.

WEB SITES

1. www.amazon.in/soft+computing
2. www.soft-computing.de/def.html
3. en.wikipedia.org/wiki/Soft_computing
4. endnote.com/downloads/style/applied-soft-computing
5. www.allbookez.com/soft-computing-lecture-notes/

Semester-I

16CSP111 WEB TECHNOLOGY – PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the fundamentals of JavaScript and use different objects
- To know the basics of ASP.NET, its objects and web forms
- To relate SQL Server and ASP.NET through database components
- To develop web application that deals with database and website development.
- To understand XML , Namespace and W3C XML Schema
- To get Familiar with Document Object Model for XML

Course Outcomes(COs)

1. Create a client side scripting web application using forms and Java Script
2. Understand the server side scripting of ASP.NET, its objects and web forms
3. Relate SQL Server and ASP.NET through database components
4. Develop web application that deals with database and website development.
5. Understand XML , Namespace and W3C XML Schema
6. Understand the Document Object Model for XML and JavaScript.

List of Programs

1. Using Javascript change the font color on reloading a webpage.
2. Generate web page that represents clock-every 60 see the page updated with server current time Using JavaScript.
3. Design a form and validate it using JavaScript.
4. Write Database Access program using ASP.NET
5. Program to retrieve Cookies information using ASP.NET
6. Program to count web page hits using ASP.NET
7. Create a menu in XML.
8. Create a demo for XSLT.
9. Display XML information in Tree structure format.

Semester-I

16CSP112 DATA MINING LAB USING MATLAB– PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives

- To identify the scope and essentiality of Data Warehousing and Mining.
- To analyze data, choose relevant models and algorithms for respective applications.
- To study spatial and web data mining.
- To develop research interest towards advances in data mining.
- To introduce students to the basic concepts and techniques of Data Mining.
- To develop skills of using recent data mining software for solving practical problems.

Course Outcomes (COs)

1. Understand Data Warehouse fundamentals, Data Mining Principles
2. Design data warehouse with dimensional modelling and apply OLAP operations.
3. Identify appropriate data mining algorithms to solve real world problems
4. Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining
5. Describe complex data types with respect to spatial and web mining.
6. Benefit the user experiences towards research and innovation integration.

List of Programs

1. Write a MATLAB program to do all basic matrix operations in MATLAB for a multidimensional array.

2. Write a MATLAB code to compares and contrasts some similarity and distance measures for the following .
(a) Compute the Hamming distance and the Jaccard similarity between the following two binary vectors.

x = 0101010001
y = 0100011000

3. a. Plot the graph of $f(x) = \exp(-2x^2 - 3y^2)$. Choose appropriate intervals for x and y.
b. Plot the graph of f (x) = cos(x) sin(y). Choose appropriate intervals for x and y.

4. The number of children for different patients in a database is given with a vector
c= {31027634-20010156}
. Find the outliers in the set C using standard statistical parameters mean and variance.
a. If the threshold value is changed from ±3 standard deviations to ±2 standard deviations what additional outliers are found?

5. For a given data set X of three-dimensional samples
X=[{120}{314}{215}{016}{243}{442}{521}{777}{000}{333}]

a) find the outliers using the distance-based technique if

i) the threshold distance is 4 and threshold fraction p for non-neighbor samples is 3.

ii) the threshold distance is 6 and threshold fraction p for non-neighbor samples is 2.

6. Given the data set X with three input features and one output feature representing the classification of samples

X:

I_1	I_2	I_3	O
2.5	1.6	5.9	0
7.2	4.3	2.1	1
3.4	5.8	1.6	1
5.6	3.6	6.8	0
4.8	7.2	3.1	1
8.1	4.9	8.3	0
6.3	4.8	2.4	1

Rank the features using a comparison of means and variances

7. A data set for analysis includes only one attribute X:

X={71251859131219712121334513876}

a) What is the mean of the data set X?

b) What is the median?

c) What is the mode and what is the modality of the data set X?

d) Find the standard deviation for X.

e) Give a graphical summarization of the data set X using a boxplot representation.

f) Find outliers in the data set X.

8. Given a data set with two dimensions X and Y.

X	Y
1	5
4	2.75
3	3
5	2.5

a) Use a linear-regression method to calculate the parameters α and β where y= α + βx.

b) Estimate the quality of the model obtained in a) Using the correlation coefficient r.

9. The following is the data set X:

X:

Year	A	B
1996	7	100
1997	5	150
1998	7	120
1999	9	150

2000	5	130
2001	7	150

Create 2D Presentations:

a) Show a bar chart for the variable A
b) Show a histogram for the variable B.
c) Show a line chart for the variable B
d) Show a pie chart for the variable A

10. Create a MATLAB function to count the number of lines in a text file.

11. Create a structure array for student mark details and print a plot for the marks of the students.

12. The test scores for the three students are given in the following table:

	RDBMS	**OracleDBA**	**WebDesigning**	**AI**
Smith	66	91	95	83
Sam	91	88	80	73
John	80	88	80	78

Find the best student using multifactorial evaluation if the weight factors for the subjects are given as the vector W= [0.3 0.2 0.1 0.4]

Semester-II

16CSP201 INTERNETWORKING WITH TCP/IP 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To get an architectural overview of the TCP/IP Protocol Suite
- To understand about subnets using IP classes
- To understand the key features and functions of ARP Protocol.
- To understand how basic routing protocol works.
- To understand about DNS and its applications
- To understand the concepts of Remote Login and VPN

Course Outcomes (COs)

At the completion of the course, students will:

1. Have the ability to analyze and differentiate networking protocols used in TCP/IP protocol suite.
2. Understand the routing IP datagrams and checksum.
3. Exposed to unicast and multicast routing.
4. Learn about host name resolution and the Domain Name System (DNS).
5. Learn about services and operations of DHCP Servers and Domain Name Servers
6. Understand about SMTP and SNMP.

UNIT-I

Introduction: WAN WAN technologies - Protocols and Standards - TCP/IP protocol suite - Internetworking Devices - Classful IP Addressing – Subnetting – Supernetting – Classless Addressing

UNIT-II

ARP & RARP – Proxy ARP – ARP over ATM – ARP and RARP Protocol Format. IP Datagram – Fragmentation – Options – IP Datagram Format – Routing IP Datagrams – Checksum. ICMP – Types of Messages - Message Format – Error Reporting – Query – Checksum.

UNIT-III

Unicast Routing Protocol: Intra Domain and Inter Domain Routing – Distance Vector Routing – RIP – Link State Routing – OSPF – Path Vector Routing – BGP – Multicast Routing – Multicast Routing Protocols. Group Management – IGMP Message – IGMP Operation – Process to Process Communication – UDP Operation – TCP Services - Flow Control.

UNIT-IV

BOOTP - DHCP – Address Discovery and Binding. DNS – Name Space – DNS in Internet – Resolution – Resource Records

UNIT-V

Remote Login - FTP – SMTP – SNMP. IP over ATM Wan – Cells – Routing the Cells – ATMARP – Logical IP Subnets. VPN

SUGGESTED READINGS

TEXT BOOK

1. Behrouz, A. Forouzan. (2009). TCP/IP Protocol Suite (3rd ed.). New Delhi: Tata McGraw Hill Publication.
   (Page Nos: 2-5 6-38 69-74 84-95 102-121 160-188 191-1-201 221-232 238-241 256-279 299-304 386-430 441-444 457-464 471-488 519-542 561-566 575-576 621-632 637-644 680-682)

REFERENCES

1. Andrews, S. Tanenbaum. (2003). Computer Networks (4th ed.). New Delhi:Prentice Hall of India Private Ltd..
2. Buck Graham. (2007). TCP/IP Addressing (2nd ed.). New Delhi: Harcount India Private Limited.
3. Douglas, E. Comer. (2000). Computer Networks and Internets (4th ed.). New Delhi: Pearson Education.
4. William Stallings. (2007). Data and Communication Network(8th ed.). New Delhi: Tata McGraw Hill.

WEB SITES

1. en.wikipedia.org/wiki/Internet_protocol_suite
2. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
3. www.yale.edu/pclt/COMM/**TCPIP**.HTM
4. www.w3schools.com/**tcpip**/default.asp

Semester-II

16CSP202 **CYBER SECURITY** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To state the basic concepts in information security, including security policies, security models, and security mechanisms.
- To provide an exposure to the spectrum of security activities methods methodologies and procedures with emphasis on practical aspects of Information Security.
- To understand principles of web security.
- To gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
- To understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.
- To provide the learner will be able to examine secure software development practices.

Course Outcomes (COs)

A student who successfully completes this course should at a minimum be able to:

1. State the basic concepts in information security, including security policies, security models, and security mechanisms.
2. Explain concepts related to applied cryptography including the four techniques for crypto-analysis symmetric and asymmetric cryptography, digital signature, message authentication code, hash functions and modes of encryption operations.
3. Explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
4. The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
5. The learner will understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.
6. The learner will be able to examine secure software development practices.

UNIT-I

Introduction to cybercrime: Introduction-Cybercrime: Definition and Information Security-who are cybercriminals? - Classification of cybercrimes. Cybercrime: The legal perspectives- cybercrimes: An Indian Perspective - cybercrime and the Indian ITA2000: Hacking and the Indian law(s) - A Global Perspective on cybercrimes: cybercrime and the Extended Enterprise - cybercrime Era: Survival Mantra for the Netizens - Concluding Remarks and Way Forward to Further Chapters.

UNIT-II

Cyberoffenses: How Criminals Plan Them: Introduction: categories of Cybercrime -How criminals Plan the Attacks: Reconnaissance Passive Attacks Active Attacks Scanning and

Scrutinizing Gathered Information Attack(Gaining and Maintaining the system Access) - social Engineering: Classification of Social Engineering - Cyberstalking: Types of stalkers Cases Reported on Cyberstalking How stalking Works? real-life incident of Cyberstalking -Cybercafe and Cybercrimes - Botnets: The Fuel for cybercrime: Botnet - Attack Vector-Cloud Computing: Why cloud computing? Types of Services Cybercrime and Cloud Computing.

UNIT-III

Cybercrime: Mobile and wireless Devices-Introduction - Proliferation of Mobile and Wireless Devices - Trends in Mobility-Credit Card Frauds in Mobile and Wireless Computing Era: Types and Techniques of Credit Card Frauds - Security challenges Posed by Mobile Devices - Registry Settings for Mobile Devices - Authentication Service security: cryptographic security LDAP Security RAS Security Media Player Control Security Networking API Security - Attacks on Mobile/Cell Phones: Mobile Phone Theft Mobile Viruses Mishing Vishing Smishing Hacking Bluetooth.

UNIT-IV

Mobile Devices: Security Implication for Organizations – Managing Diversity and Proliferation of Hand-Held Devices Unconventional/ Steath Storage Devices Threats through Lost and Stolen Devices Protecting Data on lost devices Educating the Laptop Users - Organizational Measures for Handling Mobile devices - Related Security Issues: Encrypting Organization Databases Including Mobile Devices in Security Strategy - Organizational Security Policies and Measures in mobile Computing Era: Importance of Security polices relating to mobile Computing Devices Operating Guidelines for Implementing Mobile Devices Security Polices Organizational Policies for the Use of Mobile Hand - Held Devices - Laptops: Physical Security Countermeasures.

UNIT-V

Tools and Methods Used in Cybercrime: Introduction - Proxy Servers and Anonymizers - Phishing: How Phishing Works? - Password Cracking: Online Attacks Offline Attacks Strong Weak and Random Passwords Random passwords - Keyloggers and Spywares: Software Keyloggers Hardware Keyloggers AntiKeylogger Spywares - Virus and Worms: Types of Virus - Trojan Horses and Backdoors: backdoor How to protect from Trojan Horses and Backdoors - Steganography: Steganalysis - DoS and DDoS Attacks: DoS AttacksClassification of DoS Attacks Types or Levels of DoS Attacks Tools Used to Launch DoS Attacks DDoS Attacks How to Protect from DoS/DDoS Attacks – SQL Injection: Steps for SQL Injection Attacks How to Prevent SQL Injection Attacks - Buffer Overflow: Types of Buffer Overflow How to Minimize Buffer Overflow - Attacks on Wireless Networks: Traditional Techniques of Attacks on Wireless Networks Thef of Internet Hours and Wi-fi-based Frauds and Misuses How to Secure the Wireless Networks.

SUGGESTED READINGS

TEXT BOOK

Nina Godbole , & Sunit Belapure. (2013). CYBER SECURITY. New Delhi: Wiley India Pvt. Ltd.

REFERENCES

1. Charles ,P. Pfleeger ,& Shari, L. Pfleeger. (2003).
2. Dieter Gollmann . (2006). Computer Security (2^{nd} ed.). John Wiley & Sons.
3. Godbole, N. (2009). Information Systems Security :Metrics Frameworks and Best Practices . New Delhi: Wiley India.
4. Marther, T., Kumaraswamy, S.,& Latif, S. (2009). Cloud Security and Privacy: An Enterprise Perceptive on Risk and Complaince. O'Reilly.

WEB SITES

1. http://www.csc.ncsu.edu/faculty/ning
2. csrc.nist.gov/publications/nistpubs/800-12/handbook.pdf
3. www2.warwick.ac.uk/fac/sci/dcs/teaching/modules/cs134/

Semester-II

16CSP203 ORACLE 10G ADMINISTRATION 4H – 4C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the Oracle database architecture and how its components work and interact with one another.
- To use performance monitoring database security user management and backup/recovery techniques.
- To create an Operational Database
- To Administer users and manage data.
- To Transport data between databases.
- To Configure the network.

Course Outcomes(COs)

On successful completion of the course the student should be able to:

1. Install the Oracle Database.
2. Back up and recover data.
3. Administer users and manage data.
4. Transport data between databases.
5. Configure the network.
6. Create an Operational Database

UNIT-I

Oracle DBA'S**:** oracle DBA's role - DBA job classification - types of databases. Oracle database 10g architecture: database structures - processes - memory structures - database transaction. Creating an oracle databases**:** creating the database - creating the parameter file-creating a new database - using a server parameter file.

UNIT-II

Schema management**:** creating and managing table spaces – indexes - materialized views. Oracle transaction management: oracle transactions - transaction properties - transaction concurrency control - isolation levels - implementing oracle's concurrency control - using undo data to provide read consistency - transaction query - discrete transactions - autonomous transactions - resumable space allocation.

UNIT-III

Loading and transforming data**:** overview of extraction transformation and loading - using external tables to load data - transforming data.Using data pump export and import: introduction - performing exports and imports -monitoring - transportable table spaces.

Managing and monitoring operational databases: types of oracle performance statistics - server generated alerts - automatic workload repository - active session history - undo and MTTR advisors.

UNIT-IV

User management and database security: managing users - the database resource manager - controlling access to data - auditing database usage - authenticating users -enterprise user security - database security do’s and dont’s.Backing up databases: backing up oracle databases - the recovery manager - backing up control file - oracle back up tool – user managed backups - database corruption detection - enhanced data protection for disaster recovery. Database recovery: types of database failures - oracle recovery processes - performing recovery with RMAN - media recovery scenarios.

UNIT-V

Improving database performance**:** SQL query optimization - approach to oracle performance tuning - optimizing oracle query processing - oracle optimization and oracle cost based optimizer - writing efficient SQL - DBA’s role to improve SQL processing - SQL performance tuning tools - explain plan - SQL tuning advisor - simple approach to tuning SQL statement.Performance tuning: Tuning the instance - introduction to instance tuning - automatic performance tuning vs dynamic performance views - tuning oracle memory - evaluating system performance - measuring IO performance - measuring instance performance - simple approach to instance tuning.

SUGGESTED READINGS

TEXT BOOK

Sam, R. Alapati., & John Watson. (2007). Expert Oracle Database 10g Administration(1st ed.). New Delhi: Springer (India) Pvt Ltd.

REFERENCE BOOKS

1. April Wells. (2006). Oracle DB Administration (1st ed.). New Delhi: Dream Tech Press
2. Ivan Bayross. (2006). Oracle 10g DB with HTMLDB (1st ed.). New Delhi: BPB Publications.
3. Jay Bayross. (2006). Oracle 10g Developer Suite (1st ed.). New Delhi: BPB Publications.

Web Sites

download-uk.oracle.com
cse.psu.edu
dba-oracle.com
otn.oracle.com
oracle.com
techonthenet.com/oracle
forums.oracle.com

Semester-II

16CSP204 INTRODUCTION TO SOFTWARE ARCHITECTURE 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To introduce basic concepts and principles about software design and software architecture.
- To understand design issues followed by coverage on design patterns.
- To get an overview of architectural structures and styles.
- to know practical approaches and methods for creating and analyzing software architecture are presented.
- To analyze the interaction between quality attributes and software architecture.
- To gain experiences with examples in design pattern application and case studies in software architecture.

Course Outcomes(COs)

A student who successfully completes this course should at the minimum be able to:

1. Design and motivate software architecture for large scale software systems
2. Recognize major software architectural styles design patterns and frameworks
3. Understand design issues followed by coverage on design patterns.
4. Generate architectural alternatives for a problem and select among them
5. Use well-understood paradigms for designing new systems
6. Identify and assess the quality attributes of a system at the architectural level

UNIT I

Introduction – Software Architecture – Software Design levels – An Engineering Discipline for Software – The status of Software Architecture – Architectural styles – Pipes and filters – Data Abstraction and Object-oriented organization – Event based implicit invocation – Layered systems – Repositories – Interpreters – Process Control – Other Familiar Architecture – Heterogeneous Architectures.

UNIT II

Case studies - Key word is Context – Instrumentation Software – Mobile Robotics – Cruise Control – Three Vignettes in Mixed Style

UNIT III

Shared Information Systems – Database Integration – Integration in Software Development Environments – Integration in the Design of Buildings – Architectural structures for shared Information Systems

UNIT IV

Guidance for User-Interface Architectures – The quantified Design Space – The value of Architectural formalism – Formalizing the Architecture of a specific system – Formalizing an Architectural Style – Formalizing an Architectural Design Space – Towards a Theory of Software Architecture – Z Notation

UNIT V

Requirements for Architecture – Description Languages – First class connectors – Adding Implicit Invocation to Traditional Programming Languages – Tools for Architectural Design – UniCon – Exploiting Style in Architectural Design Environments – Beyond definition/Use: Architectural Interconnection

SUGGESTED READINGS

TEXT BOOKS

1. Mary Shaw., & David Garlan. Software Architecture – Perspectives on an Emerging Discipline. New Delhi: Prentice Hall of India Eastern Economy edition.

2. Taylor Nenad., Medvidovic Eric., Dashofy, V., & Richard, N. (2010). Software Architecture: Foundations Theory and Practice. New Delhi: Wiley India Pvt. Limited.

REFERENCES

Boris Beizer. (1990). Software Testing Techniques (2nd ed.). Van Nostrand Reinhold.

Semester-II

16CSP205A OBJECT ORIENTED ANALYSIS AND DESIGN WITH UML 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- to use an object-oriented method for analysis and design
- To analyse information systems in real-world settings and to conduct methods such as interviews and observations
- To have a general understanding of a variety of approaches and perspectives of systems development, and to evaluate other is development methods and techniques
- To know techniques aimed to achieve the objective and expected results of a systems development process
- To know different types of prototyping
- To know how to use UML for notation.

Course Outcomes (COs)

Upon the completion of the course students will be able to :-

1. Understand the concepts and terms used in the object-oriented approach to systems analysis and design
2. Use Unified Modeling Language 2.2
3. Perform object-oriented analysis and design
4. Identify the characteristics of the UML and explain UML is relevant to the process development.
5. Draw class Diagrams, Object Diagram and Interaction Diagram.
6. Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, statechart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation.

UNIT-I

The Object Model: The evolution of the object model – Elements of the object model – Applying object model. **Classes and Objects:** The nature of an object – Relationships among objects.

UNIT-II

Classes and Objects: The nature of the class – Relationship among classes – The Interplay of Classes and Objects – On building quality classes and objects. **Classification:** The Importance of proper classification – Identifying proper classes and objects – Key abstraction mechanism.

UNIT-III

The notation: Elements of the notation – class diagrams –state transition diagrams – object diagrams.

UNIT-IV

The Process: First principles – The micro development process – The macro development process.

UNIT-V

UML Overview: UML History – Goals of UML – UML concept areas – Syntax of Expressions and Diagrams.

Nature and purpose of Models: A Model – Levels of Models – Meaning of Model. UML Walkthrough: UML views – Static views – use case view – interaction views – state machine view – activity view – physical view – model management view- extensibility constructs.

SUGGESTED READINGS

TEXT BOOK

1. Grady Booch. (2007). Object Oriented Analysis and Design (3rd ed.). New Delhi: Addison Wesley.

REFERENCES

1. James Rumbaugh., Ivar Jcobson., & Grady Booch. (2003). The Unified Modeling Language Reference Manual (1st ed.). New Delhi: Addison Wesley.
2. Martin Fowler., Kendall Scott. (2004). UML Distilled (2nd ed.). New Delhi: Pearson Education.

WEB SITES

1. uml-tutorials.trireme.com/
2. http://www.devshed.com/c/a/Practices/Introducing-UMLObjectOriented-Analysis-and-Design/
3. http://community.sparxsystems.com/tutorials/object-oriented-analysis-and-design

Semester-II

16CSP205B **GRID COMPUTING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To portray the recent trends in the field of Grid computing and creation and management of Internet-based utility computing infrastructure**.**
- To introduce the principles underlying the function of distributed systems and their extension to grid computing.
- To introduce students to the fundamental components of Grid environments, such as authentication, authorization, resource access, and resource discovery.
- To provide a good understanding of the concepts, standards and protocols in Grid computing
- To enable students to be able to justify the applicability, or non-applicability, of Grid technologies for a specific application.
- To perform analysis, design and implementation of ARC grid computing model.

Course Outcomes (COs)

After successful completion of this course, student will be able to

1. Understand and explain the basic concepts of Grid Computing.
2. Explain the principles underlying the function of distributed systems and their extension to grid computing
3. Explain the advantages of using Grid Computing within a given environment.
4. Identify fundamental components of Grid environments, such as authentication, authorization, resource access, and resource discovery.
5. Understand Data management and transfer in Grid environments.
6. Perform analysis, design and implementation of ARC grid computing model.

UNIT- I

Introduction: Cluster to Grid Computing – Cluster Computing Models – Grid Models – Mobile Grid Models – Applications. Parset: System-independent Parallel Programming on Distributed Systems –introduction – Semantics of the Parset Construct – Expressing Parallelism through Parsets – Implementing Parsets on a Loosely Coupled Distributed System

UNIT- II

Anonymous Remote Computing Model: Issues in Parallel Computing on Interconnected Workstations – Existing Distributed Programming Approaches – The ARC Model of Computation – The Two-tired ARC Language Constructs – Implementation. Integrating Task Parallelism with Data Parallelism: A Model for Integrating Task Parallelism into Data Parallel Programming Platforms – Integration of the Model into ARC – Design and Implementation – Applications - Performance Analysis

UNIT- III
Anonymous Remote Computing and Communication Model: Location – Independent Inter-task Communication with DP – DP Model of Iterative Grid Computations – Design and Implementation of Distributed Pipes. Parallel Programming Model on CORBA: Notion of Concurrency – System Support –Implementation and Performance

UNIT- IV
Sneha-Samuham Grid Computing Model: A Parallel Computing Model over Grids – Design and Implementation – Performance studies. Introducing Mobility into Anonymous Remote Computing and Communication Model – Issues in Mobile clusters and Parallel Computing on Mobile Clusters – Moset Overview – Computation Model – Implementation and Performance

UNIT- V
Distributed Simulated Annealing Algorithms for Job Shop Scheduling - Implementation. Parallel Simulated Annealing Algorithms - Simulated Annealing (SA) Technique – Clustering Algorithm for Simulated Annealing (SA) – Combination of Genetic Algorithm and Simulated Annealing (SA) Algorithm - Implementation. Epilogue : DOS Grid: Vision of Mobile Grids - Mobile Grid Monitoring System – Healthcare Application Scenario.

SUGGESTED READINGS

TEXT BOOK

1. Janakiram, D. (2005). Grid Computing – A Research Monograph. New Delhi: TataMcGraw Hill Publishing Company Limited.

REFERENCES

4. Joshy Joseph., & Craig Fellenstein. (2003). Grid Computing. New Delhi: Pearson Education.
5. Prabhu, C.S.R. (2008). Grid and Cluster Computing New Delhi:Prentice Hall of India

WEB SITES
1. http://cseweb.ucsd.edu/classes/sp00/cse225/notes/fran/introweb.html
2. http://www.wisegeek.com/what-is-grid-computing.htm
3. http://www.cs.kent.edu/~farrell/grid06/lectures/index.html

Semester-II

16CSP205C GEOGRAPHICAL INFORMATION SYSTEM 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To have a basic, practical understanding of GIS concepts, techniques and real world applications.
- To analyse the basic components of GIS
- To classify the maps, coordinate systems and projections
- To process spatial and attribute data and prepare thematic maps
- To identify and rectify mapping inaccuracies
- To formulate and solve geospatial problems

Course Outcomes (COs)

After successful completion of this course, student will be able to

1. Understand the basic concepts of geography necessary to efficiently and accurately use GIS technology.
2. Understand basic GIS data concepts.
3. Have an ability to perform basic GIS analysis of concepts.
4. Have demonstrated a practical application of GIS.
5. Have practical experience using basic GIS tools.
6. Have an understanding of GIS and its relationship to mapping software development.

Unit I

What is a Geographical Information Systems (GIS) – Geographically referenced data – GIS operations – Geographic Coordinate systems – Map Projections – Commonly used Map Projections – Projected Coordinate Systems – Working with Coordinate systems in GIS.

Unit II

Georelational Vector Data Model – Georelational data model – Representation of simple features – Topology – Nontopological Vector data – Data models for composite features.
Object based vector data model – Object based data model – The geodatabase data model – Interface – Topology rules – Advantages of Geodatabase model.

Unit III

Raster Data Model – Elements of Raster Data Model - Raster Data Structure – Data Compression – Data Conversion – Integration of Raster and Vector Data.
Data Input – Existing GIS data – Meta Data – Conversion of Existing Data – Creating New Data.

Unit IV

Geometric Transformation – Root Mean Square (RMS) Error – Interpretation of RMS errors Digitized Maps – Re sampling of Pixel Values.

Spatial Data Editing – Location Errors – Spatial Data Accuracy Standards – Topological Errors – Topological Editing – Nontopological Editing – Other Editing operations

Unit V

Data Display and Cryptography – Cartographic Symbolization – Types of Maps – Typography – Map Design – Map Production.
Data Exploration – Attribute and Data Query – Spatial Data Query – Raster Data Query – GIS Applications.

SUGGESTED READINGS

Text Book

1. Kang-tsung Chang. (2006). Introduction to Geographic Information Systems (3rd ed.). New Delhi: Tata McGraw-Hill.

Reference Book

1. Ian Heywood., Sarah Cornelius., Steve Carver.,& Srinivasa Raju. (2006). An introduction to Geographical Information Systems (2nd ed.). New Delhi: Pearson Education.

Semester-II

16CSP211 ROUTER CONFIGURATION – PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To get an architectural overview of the TCP/IP Protocol Suite
- To understand about subnets using IP classes
- To understand the key features and functions of ARP Protocol.
- To understand how basic routing protocol works.
- To understand about DNS and its applications
- To understand the concepts of Remote Login and VPN

Course Outcomes (COs)

At the completion of the course, students will:

1. Have the ability to analyze and differentiate networking protocols used in TCP/IP protocol suite.
2. Understand the routing IP datagrams and checksum.
3. Exposed to unicast and multicast routing.
4. Learn about host name resolution and the Domain Name System (DNS).
5. Learn about services and operations of DHCP Servers and Domain Name Servers
6. Understand about SMTP and SNMP.

List of programs

1. Simple router configuration.
2. Access and utilize the router to set basic parameters.
3. Connect configure and verify operation status of a device interface.
4. Implement static and dynamic addressing services for hosts in a LAN environment.
5. Identify and correct common problems associated with IP addressing and host configurations.
6. Configure verify and troubleshoot RIPv2.
7. Perform and verify routing configuration tasks for a static or default route given.
8. Configure verify and troubleshoot NAT operation on a router.
9. Configure and verify a PPP connection between routers.

Semester-II

16CSP212 ORACLE 10G ADMINISTRATION – PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the Oracle database architecture and how its components work and interact with one another.
- To use performance monitoring database security user management and backup/recovery techniques.
- To create an Operational Database
- To Administer users and manage data.
- To Transport data between databases.
- To Configure the network.

Course Outcomes(COs)

On successful completion of the course the student should be able to:

1. Install the Oracle Database.
2. Back up and recover data.
3. Administer users and manage data.
4. Transport data between databases.
5. Configure the network.
6. Create an Operational Database

List of Programs

1. Demo for globalization support.
2. Create database and do the manipulation.
3. Create users and grant the privileges.
4. Create table space.
5. Create different types of tables.
6. Create index and managing index tables.
7. Demo for flashback database and tables.
8. Export and import the tables.
9. Create back up for tables.
10. Re-sequence the rows using CTAS.
11. Change the initializing parameters.

Semester-III

16CSP301	**J2EE**	**4H – 4C**
Instruction Hours / week: L: 4 T: 0 P: 0	**Marks:** Int : **40** Ext : **60**	Total: **100**

Course Objectives

- To Understand the In-depth concepts of JEE
- To Understand the in-depth Life cycle of servlets and JSP.
- To Learn how to communicate with databases using Java.
- To Handle Errors and Exceptions in Web Applications
- To Use NetBeans IDE for creating J2EE Applications
- To impart expertise in Web Application Development using J2EE.

Course Outcomes(COs)

1. Understand the In-depth concepts of JEE
2. Understand the in-depth Life cycle of servlets and JSP.
3. Learn how to communicate with databases using Java.
4. Handle Errors and Exceptions in Web Applications
5. Use NetBeans IDE for creating J2EE Applications
6. Understand J2EE as an architecture and platform for building and deploying web-based, n-tier, transactional, component-based enterprise applications

UNIT-I

J2EE Overview: Beginning of Java – Java Byte code – Advantages of Java –J2EE and J2SE. J2EE Multi Tier Architecture – Distributive Systems – The Tier – Multi Tier Architecture – Client Tier Web Tier Enterprise Java Beans Tier Enterprise Information Systems Tier Implementation.

UNIT-II

J2EE Database Concepts: Data – Database – Database Schema. **JDBC Objects**: Driver Types – Packages – JDBC Process – Database Connection – Statement Objects – Result Set – Meta Data.

UNIT-III

Java Servlets: Benefits – Anatomy – Reading Data from Client –Reading HTTP Request Headers – Sending Data to client – Working with Cookies.

UNIT-IV

Enterprise Java Beans: Deployment Descriptors – Session Java Bean –Entity Java Bean Message Driven Bean.

UNIT-V

JSP: What is Java Server Pages? - Evolution of Dynamic Content Technologies – JSP & Java 2 Enterprise ed.).; **JSP Fundamentals**: Writing your first JSP- Tag conversions-

Running JSP. **Programming JSP Scripts**: Scripting Languages – JSP tags- JSP directives – Scripting elements – Flow of Control – comments;
Java Remote Method Invocation.

SUGGESTED READINGS

TEXT BOOKS

1. Jim Keogh. (2010). The Complete Reference J2EE (1st ed.). New Delhi: Tata McGraw Hill.
   (PAGE NOS. : 3 - 61 23 - 35 98 – 116124 – 151 157 – 159 350 – 369 406 – 443 380 – 395 486-490)
2. Duane, K. Fields., & Mark, A. Kolb. (2000). Web Development with Java Server Pages (1st ed.). Pune: Manning Publications.
   (PAGE NOS. : 2 – 15 46 - 64 65 – 99)

REFERENCES

1. Joseph, J. Bambara et al. (2001). J2EE Unleashed (1st ed.). New Delhi:Tech Media.
2. Paul, J. Perrone., Venkata, S. R. Chaganti., Venkata S. R. Krishna., & Tom Schwenk. (2003). J2EE Developer's Handbook. New Delhi: Sams Publications.
3. Rod Johnson. (2004). J2EE Development without EJB (1st ed.). New Delhi:Wiley Dream Tech.
4. Rod Johnson., & Rod Johnson, P.H. (2004). Expert One-On-One J2ee Design and Development. New Delhi: John Wiley & Sons.

WEB SITES

1. java.sun.com/javaee/
2. java.sun.com/j2ee/1.4/docs/tutorial/doc/
3. www.j2eebrain.com/

Semester-III

16CSP302 OPEN SOURCE TECHNOLOGIES 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the concepts and principles that underlies modern operating systems
- To practice component to relate theoretical principles with operating system implementation.
- To learn about processes and processor management
- To learn about concurrency and synchronization
- To understand memory management schemes, file system and secondary storage management security and protection etc.
- To use different IPC ways in their programs like Message Queues, Semaphores, and Shared Memories.

Course Outcomes(COs)

At the end of the course the student will be in a position to –

1. Use basic fundamental utilities which are required again and again on daily basis to work on a modern operating system.
2. Write useful shell scripts which greatly and effectively enhance the usefulness of computers, from the point of view of programmers and application developers.
3. Understand basics of various OS related concepts, from programmer's point of view, like files, directories, kernel, inodes, APIs, system calls, processes, signals, etc.
4. Develop applications where several processes need to communicate with each other to complete a task.
5. Use different IPC ways in their programs like Message Queues, Semaphores, and Shared Memories.
6. Write programs which employs advanced concepts like multithreading.

UNIT-I

History and Overview Of GNU/Linux And FOSS 3

Definition of FOSS & GNU History of GNU/Linux and the Free Software Movement Advantages of Free Software and GNU/Linux FOSS usage trends and potential—global and Indian.

UNIT-II

System Administration

GNU/Linux OS installation--detect hardware configure disk partitions & file systems and install a GNU/Linux distribution ; Basic shell commands -logging in listing files editing files copying/moving files viewing file contents changing file modes and permissions process management ; User and group management file ownerships and permissions PAM authentication ; Introduction to common system configuration files & log files ;

Configuring networking basics of TCP/IP networking and routing connecting to the Internet (through dialup DSL Ethernet leased line) ; Configuring additional hardware - sound cards displays & display cards network cards modems USB drives CD writers ; Understanding the OS boot up process ; Performing every day tasks using gnu/Linux -- accessing the Internet playing music editing documents and spreadsheets sending and receiving email copy files from disks and over the network playing games writing CDs ; X Window system configuration and utilities--configure X windows detect display devices ; Installing software from source code as well as using binary packages.

UNIT-III

Server Setup And Configuration

Setting up email servers--using postfix (SMTP services) courier (IMAP & POP3 services) squirrel mail (web mail services) ; Setting up web servers --using apache (HTTP services) php (server-side scripting) perl (CGI support) ; Setting up file services -- using samba (file and authentication services for windows networks) using NFS (file services for gnu/Linux / Unix networks) ; Setting up proxy services --using squid (http / ftp / https proxy services) ; Setting up printer services -using CUPS (print spooler) foomatic (printer database) ; Setting up a firewall -Using netfilter and iptables.

UNIT-IV

Programming Tools

Using the GNU Compiler Collection --GNU compiler tools ; the C preprocessor (cpp) the C compiler (gcc) and the C++ compiler (g++) assembler (gas) ; Understanding build systems --constructing make files and using make using autoconf and autogen to automatically generate make files tailored for different development environments ; Using source code versioning and management tools --using cvs to manage source code revisions patch & diff ; Understanding the GNU Libc libraries and linker –linking against object archives (.a libraries) and dynamic shared object libraries (.so libraries) generating statically linked binaries and libraries generating dynamically linked libraries.

Using the GNU debugging tools --gdb to debug programs graphical debuggers like ddd memory debugging / profiling libraries mpatrol and valgrind ; Review of common programming practicies and guidelines for GNU/Linux and FOSS ; Introduction to Bash sed & awk scripting.

UNIT-V

Application Programming

Basics of the X Windows server architecture ; Qt Programming ; Gtk+ Programming ; Python Programming ; Programming GUI applications with localisation support.

SUGGESTED READINGS

TEXT BOOK

1.. Venkateshwarlu, N. B. (2005) Introduction to Linux: Installation and Programming. New Delhi: BPS Publishers.

REFERENCES

1. Matt Welsh., Matthias Kalle Dalheimer., Terry Dawson.,& Lar Kaufman. (2002). Running Linux (4th ed.). O'Reilly Publishers.

2. Carla Schroder.(2004). Linux Cookbook(1st ed.). O'Reilly Cookbooks Series.

Web Sites:

1. http://www.oreilly.com/catalog/ open sources/book/toc.html

2. http://dsl.org/cookbook/cookbook_toc.html

3. http://www.tldp.org/guides.html

4. http://www.gnu.org/doc/using.html

5. http://www.networktheory.co.uk/docs/gccintro/

6. http://sources.redhat.com/autobook/

7. http://cvsbook.red-bean.com/

8. http://www.tldp.org/guides.html

9. http://developer.gnome.org/doc/GGAD

10.http://www.python.org/doc/current/tut/tut.html

Semester-III

16CSP303 **DIGITAL IMAGE PROCESSING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To make the students learn the fundamental theories and techniques of digital image processing.
- To study the mathematical transforms necessary for image processing, image manipulation and a preliminary understanding of Computer Vision.
- To make students to understand the image degradation and enhancement.
- To understand the basic relationships between pixels in an image
- To know various segmentation techniques, and object descriptors.
- To implement pattern recognition to enhance an image.

Course Outcomes(COs)

1. Perform image manipulations and analysis in many different fields.
2. Apply knowledge of computing mathematics science and engineering to solve problems in multidisciplinary research.
3. Implement the understanding in sharpening the image.
4. Perform the image segmentation using the compression method.
5. Understand the image to represent in an region.
6. Analyze the basic algorithms used for image processing &image compression with morphological image processing.

UNIT-I

Introduction: Digital image processing – Origins of digital image processing- Examples of fields that use digital image processing-Fundamental steps in digital image processing-Components of an image processing system-Representing digital image.

UNIT-II

Some Basic relationships between Pixels-Basic gray level transformations- Histogram processing - Basic spatial filtering- Smoothing special filtering- Image Degradation/ Restoration process- Noise Models.

UNIT-III

Image Segmentation: Thresholding - Edge Based Segmentation – Region Based Segmentation – Matching. Image Compression: Error Criterion - Lossy Compression - Lossless Compression.

UNIT-IV

Shape Representation and Description: Region Identification - Contour Based Representation And Description – Region Based Shape Representation And Description

UNIT-V

Image Recognition: Introduction – Statistical Pattern Recognition - Neural Net- Syntactic Pattern Recognition - Graph Matching - Clustering

SUGGESTED READINGS

TEXT BOOK

1. Rafael, C. Gonzalez ., & Richard, E. Woods. (2008). Digital Image Processing (3rd ed.). New Delhi:Pearson Education.

REFERENCES

1. Chanda, B., & Dutta Majumder, D. (2000). Digital Image Processing and Analysis (1st ed.). New Delhi: Prentice Hall of India.
2. Milan Sonka., Vaclav Hlavac.,& Roger Boyle. (2004). Image Processing Analysis and Machine Vision (2nd ed.). New Delhi: Vikas Publishing House.
3. Nick Efford. (2000). Digital Image Processing – A Practical introduction using JAVA (1st ed.). New Delhi: Pearson Education Limited.

WEB SITES

http://www.cs.dartmouth.edu/farid/tutorials/fip.pdf
http://www.imageprocessingbasics.com/
http://www.astropix.com/HTML/J_DIGIT/TOC_DIG.HTM

Semester-III

16CSP304 NETWORK ARCHITECTURE AND MANAGEMENT 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the various architecture models and routing strategies of networks.
- To understand the privacy and security needs of a network and formulate a plan.
- To analyze the various case studies of network architecture and management.
- To implement the SNMP protocol in various architectures.
- To use various network management tools and understand their modules.
- To design an architecture with all the network requirements of a client with felp of network management tools.

Course Outcomes(COs)

1. Understand the various architecture models and routing strategies of networks.
2. Understand the privacy and security needs of a network and formulate a plan.
3. Analyze the various case studies of network architecture and management.
4. Implement the SNMP protocol in various architectures.
5. Use various network management tools and understand their modules.
6. Design an architecture with all the network requirements of a client with felp of network management tools.

UNIT-I

Introduction: Objectives - Component architectures – Reference architecture – Architectural models; Addressing and Routing Architecture: Addressing mechanisms – Routing mechanisms – Addressing strategies – Routing strategies – Architectural considerations; Network Management Architecture: Defining Network Management – Network Management Mechanism - Architectural considerations; Performance Architecture; Developing goals – Performance mechanisms – Architectural considerations

UNIT- II

Security And Private Architecture: Developing a security and privacy plan – Security and privacy Administration & Mechanism - Architectural considerations; Selecting Technologies for the Network Design: Goals – Criteria for Technology Evaluation – Guidelines and constraints on Technology Evaluation – Choices for Network Design; Interconnecting Technologies Within The Network Design: Shared medium – Switching – Routing – Hybrid mechanism – Applying Interconnection Mechanism to the Design

UNIT- III

Case history of Networking and Management: Challenges of Information Technology Managers – Goals organization and functions – Network and System Management – Network Management System Platform; SNMP Broadband and TMN Management: Network Management Standards & Model – Organization Information and Communication Model – ASN.1 – Encoding structure – Macros – Functional model;

Organization and Information Model: Managed Networks – The History of Network Management – Internet Organization and standards – SNMP Model – The Organization and Information Model; Communication and Functional Model: The SNMP Communication Model – Functional Model.

UNIT- IV

SNMPv2 Management: Major changes – System architecture – Structure of Management Information – Management Information Base – SNMPv2 protocol – Compatibility; RMON: Remote monitoring – RMON1 – RMON2 – ATM remote monitoring; Broadband Network Management: ATM Networks - Network and Services – ATM Technology – ATM Network Management; Telecommunication Management Network: Operations systems – Conceptual model – Standards – Architecture – TMN Management service architecture – Integrated view of TMN – Implementation issues.

UNIT- V

Network Management Tools and Systems: Network management tools – Network statistics measurement system – Network Management Systems – System Management; Network Management Applications: Configuration Management - Fault Management - Performance Management – Security Management – Accounting Management – Report Management - Policy Based Management – Service Level Management.

SUGGESTED READINGS

TEXT BOOK

1. James, D. Mc Cabe. (2007) . Network Analysis Architecture and Design (3^{rd} ed.). Morgan Kaufmann Publishers.
2. Mani Subramanian. (2000). Network Management Principles and Practice. New Delhi: Pearson Education Asia Pvt. Ltd.

REFERENCES

1. William Stallings. (1999). SNMP SNMPv2 SNMPv3 and RMON 1 and 2 (3rd ed.). New Delhi: Pearson Education Asia Pvt. Ltd.

WEB SITES

1. http://staff.um.edu.mt/csta1//courses/lectures/csm202/os17.html
2. http://www.inf.uni-konstanz.de/dbis/teaching/ss06/os/ch14-wrongNumber.pdf
3. https://www.cs.columbia.edu/~smb/classes/s06-4118/l26.pdf

Semester-III

16CSP305A	**DISTRIBUTED OPERATING SYSTEM**	**4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the hardware and software concepts of distributed operating systems, various design issues like transparency, flexilibity etc., and communication and synchronization in distributed operating systems.
- To understand scheduling in distributed operating systems, fault tolerance, real-time distributed systems, and designing of distributed file systems.
- To understand the concept of design and implementation in the context of distributed operating systems.
- To Design and Implement Distributed applications using Technologies like RPC, threads.
- To understand How Distributed Shared Memory is managed**.**
- To analyze security issues in network and distributed environments

Course Outcomes(COs)

1. Understand the different Distributed Systems and the challenges involved in Design of the Distributed Systems.
2. Understand how computing power is created and synchronized in Distributed systems
3. Design and Implement Distributed applications using Technologies like RPC, threads.
4. Learn how to store data in Distributed File System.
5. Understand How Distributed Shared Memory is managed**.**
6. Analyze security issues in network and distributed environments

UNIT-I

Fundamentals – message passing – Remote procedure calls : Introduction – the RPC model – transparency of RPC – Implementing RPC mechanism –stub generation – RPC messages – marshaling arguments and results – server management – parameter passing semantics – call semantics.

UNIT- II

Distributed shared memory : Introduction – general architecture of DSM systems – design and implementation of DSM – granularity – structure of shared memory space – replacement strategy – heterogeneous DSM – advantages of DSM.

UNIT- III

Synchronization: Introduction – clock synchronization – event ordering – mutual exclusion. Resource management: Introduction – desirable features of a good global scheduling algorithm – task management approach – load balancing approach – load sharing approach.

UNIT- IV

Distributed file system: Introduction – desirable features of a good distributed file system – file models – file accessing models.

Naming: Introduction – desirable features of a good naming system – fundamental terminologies and concepts.

UNIT- V

Security: Introduction – potential attacks to computer system – cryptography.

SUGGESTED READINGS

TEXT BOOK

1. Pradeep, K. Sinha.(1997). Distributed Operating Systems Concepts and Design (1st ed.). New Delhi: Prentice Hall of India.

REFERENCES

1. Paul, J. Fortier. (1998). Design of Distributed Operating System concepts and Technology (1st ed.). New Delhi: Tata McGraw Hill.
2. Andrew, S. Tanenbaum. (1995). Distributed Operating System. New Delhi: Pearson Education.

WEB SITES

1. http://staff.um.edu.mt/csta1//courses/lectures/csm202/os17.html
2. http://www.inf.uni-konstanz.de/dbis/teaching/ss06/os/ch14-wrongNumber.pdf
3. https://www.cs.columbia.edu/~smb/classes/s06-4118/l26.pdf

Semester-III

16CSP305B WIRELESS APPLICATION PROTOCOL 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To expose students to software and hardware capabilities of wireless applications.
- To provide an overview of Wireless Communication networks area and its applications in communication engineering.
- To appreciate the contribution of Wireless Communication networks to overall technological growth.
- To explain the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.
- To enable students to compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks.
- To design a wireless application using WML

Course Outcomes(COs)

1. Understand software and hardware capabilities of wireless applications.
2. Analyze Wireless Communication networks area and its applications in communication engineering.
3. Appreciate the contribution of Wireless Communication networks to overall technological growth.
4. Explain the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.
5. Compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks.
6. Design and Develop a wireless application using WML

UNIT-I

Mobile Data Introduction**:** The Rise of Mobile Data-Key Services for the Mobile Internet- Overview of the WAP-The origins of the WAP- WAP architecture-WAP Internal Structure-Components of the WAP Standards- WAP Gateways-Network Infrastructure Services Supporting WAP Clients-WAP Architecture Design Principles – Relationship with other standards.

UNIT-II

The Wireless Markup Language**:** Overview-The WML Document Model-WML Authoring-URLS Identity Content-Mark Up Basics- WML Basics-Basic Content-Events Tasks and Binding.

UNIT-III

Variables –Other Content you can include-Controls-Miscellaneous Markup- Sending Information-Application Security-Other Data**;** The Meta element- Document Type

Declarations- Errors and browsers Limitations-Content generation- WML Version Negotiation.

UNIT-IV

User Interface Design**:** Making Wireless Applications Easy to Use- Website Design- Computer Terminals Vs Mobile Terminals-Designing a usable WAP site-structured usability method-user interface design guidelines- Design guidelines for selected WML Elements.

UNIT-V

Wireless Telephony Applications**:** Overview of the WTA Architecture- WTA Client Frame Work –WTA Server and Security- Design Considerations- Application Creation Tool Box- Future of WTA Enhancements.
The Mobile Internet Future**:** Better Content- Easier Access-Beyond Browsing – Beyond Cellular- Mobile Data Unleashed.

SUGGESTED READINGS

TEXT BOOK

1. Sandeep Singhal. (2007).The Wireless Application Protocol (1st ed.). New Delhi: Pearson Education.

2. Charles Arehart., & Nirmal Chidambarametal. Professional WAP (1st ed.). New Delhi: Shroff Publishers & Distributers Pvt Ltd.

REFERENCES

1. Dale BulBrook. (2004). WAP –A Beginner's Guide (1st ed.). New Delhi: TMH Publication
2. Ruseyev, S. (2003). WAP Technology &Applications(1st ed.). New Delhi: Eswar Publications.

Web Sites :

www.en.wikipedia.org/wiki/Wireless_Application_Protocol
www.wap.com
www.w3schools.com/wap/

Semester-III

16CSP305C WAN TECHNOLOGIES 4H – 4C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To describe common WAN protocols and interfaces like PPP.
- To demonstrate basic routing and network troubleshooting.
- To understand Frame delay and congestion control mechanisms
- To learn about ISDN and ISDN devices
- To analyze about VPN and its mechanisms
- To understand Asynchronous Transfer Mode (ATM) and VoIP standards and Devices

Course Outcomes(COs)

Upon successful completion of this course, the student will be able to:

1. Describe common WAN protocols and interfaces.
2. Demonstrate basic routing and network troubleshooting.
3. Understand Frame delay and congestion control mechanisms
4. Learn about ISDN and ISDN devices
5. Analyze about VPN and its mechanisms
6. Understand Asynchronous Transfer Mode (ATM) and VoIP standards and Devices

Unit I

Introduction to WAN Technologies: Point To Point Links – Circuit & Packet Switching – Virtual Circuits – Dialup Services – WAN Devices. Dialup Technology: Background – Dialup Connectivity – Dialup Methods – Benefits and Drawbacks.

Unit II

Point-To-Point Protocol: PPP Encapsulation – Link Operation – LCP Packet Formats – LCP Configuration Options. X.25: Devices and Protocol Operation – Protocol Suite – LAPB Frame Format – X.21 Address Format.

Unit III

Frame Relay: Frame Relay Devices – Virtual Circuits – Congestion Control Mechanisms – Local Management Interface – Frame Format. Integrated Services Digital Network: ISDN Devices – ISDN Channels – Services – ISDN Interfaces – ISDN Specification – Signaling System 7. Virtual Private Networks: Background – Layer 2 Tunneling Protocol – Operational Mechanisms – Adding More Security.

Unit IV

Asynchronous Transfer Mode: Standards – ATM Devices and the Network Environment – Cell Header Format – ATM Services – Switching Operations – Reference Model – Addressing – Connections – ATM and Multicasting – Quality of Service – Signaling and Connection Establishment – Connection Management Messages – PNNI – Integrated Local Management Interface – LAN Emulation – Multiprotocol Over ATM – Physical Layer Architecture. MPLS/Tag Switching: Operations – Switching Architecture –

Hierarchical Routing – Multicast Routing – Label Switching With ATM – Quality of Service and Traffic Engineering.

Unit V

Voice/Data Integration Technologies: Introduction – Advances in Applications – Voice Networking – Voice Over ATM – Voice Over Frame Relay – VOIP Standards – VOIP Technology and Future Communications – SGCP – The Simple Control Interface – Gateway Control Interface – Gateway Control Functions – Encoding of the Session Description – SGCP Transmission Over UDP – Security Requirements – Cash Flows – MGCP Overview – General SIP Tutorial. Digital Subscriber Line: ADSL Signaling and Modulation – DSL Technologies.

SUGGESTED READINGS

Text Books

1. Ed Taylor. (2000). Networking Handbook (1st ed.). New Delhi: Tata McGraw Hill (Chapter 56910)
2. CISCO Systems. (2001). Internetworking Technologies Handbook. New Delhi: Techmedia. (Chapter 31012 15171819 21 2728)

Reference Book

1. Behrouz, A. Forouzan. (2003). Data Communication and Networking (3rd ed.). New Delhi: Tata McGraw Hill.

Semester-III

16CSP311 **J2EE – PRACTICAL** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To Understand the In-depth concepts of JEE
- To Understand the in-depth Life cycle of servlets and JSP.
- To Learn how to communicate with databases using Java.
- To Handle Errors and Exceptions in Web Applications
- To Use NetBeans IDE for creating J2EE Applications
- To impart expertise in Web Application Development using J2EE.

Course Outcomes(COs)

1. Understand the In-depth concepts of JEE
2. Understand the in-depth Life cycle of servlets and JSP.
3. Learn how to communicate with databases using Java.
4. Handle Errors and Exceptions in Web Applications
5. Use NetBeans IDE for creating J2EE Applications
6. Understand J2EE as an architecture and platform for building and deploying web-based, n-tier, transactional, component-based enterprise applications

List of Programs

1. Create a sign in form in servlets.
2. Write a servlet Program to lock a server.
3. Write a servlet program that returns list of information in table format.
4. Design a counter that counts number of times user has visited the site in current browsing session.
5. Write a program to retrieve cookies information
6. Build a JAVA Bean for opening an applet from JAR file.
7. Write a program to add controls in BEAN.
8. Design a counter in JAVA BEAN.
9. Write a program to stream contents of a file using JSP.
10. Write a program to insert an applet into JSP page.

Semester-III

16CSP312 **LINUX – PRACTICAL** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives

- To understand the concepts and principles that underlies modern operating systems
- To practice component to relate theoretical principles with operating system implementation.
- To learn about processes and processor management
- To learn about concurrency and synchronization
- To understand memory management schemes, file system and secondary storage management security and protection etc.
- To use different IPC ways in their programs like Message Queues, Semaphores, and Shared Memories.

Course Outcomes(COs)

At the end of the course the student will be in a position to –

1. Use basic fundamental utilities which are required again and again on daily basis to work on a modern operating system.
2. Write useful shell scripts which greatly and effectively enhance the usefulness of computers, from the point of view of programmers and application developers.
3. Understand basics of various OS related concepts, from programmer's point of view, like files, directories, kernel, inodes, APIs, system calls, processes, signals, etc.
4. Develop applications where several processes need to communicate with each other to complete a task.
5. Use different IPC ways in their programs like Message Queues, Semaphores, and Shared Memories.
6. Write programs which employs advanced concepts like multithreading.

List of programs

1. To write a Linux program to display process deadlock state.
2. To write a program to display the allocated memory.
3. To write a program to simulate the DOS Command-Copy.
4. To write a program to implement signal handling.
5. To write a simple Linux program using thread.
6. To write a program to display the date & time using TCP Sockets.
7. To write a program to display the date & time using UDP Sockets.
8. To write a program to display the cpu scheduling
9. To write a Linux program to create a lock file.
10. To write a program to display the user information

16LSU101	தமிழ் முதல் தாள்	Semester - I			
		L	T	P	C
		4	-	-	4

பாடத்திட்டப்பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

- இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇடம்பெறுகின்ற, ‘ தமிழ்இலக்கியவரலாறு’ குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக்குரியஆய்வுமனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
- தமிழின்வளர்ச்சித்துறையாகிய, ‘அறிவியல்தமிழ்’ ; ‘இணையதமிழ்’ குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைமேம்பாடு.
- வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
- சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
- மொழிபெயப்புத்துறைசார்ந்தவேலைவாய்புத்திறன்பெற்றிருத்தல்

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு

அலகு – I : இக்கால இலக்கியம்: (10 மணிநேரம்)

கல்வி : மகாகவி பாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணி தேசிக விநாயகம் பிள்ளை – ஒற்றுமையே உயிர்நிலை.
மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் –மலையாளக் காற்று.
சூழலியல் : கவிஞர் வைதீஸ்வரன் - விரல் மீட்டிய மழை.
பெண்ணியம் : கவிஞர் சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை.

அலகு – II : அற இலக்கியம்: (10 மணிநேரம்)

கொன்றை வேந்தன்: 1-50 பாடல்கள்
திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்
பழமொழி நானூறு: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: (10 மணிநேரம்)

மூவருலா: 1-26 கண்ணிகள்
திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்
கலிங்கத்துப் பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV : கட்டுரை: (10 மணிநேரம்)

1. உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்
2. கட்டிடக்கலை - அ. இராசமாணிக்கனார்
3. வாழ்க்கை - இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: (8 மணிநேரம்)

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

16ECU101	BASIC CIRCUIT THEORY AND NETWORK ANALYSIS	Semester - I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To identify the main circuit elements and apply Kirchoff's Laws to calculate currents, voltages and powers in typical DC electric circuits using a variety of analytical methods.
- To reduce more complicated circuits into the Thevenin's and Norton's equivalent circuits.
- To know the electrical circuit connection according to a given circuit diagram.
- To make the students capable of analyzing any given electrical network.
- To make the students learn how to synthesize an electrical network from a given impedance/admittance function.
- To understand frequency response in electrical circuits

COURSE OUTCOMES

- Apply the knowledge of basic circuital law and simplify the network using reduction techniques
- Analyze the circuit using Kirchhoff's law and Network simplification theorems
- Evaluate transient response, Steady state response, network functions
- Obtain the maximum power transfer to the load and Analyze the series resonant and parallel resonant circuit
- Evaluate two-port network parameters, design attenuators and equalizers
- Synthesize one port network using Foster Forms

UNIT I - Basic Circuit Concepts

Voltage and Current Sources - Resistors: Fixed and Variable resistors - Construction and Characteristics - Color coding of resistors - Resistors in series and parallel - Inductors: Fixed and Variable inductors - Self and mutual inductance - Faraday's law and Lenz's law of electromagnetic induction - Energy stored in an inductor - Inductance in series and parallel - Testing of resistance and inductance using multimeter.

UNIT II - Circuit Analysis

Kirchoff's Current Law (KCL) - Kirchoff's Voltage Law (KVL) - Node Analysis - Mesh Analysis – Star - Delta Conversion - DC Transient Analysis: RC Circuit - Charging and discharging with initial charge - RL Circuit with Initial Current - Time Constant - RL and RC Circuits With Sources - DC Response of Series RLC Circuits.

UNIT III – AC Circuit Analysis

Sinusoidal Voltage and Current - Definition of Instantaneous – Peak - Peak to Peak - Root Mean Square and Average Values – Voltage - Current relationship in Resistor - Inductor and Capacitor – Phasor - Complex Impedance - Capacitors: Principles of capacitance - Parallel plate capacitor – Permittivity - Definition of Dielectric Constant - Dielectric strength - Energy stored in a capacitor - Air, Paper, Mica, Teflon, Ceramic, Plastic and Electrolytic capacitor - Construction and application - Capacitors in series and parallel - Factors governing the value of capacitors - Testing of capacitors using multimeter.

UNIT IV - Power in AC Circuits

Instantaneous Power - Average Power - Reactive Power - Power Factor -Sinusoidal Circuit Analysis for RL, RC and RLC Circuits - Resonance in Series and Parallel RLC

Circuits - Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth - Passive Filters: Low Pass - High Pass - Band Pass and Band Stop.

UNIT V - Network Theorems

Principal of Duality - Superposition Theorem - Thevenin's Theorem - Norton's Theorem - Reciprocity Theorem - Millman's Theorem - Maximum Power Transfer Theorem - AC circuit analysis using Network theorems - Two Port Networks: Impedance (Z) Parameters - Admittance (Y) Parameters - Transmission (ABCD) Parameters.

Suggested Readings:

Text Book

1. David A. Bell, (2015). *Electronic Devices and Circuits.* (5^{th} ed.). Oxford University Press.

Reference Books

1. Sedra, A.S., Smith, K.C., Chandorkar, A.N., (2014). *Microelectronic Circuits*, (6^{th} ed.).
2. Oxford University Press.
3. Robert L. Boylestad, (2011). *Introductory Circuit Analysis*. (11^{th} ed.). Pearson Publications.
4. Ernest S.Kuh, Charles A.Desoer, (2009). *Basic Circuit Theory*. (1^{st} ed.). Tata McGraw
5. Hill Education.
6. Hayt W. H., Kemmerly, J. E., Durbin, S. M. (2005). *Engineering Circuit Analysis*. Tata
7. McGraw Hill.

Journals

1. International Journal of Electronics and Communication Engineering.
2. European Journal of Scientific Research

Websites:

1. www.allaboutcircuits.com
2. www.circuitstoday.com

16ECU102	MATHEMATICS FOUNDATION FOR ELECTRONICS	Semester - I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVE

- This course provides a deep knowledge to the learners to understand the basic concepts of Matrices, Sequences, Complex Variable, Complex Function, First Order Ordinary Differential Equations, Power series method
- To provide students with mathematics fundamentals necessary to formulate, solve and analyses complex engineering problems.
- To prepare student to apply reasoning informed by the contextual knowledge to engineering practice.
- To build the strong foundation in Mathematics of students needed for the field of electronics and Telecommunication Engineering
- Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
- Vector differentiation and integration required in Electro-Magnetics and Wave theory.

COURSE OUTCOMES

- Able to solve qualitative problems based on vector analysis and matrix analysis such as linear independence and dependence of vectors, rank etc
- Understand the concepts of limit theory and nth order differential equations and their applications to our daily life
- Able to solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables
- Come to know the applications of double and triple integration in finding the area and volume
- Know about qualitative applications of Gauss , Stoke's and Green's theorem
- Use Vector differentiation and integration required in Electro-Magnetics and Wave theory

UNIT I - Matrices

Introduction to Matrices, System of Linear Algebraic Equations, Gaussian Elimination Method, Gauss-Seidel Method, LU decomposition, Solution of Linear System by LU decomposition. Eigen Values and Eigen Vectors, Linear Transformation, Properties of Eigen Values and Eigen Vectors, Cayley-Hamilton Theorem, Diagonalization, Powers of a Matrix. Real and Complex Matrices, Symmetric, Skew Symmetric, Orthogonal Quadratic Form, Hermitian, Skew Hermitian, Unitary Matrices.

UNIT II - Sequences and Series

Sequences, Limit of a sequence, Convergence, Divergence and Oscillation of a sequence, Infinite series, Necessary condition for Convergence, Cauchy's Integral Test, D'Alembert's Ratio Test, Cauchy's nth Root Test, Alternating Series, Leibnitz's Theorem, Absolute Convergence and Conditional Convergence, Power Series.

UNIT III - Complex Variables and Functions

Complex Variable, Complex Function, Continuity, Differentiability, Analyticity. Cauchy-Riemann (C-R) Equations, Harmonic and Conjugate Harmonic Functions, Exponential Function, Trigonometric Functions, Hyperbolic Functions. Line Integral in Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivative of Analytic Functions. Sequences, Series and Power Series, Taylor's Series, Laurent Series, Zeroes and Poles. Residue integration method, Residue integration of real Integrals.

UNIT IV - Ordinary Differential Equations

First Order Ordinary Differential Equations, Basic Concepts, Separable Ordinary Differential Equations, Exact Ordinary Differential Equations, Linear Ordinary Differential Equations. Second Order homogeneous and non-homogeneous Differential Equations.

UNIT V - Series solution of differential equations and special functions

Power series method, Legendre Polynomials, Frobenius Method, Bessel's equations and Bessel's functions of first and second kind. Error functions and gamma function.

Suggested Readings:

Text Books

1. Kreyszig, E. (2008). *Advanced Engineering Mathematics*. (9^{th} ed.). Wiley India.
2. Jain,R.K., Iyengar,S.R.K. (2007). *Advanced Engineering Mathematics*. India: Narosa Publishing House.

Reference Books

1. Murray Spiegel, Seymour Lipschutz, & John Schiller, (2007). *Outline of Complex Variables, Schaum Outline Series*. Tata McGraw Hill.
2. Wylie C .R., & Barrett L. C., (2004), *Advanced Engineering Mathematics*, Tata McGraw Hill.
3. Ramana, B.V. (2007). *Higher Engineering Mathematics*, Tata McGraw Hill.

16ECU103	SEMICONDUCTOR DEVICES	Semester - I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To learn the fundamentals of operation of the main semiconductor electronic devices.
- To understand the basic parameters of electronic devices, their performance, and limiting factors.
- To understand the basic principles of electronic device operation with emphasis on bipolar transistors, and unipolar microwave devices.
- Acquire the fundamental knowledge and expose to the field of semiconductor theory and devices and their applications.
- To give knowledge about semiconductor and discus working and applications of basic devices, including p-n junctions, BJTs and FETs
- Introduce students to the physics of semiconductors and the inner working of semiconductor devices.

COURSE OUTCOMES

- Apply the knowledge of basic circuital law and simplify the network using reduction techniques
- Apply the knowledge of semiconductors to illustrate the functioning of basic electronic devices.
- Demonstrate the switching and amplification application of the semiconductor devices.
- Demonstrate the control applications using semiconductor devices.
- Apply concepts of semiconductor devices to design and analyze circuits.
- Ability to understand and analyze the inner working of semiconductor p-n diodes

UNIT I - Semiconductor Basics

Introduction to Semiconductor Materials - Crystal Structure - Planes and Miller Indices - Energy Band in Solids - Concept of Effective Mass - Density of States - Carrier Concentration at Normal Equilibrium in Intrinsic Semiconductors - Derivation of Fermi Level for Intrinsic & Extrinsic Semiconductors – Donors – Acceptors - Dependence of Fermi Level on Temperature and Doping Concentration - Temperature Dependence of Carrier Concentrations - Carrier Transport Phenomena: Carrier Drift - Mobility – Resistivity - Hall Effect - Diffusion Process - Einstein Relation - Current Density Equation - Carrier Injection - Generation and Recombination Processes - Continuity Equation.

UNIT II - PN Junction Diode

Formation of Depletion Layer - Space Charge at a Junction - Derivation of Electrostatic Potential Difference at Thermal Equilibrium - Depletion Width and Depletion Capacitance of an Abrupt Junction - Concept of Linearly Graded Junction - Derivation of Diode Equation and I-V Characteristics - Zener and Avalanche Junction Breakdown Mechanism - Tunnel diode - Varactor diode - Solar cell: Circuit symbol – Characteristics - Applications.

Unit III - Bipolar Junction Transistors (BJT)

PNP and NPN Transistors - Basic Transistor Action - Emitter Efficiency - Base Transport Factor - Current Gain - Energy Band Diagram of Transistor in Thermal Equilibrium - Quantitative Analysis of Static Characteristics (Minority Carrier Distribution and Terminal Currents) – Base - Width Modulation - Modes of operation - Input and Output

Characteristics of CB – CE - CC Configurations - Metal Semiconductor Junctions: Ohmic and Rectifying Contacts.

UNIT IV - Field Effect Transistors

JFET – Construction - Idea of Channel Formation – Pinch - Off and Saturation Voltage – Current - Voltage Output Characteristics - MOSFET - Types of MOSFET - Circuit symbols - Working and Characteristic curves of Depletion type MOSFET (both N channel and P Channel) - Enhancement type MOSFET (both N channel and P channel) - Complimentary MOS (CMOS).

UNIT V - Power Devices

UJT - Basic construction and working - Equivalent circuit - Intrinsic Standoff Ratio - Characteristics and relaxation oscillator – Expression – SCR – Construction – Working – Characteristics – Triac – Diac – IGBT – MESFET - Circuit symbols - Basic constructional features – Operation - Applications.

Suggested Readings:

Text Books

1. Sanjay Sharm S.K, (2013). *Advance Semiconductor Devices*, (1st ed.). Kataria & Sons.
2. Nair B.Somanathan, & Deepa S.R. (2010). *Solid State Devices*, PHI Learning Private Limited.

Reference Books

1. Kano Kannan, (2009). *Semiconductor Devices*, (2nd ed.). PHI Learning Private Limited.
2. Ben G Streetman, & Banerjee S. (2009). *Solid State Electronic Devices*, (6th ed.). Pearson Education.

Journals

1. International Journal of Electronics and Communication Engineering.
2. International Journal of Emerging Science and Engineering.

Websites:

1. www.ustudy.com
2. www.circuitstoday.com

16ECU111	BASIC CIRCUIT THEORY AND NETWORK ANALYSIS - PRACTICAL	Semester - I			
		L	T	P	C
		-	-	3	2

COURSE OBJECTIVES

- To give knowledge about semiconductor physics and discus working and applications of basic devices, including p-n junctions, BJTs and FETs
- Introduce students to the semiconductor devices and the inner working of semiconductor devices.
- Know the formation and properties of semiconductor materials
- Understand the operation of diode
- Know the usage of electronic equipments
- Know the testing of components

COURSE OUTCOMES

- Apply the knowledge of basic circuital law and simplify the network using reduction techniques
- Apply the knowledge of semiconductors to illustrate the functioning of basic electronic devices.
- Demonstrate the switching and amplification application of the semiconductor devices.
- Demonstrate the control applications using semiconductor devices.
- Apply concepts of semiconductor devices to design and analyze circuits.
- Ability to understand and analyze the inner working of semiconductor p-n diodes

(Any 8 Experiments)

1. Familiarization with

   a) Resistance in series, parallel and series – Parallel.

   b) Capacitors & Inductors in series & Parallel.

2. Measurement of Amplitude, Frequency & Phase difference using CRO.

3. Verification of Ohm's Law.

4. Verification of Kirchoff's Law.

5. Verification of Norton's theorem.

6. Verification of Thevenin's Theorem.

7. Verification of Superposition Theorem.

8. Verification of Maximum Power Transfer Theorem.

9. Verification of Millman's Theorem.

10. Study of the Frequency Response of a Series LCR Circuit and determination of its

    (a) Resonant Frequency (b) Impedance at Resonance (c) Quality Factor Q
    (d) Band Width

16ECU112	**MATHEMATICS FOUNDATION FOR ELECTRONICS - PRACTICAL**	**Semester - I**			
		L	**T**	**P**	**C**
		-	**-**	**3**	**2**

COURSE OBJECTIVES

- To give knowledge about semiconductor physics and discus working and applications of
- definite Integral, Improper integrals and some special integrals as Beta functions, Gamma Functions and Error functions
- Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
- Applications of the definite Integral to derive different important quantities as Arc Length, Area, Volume, Work and Moments
- Details of set theory which is basic of all sciences
- Different types of matrices and their properties.

COURSE OUTCOMES

- Understand the problems and solve them with correlation and regression analysis
- Find the nth derivatives of the function, evaluate its indeterminate forms and way to expand a function in series form
- Analytically and graphically understand the nature and forms of function
- Apply the principles of integral to solve a variety of practical problems
- Equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics
- Enhance and develop the ability of using the language of mathematics in analyzing the real world problems of sciences and engineering

(Any 8 Experiments)

(Sci(PRACTICAL/MAT(PRACTICAL/ any other Mathematical Simulation Software)

1. Solution of First Order Differential Equations
2. Solution of Second Order homogeneous Differential Equations
3. Solution of Second Order non-homogeneous Differential Equations
4. Convergence of a given series.
5. Divergence of a given series.
6. Solution of linear system of equations using Gauss Elimination method.
7. Solution of linear system of equations using Gauss – Seidel method.
8. Solution of linear system of equations using L-U decomposition method.
9. Solution of coupled differential equations.
10. Solution of Differential equation using Euler's method.

<table>
<tr><td rowspan="3">16ECU113</td><td rowspan="3">SEMICONDUCTOR DEVICES - PRACTICAL</td><td colspan="4">Semester - I</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>-</td><td>-</td><td>4</td><td>2</td></tr>
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COURSE OBJECTIVES

- To give knowledge about semiconductor physics and discus working and applications of diodes.
- Know the formation and properties of semiconductor materials Understand the operation of diode
- Understand the formation and properties of semiconductor materials which forms the basis for the formation of PN diode, zener diode etc
- Explain the operation of transistor
- Know the need for biasing of transistor
- Know the operation of FET and MOSFET

COURSE OUTCOMES

- Know the characteristics of diodes and transistors
- Measure the characteristics of electronic circuits and present experimental results
- Understand the construction and operation of transistor and its usage in applications like amplifiers etc
- Know the need for biasing of transistor for the design of amplifier
- Designing electronic circuits
- Performance analysis of electronic circuits

(Any 10 Experiments)

1. VI Characteristics of PN Junction Diode
2. VI Characteristics of Zener Diode.
3. VI Characteristics of the Common Base Configuration of BJT and to obtain ri, ro, α.
4. VI Characteristics of the Common Collector Configuration of BJT and obtain voltage gain, ri, ro.
5. VI Characteristics of UJT.
6. VI Characteristics of SCR.
7. VI Characteristics of TRIAC
8. VI Characteristics of DIAC
9. VI Characteristics of JFET.
10. Study of Characteristics of Solar Cell.
11. Band Gap Energy of Silicon Diode
12. LDR Characteristics

16AEC101	ENVIRONMENTAL STUDIES	Semester - I			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- Creating the awareness about environmental problems among people.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and improvement.
- Recognize the interconnectedness of multiple factors in environmental challenges
- Engage constructively with diverse forms of knowledge and experience
- Recognize and apply methodological approaches of the social sciences, natural sciences, and humanities

COURSE OUTCOMES

- Understand key concepts in the life and physical sciences and will apply them to environmental issues
- Apply knowledge of the sciences within an interdisciplinary context in solving environmental issues such as environmental health, food and agriculture, energy, waste and pollution, and loss of biodiversity.
- Possess the intellectual flexibility necessary to view environmental questions from multiple perspectives, prepared to alter their understanding as they learn new ways of understanding.
- Solve problems systematically, creatively, and reflexively, ready to assemble knowledge and formulate strategy
- Identify, interpret, and apply basic measures (metrics and formulae) of social system variables to assess socio-environmental conditions.
- Analyze and evaluate ideological and philosophical approaches used to understand environmental relationships.

UNIT I - Environment

Environment Definition - Scope and importance - Components - Ecosystem Definition - Concept - Scope - Importance - Structure and functions of ecosystem - Energy flow - Ecological succession Food chains and food webs - Classification of ecosystem.

UNIT II - Natural Resources - Renewable and Non-renewable Resources

Natural resources and associated problems - Forest resources - Water resources - Mineral resources - Food resources - Energy resources - Land resources : Use and over-utilization – exploitation - Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles - Ill-effects of fire works.

UNIT III - Biodiversity and Its Conservation

Introduction – Definition - Genetic - Species and ecosystem diversity - Biogeographical classification of India - Value of biodiversity: consumptive use - Productive use - Social - Ethical - Aesthetic and option values - Biodiversity at global - National and local levels - India as a mega - Diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss - Poaching of wildlife - man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity - in-situ and ex-situ conservation of biodiversity.

UNIT IV - Environmental Pollution

Definition - Causes - Effects and control measures of Air pollution - Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards - Solid waste management - Causes - Effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: Foods - Earthquake - Cyclone and landslides.

UNIT V - Social Issues and the Environment

From unsustainable to sustainable development - Urban problems related to energy - Water conservation - Rain water harvesting - Watershed management - Resettlement and rehabilitation of people - Its problems and concerns - Environmental ethics: Issues and possible solutions - Climate change - Global warming - Acid rain - Ozone layer depletion - Nuclear accidents and holocaust - Case studies - Wasteland reclamation - Consumerism and waste products Environment Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and Control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation - Public awareness - Population growth - variation among nations - Population explosion - Family Welfare Programme - Environment and human health - Human rights - Value education - HIV/AIDS - Women and Child Welfare - Role of Information Technology in environment and human health.

Suggested Readings:

Text Books

1. Tripathy.S.N. & Sunakar Panda, (2004). *Fundamentals of Environmental Studies*. (2nd ed.)., New Delhi: Vrianda Publications Private Ltd.,
2. Arvind Kumar, (2004). *A Textbook of Environmental Science*. New Delhi, APH Publishing Corporation.

Reference Books

1. Verma, P.S. & Agarwal, V.K. (2001). *Environmental Biology (Principles of Ecology)*. New Delhi, S. Chand and Company Limited.
2. Anubha Kaushik, & Kaushik, C.P. (2004). *Perspectives in Environmental Studies*. New Delhi, New Age International Pvt. Limited.
3. Singh, M.P., Singh, B.S., & Soma S. Dey, (2004). *Conservation of Biodiversity and Natural Resources*. Delhi, Daya Publishing House.
4. Daniel B.Botkin & Edward A. Keller. (1995). *Environmental Science*. New York, John Wiley and Sons.
5. Uberoi, N.K. (2005). *Environmental Studies*. New Delhi, India: Excel Books Publications.

16LSU201	தமிழ் இரண்டாம் தாள்	Semester - II			
		L	T	P	C
		4	-	-	4

பாடத்திட்டப்பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கைமேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப்பயன்விளைவு

- இந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇந்தியகுடியுரிமைப்பணிமுதலானபோட்டித்தேர்வுகளில், விருப்பப்பாடமாகஇடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்தமுழுமையானஅறிமுகம்பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல்மற்றும்தொல்லியல்சார்ந்தஆவணத்தேடலுக்குரியஆய்வுமனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
- தமிழின்வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்' ; 'இணையதமிழ்' குறித்தபன்நோக்குஅணுகுமுறையிலானஆய்வுச்சிந்தனைமேம்பாடு.
- வேலைவாய்ப்புக்குரியசுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத்திறன்மேம்பாடும்பெற்றிருத்தல் .
- சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியாகஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
- மொழிபெயப்புத்துறைசார்ந்தவேலைவாய்புத்திறன்பெற்றிருத்தல்

தாள்கள்வரிசையும்தேர்வுச்செயல்திட்டமும்பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
இரண்டு	II	4	3	40 / 60	100	4

அலகு – I : பக்தி இலக்கியம் (10 மணிநேரம்)

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. **சைவம்** - பெரியபுராணம் - திருமூலநாயனார் புராணம்.
2. **வைணவம்** - பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

அலகு – II : சங்க இலக்கியம் : (15 மணிநேரம்)

சங்க இலக்கியங்கள் அறிமுகம்

அ). எட்டுத்தொகை

நற்றிணை : பிரசம் கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு –

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : சுடர்தொடீ கேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு : அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி - 48

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள் – 'சிறுதினை மலரொடு' என்பதிலிருந்துதொடங்கி, 'அறிந்தவாறே' என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – 'தெய்வம் சான்ற' என்பதிலிருந்து தொடங்கி, 'நல்குமதி' என்பது வரையிலான தொடர்கள்: 286-295.

அலகு - III : காப்பியம் **(6 மணிநேரம்)**

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29) – கண்ணகியின் சிறப்பு:

'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி,

'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234) - சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485) - செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

அலகு – IV : சிறுகதை **(10 மணிநேரம்)**

1. குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்
2. காட்டில் ஒரு மான் - அம்பை
3. நாற்காலி – கி.ராஜநாராயணன்
4. நகரம் – சுஜாதா

அலகு- V : மொழிப்பயிற்சி **(7 மணிநேரம்)**

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
மொழிபெயர்ப்பு

16ENU201	ENGLISH	Semester - II			
		L	T	P	C
		4	-	-	4

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcome:

- Develop the four types of skills
- Reading and comprehending literary works
- Genres of literature to provide moral education
- Develop communication skills in business environment
- Interpersonal skills will be developed.
- Betterment of language competence

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT V

Short Story: The Bird – Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. *Spring* 2013**.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala, V. (2006). *English for Communication*. : Chennai, Emerald Publishers.

16ECU201	ELECTRONIC CIRCUITS	Semester - II			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- Ability to design different types of Electronic Circuits such as Amplifiers and Oscillators.
- To understand and implement the advanced electronic circuits such as amplifiers etc with the help of theoretical and practical problem solving.
- Ability to analyze the different types of configurations and applications of Transistor.
- Ability to determine the stability of feedback amplifiers and their steady state performance.
- To analyze the Circuits in time and frequency domain
- Calculation and measurement of parameters for electronic circuits, to introduce the students to the advanced concepts of electronics.

COURSE OUTCOMES

- Know the characteristics of diodes and transistors
- Design simple circuits and know the benefits of feedback in amplifier
- Apply their knowledge in analyzing Circuits by using network theorems.
- Measure the characteristics of electronic circuits and present experimental results
- Compare and classify oscillators
- Analyze electrical circuits and calculate the main parameters

UNIT I - Diode Circuits

Ideal diode - Piecewise linear equivalent circuit - DC load line analysis - Quiescent (Q) point. Clipping - Clamping circuits - Rectifiers: HWR, FWR (center tapped and bridge) - Circuit diagrams – Working – Waveforms - Ripple factor – Efficiency - Comparison. Filters: Types - Circuit diagram - Shunt Capacitor filter with waveforms - Zener diode regulator circuit diagram - Load and Line regulation - Disadvantages of Zener diode regulator.

UNIT II - Bipolar Junction Transistor

Review of CE - CB Characteristics - Regions of operation - Hybrid parameters - Transistor biasing - DC load line - Operating point - Thermal runaway – Stability - Stability factor - Fixed bias without and with RE - Collector to base bias - Voltage divider bias - Emitter bias (+VCC and –VEE bias) - Circuit diagrams – Working - Transistor as a switch - Circuit and working - Darlington pair and its applications - BJT amplifier (CE) - DC and AC load line analysis - Hybrid model of CE configuration - Quantitative study of the frequency response of a CE amplifier - Effect on gain and bandwidth for Cascaded CE amplifiers (RC coupled).

UNIT III - Feedback Amplifiers

Concept of feedback - Negative and positive feedback - Advantages and disadvantages of negative feedback - Voltage (series and shunt) - Current (series and shunt) feedback amplifiers - gain, input and output impedances Barkhausen criteria for oscillations, Study of phase shift oscillator, Colpitts oscillator and Hartley oscillator.

UNIT IV - MOSFET Circuits

Review of Depletion and Enhancement MOSFET - Biasing of MOSFETs - Small Signal Parameters - Common Source amplifier circuit analysis - CMOS circuits - MOSFET Current -Voltage characteristics - MOSFET scaling and small geometry effects - MOSFET capacitances

UNIT IV - Power Amplifiers

Difference between voltage and power amplifier - Classification of power amplifiers - Class A, Class B, Class C and their comparisons - Operation of a Class A single ended power amplifier - Operation of Transformer coupled Class A power amplifier - Overall efficiency - Circuit operation of complementary symmetry Class B push pull power amplifier - Crossover distortion - Heat sinks - Single tuned amplifiers: Circuit diagram - Working and Frequency Response - Limitations of single tuned amplifier - Applications of tuned amplifiers in communication circuits.

Suggested Readings:

Text Book

1. Salivahanan, S., Suresh Kumar, N., & Vallavaraj A. (2012). *Electronic Devices and Circuits*. (3rd ed.). Tata Mc Graw Hill publishing Company Limited.

Reference Books

1. Robert B oylstead & Louis Nashelsky, (2013). *Electronic Devices and Circuit Theory*. (9th ed.). PHI Learning Private Limited.
2. Jacob Millman, Christos.C.Halkias & Satyabrata Jit, (2010). *Electronic Devices and Circuits*. (3rd ed.). Tata Mc Graw–Hill Publications.
3. Bakshi, I.U.A. & Godse, A.P. (2010). *Electronic Devices and Circuits*, Technical Publications.

Journals

1. International Journal of Applied Engineering Research
2. International Journal of Emerging Science and Engineering.

Websites

1. www.ustudy.com
2. www.circuitstoday.com

16ECU202	C PROGRAMMING AND DATA STRUCTURES	Semester - II			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To understand various features in C
- To help students to understand the implementation of C language
- To prepare object-oriented design for small/medium scale problems
- To understand the fundamental algorithms such as searching, and sorting
- To understand the fundamental data structures such as lists, trees, and graphs
- Correctly determine the relative runtimes of different algorithms

COURSE OUTCOMES

- Analyze unstructured problems and design computer solutions
- Apply or a create suitable algorithm to solve a particular problem
- An ability to apply knowledge of computing and mathematics appropriate to the discipline
- An ability to analyze a problem and identify the computing requirements appropriate for its solution
- An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs, and use current techniques
- Able to design and analyze the time and space efficiency of the data structure

UNIT I - C Programming Language

Introduction: Importance of C - Character set – Tokens – Keywords – Identifier – Constants - Basic data types Variables: declaration & assigning values - Structure of C program Operators : Arithmetic operators - Relational operators - Logical operators - Assignment operators - Increment and decrement operators - Conditional operators - Bit wise operators - Expressions and evaluation of expressions - Type cast operator - Implicit conversions - Precedence of operators.

UNIT II - Decision Making, Branching & Looping

Decision making - Branching and looping: If - If-else - Else-if - Switch statement – Break - For loop - While loop and Do-loop - Functions: Defining functions - Function arguments and passing - Returning values from functions - Arrays: concepts – Declaration - Accessing elements - Storing elements - two-dimensional and multi-dimensional arrays - Input/output statement and library functions (math and string related functions).

UNIT III - Structures

Defining and declaring a structure variables - Accessing structure members - initializing a structure - Copying and comparing structure variables - Array of structures - Arrays within structures - Structures within structures - Structures – Functions – Pointers - Introduction to C++: Object oriented programming - Characteristics of an object -oriented language.

UNIT IV - Data Structures

Definition of stack - Array implementation of stack - Conversion of infix expression to prefix - Postfix expressions - Evaluation of postfix expression - Definition of Queue -

Circular queues - Array implementation of queues - Linked List and its implementation - Link list implementation of stack and queue - Circular and doubly linked list.

UNIT V - Searching and Sorting

Insertion sort - Selection sort - Bubble sort - Merge sort - linear Search - Binary search. Trees : Introduction to trees - Binary search tree - Insertion and searching in a BST - Preorder - Postorder - Inorder traversal (recursive)

Suggested Readings:

Text Books

1. Yashavant Kanetkar, *Let Us C*, BPB Publications.
2. Balagurusamy C. *Programming in ANSI*, (2^{nd} ed.). TMH.

Reference Books

1. Byron S Gottfried, *Programming with C*, Schaum Series.
2. Brian W. Kernighan, Dennis M. Ritchie, *The C Programming Language*, Prentice Hall
3. Yashavant Kanetkar, Pointers in C, BPB Publications
4. S. Sahni and E. Horowitz, Data Structure, Galgotia Publications.
5. Tanenbaum, *Data Structures using C*, Pearson/PHI.
6. Ellis Horowitz & Sartaz Sahani, *Fundamentals of Computer Algorithms*, Computer Science Press.

16ECU203	COMMUNICATION ELECTRONICS	Semester - II			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To learn the designing procedure and operation of circuits used for communication.
- To understand the basic concepts of AM, FM, and PM transmission and reception.
- To assess and evaluate different modulation and demodulation techniques.
- To evaluate the influence of noise on communications signals.
- To introduce students to various modulation and demodulation techniques of analog communication
- To analyze different parameters of analog communication techniques. 3. It also focuses on pulse modulation and demodulation

COURSE OUTCOMES

- Apply or a create suitable algorithm to solve a particular problem
- Understand and identify the fundamental concepts and various components of analog communication systems
- Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
- Describe analog pulse modulation techniques and digital modulation technique
- Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.
- Use of different modulation and demodulation techniques used in analog communication

UNIT I - Electronic communication

Block diagram of an electronic communication system - Electromagnetic spectrum - Band designations and applications - Need for modulation - Concept of channels – Baseband signals - Concept of Noise - Types of Noise - Signal to noise ratio - Noise Figure - Noise Temperature - Friss formula.

UNIT II – Amplitude Modulation

Amplitude Modulation - Modulation index - Frequency spectrum - Generation of AM, Amplitude Demodulation (diode detector) - Concept of Double side band suppressed carrier -Single side band suppressed carrier - Other forms of AM (Pilot Carrier Modulation - Vestigial Side Band modulation - Independent Side Band Modulation) - Block diagram of AM Transmitter - Receiver.

UNIT III - Angle modulation

Frequency and Phase modulation - Modulation index - Frequency spectrum - Equivalence between FM and PM - Generation of FM (direct and indirect methods) - FM detector (PLL) - Block diagram of FM Transmitter and Receiver - Comparison between AM, FM and PM.

UNIT IV - Pulse Analog Modulation

Channel capacity - Sampling theorem – PAM – PDM - PPM modulation and detection techniques – Multiplexing - TDM and FDM - Pulse Code Modulation: Need for digital transmission – Quantizing - Uniform and Non-uniform Quantization - Quantization Noise – Companding – Coding – Decoding - Regeneration.

UNIT V - Digital Carrier Modulation Techniques

Block diagram of digital transmission and reception - Information capacity - Bit Rate -Baud Rate and M-ary coding - Amplitude Shift Keying (ASK) - Frequency Shift Keying (FSK) - Phase Shift Keying (PSK) - Binary Phase Shift Keying (BPSK) - Quadrature Phase Shift Keying.

Suggested Readings:

Text Books

1. Kennedy and Davis, 2012, Electronic Communication Systems, Fifth Edition, Tata McGraw Hill.
2. Dennis Roddy and John Coolen, 2008, Electronic Communications, Pearson Education, Fourth Edition.

Reference Books

1. Frenzel, 2015, Principles of Electronic communication systems, Fourth Edition, McGraw Hill.
2. Tomasi, 2013, Advanced Electronic Communications Systems, Sixth Edition, PHI Limited.
3. S. Haykin, 2013, Communication Systems, Fifth Edition, Wiley India.
4. Anok Singh & A K Chhabra, 2010, Principles of Communication Engineering, Seventeenth Edition, S.Chand Publications.

Journals

1. International Journal of Emerging Science and Engineering.
2. International Journal of Computer and Communication Technology

Websites:

1. www.allaboutcircuits.com
2. www.circuitstoday.com

16ECU211	ELECTRONIC CIRCUITS - PRACTICAL	Semester - II			
		L	T	P	C
		-	-	3	2

COURSE OBJECTIVES

- To identify and test various electronic components
- To use DSO for various measurements
- To plot the characteristics of diode and transistor
- To design and implement feedback amplifier circuits
- To measure the frequency of oscillators.
- To design and test regulated power supplies

COURSE OUTCOMES

- Verify the rectifier circuits using diodes and implement them using hardware
- Design the biasing circuits like self biasing
- Understand the construction, operation and characteristics of FET which can be used in the design of amplifiers
- Design simple circuits
- Know the benefits of feedback in amplifier
- Compare and classify oscillators.

(Any 8 Experiments)

1. Half wave rectifier and Full wave rectifier
2. Capacitor, Inductor and Pi filters
3. Designing and testing of 5V/9V DC regulated power supply
4. Clipping and clamping circuit
5. RC coupled amplifier
6. Class A, B and C Power Amplifier
7. Colpitt’s Oscillator
8. Hartley’s Oscillator
9. Phase Shift Oscillator
10. Frequency response of Common Source FET amplifier

16ECU212	C PROGRAMMING AND DATA STRUCTURES - PRACTICAL	Semester - II			
		L	T	P	C
		-	-	3	2

COURSE OBJECTIVES

- To make the student learn a programming language and to understand various features in C
- To develop skills to design and analyze simple linear and non linear data structures
- To learn problem solving techniques.
- To write programs in C and to solve the problems.
- Gain knowledge in practical applications of data structures
- Analyze unstructured problems and design computer solutions

COURSE OUTCOMES

- Able to design and analyze the time and space efficiency of the data structure
- Be capable to identity the appropriate data structure for given problem
- Read, understand and trace the execution of programs written in C language
- Write the C code for a given algorithm
- Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
- Write programs that perform operations using derived data types.

(Any 8 Experiments)

1. Generate the Fibonacci series up to the given limit N and also print the number of elements in the series.
2. Find minimum and maximum of N numbers.
3. Find the GCD of two integer numbers.
4. Calculate factorial of a given number.
5. Find all the roots of a quadratic equation Ax2 + Bx + C = 0 for non – zero coefficients A, B and C. Else report error.
6. Calculate the value of sin (x) and cos (x) using the series. Also print sin (x) and cos (x) value using library function.
7. Generate and print prime numbers up to an integer N.
8. Sort given N numbers in ascending order.
9. Find the sum & difference of two matrices of order MxN and PxQ.
10. Find the product of two matrices of order MxN and PxQ.

16ECU213	COMMUNICATION ELECTRONICS - PRACTICAL	Semester - II			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Convert analog signals to digital format and describe Pulse and digital Modulation techniques
- To introduce students to various modulation and demodulation techniques of analog communication.
- To analyze different parameters of analog communication techniques
- It also focuses on pulse modulation and demodulation
- To understand the concept in communication system to use it in solving the global complex problems.
- Evaluate the performance levels (Signal-to-Noise Ratio) of AM, FM and PM systems in the presence of additive white noise.

COURSE OUTCOMES

- Able to identify and describe different analog modulation techniques.
- Able to understand basic theories of Digital communication system in practical
- Able to design and implement different modulation and demodulation techniques
- Able to analyze digital modulation techniques by using various tools.
- Able to identify and describe different techniques in modern digital communications, in particular in source coding using various tools
- Implement different types of Amplitude, Frequency, Phase and Pulse modulation and demodulation schemes

(Any 10 Experiments)

1. Amplitude Modulation and Demodulation
2. Frequency Modulation and Demodulation
3. Pulse Amplitude Modulation
4. AM Transmitter/Receiver
5. FM Transmitter/Receiver
6. Time Division Multiplexing
7. Frequency Division Multiplexing
8. Function generator using IC 8038
9. Pulse Width Modulation
10. Pulse Position Modulation
11. Pulse Code Modulation
12. BPSK Modulation and Demodulation

16ECU301	DIGITAL ELECTRONICS AND VHDL	Semester - III			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To enable the students to represent numerical values in various number systems and perform number conversions between different number systems.
- To analyze and design digital combinational circuits like decoders, encoders, multiplexers, and de-multiplexers including arithmetic circuits (half adder, full adder, multiplier).
- To design sequential digital circuits like flip-flops, registers and counters.
- To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables.
- To lay the foundation for further studies in areas such as communication, VLSI, computer, microprocessor.
- To understand number representation and conversion between different representation in digital electronic circuits.

COURSE OUTCOMES

- Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
- Design combinational and sequential circuits.
- Design and implement hardware circuit to test performance and application.
- Implement combinational and sequential circuits using VHDL
- Classify different semiconductor memories
- Analyze, design and implement sequential logic circuits

UNIT I - Number System and Codes

Decimal - Binary - Hexadecimal and Octal number systems - Base conversions – Binary - Octal – Hexadecimal - Arithmetic (addition, subtraction by complement method, multiplication) - Representation of signed and unsigned numbers - Binary Coded Decimal code - Logic Gates - Boolean algebra - Introduction to Boolean Algebra and Boolean operators - Truth Tables of OR, AND, NOT - Basic postulates - Fundamental theorems of Boolean algebra - Truth tables – Construction - Symbolic representation of XOR, XNOR - Universal (NOR and NAND) gates - Digital Logic families: Fan-in - Fan out - Noise Margin - Power Dissipation - Figure of merit - Speed power product - TTL and CMOS families and their comparison.

UNIT II - Combinational Circuits

Standard representation of logic functions (SOP and POS) - Karnaugh map minimization - Encoder and Decoder - Multiplexers and Demultiplexers - Implementing logic functions with multiplexer - Binary Adder - Binary Subtractor - Parallel adder/subtractor.

UNIT III - Sequential Circuits

Latches and Flip flop - S-R Flip flop - J-K Flip flop – T - D type Flip flop - Clocked and edge triggered Flip flops - Master slave flip flop – Registers - Counters (synchronous and asynchronous and modulo-N) - State Table - State Diagrams - Counter design using excitation table and equations - Ring counter - Johnson counter - Analog to Digital Converter - Digital to Analog Converter.

UNIT IV - Introduction to Verilog

A Brief History of HDL-Structure of HDL Module - Comparison of VHDL and Verilog - Introduction to Simulation and Synthesis Tools - Test Benches - Verilog Modules – Delays - data flow style - Behavioral style - Structural style - Mixed design style -Simulating design - Introduction to Language Elements – Keywords – Identifiers -White Space Characters - Comments – Format – Integers – Reals – strings - Logic Values - Data Types - Net types - undeclared nets - Scalars and vector nets - Register type – Parameters – Expressions – Operand – Operators -Types of Expressions - Data flow Modeling -Behavioral Modeling.

UNIT V - Data flow Modeling

Continuous assignment - Net declaration assignments – Delays - Net delays - Behavioral Modeling - Procedural constructs - Timing controls - Block statement - Procedural assignments - conditional statement - Loop statement - Procedural continuous assignment - Gate level modeling – Introduction - Built in Primitive Gates - Multiple input gates - Tri-state gates - Pull gates - MOS switches - Bidirectional switches - Gate delay - Array instances - Implicit nets.

Suggested Readings:

Text Books

1. Salivahanan, (2014). *Digital Electronics and its Principles*. (10th ed.). McGraw Hill Education Private Limited.
2. Albert Paul Malvino, Donald P. Leach & Goutam Saha, (2010). *Digital Principles and Application*. (7th ed.). Tata McGraw Hill.

Reference Books

1. Morris Mano, M. (2014). *Digital System Design*. (4th ed.). Pearson Education Asia.
2. Sumathi, S. (2011). *Principles of VLSI Design*. Scitech Publications.
3. Pucknell D.A., & Eshraghian K. (2009). *Basic VLSI Design*. (3rd ed.). PHI.
4. Phadke, A.A., & Deokar, S.M., (2009). *Digital Logic Design and VHDL*. 4th ed.). Tata Mc-Graw Hill Publications.

Journals

1. International Journal of Emerging trends in Electrical and Electronics.
2. International Journal of Computer and Communication Technology

Websites

1. www.makezine.com
2. www.circuitstoday.com

16ECU302	DIGITAL AND CELLULAR COMMUNICATION	Semester - III			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To enable the students to learn the digital and cellular technology
- To identify the functions of different components
- Learn about theoretical bounds on the rates of digital communication system
- To represent a digital signal using several modulation methods
- Draw signal space diagrams compute spectra of modulated signals and apply redundancy for reliable communication.
- To make students familiar with fundamentals of mobile communication systems

COURSE OUTCOMES

- Understand the basics of information theory, source coding techniques and calculate Entropy of source
- To know the various types of noises in communication systems and reduction techniques
- Describe and determine the performance of line codes and methods to mitigate inter symbol interference
- Learn the generation and detection of base band system
- Understand the generation, detection signal space diagram, spectrum, bandwidth efficiency, and probability of error analysis of different band pass modulation techniques
- Describe and determine the performance of different error control coding schemes for the reliable transmission of digital representation of signals and information over the channel.

UNIT I - Data Transmission

Introduction – Representation of data signal – Parallel and serial data transmission – 20milli amps loop and line drivers – Transient noise – Data signal – Signal shaping and signaling speed – Noise and error analysis – Repeaters.

UNIT II - Communication System

Model of communication system – Elements of digital communication system: Information source - Source encoder/decoder - Communication channel - Modulator – Demodulator - Channel encoder/decoder - Other functional blocks – Analysis of communication system – Design of communication system.

UNIT III - Digital Carrier Modulation Schemes

Binary phase shift keying – Differential phase shift keying – Differentially encoded PSK – Quadrature phase shift keying – Base band signal receiver – Phase shift keying – Frequency shift keying – Non-coherent detection of FSK.

UNIT IV - Pulse Modulation And Quantization

Pulse amplitude modulation - Pulse width modulation - Pulse position modulation - Quantization of signals – Quantization error – Pulse code modulation – Electrical representation of Binary digits – PCM system – Companding – Multiplexing PCM signals – Differential PCM – Delta modulation – Adaptive delta modulation.

UNIT V - Digital Cellular Systems

GSM Architecture – Layer modeling – transmission – Data Service – Multiple Access Scheme – Channel Coding Inter leaving – Radio resource management – Mobility management – Communication management – Network management – TDMA Architecture – Transmission and Modulation – CDMA – Terms of CDMA Systems – Call Processing – Hand over Procedures

Suggested Readings:

Text Books

1. Chakrabarti, P. (2012). *Principles of Digital Communications*. (1^{st} ed.). Dhanpat Rai Publications Private Limited.
2. Kennedy and Davis, (2012). *Electronic Communication Systems*. (5^{th} ed.). Tata McGraw Hill.

Reference Books

1. John R.Barry, (2010). *Digital Communication*, Springer Publications.
2. Kanna, V.K. (2009). *Digital Communications*, S.Chand Publications.
3. Frenzel, (2015). *Principles of Electronic Communication Systems*. (4^{th} ed.). McGraw Hill.
4. Tomasi, (2013). *Advanced Electronic Communications Systems*. (6^{th} ed.). PHI.

Journals

1. International Journal of Emerging trends in Electrical and Electronics.
2. International Journal of Computer and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.hackaday.io

16ECU303	INTERNET AND JAVA PROGRAMMING	Semester - III			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To understand the basic concepts of Internet
- To know the java path setting and programming techniques
- To understand the fundamental of Packages and access modifiers and interface in java
- To know the basic java programming and Applet programming
- To program in the Java programming language
- Knowledge of object-oriented paradigm in the Java programming language,

COURSE OUTCOMES

- Understand the basics of information theory, source coding techniques and calculate Entropy of source se an integrated development environment to write, compile, run, and test simple object-oriented Java programs
- Read and make elementary modifications to Java programs that solve real-world problems
- Validate input in a Java program
- Identify and fix defects and common security issues in code
- Document a Java program using Javadoc
- Use a version control system to track source code in a project.

UNIT I - Internet

Introduction, Understanding the Internet, Internet Addressing, Hardware Requirements to Connect to the Internet.

UNIT II - Data types, Arrays, Operators, Flow control

Branching, Looping. Classes, New Operator, Dot Operator, Method Declaration and Calling, Constructors.

UNIT III - Inheritance

Inheritance, Super, Method Overriding Final, Finalize, Static, Package and Import Statement, Interface and Implements

UNIT IV - Exception Handling

Exception Types, Uncaught and Calling, Nested Try Statements, Java Thread Model, and Thread, Runnable, Thread Priorities, Synchronization, Deadlock

UNIT V - File

Input Stream, Output Stream, and File Stream. Applets-Tag, Order of Applet Initialization, Repainting, Sizing Graphics- Abstract Window Tool Kit Components

Suggested Readings:

Text Books

1. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley, (2014). *The Java Language Specification, Java SE 8 Edition (Java Series*). Addison Wesley.

2. Joshua Bloch, (2008). *Effective Java*, (2^{nd} ed.). Addison Wesley.

Reference Books

1. Cay S. Horstmann & GaryCornell, (2012). *Core Java 2 Volume 1*. (9^{th} ed.). Prentice Hall.
2. Cay S. Horstmann & Gary Cornell, (2013). *Core Java 2 Volume 2*. (9^{th} ed.). Prentice Hall.
3. Harley Hahn, (1997). *The Internet Complete Reference*. (2^{nd} ed.). Tata McGraw Publication Ltd.

16ECU304A	DESIGN AND FABRICATION OF PRINTED CIRCUIT BOARDS	Semester - III			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To make familiar with PCB design and various processes involved.
- To provide in-depth core knowledge in design, performance analysis and fabrication of Printed Circuit Boards.
- To gain knowledge on PCB fabrication process and factors affecting PCB performance
- Understand the need for PCB Design and steps involved in PCB Design and Fabrication process.
- Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools
- Recognize the technologies used in electronic industry through the practical experience gained in the course

COURSE OUTCOMES

- Students can explore different aspect of Printed Circuit Board Design and fabrication
- Students can learn various types of PCBs. Schematic Design. entry Rules for Schematic Entry, Component Layout methods
- Placement Rules, Routing Techniques for Single Sided Board.
- Post Processing of design and Fabrication documents.
- After completing this course students can design and fabricate their own PCB for their Project and can also work in PCB Designing and Fabrication area
- Understand the steps involved in schematic, layout, fabrication and assembly process of PCB design

UNIT I - PCB Fundamentals

PCB Advantages - Components of PCB - Electronic components - Microprocessors and Microcontrollers - IC's - Surface Mount Devices (SMD) - Classification of PCB - single, double, multilayer and flexible boards - Manufacturing of PCB - PCB standards.

UNIT II - Schematic & Layout Design

Schematic diagram – General - Mechanical and Electrical design considerations - Placing and Mounting of components - Conductor spacing – Routing guidelines - Heat sinks - Package density - Net list - Creating components for library – Tracks – Pads – Vias - Power plane - Grounding.

UNIT III - Technology of PCB

Design automation - Design Rule Checking - Exporting Drill and Gerber Files – Drills - Footprints and Libraries Adding and Editing Pins - Copper clad laminates materials of copper clad laminates - Properties of laminates (electrical & physical) - Types of laminates - Soldering techniques.

UNIT IV – Etching and Soldering

Introduction - Film master preparation - Image transfer - Photo printing - Screen Printing - Plating techniques etching techniques - Mechanical Machining operations - Lead cutting and Soldering Techniques - Testing and quality controls.

UNIT V – Design Rules and Automation

Reflection – Crosstalk – Ground and Supply line noise – Electromagnetic Interference from pulse type EM fields and Automation – Automated artwork drafting - CAD - Environmental concerns in PCB industry.

Suggested Readings:

Text Books

1. Walter C.Bosshart, (2007). *PCB Design and Technology*, Tata McGraw Hill Publications.
2. Clyde F.Coombs, (2008). *Printed Circuits Handbook*, (6th ed.). Tata McGraw Hill Publications.

Journals

1. International Asian Research Journal.
2. International Journal of Communication on Applied Electronics.

Websites

1. www.edx.org
2. www.circuitstoday.com

16ECU304B	ELECTRONIC INSTRUMENTATION	Semester - III			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To understand operation of different instruments
- To provide basic knowledge about the various sensors. and data acquisition systems applied in Wireless sensor network
- To provide fundamental concepts of control system.2 such as mathematical modeling, time response and frequency response
- To develop concepts of stability and its assessment.3 criteria.
- Explain basic concepts and definitions in measurement
- to find transfer functions for given system

COURSE OUTCOMES

- Able to understand operation of different instruments.
- Understand the principles of various types of transducers and sensors
- Able to calculate time domain and frequency domain parameter for given system
- Able to predict stability of given system using appropriate criteria
- Identify the various parameters that are measurable in electronic instrumentation
- Practice the construction of testing and measuring set up for electronic systems.

UNIT I - Measurements

Qualities of Measurement: Specifications of instruments - Static and dynamic characteristics - Error (Gross error, systematic error, absolute error and relative error) - Uncertainty analysis - Statistical analysis of data and curve fitting - Basic Measurement Instruments: PMMC instrument – Galvanometer - DC measurement – Ammeter – Voltmeter - Ohm meter - AC measurement - Digital voltmeter systems (integrating and non-integrating types) - Digital multimeters - Digital frequency meter system (different modes and universal counter). Connectors and Probes: low capacitance probes - High voltage probes - current probes - Identifying electronic connectors – audio and video - RF/Coaxial - USB etc.

UNIT II - Measurement of Resistance and Impedance

Low Resistance: Kelvin's double bridge method - Medium Resistance by Voltmeter Ammeter method - Wheatstone bridge method - High Resistance by Megger - A.C. bridges - Measurement of Self Inductance - Maxwell's bridge - Hay's bridge - Anderson's bridge - Measurement of Capacitance - Schering's bridge - DeSauty's bridge - Measurement of frequency - Wien's bridge. A-D and D-A Conversion: 4 bit binary weighted resistor type D-A conversion - Circuit and working - Circuit of R-2R ladder – A/D conversion characteristics - Successive approximation ADC.

UNIT III – Oscilloscopes

CRT - Wave form display and electrostatic focusing - Time base and sweep synchronization - Measurement of voltage - Frequency and phase by CRO - Oscilloscope probes - Dual trace oscilloscope - Sampling Oscilloscope - DSO and Powerscope: Block diagram - Principle and Working - Advantages and applications - CRO specifications (bandwidth, sensitivity, rise time). Signal Generators: Audio oscillator - Pulse Generator - Function generators.

UNIT IV - Transducers

Classification of transducers - Basic requirement/characteristics of transducers - Active & passive transducers - Resistive (Potentiometer - Strain gauge – Theory, types - temperature compensation and applications) - Capacitive (Variable Area Type – Variable Air Gap type – Variable Permittivity type) - Inductive (LVDT) - Piezoelectric transducers - Measurement of displacement - Velocity - Acceleration - Measurement of pressure - Measurement of temperature - Light transducers.

UNIT V – Digital Instruments

Performance characteristics of instruments – Digital Multimeter – Digital frequency meter – Digital measurement of time – Digital measurement of mains frequency – Digital tacometer – Digital phase meter – Digital capacitance meter.

Suggested Readings:

Text Books

1. David A. Bell, (2013). *Electronic Instrumentation and Measurements*. Prentice Hall.
2. Kalsi, H. S. **(**2012). *Electronic Instrumentation*, (3rd ed.). TMH.

Reference Books

1. Joseph J Carr, (2011). *Elements of Electronic Instrumentation and Measurement*. Pearson Education.
2. Alan S. Morris, (2010). *Measurement and Instrumentation Principles*. Elsevier (Buterworth Heinmann.
3. Sawhney, A. K. (2009). *Electrical and Electronics Measurements and Instrumentation*. DhanpatRai and Sons.

Journals

1. International Asian Research Journal.
2. International Journal of Communication on Applied Electronics.

Websites

1. www.edx.org
2. www.coursera.org

16ECU311	DIGITAL ELECTRONICS AND VHDL - PRACTICAL	Semester - III			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Learn and understand the basics of digital electronics, Boolean algebra, and able to design the simple logic circuits and test/verify the functionality of the logic circuits
- Provide hands-on experience in digital circuits, which can be constructed by using standard integrated circuits (ICs)
- Investigate the operation of several digital circuits combinational and sequential
- To model complex digital systems at several level of abstractions; behavioral and structural, synthesis and rapid system prototyping.
- To develop and simulate register-level models of hierarchical digital systems
- To design and model complex digital system independently or in a team

COURSE OUTCOMES

- Identify the various digital ICs and understand their operation.
- Apply Boolean laws and K-map to simplify the digital circuits
- Understand the function of elementary digital circuits under real and simulated environment
- Describe and explain the operation of fundamental digital gates
- Analyze the operation of a flip-flop and examine relevant timing diagrams 4. Analyze the operation of counters and shift registers
- Design operate practical digital logic circuits

(Any 10 Experiments)

DIGITAL ELECTRONICS PRACTICAL

1. To verify and design AND, OR, NOT and XOR gates using universal gates.
2. Half Adder and Full Adder circuits
3. Comparator
4. Encoder and Decoder circuits
5. 4 X 1 Multiplexer using gates.
6. Counters

VHDL PRACTICAL

7. Design and Implementation of logic gates.
8. Design and Implementation of Half Subtractor and Full Subtractor
9. Design and Implementation of Up/Down Counter
10. Design and Implementation of flip-flop circuits
11. Design and Implementation of Multiplexer and Demultiplexer circuits.
12. Design and simulation of a 4 bit Adder.

16ECU312	DIGITAL AND CELLULAR COMMUNICATION - PRACTICAL	Semester - III			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To understand the building blocks of digital commutation system.
- To analyze error performance of a digital communication system in presence of noise and other interferences
- To understand information theoretic behavior of a communication system.
- To understand various source coding and channel coding techniques
- To develop to understand the concept of different types of coding.
- To understand Multiple Access and Spread Spectrum Techniques.

COURSE OUTCOMES

- Perform the time and frequency domain analysis of the signals in digital communication systems
- Design a suitable source and channel coding scheme for a communication system
- Analyze Performance of Multiple Access and Spread Spectrum Techniques
- Understand various spreading techniques and determine bit error performance of various digital communication systems
- determine the performance of different error control coding schemes for the reliable transmission of digital representation of signals and information over the channel
- Learn the generation and detection of base band system

(Any 10 Experiments)

1. Line Coding Schemes
2. Dibit Encoder
3. Delta modulation
4. Adaptive delta Modulation
5. Differential Pulse Code Modulation
6. Quadrature Phase Shift Keying
7. Time Division Multiplexing
8. Base Band Transceiver(Interpolation, Pairing)
9. Adaptive Linear Equalizer
10. Code Division Multiplexing
11. Direct Sequence Spread Spectrum (DSSS) CDMA
12. GSM Transmitter/Receiver

16ECU313	INTERNET AND JAVA PROGRAMMING - PRACTICAL	Semester-I			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To get familiar with basics of the Internet Programming.
- To gain ability to develop responsive web applications
- Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
- Concepts of inheritance, packages, interfaces and multithreading are introduced.
- Knowledge of object-oriented paradigm in the Java programming language
- The use of Java in a variety of technologies and on different platforms

COURSE OUTCOMES

- To understand the basic concepts of Internet
- Describe and differentiate different Web Extensions and Web Services
- Remember the fundamentals of Java programming language
- Understand the basics of Java programming, multi-threaded programs and Exception handling
- Analyze and use Java in a variety of applications
- Able to design, code and debug JAVA language programs

(Any 10 Experiments)

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of length in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(, setLength(), append(), insert(), concat()and equals().
9. Write a program to create a distance class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
10. Modify the distance class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is

found, then java will apply automatic type conversions(from lower to higher data type)

12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword

16ECU314A	DESIGN AND FABRICATION OF PRINTED CIRCUIT BOARDS - PRACTICAL	Semester - III			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- Understand the need for PCB Design and steps involved in PCB Design and Fabrication process
- To gain knowledge on PCB fabrication process and factors affecting PCB performance
- Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools
- To make familiar with PCB design and various processes involved.
- To provide in-depth core knowledge in design, performance analysis and fabrication of Printed Circuit Boards
- Recognize the technologies used in electronic industry through the practical experience gained in the course

COURSE OUTCOMES

- Appreciate the necessity and evolution of PCB, types and classes of PCB.
- Understand the steps involved in schematic, layout, fabrication and assembly process of PCB design.
- Understand basic concepts of transmission line, crosstalk and thermal issues
- Students can explore different aspect of Printed Circuit Board Design and fabrication
- Students can learn various types of PCBs, Schematic Design, entry Rules for Schematic Entry and Component Layout methods
- Design (schematic and layout) PCB for analog circuits, digital circuits and mixed circuits

(Any 8 Experiments)

1. Fabrication of Electronic Components
2. Etching process in PCB.
3. Soldering practice in PCB.
4. PCB fabrication process of DMM and Power supply.
5. PCB Design software simulation.
6. Generation of CAM Files for single side PCB (Measuring voltage Drop)
7. Generation of CAM Files for single side PCB (Full wave Rectifier)
8. PCB Assembly and Testing (Measuring voltage Drop)
9. PCB Assembly and Testing (Full wave Rectifier)
10. Study of single side PCB Fabrication process.

16ECU314B	ELECTRONIC INSTRUMENTATION - PRACTICAL	Semester - III			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- To understand scientific measurement principles and concepts behind modern electronic instrumentation
- To understand the principle of various types of transducers
- To know the construction and working of frequently used equipment's like CRO, Signal generator, spectrum analyzer etc
- To know the fundamentals of measuring systems including the particular limitations and capabilities Of a number of measuring devices (pressure transducers, strain gages, thermocouples, etc.) and Equipment's (oscilloscope, spectrum analyzer, etc.)
- To provide fundamental concepts of control system such as mathematical modeling, time response and frequency response
- To develop concepts of stability and its assessment.

COURSE OUTCOMES

- Identify various errors in measurement system and correct them.
- Understand the principles of various types of transducers and sensors
- Able to understand operation of different instruments.
- Able to calculate time domain and frequency domain parameter for given system
- Identify the various parameters that are measurable in electronic instrumentation
- Practice the construction of testing and measuring set up for electronic systems

(Any 8 Experiments)

1. Design of multi range ammeter and voltmeter using galvanometer.
2. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.
3. Measurement of Capacitance by de'Sautys.
4. Measure of low resistance by Kelvin's double bridge.
5. To determine the Characteristics of resistance transducer - Strain Gauge (Measurement of Strain using half and full bridge.)
6. To determine the characteristics of LVDT.
7. To determine the characteristics of Thermistors and RTD.
8. Measurement of temperature by Thermocouples
9. To study the Characteristics of LDR, Photodiode, and Phototransistor
10. Characteristics of Solid State sensor/ Fiber optic sensor

16ECU401	OPERATIONAL AMPLIFIER AND IT'S APPLICATIONS	Semester - IV			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To develop an in-depth knowledge on IC fabrication technology
- To understand the basic concepts of operational amplifier and its various applications
- To understand the basics of PLL and its practical applications
- To know about analog multipliers
- To know about various analog switches and different A/D and D/A convertors
- To understand the concepts of switched capacitor filters,Voltage regulator and various• amplifiers

COURSE OUTCOMES

- Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems
- Develop skills to design simple circuits using OP-AMP
- Gain knowledge about various multiplier circuits, modulators and demodulators
- Gain knowledge about PL
- Learn about various techniques to develop A/D and D/A convertors
- Develop skills to develop simple filter circuits and various amplifiers and can solve problems related to it.

UNIT I - IC Fabrication Technology

Introduction to Integrated Circuit Fabrication – Classification – Integrated Circuit chip size and circuit complexity - Fundamentals of Monolithic Integrated Circuit technology –Basic planar process – Fabrication of a Typical circuit – Active and Passive Components Integrated Circuits - Thin and Thick film technology – Technology Trends.

UNIT II - Basic Operational Amplifier

Concept of differential amplifiers (Dual input balanced and unbalanced output) - Constant current bias - Current mirror - Cascaded differential amplifier stages with concept of level translator - Block diagram of an operational amplifier (IC 741) - Op-Amp parameters: Input offset voltage - Input offset current - Input bias current Differential input resistance - Input capacitance - Offset voltage adjustment range - Input voltage range - Common mode rejection ratio - Slew rate - Supply voltage rejection ratio.

UNIT III – Operational Amplifier Circuits

Open and closed loop configuration - Frequency response of an op-amp in open loop and closed loop configurations – Inverting - Non-inverting - Summing and difference amplifier – Integrator – Differentiator - Voltage to current converter - Current to voltage converter – Comparators.

UNIT IV – Comparator

Basic comparator - Level detector - Voltage limiters - Schmitt Trigger - Signal generators: Phase shift oscillator - Wein bridge oscillator - Square wave generator - Triangle wave generator - Saw tooth wave generator - Voltage controlled oscillator(IC 566) - Multivibrators (IC 555): Block diagram - Astable and monostable multivibrator circuit -

Applications of Monostable and Astable multivibrators.

UNIT V - Phase locked loops (PLL)

Block diagram - Phase detectors - IC565 - Fixed and variable IC regulators: IC 78xx and IC 79xx - Concepts only - IC LM317 - Output voltage equation - Signal Conditioning circuits: Sample and hold systems - Active filters: First order low pass and high pass butterworth filter - Second order filters - Band pass filter - Band reject filter - All pass filter - Log and antilog amplifiers.

Suggested Readings:

Text Books

1. Choudhury, D. R., & Jain, S. (2014). *Linear integrated circuits* (4th ed.). New York: Wiley.
2. Salivahanan, S. (2008). *Linear Integrated Circuits*, (4th ed.). Tata McGraw Hill Publications.

Reference Books

1. Kishore, K.L. (2011). *OP-AMP and Linear Integrated Circuits*. Pearson Education.
2. Chitode, J.S. (2010). *Linear Integrated Circuits*. (6th ed.). Pune: Technical Publications.
3. Botkar, K.R. (2008). *Integrated Circuits*. Khanna Publications.

Journals

1. International Education and Research Journal
2. International Journal for Research and Development in Technology

Websites

1. www.engineersgarage.com
2. www.circuitstoday.com

16ECU402	MICROPROCESSOR AND MICROCONTROLLER	Semester - IV			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To know the fundamental concept of microprocessor 8085 and microcontroller architecture and to program in assembly language.
- To learn the interfacing of different peripherals for various typical applications
- To develop background knowledge and core expertise of microcontroller
- To know the importance of different peripheral devices and their interfacing to microcontrollers
- To know the design aspects of microcontrollers. 4. To write assembly language programs of microcontrollers for various applications.
- To provide a strong practical knowledge in the application areas.

COURSE OUTCOMES

- Apply basic concept of digital fundamentals to Microprocessor based personal computer system.
- Identify a detailed s/w & h/w structure of the Microprocessor.
- Illustrate how the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.
- Distinguish and analyze the properties of Microprocessors & Microcontrollers.
- Aanalyze the data transfer information through serial & parallel ports
- Train their practical knowledge through laboratory experiments.

UNIT I - Introduction to Microprocessor

Introduction – Applications - Basic block diagram – Speed - Word size - Memory capacity - Classification of microprocessors - Microprocessor 8085: Features - Architecture - Block diagram - General purpose registers - Register pairs – Flags - Stack pointer - Program counter - Types of buses - Multiplexed address and data bus - Generation of control signals - Pin description of microprocessor 8085 - Basic interfacing concepts - Memory mapped I/O and I/O mapped I/O.

UNIT II - 8085 Instruction Sets

Operation code - Operand and Mnemonics - Instruction set of 8085 - Instruction classification - Addressing modes - Instruction format - Data transfer instructions - Arithmetic instructions - Increment and decrement instructions - Logical instructions - Branch instructions - Machine control instructions - Assembly language programming examples.

UNIT III - Branch Instructions

Stack operations – Subroutine - Call and return instructions - Delay loops - Use of counters - Timing diagrams - Instruction cycle - Machine cycle - T- states - Time delay. Interrupt structure of 8085A microprocessor - Processing of vectored and non-vectored interrupts - Latency time and response time - Handling multiple interrupts - Microcontrollers: Introduction - different types of microcontrollers - Embedded microcontrollers - Processor architectures - Harvard vs. Princeton - CISC vs. RISC architectures - Microcontroller memory types - Microcontroller features – Clocking - I/O pins – Interrupts – Timers - Peripherals.

UNIT IV - PIC16F887 Microcontroller

Core features – Architecture - Pin diagram - Memory organization - Program and data memory organization - I/O Ports - Oscillator module - Timer modules - Comparator module - Analog-to-digital converter (ADC) module - Data EEPROM - Enhanced capture/compare/PWM module – EUSART - Master synchronous serial port (MSSP) module - Special features of the CPU - Interrupts - Addressing modes - Instruction set.

UNIT V - Interfacing to PIC16F887

LED – Switches - Solid State Relay - Seven Segment Display - 16x2 LCD display - 4x4 Matrix Keyboard – Traffic light controller - Digital to Analog Converter - Stepper Motor and DC Motor - Interfacing program examples using C language.

Suggested Readings:

Text Books

1. Kani, A. N. (2012). *Microprocessors and Microcontrollers: includes 8085*
2. *Microprocessors, 8086 Microprocessors, Advance Microprocessors Microcontrollers*. New Delhi: Tata McGraw Hill Publications.
3. Gaonkar, R. S., & Gaonkar, R. S. (2009). *Microprocessor Architecture,Programming, and Applications with the 8085* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Reference Books

1. Ayala, K. J. (2007). *The 8051 microcontroller* (3rd ed.). Clifton Park, NY: Thomson Delmar Learning.
2. Ray, & Bhurchnadi, (2008). *Advanced Microprocessor and Peripherals*. (6^{th} ed.). Tata McGraw Hill Publications.

Journals

1. International Journal of Advanced and Applied Sciences
2. International Education and Research Journal

Websites

1. www.sparkfun.com
2. www.circuitstoday.com

16ECU403	POWER ELECTRONICS	Semester - IV			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To know the fundamental concept of Power Electronics and its Applications
- To teach fundamental principles of thyristor family.
- To become familiar with power devices and their application in various fields
- Learners are expected to understand various controllers , converters , inverters and choppers
- To familiarize students to the principle of operation, design and synthesis of different power conversion circuits and their applications
- To provide strong foundation for further study of power electronic circuits and systems

COURSE OUTCOMES

- Apply basic concept of digital fundamentals to Microprocessor based personal computer system
- Demonstrate an understanding of fundamentals of thyristor family.
- Analyze the various applications and circuits based on thyristor .
- Build and test circuits using power devices such as SCR, IGBT and MOSFET.
- Analyze and design controlled rectifier, DC to DC converters, DC to AC
- Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices

UNIT I - Power Devices

Need for semiconductor power devices - Power diodes - Enhancement of reverse blocking capacity - Introduction to family of thyristors - Silicon Controlled Rectifier (SCR): Structure - I-V characteristics - Turn-On and Turn-Off characteristics – Ratings - Factors affecting the characteristics/ratings of SCR – Gate triggering circuits - Control circuits design and Protection circuits - Snubber circuit.

UNIT II – DIAC and TRIAC

Diac and Triac: Basic structure - Working and V-I characteristic of - Application of a Diac as a triggering device for a Triac - Insulated Gate Bipolar Transistors (IGBT): Basic structure - I-V Characteristics - Switching characteristics - Device limitations - Safe operating area (SOA).

Application of SCR: Static switch - Phase controlled rectification - Single phase half wave - Full wave and bridge rectifiers with inductive & non-inductive loads - AC voltage control using SCR - Triac as a switch - Power MOSFETs: operation modes - Switching characteristics - Power BJT - Second breakdown - Saturation and quasi-saturation state.

UNIT III - Power Inverters

Need for commutating circuits - Types - D.C. link invertors - Parallel capacitor commutated invertors with and without reactive feedback – Analysis - Series Invertor - Limitations – Bridge invertors.

UNIT IV - Choppers

Basic chopper circuit - Types of choppers – Step down chopper – Step up chopper - Operation of d.c. chopper circuits using self commutation - Cathode pulse turn-off chopper - Load sensitive cathode pulse turn-off chopper - Morgan's chopper.

UNIT V - Electromechanical Machines

DC Motors - Basic understanding of field and armature - Principle of operation - EMF equation - Back EMF - Factors controlling motor speed - Thyristor based speed control of dc motors - AC motor - Rotor and stator - Torque & speed of induction motor - Thyristor control of ac motors

Suggested Readings:

Text Books

1. Rashid, M. H. (2014). *Power Electronics: Circuits, Devices, and Applications* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.
2. Rai, H. C. (2013). *Industrial and Power Electronics*, (3rd ed.)., Millennium: Umesh Publications.

Reference Books

1. Joe., V. R. (2010). *Industrial Power Electronics*. Vanderbijlpark: Lerato.
2. HariBabu, K. (2009). *Power Electronics*. Scitech Publication.

Journals

1. International Journal of Electrical and Electronic Engineers
2. International Journal of Engineering and Technology

Websites

1. www.nptel.ac.in
2. www.quora.com

16ECU404A	ELECTRICAL CIRCUITS AND NETWORK SKILLS	Semester -IV			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To get technically expertise in electrical machines and drive systems, and being able to apply the knowledge to practical industry systems and appliances.
- To understand the new technological development in the field of electrical drive, and being skillful in numerical calculation, technical writing, and presentation of electrical machine technology.
- To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques
- To analyze circuits in time and frequency domain
- To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship
- To synthesize the network using passive elements.

COURSE OUTCOMES

- Apply concepts of electric network topology, nodes, branches, loops to solve circuit problems including the use of computer simulation
- Understand the basic concepts of graph and analyze the basic electrical circuits using graph theory
- Apply time and frequency concepts of analysis
- Understand various functions of network and also the stability of network
- Learn the various parameters and their interrelationship, able to solve numericals with series, cascade and parallel connections.
- Synthesize the network using passive elements.

UNIT I - Basic Electricity Principles

Voltage – Current – Resistance – Power - Ohm's law – Series-parallel and parallel-series combinations - AC and DC Electricity - Familiarization with multimeter - Voltmeter and Ammeter - Electrical Circuits: Basic electric circuit elements and their combination - Rules to analyze DC sourced electrical circuits - Current and voltage drop across the DC circuit elements - Single-phase - Three-phase alternating current sources - Rules to analyze AC sourced electrical circuits - Real-imaginary and complex power components of AC source - Power factor - Saving energy and money.

UNIT II - Electrical Drawing and Symbols

Drawing symbols – Blueprints - Reading: Schematics - Ladder diagrams - Electrical Schematics - Power circuits - Control circuits - Reading: of circuit schematics - Tracking the connections of elements and identify current flow and voltage drop.

UNIT III - Generators and Transformers

DC Power sources - AC/DC generators – Inductance – Capacitance – Impedance - Operation of transformers - Electric Motors: Single-phase - Three-phase - DC motors - Basic design - Interfacing DC or AC sources to control heaters and motors - Speed and power of ac motor.

UNIT IV - Solid-State Devices

Resistors - Inductors – Capacitors - Diode and rectifiers - Components in Series or in shunt - Response of inductors and capacitors with DC or AC sources - Electrical Protection: Relays - Fuses and disconnect switches - Circuit breakers - Overload devices - Ground-fault protection - Grounding and isolating - Phase reversal - Surge protection - Relay protection device.

UNIT V - Electrical Wiring

Different types of conductors and cables - Basics of wiring - Star and delta connection - Voltage drop and losses across cables and conductors - Instruments to measure current – Voltage - Power in DC and AC circuits – Insulation - Solid and stranded cable – Conduit - Cable trays - Splices: Wire-nuts – Crimps - Terminal blocks – Solder - Preparation of extension board.

Suggested Readings:

Text Books

1. Smith, K. C., & Alley, R. E. (2014). *Electrical Circuits: An Introduction*. Cambridge: Cambridge University Press.
2. Bird, J. O. (2012). *Electrical Circuit Theory and Technology*. Amsterdam: Newnes.

Reference Books

1. Monier, C. J. (2008). *Electric Circuit Analysis*. Upper Saddle River, NJ: Prentice Hall.
2. Kumar, K. S. (2009). *Electric Circuits and Networks*. Delhi, India: Dorling Kindersley (India).

Journals

1. International Journal of Electrical and Electronic Engineers
2. International Journal of Engineering and Technology

Websites

1. www.nptel.ac.in
2. www.quora.com

16ECU404B	DIGITAL SYSTEM DESIGN	Semester - IV			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To provide strong knowledge on Programmable Logic Devices and its usage in industrial automation.
- To understand number representation and conversion between different representation in digital electronic circuits.
- To analyze logic processes and implement logical operations using combinational logic circuits.
- To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines
- To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL
- To implement combinational and sequential circuits using VHDL

COURSE OUTCOMES

- Develop a digital logic and apply it to solve circuit problems
- Analyze, design and implement combinational logic circuits
- Classify different semiconductor memories
- Analyze, design and implement sequential logic circuits
- Analyze digital system design using PLD
- Simulate and implement combinational and sequential circuits using VHDL systems

UNIT I - Sequential Logic Circuits

Introduction to Sequential Logic Circuits - Mealy Machine- Moore Machine - State Diagrams - State Table Minimization - Incompletely Specified Sequential Machines - State Assignments - Design of Synchronous and Asynchronous Sequential Logic Circuits - Working in Fundamental and Pulse Mode.

UNIT II - Synchronous Sequential Circuit Design

Introduction of Clocked Synchronous Sequential Networks (CSSN) - Modeling of CSSN - State Table Assignment and Reduction – Design of CSSN - ASM Chart - ASM Realization.

UNIT III - Asynchronous Sequential Circuit Design

Introduction of Asynchronous Sequential Circuits (ASC) - Flow Table Reduction - Races in ASC - State Assignment - Problem and the Transition Table - Design of ASC - Static and Dynamic Hazards - Mixed Operating Mode Asynchronous Circuits.

UNIT IV - Programmable Logic Devices

Basic Concepts - Programming Technologies - Programmable Logic Element(PLE), Programmable Logic Array(PLA) - Programmable Array Logic(PAL) - Complex PLD's(CPLD) -System Design using PLD's - Design of Combinational and Sequential Circuits using PLD's.

UNIT V - Study of FPGA and XILINX

Introduction to Field Programmable Gate Arrays - Types of FPGA – Xilinx XC3000 Series - Logic Cell Array (LCA) - Configurable Logic Blocks (CLB) - Input/Output Block (IOB) -Programmable Interconnect Point (PIP).

Suggested Readings:

Text Books

1. Givone, D. D. (2003). *DigitalPrinciples and Design*. Dubuque: McGraw-Hill.
2. Floyd, T. L. (2014). *Digital Fundamentals*. Essex: Pearson Education.

Reference Book

1. Gothmann, W. H. (2009). *Digital Electronics: An Introduction to Theory and Practice*. Englewood Cliffs, NJ: Prentice-Hall.

Journals

1. International Journal of Emerging trends in Electrical and Electronics.
2. International Journal of Computer and Communication Technology

Websites

1. www.makezine.com
2. www.circuitstoday.com

16ECU411	OPERATIONAL AMPLIFIER - PRACTICAL	Semester - IV			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To Gain the practical hands-on experience on 741 Op-Amp applications
- To understand the basic concepts of operational amplifier and its various applications
- To Gain the practical hands-on experience on 555 Timer applications.
- To Gain the practical hands-on experience on Voltage Regulator and Three terminal voltage regulators
- To know about various analog switches and different A/D and D/A convertors
- To understand the concepts of switched capacitor filters, Voltage regulator and various amplifiers

COURSE OUTCOMES

- Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems
- Develop skills to design simple circuits using OP-AMP
- Able to utilize items such as decibels, Bode plots, and negative feedback for circuit analysis.
- Gain knowledge about various multiplier circuits, modulators and demodulators
- Gain knowledge about PL
- Develop skills to develop simple filter circuits and various amplifiers and can solve problems related to it.

(Any 10 Experiments)

1. Study of op-amp characteristics: CMRR and Slew rate.
2. Inverting and non-inverting configuration using an opamp.
3. Adder and subtractor circuit.
4. Integrator using op-amp for a given specification and study its frequency response.
5. Differentiator using op-amp for a given specification and study its frequency response.
6. First Order low-pass and high-pass filters using op-amp.
7. Schmitt Trigger using Op-amp
8. RC Phase Shift Oscillator using op-amp.
9. IC 555 as an astable multivibrator.
10. IC 555 as monostable multivibrator.
11. Regulated power supply using IC 78 series and 79 series.
12. VCO using IC565.

<table>
<tr><td rowspan="3">16ECU412</td><td rowspan="3">MICROPROCESSOR AND MICROCONTROLLER - PRACTICAL</td><td colspan="4">Semester - IV</td></tr>
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COURSE OBJECTIVES

- To expose students to the operation of typical microprocessor and microcontroller.
- To prepare the students to be able to solve different problems by developing different programs
- To develop the quality of assessing and analyzing the obtained data
- To illustrate the architecture of 8085 a microprocessors.
- To understand the interfacing circuits for various applications of 8051 microcontroller
- To introduce the architecture of advanced microprocessors and microcontrollers.

COURSE OUTCOMES

- Identify relevant information to supplement to the Microprocessor and Microcontroller course
- Set up programming strategies and select proper mnemonics and run their program on the training boards
- Practice different types of programming keeping in mind technical issues Develop testing and experimental procedures on Microprocessor and Microcontroller analyze their operation under different cases
- Prepare professional quality textual and computational results, incorporating accepted data analysis and synthesis methods, simulation software, and word-processing tools
- Illustrate the organization of registers and memory in microprocessors.

(Any 10 Experiments)

8085 Assembly language programs:

1. Program to transfer a block of data.
2. Program for multibyte addition and subtraction
3. Program to multiply and divide two 8-bit numbers.
4. Ascending and Descending numbers in an array.
5. Speed control of a DC motor.
6. Traffic light controller.

PIC Microcontroller Programming

Note: Programs to be written using C programming language

1. LED blinking with a delay of 1 second.
2. Interfacing of LCD (2X16).
3. Interfacing of stepper motor and Rotating stepper motor by N steps clockwise/anticlockwise with speed control.
4. Generate sine, square, saw tooth, triangular and staircase waveform using DAC interface.
5. Analog to digital conversion using internal ADC and display the result on LCD.
6. Digital clock.

16ECU413	POWER ELECTRONICS - PRACTICAL	Semester - IV			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To provide the students a deep insight in to the working of different switching devices with respect to their characteristics
- To analyze different converters and control with their applications
- To develop an overall approach for students from construction of control rectifier , inverter, choppers, study its specification, the functionality, design and practical applications
- To become familiar with power devices and their application in various fields
- To understand various controllers , converters , inverters and choppers
- To Know the advanced converters and switching techniques implemented in recent technology

COURSE OUTCOMES

- Express the design and control of rectifiers, inverters
- Design of power electronic converters in power control applications.
- Ability to express characteristics of SCR, BJT, MOSFET and IGBT
- Ability to express communication methods
- Ability design AC voltage controller and Cyclo Converter
- Ability to design Chopper circuits

(Any 10 Experiments)

1. SCR as a half wave and full wave rectifiers with R and RL loads
2. DC motor control using SCR.
3. Buck - Boost Regulator
4. AC voltage controller using TRIAC with UJT triggering.
5. Snubber circuit
6. Single phase inverter.
7. Fan control using TRIAC and DIAC.
8. Cyclo Converters
9. Automatic Battery Charger
10. Triac Flasher.
11. Thyristor Chopper
12. Burglar Alarm

16ECU414A	ELECTRICAL CIRCUITS AND NETWORK SKILLS - PRACTICAL	Semester - IV			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- To provide the students a deep insight in to the working of different switching devices with respect to their characteristics
- To get technically expertise in electrical machines and drive systems, and being able to apply the knowledge to practical industry systems and appliances.
- To understand the new technological development in the field of electrical drive, and being skillful in numerical calculation, technical writing, and presentation of electrical machine technology.
- To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques
- To analyze circuits in time and frequency domain
- To synthesize the network using passive elements

COURSE OUTCOMES

- Apply concepts of electric network topology, nodes, branches, loops to solve circuit problems including the use of computer simulation
- Understand the basic concepts of graph and analyze the basic electrical circuits using graph theory
- Apply time and frequency concepts of analysis
- Understand various functions of network and also the stability of network
- Able to solve numericals with series, cascade and parallel connections.
- Synthesize the network using passive elements.

(Any 8 Experiments)

1. Verification of KVL using Digital simulation
2. Verification of KCL using Digital simulation
3. Thevenin's Theorem using Digital simulation
4. Verification of Superposition theorem using Digital simulation
5. Verification of Reciprocity Theorem using Digital simulation
6. Maximum Power Transfer theorem using Digital simulation
7. Circuit Transients by Digital simulation
8. RLC Series Resonance by Digital simulation
9. Transient analysis of Series RL circuits
10. Transient analysis of Series RC circuits

16ECU414B	DIGITAL SYSTEM DESIGN - PRACTICAL	Semester - IV			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables
- To lay the foundation for further studies in areas such as communication, VLSI, computer, microprocessor
- To analyze logic processes and implement logical operations using combinational logic circuits
- To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines
- To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL
- To implement combinational and sequential circuits using VHDL

COURSE OUTCOMES

- Analyze the operation of a flip-flop and examine relevant timing diagrams
- Design operate practical digital logic circuits
- Develop a digital logic and apply it to solve circuit problems
- Analyze, design and implement combinational logic circuits
- Classify different semiconductor memories
- Analyze, design and implement sequential logic circuits

(Any 8 Experiments)

Note: EDA Tools/VHDL/Verilog/Mentor Graphics/Cadence

1. To convert a Boolean expression into logic gate circuit and assemble it using logic gate IC's.
2. Design of parity generator and checker circuit.
3. Barrel shifter
4. Design a seven segment display driver.
5. Image capturing
6. Counters and Shift registers
7. IIR filters
8. FIR filters
9. Design and simulation of a 4 bit Adder.
10. Frequency synthesizer

16ECU501A	PROGRAMMABLE LOGIC CONTROLLER	Semester-VI			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To identify logical process control in automation
- To connect PLC peripherals with PLC for logical functioning.
- To get strong knowledge in the developing of basic PLC programs
- To understand the components of a PLC system To understand how PLCs are used
- To understand the H&S requirements of a PLC- controlled system
- To understand different methods of interfacing with a PLC

COURSE OUTCOMES

- Identify the main parts of programmable logic controller
- Develop logic gate circuits for Boolean expressions
- Able to state basic PLC Terminology
- Identify logical process control, in automation.
- Describe how a programmable logic controller is programmed.
- Describe switching elements on input/output modules

UNIT I - Introduction

Introduction - Programmable Logic structures - Programmable Logic Arrays (PLAs) - Programmable Array Logic (PALs) - Programmable Gate Arrays (PGAs) - Field Programmable Gate Arrays (FPGAs) - Sequential network design with Programmable Logic Devices (PLDs) - Design of sequential networks using ROMs and PLAs - Traffic light controller using PAL.

UNIT II - PLC Structure

Programmable Logic Controllers (PLCs) - Introduction - Parts of PLC - Principles of operation - PLC sizes - PLC hardware components - I/O section - Analog I/O section - Analog I/O modules - Digital I/O modules - CPU Processor - Memory module - Programming devices - Diagnostics of PLCs with Computers.

UNIT III - PLC programming

Simple instructions - Programming EXAMINE ON and EXAMINE OFF instructions - Electromagnetic control relays - Motor starters - Manually operated switches - Mechanically operated and Proximity switches - Output control devices - Latching relays - PLC ladder diagram - Converting simple relay ladder diagram into PLC relay ladder diagram.

UNIT IV - Timer instructions

Introduction to timer - ON DELAY timer - OFF DELAY timer - Counter instructions - Up/Down counters - Timer and Counter applications - Program control instructions - Data manipulating instructions - Math instructions.

UNIT V - Applications of PLC

Simple materials handling applications - Automatic control of warehouse door - Automatic lubricating oil supplier - Conveyor belt motor control - Automatic car washing machine - Bottle PRACTICALel detection - Process control application.

Suggested Readings:

Text Books

1. Webb, J. W., & Reis, R. A. (2009). *Programmable Logic Controllers: Principles and Applications*. Upper Saddle River: Prentice Hall.
2. Dunning, G. (2007). *Introduction to Programmable Logic Controllers*. Albany, NY: Delmar.

Journals

1. International Journal of Electrical and Electronic Engineers
2. International Journal of Engineering and Technology

Websites

1. www.nptel.ac.in
2. www.quora.com

16ECU501B	NANO ELECTRONICS	Semester - V			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To discuss about the latest technology on nano systems based Nanoelectronics.
- To know the various methods to fabricate and measure Nanoscale features.
- To identify the critical parameters that one must evaluate when considering any new Nanoelectronics device.
- Know the types of nanotechnology, atomic structure, molecular technology and• preparation of nano materials
- Understand the fundamentals of nano electronics and its properties.
- Know the Silicon MOSFET's, QTD and carbon nano tubes

COURSE OUTCOMES

- Understand the fundamentals of Nano Electronics and its properties.
- Gain the concepts of quantum theory.
- Understand the latest technology on nano systems based Nano electronics
- Identify the various methods to fabricate and measure Nanoscale features.
- Evaluate the critical parameters when considering any new Nano electronics device.
- Understand the applications of Nano Electronics.

UNIT I - Introduction

Definition of Nano-Science and Nano Technology - Applications of Nano - Technology. Introduction to Physics of Solid State: Size dependence of properties - Bonding in atoms and giant molecular solids - Electronic conduction - Systems confined to one, two or three dimension and their effect on property.

UNIT II - Quantum Theory for Nano Science

Time dependent and time independent Schrodinger wave equations - Particle in a box - Potential step: Reflection and tunneling (Quantum leak) - Penetration of Barrier - Electron trapped in 2D plane (Nano sheet) - Quantum confinement effect in nano materials - Quantum Wells, Wires and Dots: Preparation of Quantum Nanostructure - Size and Dimensionality effect - Fermi gas - Potential wells - Partial confinement –Excitons - Single electron Tunneling - Infrared detectors - Quantum dot laser Superconductivity.

UNIT III - Growth Techniques of Nanomaterials

Synthetic aspects: bottom up and top down approaches - Lithograpahic and Nonlithograpahic techniques - Sputtering and film deposition in glow discharge - DC sputtering technique (p-CuAlO2 deposition) - Thermal evaporation technique - E-beam evaporation - Chemical Vapour deposition(CVD) - Synthesis of carbon nano-fibres - Multi-walled carbon nanotubes - Pulsed Laser Deposition - Molecular beam Epitaxy - Sol-Gel Technique (No chemistry required) - Synthesis of nanowires/rods - Electro deposition - Chemical bath deposition - Ion beam deposition system – Vapor Liquid –Solid (VLS) method of nanowire.

UNIT IV - Methods of Measuring Properties and Characterization techniques

Microscopy: Scanning Probe Microscopy (SPM) - Atomic Force Microscopy (AFM)

- Field Ion Microscopy - Scanning Electron Microscopy (SEM) - Transmission Electron Microscopy(TEM) including energy dispersive X-ray (EDX) analysis - Low energy electron diffraction (LEED) - Reflection high energy electron diffraction (RHEED) - Spectroscopy: Infra-red and Raman Spectroscopy - X-ray Spectroscopy - Magnetic resonance - Optical and Vibrational Spectroscopy Characterization.

UNIT V - Applications

Carbon nanotubes - Nano cuboids - Graphene - Carbon quantum dots: Fabrication - Structure - Electrical - Mechanical - Vibrational properties – Applications - Use of nano particles for biological application - Drug delivery and bio-imaging - Impact of nanotechnology on the environment.

Suggested Readings:

Text Books

1. Singh, G. P. (2011). *Basics of Nano Electronics*, (1st ed.). Animol Publications Pvt. Ltd.
2. Goser, .K (2005). *Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum devices.* (1st ed.). Springer.

Reference Books

1. Pradeep, T. (2008). *Nano: The Essentials: Understanding Nanoscience and*
2. *Nanotecnology*. New Delhi.: Tata McGraw Hill.
3. Kelsall, R. W., Ian W. Hamley, I.W., & Geoghegan, M. (2005). *Nanoscale Science and Technology*. John Wiley & Sons, Ltd.

Journals

1. International Journal of Nanofluids and Nanoparticles
2. International Journal of New Technology and Research

Websites

1. www.tutorialspoint.com
2. www.allaboutcircuits.com

16ECU502A	ADVANCED COMMUNICATION SYSTEMS	Semester - V			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- Provides knowledge in understanding the characteristics of different multiple access techniques in mobile/wireless communication.
- To understand the need of coding, Channel models, Diversity, Equalization and Channel estimation techniques. Able to apply analytical and empirical models in the design of wireless links.
- To understand the Wireless communication systems and standards.
- Students can design an optimum Single and multi-carrier communication system under given power, spectral and error performance constraints
- Analyze the error performance of digital modulation techniques
- Explore M ary signaling

COURSE OUTCOMES

- Understand the need of coding, Channel models, Diversity, Equalization and Channel estimation techniques.
- Understand the Wireless communication systems and its standards
- Apply analytical and empirical models in the design of wireless links.
- Evaluate the characteristics of speech signals and their frequency limitations.
- Describe and evaluate the design and performance of digital and analog circuits.
- Ability to analyze and evaluate digital communication systems.

UNIT I -Wave Propagation

EM Waves – Free Space Propagation – Surface Wave Propagation – Sky Wave Propagation – Space Wave Propagation – Trophospheric Scatter Propagation – Structure of Atmosphere – Characteristics of Ionized Regions – Virtual Height – Maximum Usable Frequency - Lowest Usable Frequency – Skip Distance – Optimum Working Frequency – Ionospheric Abnormalities – Duct Propagation.

UNIT II -Antenna Theory

Electro Magnetic radiations – Elementary doublet – Current and Voltage Distribution – Resonant antennas, Radiation patterns and Length calculations – Non resonant antennas – Antenna gain and Effective radiated power – Antenna resistance – Bandwidth, Beam width and Polarization – Grounded and Ungrounded antennas – Impedance matching – Dipole Arrays - Yagi Uda antenna – Parabolic antenna – Horn and Lens antenna .

UNIT III - Satellite Communication

System Description – Telemetry, Tracking and Command – Communication Space Craft – Satellite Orbit – GEO – LEO – MEO – Satellite Position – Linkage – Frequencies – Inside the Satellite: Transponder – Antenna Systems – Power Packages – Station Keeping – Ground Station – Aligning the Satellite Dish.

UNIT IV - Optical Fiber Communication

Basic Fiber Optic System – Frequencies – Fiber Optic Cables – Refraction – Numerical Aperture – Graded Index Cables – Single Mode – Multimode – Cable Constructions – Cable Losses – Connecter – Light Sources – Light Detector - System

Components – Advantages And Disadvantages.

UNIT V – Microwave Communication

Introduction – Maxwell's equation – Amperes law – Faradays law – Gauss law – Wave equation – Types of wave guides –Microwave tubes: - Two cavity Klystron – Multi cavity Klystron – Reflex Klystron – Traveling wave tube (TWT) – Radar – Classification- Applications.

Suggested Readings:

Text Books

1. Kennedy, G., & Davis, B. (2012). *Electronic Communication Systems*. Lake Forest, IL: Glencoe.
2. Schoenbeck, R. J. (2011). *Electronic Communications: Modulation and Transmission*. New York: Merrill.

Reference Books

1. Lathi, B. P., & Ding, Z. (2010). *Modern Digital and Analog Communication Systems*. New York: Oxford University Press.
2. Taub, H., & Schilling, D. L. (2012). *Principles of Communication Systems*. New York: McGraw Hill.
3. Roddy, D., & Coolen, J. (1984). *Electronic Communications*. Reston, VA: Reston Pub.

Journals

1. International Journal of Information and Communication Technology.
2. International Journal of Computer and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.hackaday.io

16ECU502B	CONTROL SYSTEMS	Semester - V			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To know the fundamental concept of signals and production for controlling equipment or machines.
- To learn the various closed loop control systems current output is taken into consideration and corrections are made based on feedback
- To introduce different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form to interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis
- To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions
- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system
- Formulate different types of analysis in frequency domain to explain the nature of stability of the system

COURSE OUTCOMES

- Understand the concept of time response and frequency response of the system.
- Analyze feedback characteristics of linear control systems to reduced the disturbance.
- Analyze time response of first and second order control systems for different standard test signals.
- Perform frequency domain analysis of linear control system using nyquist stability criterion.
- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.
- Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.

UNIT I - Introduction to Control Systems

Open loop and Closed loop control systems - Mathematical modeling of physical systems (Electrical - Mechanical and Thermal) - Derivation of transfer function - Armature controlled and field controlled DC servomotors - AC servomotors - Block diagram representation and signal flow graph - Reduction Technique - Mason's Gain Formula - Effect of feedback on control systems.

UNIT II - Time Domain Analysis

Time domain performance criteria - Transient response of first, second and higher order systems - Steady state errors and static error constants - Performance indices. Concept of Stability: Asymptotic stability and conditional stability - Routh-Hurwitz criterion - Relative stability analysis - Root Locus plots and their applications.

UNIT III - Frequency Domain Analysis

Correlation between time and frequency response - Polar and inverse polar plots - Frequency domain specifications - Logarithmic plots (Bode Plots) - Gain and phase margins - Nyquist stability criterion - Relative stability using Nyquist criterion - Constant M and N circles.

UNIT IV - State Space Analysis

Definitions of state - State variables - State space - Representation of systems - Solution of time invariant - Homogeneous state equation - State transition matrix and its properties - Controllers and Compensation Techniques: Response with P, PI and PID Controllers - Concept of compensation - Lag - Lead and Lag-Lead networks.

UNIT V - Design of Digital Control System

Z Plane Specifications of Control System Design – Digital Compensator Design – Frequency Response Method - State Feedback – Pole Placement Design – State Observers – Digital Filter Properties – Frequency Response – Kalman's Filter.

Suggested Readings:

Text Books

1. Jairath, A. K. (2013). *Control systems: The State Variable Approach (Conventional and MATLAB*. Boca Raton: CRC Press.
2. Nagrath, I. J., & Gopal, M. (1982). *Control Systems Engineering*. New York: Wiley.

Reference Books

1. Kuo, B. C. (2011). *Automatic Control Systems*. Englewood Cliffs, NJ: Prentice-Hall.
2. Ananadanatrajan, R., & Babu, P.R. (2012). *Control Systems Engineering*. (4^{th} ed.). Scitech Publications (India).
3. Ogata, K. (2009). *Modern Control Engineering*. Englewood Cliffs, NJ: Prentice-Hall.

Journal

1. International Journal of Electrical, Electronics and Mechanical Controls.

Websites

1. www.edx.org
2. www.coursera.org

16ECU503A	BIOMEDICAL INSTRUMENTATION	Semester - V			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To know the fundamental concept of origin of Bio-electric signals and recording it with highly precision equipment.
- To learn the various medical equipment used for diagnosis and therapeutic purpose.
- To provide a large number of quality trained Medical Electronics professionals for preventive and maintenance work needed to maintain hi-tech medical equipments in hospitals to ensure good health care.
- To explore the human body parameter measurements setups
- To give basic ideas about how multimedia evidences are useful in crime investigation.
- Understanding basic principles and phenomena in the area of medical diagnostic instrumentation, theoretical and practical preparation enabling students to maintain medical instrumentation.

COURSE OUTCOMES

- Understand the fundamental concept of origin of Bio-electric signals and recording it with highly precision equipment.
- Differentiate and analyze the biomedical signal sources.
- Identify common biomedical signals and distinguish characteristic features.
- Ability to study various transducers
- Identify common signal artifacts, their sources and formulate strategies for their suppression.
- Familiarize with patient safety issues related to biomedical instrumentation.

UNIT I - Biomedical signals & Physiological transducers

Source of biomedical signal - Origin of bioelectric signals - Recording electrodes - Electrodes for ECG - EMG & EEG - Physiological transducers Pressure - Temperature - Photoelectric & ultrasound Transducers - breathing mechanics Spiro meter - Respiratory therapy equipments Inhalators ventilators & Respirators - Humidifiers - Nebulizers Aspirators - Biomedical recorders ECG - EEG & EMG. MEMS based biosensors

UNIT II - Patient Monitoring systems and Audiometers

Cardiac monitor - Bedside patient monitor - Measurement of heart rate - Blood pressure - Temperature - Respiration rate - Arrhythmia monitor - Methods of monitoring fatal heart rate - Monitoring PRACTICALor activity - Audiometers Audiometers - Blood cell counters - Oximeter - Blood flow meter - Cardiac output measurement - Blood gas analyzers.

UNIT III - Modern Imaging systems

Introduction - Basic principle & Block diagram of x-ray machine - x-ray Computed Tomography (CT) - Magnetic resonance imaging system (NMR) - Ultrasonic imaging system - Eco-Cardiograph - Eco Encephalography - Ophthalmic scans - MRI - Therapeutic Equipments Cardiac pacemakers - Cardiac defibrillators - Hemodialysis machine - Surgical diathermy machine.

UNIT IV - Patients safety & Computer Applications in Biomedical field

Precaution - Safety codes for electro medical equipment - Electric safety analyzer -

Testing of biomedical equipment - Use of microprocessors in medical instruments.

UNIT V - PC based medical instruments

Computerized Critical care units - Planning & designing a computerized critical care unit - Physiotherapy Software Diathermy - Microwave diathermy - Ultrasound therapy unit. Electrotherapy Equipments - Ventilators.

Suggested Readings:

Text Books

1. Chatterjee, S., & Miller, A. (2010). *Biomedical Instrumentation Systems*. Clifton Park, NY: Delmar Cengage Learning.
2. Cromwell, L. (2014). *Biomedical Instrumentation and Measurements*. Englewood Cliffs, NJ: Prentice-Hall.

Reference Books

1. Jog, N. K. (2006). *Electronics in Medicine and Biomedical Instrumentation*. New Delhi: Prentice- Hall of India.
2. Webster, J. G., & Clark, J. W. (2012). *Medical Instrumentation: Application and Design*. Boston: Houghton Mifflin.
3. Singh, M. (2010). *Introduction to Biomedical Instrumentation*. New Delhi: PHI Learning.
4. Jacobson, B., & Webster, J. G. (2012). *Medicine and Clinical Engineering*. Englewood Cliffs, NJ: Prentice-Hall.

Journals

1. International Journal of Recent Scientific Research.
2. International Journal of New Technology and Research

Websites

1. www.circuitstoday.com
2. www.coursera.org

16ECU503B	SIGNALS AND SYSTEMS	Semester-V			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To understand the process of convolution between signals and able to solve differential equation using Laplace transform techniques.
- To understand the intuitive meaning of frequency domain and the importance of analyzing and processing signals in the frequency domain.
- Able to compute the Fourier series or Fourier transform Z-transform
- To introduce students the concept and theory of signals and systems needed in electronics and telecommunication engineering fields
- Knowledge about basic signal and system modeling concept and definitions
- Knowledge about the application and use of mathematical transforms and state-variables in order to solve electrical engineering problems

COURSE OUTCOMES

- Understand about various types of signals and systems, classify them, analyze them and perform various operations.
- Understand the use of transform to analysis of signals and systems in continuous and discrete time domain
- Implement the concept and theory of signals and systems in electronics and communication field.
- Ability to have idea of signal and system analysis and its characterization in time and frequency domain.
- Students can perform mathematical and graphical convolution of signals and systems.
- Compute the Fourier series or Fourier transform Z-transform

UNIT I - Signals and Systems

Continuous and discrete time signals - Transformation of the independent variable - Exponential and sinusoidal signals - Impulse and UNIT step functions - Continuous-Time and Discrete -Time Systems - Basic System Properties.

UNIT II - Linear Time -Invariant Systems (LTI)

Discrete time LTI systems - Convolution Sum - Continuous time LTI systems - Convolution integral - Properties of LTI systems - Commutative - Distributive - Associative - LTI systems with and without memory - Invariability - Causality - Stability - UNIT Step response - Differential and Difference equation formulation - Block diagram representation of first order systems.

UNIT III - Fourier Series Representation of Periodic Signals

Continuous - Time periodic signals - Convergence of the Fourier series - Properties of continuous - Time Fourier series - Discrete-Time periodic signals - Properties of Discrete - Time Fourier series - Frequency-Selective filters - Simple RC highpass and lowpass filters.

UNIT IV - Fourier Transform

Periodic signals - Properties of Continuous time Fourier transform - Convolution and Multiplication Properties - Properties of Fourier transform - Basic Fourier transform Pairs.

UNIT V - Laplace Transform

Laplace Transform - Inverse Laplace Transform - Properties of the Laplace Transform - Laplace Transform Pairs - Laplace Transform for signals - Laplace Transform Methods and Circuit Analysis - Impulse and Step response of RL - RC and RLC circuits

Suggested Readings:

Text Books

1. Oppenheim, A. V., Willsky, A. S., & Young, I. T. (2013). *Signals and systems* (4th ed.). Englewood Cliffs, NJ: Prentice-Hall.
2. Nagrath, I. J. (2009). *Signals and Systems* (2nd ed.). New Delhi: Tata McGraw-Hill.

Reference Books

1. Haykin, S. (2016). *Signals and Systems* (5th ed.). S.l.: John Wiley.
2. Rao, P. R. (2008). *Signals and Systems* (1st ed.). New Delhi: Tata McGrawiHill.

Journals

1. International Journal of Signal Processing Systems.
2. International Journal of New Technology and Research

Websites

1. www.allaboutcircuits.com
2. www.coursera.org

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16ECU504A	ROBOTICS	Semester - V			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To learn the basic configuration of Robotics
- To understand the various types of Robots.
- To get an exposure in Robot control systems
- To acquire the knowledge on advanced algebraic tools for the description of motion
- To develop the ability to analyze and design the motion for articulated systems.
- To develop an ability to use software tools for analysis and design of robotic systems

COURSE OUTCOMES

- Understand the relationship between mechanical structures of industrial robots and their operational workspace characteristics.
- Illustrate the kinematics and dynamics of robotics.
- Implementation of related instrumentation and control in robotics
- Ability to solve inverse kinematics of simple robot manipulators
- Able to do the path planning for a robotic system
- Identify a Robot for a specific application.

UNIT I - Programming Environments

Integrated Development Environment (IDE) for AVR microcontrollers - Free IDEs like AVR Studio - WIN AVR - Installing and configuring for Robot programming - In System Programmer (ISP) - Loading programmes on Robot.

UNIT II - Actuators

DC Motors - Gearing and Efficiency - Servo Motors - Stepper motors - Motor Control - Implementations and techniques.

UNIT III - Sensors

White line sensors - IR range sensor of different range - Analog IR proximity sensors - Analog directional light intensity sensors - Position encoders - Servo mounted sensor pod/Camera Pod - Wireless colour camera - Ultrasound scanner - Gyroscope and Accelerometer – Magnetometer - GPS receiver - Battery voltage sensing - Current Sensing

UNIT IV – Interfacing Concepts

LCD interfacing with robot (2 x 16 Characters LCD) - Other indicators: Indicator LEDs - Buzzer - Timer / Counter operations - PWM generation - Motor velocity control - Servo control - Velocity calculation - Motor position Control - Event scheduling.

UNIT V - Communication

Wired RS232 (serial) Communication - Wireless ZigBee Communication - USB Communication - Simplex infrared Communication (IR remote to robot).

Suggested Readings:

Text Book

1. Saha, S.K. (2014). *Introduction to Robotics*. (2nd ed.). New Delhi: Tata McGraw-Hill

Reference Books

1. Groover, M. P. (1986). *Industrial Robotics: Technology, Programming, and Applications*. New York, NY: McGraw-Hill.
2. Craig, J. J. (1989). *Introduction to Robotics: Mechanics and Control*. Reading, MA: Addison-Wesley.
3. Niku, S. B. (2011). *Introduction to Robotics: Analysis, Control, Applications*. Hoboken, N.J: Wiley.

Journals

1. International Journal of Research in Science and Technology
2. International Journal of New Technology and Research

Websites

1. www.robotroom.com
2. www.letsmakerobot.com

16ECU504B	MOBILE APPLICATIONS DEVELOPMENT	Semester - V			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To understand system requirements for mobile applications.
- To generate suitable design using specific mobile development framework.
- To apply analytical and empirical models in the design of wireless links
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
- Program mobile applications for the Android operating system that use basic and advanced phone features, and
- Deploy applications to the Android marketplace for distribution

COURSE OUTCOMES

- Understand system requirements for mobile applications.
- Generate suitable design using specific mobile development framework.
- Apply analytical and empirical models in the design of wireless links.
- Develop user interfaces for the android platform.
- Identify the interaction between user interface and underlying application infrastructure.
- Configure android application development tools

UNIT I - Introduction

Mobile Application Programming - Different Platforms - Architecture and working of Android - iOS and Windows phone 8operating system - Comparison of Android - iOS - Windows phone 8.

Android Development Environment: Android - Advantages and Future of Android - Tools and about Android SDK - Installing Java – Eclipse – Android - Android Software Development Kit for Eclipse - Android Development Tool: Android Tools for Eclipse - AVDs: Smartphone Emulators - Image Editing

UNIT II - Android Software Development Platform

Understanding Java SE and the Dalvik Virtual Machine - Directory Structure of an Android Project - Common Default Resources Folders - The Values Folder - Leveraging Android XML - Screen Sizes - Launching Your Application: TheAndroid Manifest.xml File - Creating Your First Android Application.

UNIT III - Android Framework Overview

The Foundation of OOP - The APK File - Android Application Components - Android Activities: Defining the User Interface - Android Services: Processing in the Background - Broadcast Receivers: Announcements and Notifications - Content Providers: Data Management - Android Intent Objects: Messaging for Components - Android Manifest XML: Declaring Your Components.

UNIT IV - Views and Layouts in Android

Buttons – Menus – Dialogs - Graphics Resources: Introducing the Drawables - Implementing Images - Core Drawable Subclasses - Using Bitmap – PNG - JPEG - GIF Images in Android - Creating Animation in Android Handling User Interface(UI) Events: An Overview of UI Events in Android - Listening for and Handling Events - Handling UI Events via the View Class - Event Callback Methods - Handling Click Events - Touchscreen Events - Keyboard Events - Context Menus - Controlling the Focus.

UNIT V - Content Providers

An Overview of Android Content Providers - Defining a Content Provider - Working with a Database - Intents and Intent Filters: Intent - Implicit Intents - Explicit Intents - Intents with Activities - Intents with Broadcast Receivers - Advanced Android: New Features in Android 4.4 - iOS Development Environment: Overview of iOS - iOS Layers - Introduction to iOS application development - Windows phone Environment: Overview of windows phone and its platform - Building windows phone application.

Suggested Readings:

Text Books

1. Novák, I., Arvai, Z., Balássy, G., & Fulop, D., (2012). *Beginning Windows 8 Application Development*. IN: John Wiley & Sons.
2. Mark, D., Nutting, J., & LaMarche, J. (2013). *Beginning iOS 6 development: Exploring the iOS SDK*. Berkeley, CA: Apress.

Journals

1. International Journal of Information and Communication Technology.
2. International Journal of Computer and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.hackaday.io

<table>
<tr><td rowspan="3">16ECU511A</td><td rowspan="3">PROGRAMMABLE LOGIC CONTROLLER - PRACTICAL</td><td colspan="4">Semester-VI</td></tr>
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COURSE OBJECTIVES

- To acquaint the students with the fundamental principles of two-valued logic and various devices used
- To connect PLC peripherals with PLC for logical functioning
- To get strong knowledge in the developing of basic PLC programs
- To understand the components of a PLC system To understand how PLCs are used
- To understand the H&S requirements of a PLC- controlled system
- To understand different methods of interfacing with a PLC

COURSE OUTCOMES

- Able to describe typical components of a Programmable Logic Controller
- apply the concept of electrical ladder logic, its history, and its relationship to programmed PLC instruction
- Able to use timer, counter, and other intermediate programming functions
- Able to design and program a small, automated industrial production line.
- Develop ladder logics for a particular design
- Simplify designs with Boolean algebra

(Any 10 Experiments)

1. Different applications of Push buttons.
2. Working of different types of Timers.
3. Working of different types of Counters.
4. Sequential operation of ON/OFF of a set of lights.
5. Latching and Unlatching of a Motor.
6. Automatic indication of water tank level.
7. Traffic lights indication.
8. Logic Gates
9. Latching and Unlatching
10. Interlocking
11. Sequential operation of ON/OFF of a set of lights
12. Counters

16ECU511B	NANO ELECTRONICS - PRACTICAL	Semester -V			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Make them understand various advanced concepts in nanoelectronics
- Explore the fundamentals on QED, SED, Molecular electronics and spintronics
- Train the students on state-of-the-art computational tools for modeling and simulation of nanoelectronics devices
- To identify the critical parameters that one must evaluate when considering any new Nanoelectronics device
- Know the types of nanotechnology, atomic structure, molecular technology and• preparation of nano materials
- Understand the fundamentals of nano electronics and its properties.

COURSE OUTCOMES

- Able to describe typical components of a Programmable Logic Controller
- Gain the concepts of nanoelectronics such as ballistic transport and quantum confinement.
- Identify the various methods to fabricate and measure Nanoscale features.
- Evaluate the critical parameters when considering any new Nano electronics device.
- Understand the latest technology on nano systems based Nano electronics
- Design and simulate various advanced nanoelectronic devices

(Any 10 Experiments)

1. Synthesis of at least two different sizes of Nickel Oxide Nano Particles Using Sol-Gel Method.
2. Synthesis of at least two different sizes of Copper Oxide Nano Particles Using Sol-Gel Method.
3. Synthesis of at least two different sizes of Zinc Oxide Nano Particles Using Sol-Gel Method.
4. Polymer synthesis by suspension method / emulsion method B-H loop of nanomaterials.
5. Magnetoresistance of thin films and nanocomposite, I-V characteristics and transient response.
6. Particle size determination by X-ray diffraction (XRD) and XRD analysis of the given XRD spectra.
7. Determination of the particle size of the given materials using He-Ne LASER.
8. Selective area electron diffraction: Software based structural analysis based on TEM based experimental data from published literature.

9. Surface area and pore volume measurements of nanoparticles.
10. Spectroscopic characterization of metallic, semiconducting and insulating Nano-particles.
11. Developing a lead free solder using copper nanoparticles.
12. Deposition of Nano crystals on plastic sheets.

16ECU512A	**ADVANCED COMMUNICATION SYSTEMS - PRACTICAL**	**Semester - V**

L	T	P	C
-	-	4	2

COURSE OBJECTIVES

- Understand radio-frequency systems and their applications
- Analyze the performance parameters of radio frequency circuits
- Analyze the performance parameters of radio frequency circuits
- Identify design trade-off of radio frequency communication systems.
- To analyze error performance of a digital communication system in presence of noise and other interference
- To understand various source coding and channel coding techniques

COURSE OUTCOMES

- To focuses the fundamental concepts on TDM, Pulse modulations, digital modulation techniques
- To enhance the knowledge of source coding techniquesand Error-control coding techniques.
- To understand the basic concept of digital commutation system
- To understand Multiple Access and Spread Spectrum Techniques for mobile and cellular communication system.
- Estimate various losses in optical fiber
- Design fiber optic communication link

(Any 10 Experiments)

1. Performance analysis of Half wave dipole antenna
2. Performance analysis of Loop antenna
3. Performance analysis of Yagi Uda antenna
4. Performance analysis of Log periodic antenna
5. Radio wave propagation path loss calculations
6. Tunnel Diode Oscillator and Gunn Diode Oscillator
7. Analog fiber optic transmitter & receiver
8. Digital fiber optic transmitter & receiver
9. Radiation Pattern by Horn antenna
10. Reflex Klystron characteristics using microwave bench
11. Gunn Diode oscillator
12. Impedance and power measurement by Smith chart

16ECU512B	CONTROL SYSTEMS - PRACTICAL	Semester-V			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To know the concept of time response and frequency response of the system
- To introduce different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form
- To interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis
- To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions
- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system
- Formulate different types of analysis in frequency domain to explain the nature of stability of the system

COURSE OUTCOMES

- Represent the mathematical model of a system
- Determine the response of different order systems for various step inputs 3. Analyze the stability of the system
- Ability to formulate transfer function for the given control system problem
- Ability to find time response of the given control system model
- Ability to design Lead, Lag, Lead-Lag system in control system.
- Ability to design PID controllers for the given control system model.

(Any 10 Experiments)

1. Characteristics of synchro transmitter receiver
2. Characteristics of synchro as an error detector
3. Position control of DC motor
4. Speed control of DC motor
5. Characteristics of AC servo motor
6. Time response of type 0,1 and 2 systems
7. Frequency response of first and second order systems
8. Time response characteristics of a second order system.
9. Effect of damping factor on performance of second order system
10. Frequency response of Lead networks.
11. Frequency response of Lag networks.
12. Study of P, PI and PID controller.

16ECU513A	BIOMEDICAL INSTRUMENTATION - PRACTICAL	Semester-V			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To introduce an fundamentals of transducers as applicable to physiology ● To explore the human body parameter measurements setups
- To make the students understand the basic concepts of forensic techniques. With widespread use and requirements of medical instruments
- Gives knowledge of the principle of operation and design of biomedical instruments
- To provide a large number of quality trained Medical Electronics professionals for preventive and maintenance work needed to maintain hi-tech medical equipments in hospitals to ensure good health care.
- To explore the human body parameter measurements setups
- To give basic ideas about how multimedia evidences are useful in crime investigation.

COURSE OUTCOMES

- Understand the physiology of biomedical system
- Measure biomedical and physiological information
- Discuss the application of Electronics in diagnostics and therapeutic area
- Develop a thorough understanding on basics of biomedical amplifiers
- Develop a thorough understanding on principles of medical instrumentations
- Develop a thorough understanding on clinical applications of medical instrumentation systems

(Any 10 Experiments)

1. Characterization of bio potential amplifier for ECG signals.
2. Study on ECG simulator
3. Measurement of heart sound using electronic stethoscope. Study on ECG heart rate monitor /simulator
4. Study of pulse rate monitor with alarm system
5. Determination pulmonary function using spirometer.
6. Measurement of respiration rate using thermister /other electrodes.
7. Respiration Rate monitor/ apnea monitor
8. Ultrasound transducers based on medical system
9. Study of a Pacemaker.
10. Measurement of pulse rate using photoelectric transducer & pulse counting for known period.
11. To study fingertip oximeter and analysis of various parameters.
12. Display the frequency spectrum of a signal using MatPRACTICAL/PRACTICALview.

16ECU513B	SIGNALS AND SYSTEMS - PRACTICAL	SEMESTER-V			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To introduce an fundamentals of transducers as applicable to physiology
- Understanding signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide
- Able to compute the Fourier series or Fourier transform Z-transform
- Knowledge about basic signal and system modeling concept and definitions
- Knowledge about the application and use of mathematical transforms and state-variables
- Development of the mathematical skills to solve problems involving convolution, filtering, modulation and sampling.

COURSE OUTCOMES

- Apply the knowledge of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals.
- Analyse the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis.
- Classify systems based on their properties and determine the response of LSI system using convolution.
- Analyze system properties based on impulse response and Fourier analysis.

Apply the Laplace transform and Z- transform for analyze of continuous-time and discrete-time signals and systems

(Any 10 Experiments)

1. Generation of Signals: continuous time
2. Generation of Signals: discrete time
3. Time shifting of signals.
4. Time scaling of signals.
5. Convolution of Signals
6. Solution of Difference equations.
7. Fourier series representation of continuous time signals.
8. Fourier transform of continuous time signals.
9. Laplace transform of continuous time signals.
10. Introduction to Xcos/similar function and calculation of output of systems represented by block diagrams
11. Sampling and signal reconstruction and Spectral Analysis using DFT.
12. Correlation of signals.

16ECU514A	ROBOTICS - PRACTICAL	Semester - V			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- To learn the basic configuration of Robotics
- To understand the various types of Robots.
- To get an exposure in Robot control systems
- To acquire the knowledge on advanced algebraic tools for the description of motion
- To develop the ability to analyze and design the motion for articulated systems.
- To develop an ability to use software tools for analysis and design of robotic systems

COURSE OUTCOMES

- Understand the relationship between mechanical structures of industrial robots and their operational workspace characteristics.
- Illustrate the kinematics and dynamics of robotics.
- Implementation of related instrumentation and control in robotics
- Ability to solve inverse kinematics of simple robot manipulators
- Able to do the path planning for a robotic system
- Identify a Robot for a specific application.

(Any 8 Experiments)

1. Study of different types of Robots based on configuration and application
2. Study of different types of links and joints used in Robots
3. Study of components of Robots with drive system and end effectors
4. Determination of maximum and minimum position of links
5. Verification of transformation (position and orientation) with respect to gripper and world coordinate system
6. Estimation of accuracy, repeatability and resolution
7. Robot programming exercises
8. Design, modeling and analysis of two different types of grippers.
9. Study of sensor integration.
10. Study of robotic system design.

16ECU514B	MOBILE APPLICATIONS DEVELOPMENT - PRACTICAL	Semester - V			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- Understand aspects of mobile programming that make it unique from programming for other platforms,
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
- Program mobile applications for the Android operating system that use basic and advanced phone features, and
- Deploy applications to the Android marketplace for distribution
- Program mobile applications for the Android operating system that use basic and advanced phone features, and
- Deploy applications to the Android marketplace for distribution

COURSE OUTCOMES

- Understand system requirements for mobile applications.
- Generate suitable design using specific mobile development framework.
- Apply analytical and empirical models in the design of wireless links.
- Develop user interfaces for the android platform.
- Identify the interaction between user interface and underlying application infrastructure.
- Configure android application development tools

(Any 8 Experiments)

1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading:
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.

16ECU601A	EMBEDDED SYSTEMS	Semester-VI			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- Ability to design an Embedded System, component or process to meet desired needs within realistic constraints.
- To develop the next generation technologies, methods and tools for modeling, design, implementation and operation of hardware/software systems embedded in intelligent devices
- To provide a broad overview of both theoretical and practical aspects of a design flow for To understand the need and applications of Microcontrollers n embedded system.
- To understand architecture and features of typical Microcontroller.
- Learn interfacing of real world input and output devices
- To study various hardware and software tools for developing applications embedded systems

COURSE OUTCOMES

- Understand hardware and software design requirements of embedded systems.
- Acquire knowledge about embedded processors and their applications
- Analyze the embedded systems specification and develop software programs.
- Ability to design an Embedded System, component or process to meet desired needs within realistic constraint
- Evaluate the requirements of programming embedded systems and tool chain for embedded systems.
- Explore the features of the microcontroller and provide solutions for embedded applications

UNIT I - Introduction to Embedded Systems

Overview of Embedded Systems - Features - Requirements and Applications - Recent Trends in the Embedded System Design - Common architectures for the Embedded System Design - Embedded Software design issues.

UNIT II - Embedded Design Process

Embedded Design Life Cycle – Product Specification – Hardware / Software Partitioning – Detailed Hardware and Software Design – Integration – Product Testing – Selection Processes – Microprocessor Vs Micro Controller – Performance Tools – Bench Marking – RTOS Micro Controller Tool Chain AvaiPRACTICALility – Other Issues in Selection Processes.

UNIT III - Introduction to microcontrollers

Overview of Harvard architecture and Von Neumann architecture - RISC and CISC microcontrollers - AVR RISC Microcontrollers: Introduction to AVR RISC Microcontrollers - Architecture overview - Status register - General purpose register file.

UNIT IV - Interrupts and Timer

Memories - Instruction set - Data Transfer Instructions - Arithmetic and Logic Instructions Branch Instructions - Bit and Bit-test Instructions - MCU Control Instructions - Simple programs in Assembly Language / C Language - Introduction to System Clock -

Reset sources.

UNIT V – Peripherals

Introduction to interrupts - External interrupts - IO Ports - 8-bit and 16-bit Timers - Introduction to different modes - Input Capture and Compare Match Analog Comparator - Analog-to-Digital Converter - Serial Peripheral Interface (SPI) - The Universal Synchronous and Asynchronous serial Receiver and Transmitter (USART) - Two Wire Interface (TWI) / I2C bus.

Suggested Readings:

Text Books

1. Andrew, N., Sloss, Dominic Symes, & Chris Wright, (2011). *ARM System Developer's Guide – Designing and Optimizing System Software*, (1st ed.). Morgan.: Kaufmann Publishers.

Reference Books

1. Predko, M. (2007). *Programming and Customizing the PIC Microcontroller*. New York: Tab.
2. Smith, W. A. (2010). *ARM Microcontroller Interfacing hardware and software*. Susteren: Elektor

Journals

1. International Journal of Research in Electronics and Communication Technology
2. International Journal of Engineering and Technology

Websites

1. www.embeddedrelated.com
2. www.nptel.ac.in

16ECU601B	BASIC VLSI DESIGN	Semester-VI			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To enable the students to model, simulate and test the Electronics and Instrumentation based design.
- To provide a design flexibility using graphical programming language
- To provide a platform for the students to do multidisciplinary projects
- To facilitate the conduct of short term and continuous learning programmes
- To provide knowledge on design of process control by using virtual instrumentation techniques To provide knowledge in process analysis by VI tools
- To develop basic VI programs using loops, case structures etc. including its applications in image, signal processing and motion control.

COURSE OUTCOMES

- Understand basics of acquisition techniques and its interface.
- Recognize the components of virtual instrumentations and measurement.
- Get adequate knowledge in VI Tool sets.
- Use Lab view software for instrument control, measurement and data acquisition.
- Understand VI Programming techniques.
- Ability to use state machines to solve complex problems.

UNIT I - Metal Oxide Semiconductor (MOS)

Introduction to basic principle of MOS transistor - Large signal MOS models (long channel) for digital design - SPICE model - MOS device layout.

UNIT II - MOS Inverter

Transistor layout - Inverter layout - CMOS digital circuit layout - Inverter principle - Depletion and enhancement load inverters - Basic CMOS inverter - Transfer characteristics - Logic threshold - Noise margins - Dynamic behavior.

UNIT III - Combinational MOS Logic Design

Propagation Delay and Power Consumption - Static MOS design - Pass Transistor logic - Complex logic circuits - Sequential MOS Logic Design - Static latches - Flip flops & Registers.

UNIT IV - Memory Design

Dynamic Latches & Registers - CMOS Schmitt trigger - Monostable sequential Circuits - Astable Circuits - ROM & RAM cells design - Dynamic MOS design - Dynamic logic families and performances - Interconnect & Clock Distribution - Interconnect delays - Cross Talks - Clock Distribution.

UNIT V – Power Estimation

Power Estimation Techniques – Logic level Power Estimation – Simulation Power Analysis – Probabilistic Power Analysis.

Suggested Readings:

Text Book

1. Pucknell, D. A. & Eshraghian, K. (2009). *Basic VLSI design*. Sydney u.a.: Prentice Hall.

Reference Books

1. Sumathi, S. (2011). *Principles of vlsi design,*. S.l.: Scitech Publications (Ind.).
2. Kang, & Leblebigi, (2014). *CMOS Digital IC Circuit Analysis & Design.* McGraw Hill.

Journals

1. International Journal of Information and Communication Technology.
2. International Journal of Computer and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.hackaday.io

16ECU602A	DIGITAL SIGNAL PROCESSING	Semester-VI			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To understand the fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform.
- To get an exposure on Discrete Fourier Transforms (DFT), its applications and implementation by FFT techniques.
- To apply design technique for FIR type digital filters
- Understand fundamentals of Digital Signal Processing
- Analyze & compare different signal processing strategies.
- Become aware of some applications of DSP.

COURSE OUTCOMES

- Understand the fundamental concepts and theory of Discrete Fourier Series and Discrete Fourier Transform
- Ability to compute various transform analysis of Linear Time Invariant Systems.
- Implement problem solving strategies to DSP Problems.
- Able to test signal processing algorithms for various applications
- Ability to understand Various applications of DSP such as signal processing and telecommunication.
- Apply design techniques for FIR type digital filters

UNIT I - Discrete Time systems

Discrete sequences - Linear coefficient difference equation - Representation of DTS - LSI Systems - Stability and causality - Frequency domain - Representations and Fourier transform of DT sequences.

UNIT II - Z-Transform

Definition – Properties - Inverse Z Transform and stability - Parsevals Theorem - Applications - System Function: Signal flow graph - Representation and analysis of Discrete Time Systems -Techniques of representations - Matrix generation - Solution for DTS evaluations.

UNIT III - Discrete Fourier Transform

DFT assumptions - Inverse DFT - Matrix relations - Relationship with FT and its inverse - Circular convolution - DFT theorems – DCT – Computation of DFT - FFT Algorithms and processing gain – Discrimination - Interpolation and extrapolation - Gibbs Phenomena - FFT of real functions - Interleaving - Resolution improvement - Word length effects.

UNIT IV - Digital Filters

Analog filter review - System function for IIR and FIR filters - Network representation -Canonical and decomposition networks - IIR filter realization methods – Limitations - FIR filter realization techniques - Discrete correlation and convolution - Properties - Limitations.

UNIT V - TMS 320 C 6713

Introduction – TMS320C6713 Overview – Key Features – Architectural Overview – Functional Block Diagram - Internal Memory Organization – CALU – System Control – PLU – Interrupts – Addressing Modes – Instruction Set.

Suggested Readings:

Text Book

1. Oppenheim, A.V., Schaffer, R.W., & Buck, C. (2013). *Discrete Time Signal Processing.* (2nd ed.). Prentice Hall India.

Reference Books

1. Mitra, S.K. (2013). *Digital Signal Processing – A computer Based Approach*. (4th ed.). McGraw Hill.
2. Nagoor Kani, A. (2012). *Digital Signal Processing*. (2nd ed.). Tata McGraw Hill Pvt Ltd.

Journals

1. International Journal of Signal Processing Systems.
2. International Journal of New Technology and Research

Websites

1. www.allaboutcircuits.com
2. www.coursera.org

16ECU602B	VIRTUAL INSTRUMENTATION	Semester-VI			
		L	T	P	C
		4	-	-	4

COURSE OBJECTIVES

- To enable the students to model, simulate and test the Electronics and Instrumentation based design.
- To provide a design flexibility using graphical programming language
- To provide a platform for the students to do multidisciplinary projects
- To facilitate the conduct of short term and continuous learning programmes
- To provide knowledge on design of process control by using virtual instrumentation techniques To provide knowledge in process analysis by VI tools
- To develop basic VI programs using loops, case structures etc. including its applications in image, signal processing and motion control.

COURSE OUTCOMES

- Understand basics of acquisition techniques and its interface.
- Recognize the components of virtual instrumentations and measurement.
- Get adequate knowledge in VI Tool sets.
- Use Lab view software for instrument control, measurement and data acquisition.
- Understand VI Programming techniques.
- Ability to use state machines to solve complex problems.

UNIT I - Introduction

General functional description of a digital instrument - Block diagram of a Virtual Instrument - Physical quantities and Analog interfaces - Hardware and Software - User interfaces - Advantages of Virtual instruments over conventional instruments - Architecture of a Virtual instrument and its relation to the operating system.

UNIT II - Software Overview

LABVIEW - Graphical user interfaces - Controls and Indicators - 'G' programming - labels and Text - Shape, Size and Color - Owned and free labels - Data type, Format, Precision and representation - Data types - Data flow programming - Editing - Debugging and Running a Virtual instrument - Graphical programming palettes and tools - Front panel objects - Functions and Libraries.

UNIT III - Programming Structure

FOR loops - WHILE loops - CASE structure - Formula nodes - Sequence structures - Arrays and Clusters - Array operations - Bundle - Bundle/Unbundle by name - Graphs and charts - String and file I/O - High level and Low level file I/O's - Attribute modes Local and Global variables. Operating System and Hardware Overview: PC architecture - Current trends - Operating system requirements - Drivers – Interface Buses – PCI Bus – Interface cards – Specification – Analog and Digital interfaces – Power - Speed and timing considerations.

UNIT IV - Hardware Aspects

Installing hardware - Installing drivers - Configuring the hardware - Addressing the hardware in LabVIEW - Digital and Analog I/O function - Data Acquisition - Buffered I/O - Real time Data Acquisition.

UNIT V - LabView Applications

IMAQ - Motion Control: General Applications - Feedback devices - Motor Drives - Instrument Connectivity – GPIB - Serial Communication – General - GPIB Hardware & Software specifications - PX1 / PC1: Controller and Chassis Configuration and Installation.

Suggested Readings:

Text Books

1. Lisa K Wells, (2010). *LabView for Everyone.* New Delhi.: Prentice Hall of India.
2. Garry M Johnson, (2005). *LabView Graphical Programming.* New Delhi.: Tata McGraw Hill.

Journals

1. International Journal of Signal Processing Systems.
2. International Journal of New Technology and Research

Websites

1. www.allaboutcircuits.com
2. www.eetimes.com

16ECU603A	PROGRAMMING WITH LABVIEW	Semester-VI			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To learn and to navigate LABVIEW and use the block diagram, front panel, and Functions and Controls palettes.
- To explore use of graphs and charts and build a user interface.
- To gain knowledge on the different data types and methods to organize and group data, controls, and indicators in LABVIEW.
- Understand basics of acquisition techniques and its interface.
- Recognize the components of virtual instrumentations and measurement
- To develop basic applications in the LabVIEW graphical programming environment

COURSE OUTCOMES

- Gain knowledge on the different data types and methods to organize and group data, controls, and indicators in LABVIEW
- Understand various functions available in Lab View for instrumentation applications.
- Ability to model complex system using Lab view.
- Ability to improve lab view programming skills
- Able to use graphical programming language.
- Ability to simulate and test behavior of system.

UNIT I - Introduction to Virtual Instrumentation

Computers in Instrumentation - Concept of Virtual Instrumentation (VI) - History of VI - LABVIEW and VI - Conventional and Graphical Programming - Distributed Systems.

UNIT II - Basics of LABVIEW

Components of LABVIEW - Owned and Free Labels - Tools and Other Palettes Arranging Objects - Pop-Up Menus -Colour Coding - Code Debugging - Creating Sub-VIs - For Loop - While Loop - Loop Behaviour and Interloop Communication - Local Variables - Global Variables - Shift Registers.

UNIT III - Programming Fundamentals

Feedback – Auto indexing - Loop Timing - Timed Loops Sequence Structures - Case Structure - Formula Node - Event Structure - Arrays - Clusters - Inter-Conversion of Arrays and Clusters - Waveform Chart - Resetting Plots - Waveform Graph – Use of Cursors - X-Y Graph - Introduction to a State Machine - Event Structures - Full State Machine - File Formats - File I/O Functions - Path Functions.

UNIT IV - Basics of Data Acquisition

Classification of Signals – Real World Signals - Analog Interfacing - Connecting the Signal to the Board - Practical vs Ideal Interfacing - Bridge Signal Sources.

UNIT V - Data Acquisition with LABVIEW

Measurement and Automation Explorer - Waveform DataType - Working in DAQmx -Working in NI-DAQ - Use of Simple analog and digital VIs -Continuous data acquisition - Acquisition of data in bursts - DAQ Assistant - Analysis Assistant - Instrument Assistant -

Instrument Interfacing and LABVIEW - Data Sockets.

Suggested Readings:

Text Book

1. Sanjay Gupta, & Joseph John, (2005). *Virtual Instrumentation using LABVIEW*. (2^{nd} ed.). TMH Pvt. Ltd.

Reference Books

1. Travis, J., King, J. (2006). *LABView for Everyone*, (3^{rd} ed.). Prentice Hall.
2. Johnson, G.W., & Jeninngs, R. (2006). *LABView Graphical Programming*, (4^{th} ed.). McGraw Hill.

Journals

1. International Journal of Scientific and Engineering Research.
2. International Journal of Electronics and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.eetimes.com

16ECU603B	VERILOG AND FPGA BASED SYSTEM DESIGN	Semester-VI			
		L	T	P	C
		3	-	-	3

COURSE OBJECTIVES

- To understand the fundamentals of Verilog and FPGA based system design.
- To appreciate the design process in FPGA through an application on the design of a system design
- Describe general FPGA architecture, internals and use cases
- Understanding of building blocks that are available to digital designers
- Apply design flow methodology for a given problem
- Implement and debug various digital designs

COURSE OUTCOMES

- Understand the fundamentals of Verilog and FPGA based system design.
- Design and optimize complex combinational and sequential digital circuits
- Apply design flow methodology for a given problem
- Solve time related problems
- Implement and debug various digital designs.
- Analyze a given design based on synthesis, implementation and timing reports

UNIT I - Digital logic design flow

Combinational circuits - Combinational building blocks: Multiplexors – Demultiplexers - Decoders - Encoders - Adder circuits - Sequential circuit elements: Flip-Flop - Latch – Register- Finite state machines: Mealy and Moore - Other sequential circuits: Shift registers – Counters - FSMD (Finite State Machine with Datapath): Design and analysis. Microprogrammed control - Memory basics and timing - Programmable Logic devices.

UNIT II - Evolution of Programmable logic devices

PAL - PLA – GAL - CPLD - FPGA architectures - Placement and routing - Logic cell structure - Programmable interconnects - Logic blocks - I/O Ports - Clock distribution in FPGA - Timing issues in FPGA design - Boundary scan.

UNIT III - Verilog HDL

Introduction to HDL - Verilog primitive operators - Structural Verilog - Behavioral Verilog - Design verification - Modeling of combinational and sequential circuits (including FSM and FSMD) with Verilog Design - Examples in Verilog.

UNIT IV – Basics of FPGA

Introduction - FPGA basics - FPGA Design - FPGA schematic connectivity - Wiring the design - schematic components - Processor cores - Peripheral Components - Generic components - Vendor macro and primitive libraries - Create a PWM.

UNIT V - Targeting and Running the design

Constraint files– Configurations - NanoBoard constraint files - Configuration Manager -Auto Configuring an FPGA project - Defining constraints manually - Editing a constraint file - Configuring MyPWM - Controlling the build process -

Understanding the build process - Button regions - Accessing stage reports / outputs - Build stages - Configuring a build stage.

Suggested Readings:

Text Book

1. Bhasker, J. (2010). *A VHDL Primer*. (3rd ed.). Pearson Education.

Reference Books

1. Nazeih M. Botros, (2012). *HDL Programming VHDL and Verilog.* (1st ed.). Wiley India Pvt. Ltd.
2. Douglas. P. Perry, (2014). *VHDL: Programming by Examples.* (4th ed.). Mc Graw Hill Publications.

Journals

1. International Journal of Information and Communication Technology.
2. International Journal of Computer and Communication Technology.

Websites

1. www.allaboutcircuits.com
2. www.hackaday.io

16ECU611A	EMBEDDED SYSTEMS - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Demonstrate the sensing of different physical parameters
- Explain the calibration of parameters measured and displayed
- Evaluate the data transfer
- To understand the need and applications of Microcontrollers and ARM Processors in embedded system.
- To understand architecture and features of typical Microcontroller
- To learn interfacing of real world input and output devices

COURSE OUTCOMES

- Define the arithmetical and logical assembly language for microcontroller
- Know the downloading procedure on hardware into flash ROM and show the testing data on defined port wish board
- Competent to evaluate the data transfer response
- Able to describe the microcontroller and ARM Processor Architecture and its Features
- Learn importance of microcontroller and ARM Processor in designing embedded applications
- Learn use of hardware and software tools. 4. Develop interfacing to real world devices.

(Any 10 Experiments)

1. Flash LED at an observable rate.
2. Hello LED – Flash LED at a rate such that the LED appears always on. Estimate the onset of the rate when the LED appears to stay on
3. Controlling ON/OFF of an LED using switch.
4. Toggle the LED every second using Timer interrupt.
5. Read the ADC value of the voltage divider involving the LDR. Print the value on the serial monitor.
6. Use the thermistor to estimate the temperature and print the raw value on the serial monitor.
7. Connect the LCD I/O Board and print 'Hello World' on the LCD. Scroll display from left to right.
8. Speed control of stepper motor.
9. Serial Communication Interface
10. I2C Interface
11. Programming using Interrupts.
12. Generation of Pulse Width Modulation

16ECU611B	BASIC VLSI DESIGN - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- Introduced digital integrated circuits
- Introduce CMOS devices and manufacturing technology.
- Introduce CMOS logic gates and their layout.
- Ability to find Propagation delay, noise margins, and power dissipation in the digital VLSI circuits.
- Ability to design Combinational (e.g., arithmetic) and sequential circuit.
- Ability to design Memory in VLSI circuits.

COURSE OUTCOMES

- Analyze the CMOS layout levels, how the design layers are used in the process sequence, and resulting device structures (i.e. cross-sectional views).
- Implement digital logic designs of various types (i.e. combinational logic, multiplexers).
- Analyze performance issues and the inherent trade-offs involved in system design (i.e. power vs. speed).
- Complete a moderately complex design project involved with data path operators, data registers, serial/parallel conversion, clocking/timing details and feedback.
- Identify the interactions between process parameters, device structures, circuit performance, and system design.

(Any 10 Experiments)

1. Design and implementation of logic gates
2. Design and simulation of Real Time Clock
3. Design and implementation of Encoder and Decoder
4. To plot the (i) output characteristics & (ii) transfer characteristics of an n-channel MOSFET.
5. To plot the (i) output characteristics & (ii) transfer characteristics of an p-channel MOSFET.
6. To design and plot the static (VTC) and dynamic characteristics of a digital CMOS inverter.
7. To design and plot the output characteristics of a 3-inverter ring oscillator.
8. To design and plot the dynamic characteristics of 2-input NAND, NOR logic gates using CMOS technology.
9. To design and plot the dynamic characteristics of 2-input XOR and XNOR logic gates using CMOS technology.
10. To design and plot the characteristics of a 4x1 digital multiplexer using pass transistor logic.

11. To design and plot the characteristics of a positive and negative latch based on multiplexers.
12. To design and plot the characteristics of a master-slave positive and negative edge triggered registers based on multiplexers.

16ECU612A	DIGITAL SIGNAL PROCESSING - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To implement Linear and Circular Convolution
- To implement FIR and IIR filters
- Familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.
- Aware about implications of the properties of systems and signals
- To design FIR filters and IIR Filters
- Analyze discrete-time filter banks and multi-rate signal processing system

COURSE OUTCOMES

- Analyze the CMOS layout levels, how the design layers are used in the process sequence, and
- Understand the handling of discrete/digital signals using MATLAB
- Understand the basic operations of Signal processing
- Analyze the spectral parameter of window functions
- Design IIR, and FIR filters for band pass, band stop, low pass and high pass filters
- Design the signal processing algorithm using MATLAB & VLAB.

(Any 10 Experiments)

USING TMS320C5X/TMS320C54XX/TMS320C67XX/MATLAB

1. Study of addressing Modes of DSP using simple examples
2. Arithmetic operations
3. Generation of unit sample sequence, unit step, ramp function, discrete time sequence, real sinusoidal sequence.
4. Generate and plot sequences over an interval.
5. Given x[n], write program to find X[z].
6. Fourier Transform, Discrete Fourier Transform and Fast Fourier Transform
7. Design of a Butterworth analog filter for low pass and high pass.
8. Design of digital filters.
9. Correlation of two discrete signals
10. Quantization noise
11. Waveform generation
12. Discrete Cosine Transform

16ECU612B	VIRTUAL INSTRUMENTATION - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	4	2

COURSE OBJECTIVES

- To enable the students to model, simulate and test the Electronics and Instrumentation based design.
- To provide a design flexibility using graphical programming language
- To provide a platform for the students to do multidisciplinary projects
- To facilitate the conduct of short term and continuous learning programmes
- To provide knowledge on design of process control by using virtual instrumentation techniques To provide knowledge in process analysis by VI tools
- To develop basic VI programs using loops, case structures etc. including its applications in image, signal processing and motion control.

COURSE OUTCOMES

- Understand basics of acquisition techniques and its interface.
- Recognize the components of virtual instrumentations and measurement.
- Get adequate knowledge in VI Tool sets.
- Use Lab view software for instrument control, measurement and data acquisition.
- Understand VI Programming techniques.
- Ability to use state machines to solve complex problems

(Any 10 Experiments)

1. Creating a simple VI to place a Digital Control.
2. Navigation and Editing.
3. VI to make a Degree C to Degree F Converter.
4. Converting VI in to Sub VI.
5. Write a program to count Modulus 32 and display the values in decimal, octal decimal and Binary.
6. Built a VI using while loop that displays random numbers in to three wave form charts. (Strip, scope & Sweep)
7. Data Acquisition using LABVIEW.
8. Development of Temperature Measurement using LABVIEW.
9. Development of Virtual Instrument for Function Generator using LABVIEW.
10. Development of Virtual Instrument for Audio Signal Spectrum Analyser using LABVIEW.
11. Design of V-F and F-V converter.
12. Instrumentation amplifier.

16ECU613A	PROGRAMMING WITH LABVIEW - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- Know about dataflow and Graphical Programming Language
- Describe and utilize the NI example finder.
- Describe what is meant by 'data acquisition'.
- Describe the function of the 'General Purpose Interface Bus (GPIB)'.
- Design and implement various front panel controls and indicators.
- Connect and manipulate nodes and wires in the block diagram

COURSE OUTCOMES

- Execute save and load dialogs.
- Demonstrate the use of the revert function.
- Troubleshoot broken VIs.
- Single-Step through a VI.
- Implement execution highlighting and setting break points.
- Create SubVIs

(Any 8 Experiments)

1. Set up a while loop to execute EXACTLY the predefined number of iterations.
2. Write a program to invert the state of a Boolean indicator twice a second, until the program is stopped by the user. The Boolean should initially be TRUE. Solve the problem using two different methods: Shift Register, and Local Variables.
3. Write a program to count Modulus 32 and display the values in decimal, Hexadecimal, octal and binary. Use a STOP button to stop your code programmatically. Use local variables to stop a while loop and reset the Stop button. The action of the switch should be set to Switch When Pressed or Switch When Released.
4. Set up a temperature simulator as follows. Allow for a user defined a set point (you may place it inside the while loop). In the while loop add an error amounting to a maximum of ±10°C to the set point. Set up over- and undertemperature LEDs to light up whenever the deviation is >5°C. The loop should operate once every second.
5. Build a VI using the while loop that displays random numbers (0-5) into three Waveform Charts (strip, scope, sweep). Incorporate appropriate switching and delays.
6. Set up an 8-bit Binary counter and display your results graphically. The graph should have 8-traces corresponding to bits 0-7. For this you may like to the Following: Number to Boolean Array, Boolean to (0,1).

7. Write a simple program to generate a Voltage at Analog Output 0 using a knob to select the voltage. Verify using a Multimeter.
8. Read the status of NI Instrument simulator by using its different commands.
9. Converting Voltage to Resistance.
10. Converting Resistance to Temperature.

16ECU613B	VERILOG AND FPGA BASED SYSTEM DESIGN - PRACTICAL	Semester-VI			
		L	T	P	C
		-	-	3	1

COURSE OBJECTIVES

- To understand the fundamentals of Verilog and FPGA based system design.
- To appreciate the design process in FPGA through an application on the design of a system design
- Describe general FPGA architecture, internals and use cases
- Understanding of building blocks that are available to digital designers
- Apply design flow methodology for a given problem
- Implement and debug various digital designs

COURSE OUTCOMES

- Understand the fundamentals of Verilog and FPGA based system design.
- Design and optimize complex combinational and sequential digital circuits
- Apply design flow methodology for a given problem
- Solve time related problems
- Implement and debug various digital designs.
- Analyze a given design based on synthesis, implementation and timing reports

(Any 8 Experiments)

1. Write code to realize basic and derived logic gates.
2. Half adder, Full Adder using basic and derived gates.
3. Half subtractor and Full Subtractor using basic and derived gates.
4. Design and simulation of a 4 bit Adder.
5. Multiplexer (4x1) and Demultiplexer using logic gates.
6. Decoder and Encoder using logic gates.
7. Clocked D, JK and T Flip flops (with Reset inputs)
8. 3-bit Ripple counter
9. To design and study switching circuits (LED blink shift)
10. To design traffic light controller.

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)
முதல்பருவம்
(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)
(For I-UG Science Degree Classes) 16LSU101

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

- இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
- மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016-2017)

பகுதி – I, தமிழ் பருவம் I

16LAU101 : **தமிழ் முதல் தாள்** 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது**)**

அலகு – I : இக்கால இலக்கியம்: **(10 மணிநேரம்)**

கல்வி : மகாகவி பாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணி தேசிக விநாயகம் பிள்ளை – ஒற்றுமையே உயிர்நிலை.
மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் –மலையாளக் காற்று.
சூழலியல் : கவிஞர் வைதீஸ்வரன் - விரல் மீட்டிய மழை.
பெண்ணியம் : கவிஞர் சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை.

அலகு – II : அற இலக்கியம்: **(10 மணிநேரம்)**

கொன்றை வேந்தன்: 1-50 பாடல்கள்
திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்
பழமொழி நானூறு: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: **(10 மணிநேரம்)**

மூவருலா: 1-26 கண்ணிகள்
திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்
கலிங்கத்துப் பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV : கட்டுரை: **(10 மணிநேரம்)**

1. **உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்**
2. **கட்டிடக்கலை** - அ. இராசமாணிக்கனார்
3. **வாழ்க்கை** - இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: **(8 மணிநேரம்)**

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Semester – I

16AEC101 ENVIRONMENTAL STUDIES 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **100** Total: **100**

Course Objectives (CO)

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- To apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- To reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

UNIT-I: Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

Unit II: Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources: Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fire works.

Unit III: Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV: Environmental Pollution - Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution , Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit V: Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

Suggested Readings

T1: Tripathy. S.N., & Sunakar Panda. (2004). Fundamentals of Environmental Studies (2nd ed.) . New Delhi: Vrianda Publications Private Ltd.

T2: Arvind Kumar. (2004). A Textbook of Environmental Science. New Delhi: APH Publishing Corporation.

T3:Verma, P.S., & Agarwal V.K. (2001). Environmental Biology (Principles of Ecology) . New Delhi: S.Chand and Company Ltd.

T4: Anubha Kaushik., & Kaushik, C.P. (2004). Perspectives in Environmental Studies. New Delhi: New Age International Pvt. Ltd. Publications.

R1: Singh, M.P., Singh, B.S., & Soma, S. Dey. (2004). Conservation of Biodiversity and Natural Resources. New Delhi: Daya Publishing House.

R2: Daniel, B. Botkin., & Edward, A. Keller. (1995). Environmental Science New York: John Wiley and Sons, Inc.,.

R3: Uberoi, N.K. (2005). Environmental Studies. New Delhi: Excel Books Publications.

Semester-I

16CTU101 Programming Fundamentals Using C / C++ 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int:**40** Ext : **60** Total: **100**

Course Objectives (CO)

- To impart adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basics of C Language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To teach the issues in file organization and the usage of file systems.
- To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
- To learn how to write inline functions for efficiency and performance.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Obtain the knowledge about the number systems this will be very useful for bitwise operations.
2. Develop programs using the basic elements like control statements, Arrays and Strings.
3. Understand about the dynamic memory allocation using pointers which is essential for utilizing memory
4. Understand about the code reusability with the help of user defined functions.
5. Develop advanced applications using enumerated data types, function pointers and nested structures, the basic object-oriented design principles in computer problem solving.
6. Learn the basics of file handling mechanism that is essential for understanding the concepts in database management systems, the uses of preprocessors and various header file directives, the characteristics of an object-oriented programming language in a program.

UNIT-I

Introduction to C and C++:

History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++.

Data Types, Variables, Constants, Operators and Basic I/O: Declaration, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators, Using Comments in programs, Character I/O, Formatted and Console I/O, Using Basic Header Files.

Expressions, Conditional Statements and Iterative Statements: Simple Expressions in C++, Understanding Operators Precedence in Expressions, Conditional Statements, Understanding syntax and utility of Iterative Statements, Use of break and continue in Loops, Using Nested Statements.

UNIT-II

Functions and Arrays: Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.

Creating and Using One Dimensional Arrays, Use Various types of arrays, Two-dimensional Arrays, Introduction to Multi-dimensional arrays.

UNIT-III

Derived Data Types (Structures and Unions): Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members.

Pointers and References in C++: Understanding a Pointer Variable, Simple use of Pointers, Pointers to Pointers, Pointers to structures, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions.

UNIT-IV

File I/O, Preprocessor Directives: Opening and closing a file, Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives, Macros.

UNIT-V

Using Classes in C++: Principles of Object-Oriented Programming, Defining & Using Classes, Constructors, Constructor Overloading, Function overloading and Operator overloading in classes, Class Variables & Functions, Access specifiers, Overview of Template classes and their use.

Inheritance, Polymorphism and Exception Handling: Introduction to Inheritance, Polymorphism, Basics Exceptional Handling.

Suggested Readings:

1. BjarneStroustrup, "Programming -- Principles and Practice using C++", 2nd Edition, Addison-Wesley 2014.

2. BjarneStroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley , 2013

3. Harry, H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide", First Create space Inc, O-D Publishing, LLC USA.2014

4. Stanley B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Published by Addison-Wesley, 5th Edition, 2012

5. Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.

6. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.

7. Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.

8 . Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.

9. Scott Meyers, "Effective C++", 3rd Edition, Published by Addison-Wesley, 2005.

WEB SITES

1. http://www.cs.cf.ac.uk/Dave/C/CE.html
2. http://www2.its.strath.ac.uk/courses/c/
3. http://www.iu.hio.no/~mark/CTutorial/CTutorial.html
4. http://www.cplusplus.com/doc/tutorial/
5. www.cplusplus.com/
6. www.cppreference.com/

Semester – I

16CTU102 COMPUTER SYSTEM ARCHITECTURE 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To enable the students to gain knowledge on the architecture of modern computer.
- To understand how computer stores positive and negative numbers and to perform arithmetic operation of positive and negative numbers.
- To learn about logic gates and solve problems using Boolean algebra.
- To understand the simplification of circuits like adders, subtractors, multiplexers, encoders.
- To understand the basic computer organization and design.
- To learn Cache memory and its importance

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Acquire a basic knowledge about computer system architecture, digital circuits and the low - level programming skills.
2. Understand the inner workings and performance capabilities of advanced microprocessors.
3. Solve the problems using Boolean algebra
4. Understand the basic computer organization and design.
5. Learn about Cache memory and its importance
6. Solve the binary arithmetic problems and conversion among the number systems

UNIT -I Introduction

Logic gates, Boolean algebra, circuit simplification, combinational circuits: Adders and Subtractors –Multiplexers and De multiplexers – Encoders and Decoders- sequential circuits: Flip Flop's, registers, counters and memory units.

UNIT -II Data Representation and Basic Computer Arithmetic

Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

UNIT –III Basic Computer Organization and Design

Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

UNIT-IV Central Processing Unit

Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

UNIT –V Memory and Input-Output Organization

Cache memory, Associative memory, mapping Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

Suggested Readings:

1. Dos Reis, A. J. (2009). Assembly Language and Computer Architecture using C++ and JAVA. Course Technology
2. Stallings, W. (2010). Computer Organization and Architecture Designing for Performance (8th ed.) New Delhi: Prentice Hall of India,
3. Mano, M.M. (2013). Digital Design, New Delhi: Pearson Education Asia.
4. Carl Hamacher. (2012). Computer Organization (5th ed.). New Delhi: McGrawHill.

16CTU103	**DEVELOPING PROGRAMMING LOGIC AND TECHNIQUES**	**Semester – I** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To develop a basic understanding of many areas of information technology and how they are used
- To understand the basic structure of a program including sequence, decisions and looping
- To understand how to design a program to solve a simple program
- To introduce the basics of several programming language and understand the commonality and differences in languages
- To lay a basic foundation involving hardware, software, navigation, the Internet for future development
- To understand what a database is and how to design a working model

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Demonstrate knowledge of high-level structured programming logic and algorithm development.
2. Demonstrate knowledge of structured program design and modularity.
3. Demonstrate knowledge of file-based input/output operations, file manipulation and maintenance, extract reporting, and report writing.
4. Demonstrate knowledge of records, data types and structures, storage classes, addressable memory locations.
5. Demonstrate knowledge of table utilization, arrays and subscripts.
6. Demonstrate knowledge of arithmetic expressions, control structures, iteration techniques.

UNIT – I

Language Evolution Machine Language, Assembly Language, High Level Language. Translators: compiler, Interpreter and Assembler. The Compilation Process, Linker, Loader, Study of HLL, Characteristics of Good Language, Generation of Languages, Study of Programming Languages (Function Oriented, Object Oriented, Event-Based).

UNIT – II

Programming Construction Tools Problem Analysis, Process Analysis, Conceptual Development of Solution. Development Tools: Algorithm: Types of Algorithm, Algorithm of Analysis, Advantage and Disadvantage of Algorithm, Complexity of Algorithm, Big-O Notation.

UNIT – III

Flowcharts: Types of Flowcharts, Advantage and Disadvantage of Flowchart. Pseudocode: Definition and Its Characteristics Control Statements Basics of Programming Language: Usage of Character Set, Meaning of Keywords and Identifiers, Role of Data Types, Constants and Variables.

UNIT – IV

Importance of Casting, Different Types of Operators and their Precedence, Expressions, Conditional Statements (One-Way, Two-Way and Multi-Way Conditional), Looping Statements (For, While, do-while), Usage of Exit, continue, Break and Goto Statement.

UNIT – V

Arrays: Arrays, One dimensional array, Various operatio on Array (Inserting of Elements, Deleting of Element, Rotating List, Sorting, Searching, Merging Etc) and Two dimensional arrays (Matrix Addition, Transpose of Matrix, Matrix Multiplication), Modular programming and its features.

Suggested Readings:

1. 1.Anil V.Chouduri. The Art of Programming through Flowchart and Algorithms. Laxmi Publication.
2. Maureen Sprankle (2009). Problem Solving Programming Concepts (7th ed.). Pearson Education.
3. Behrouz Forouzan. Basic of Computer Science. Cengage Learning
4. Donald Knuth. The Art of Computer Programming Vol-I,II, III, Pearson.
5. Horowitz, Sahani. Fundamental of Computer Algorithm. Orient Longman.

Semester – I

16CTU111 PROGRAMMING FUNDAMENTALS USING C / C++ - PRACTICAL **3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To impart adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basics of C Language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To teach the issues in file organization and the usage of file systems.
- To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
- To learn how to write inline functions for efficiency and performance.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Obtain the knowledge about the number systems this will be very useful for bitwise operations.
2. Develop programs using the basic elements like control statements, Arrays and Strings.
3. Understand about the dynamic memory allocation using pointers which is essential for utilizing memory
4. Understand about the code reusability with the help of user defined functions.
5. Develop advanced applications using enumerated data types, function pointers and nested structures, the basic object-oriented design principles in computer problem solving.
6. Learn the basics of file handling mechanism that is essential for understanding the concepts in database management systems, the uses of preprocessors and various header file directives, the characteristics of an object-oriented programming language in a program.

List of Programs

1. WAP to display Fibonacci series (i)using recursion, (ii) using iteration

2. WAP to compute the sum of the first n terms of the following series
S = 1+1/2+1/3+1/4+……

3. Write a program to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.

4. WAP to print the sum and product of digits of an integer.

5. WAP to reverse a number.

6. Write a program that checks whether a given string is Palindrome or not.

7. WAP to print a triangle of stars as follows (take number of lines from user):

```
*
***
*****
*******
*********
```

8. WAP to perform following actions on an array entered by the user:

i) Calculate and print the sum and average of the elements of array

ii) Print the maximum and minimum element of array

9. Write a program that swaps two numbers using pointers.

10. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.

11. Write a program to perform operations on strings.

12. Write a program to perform following Matrix operations (2-D array implementation): a) Sum b) Difference c) Product

13. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.

14. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).

15.Copy the contents of one text file to another file using command line argument.

Semester – I

16CTU112 COMPUTER SYSTEM ARCHITECTURE- PRACTICAL 3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To enable the students to gain knowledge on the architecture of modern computer.
- To understand how computer stores positive and negative numbers and to perform arithmetic operation of positive and negative numbers.
- To learn about logic gates and solve problems using Boolean algebra.
- To understand the simplification of circuits like adders, subtractors, multiplexers, encoders.
- To understand the basic computer organization and design.
- To learn Cache memory and its importance

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Acquire a basic knowledge about computer system architecture, digital circuits and the low - level programming skills.
2. Understand the inner workings and performance capabilities of advanced microprocessors.
3. Solve the problems using Boolean algebra
4. Understand the basic computer organization and design.
5. Learn about Cache memory and its importance
6. Solve the binary arithmetic problems and conversion among the number systems

List of Experiments

1. Verification of Logic Gates
2. Code converters
3. Realization of Multiplexer using basic gates
4. Encoder and Decoder
5. Realization Half and Full adders
6. Realization of Subtractor
7. Realization of Parity generator
8. Flip-Flop Circuits
9. Digital to analog Converters
10. Demonstrate a Basic Arithmetic Computing operations

Semester – I

16CTU113 OFFICE AUTOMATION - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To create a document in Microsoft Word with formatting options, edit, save, and print documents to include documents with lists and tables, Format text and to use styles, add a header and footer to a document, add a graphic to a document.
- To write functions in Microsoft Excel to perform basic calculations and to convert number to text and text to number.
- To indicate the names and functions of the Excel interface components.
- To enter and edit data, Format data and cells.
- Construct formulas, including the use of built-in functions, and relative and absolute references.
- Create and modify charts.

Course Outcomes (COs)

After completion of this course, the students will be able to

1. Modify text using various formatting options from the editing tools under the Home tab, Set up section breaks to create different headers and footers for the odd and even pages within the document sections.
2. Demonstrate the mechanics and uses of Word tables to organize and present data, Demonstrate working knowledge of using Word's themes and clip art to create a variety of visual effects.
3. Demonstrate working knowledge of Word's advanced formatting techniques and presentation styles,
4. Demonstrate applicable knowledge and uses of accepted business style formatting conventions.
5. Create and design a spreadsheet for general office use, demonstrate the basic mechanics and navigation of an Excel spreadsheet.
6. Demonstrate formatting techniques and presentation styles, demonstrate the use of basic functions and formulas

List of Programs

Practical exercises based on MS Office/ Open Office tools using document preparation and spreadsheet handling packages.

MS Word

1. Prepare **a grocery list** having four columns (Serial number, The name of the product, quantity and price) for the month of April, 06.

- Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.
- The headings of the columns should be in 12-point and bold.
- The rest of the document should be in 10-point Times New Roman.

- Leave a gap of 12-points after the title.

2. Create a **telephone directory**.

- The heading should be 16-point Arial Font in bold
- The rest of the document should use 10-point font size
- Other headings should use 10-point Courier New Font.
- The footer should show the page number as well as the date last updated.

3. Design a **time-table form** for your college.

- The first line should mention the name of the college in 16-point Arial Font and should be bold.
- The second line should give the course name/teacher‟s name and the department in 14-point Arial.
- Leave a gap of 12-points.
- The rest of the document should use 10-point Times New Roman font.
- The footer should contain your specifications as the designer and date of creation.

4. BPB Publications plans to release a new book designed as per your syllabus. Design the **first page of the book** as per the given specifications.

- The title of the book should appear in bold using 20-point Arial font.
- The name of the author and his qualifications should be in the center of the page in 16-point Arial font.
- At the bottom of the document should be the name of the publisher and address in 16-point Times New Roman.
- The details of the offices of the publisher (only location) should appear in the footer.

5. Create the following one page documents.
    a. Compose a note inviting friends to a get-together at your house, Including a list of things to bring with them.
    b. Design a certificate in landscape orientation with a border around the document.
    c. Design a Garage Sale sign.
    d. Make a sign outlining your rules for your bedroom at home, using a numbered list.

6. Create the following documents:
    (a) A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.
    (b) Use a newsletter format to promote upcoming projects or events in your classroom or college.

7. Convert following text to a table, using comma as delimiter

Type the following as shown (do not bold).
Color, Style, Item
Blue, A980, Van
Red, X023, Car
Green, YL724, Truck
Name, Age, Sex
Bob, 23, M
Linda, 46, F
Tom, 29, M

8. Enter the following data into a table given on the next page.

Salesperson	**Dolls**	**Trucks**	**Puzzles**
Kennedy, Sally	1327	1423	1193
White, Pete	1421	3863	2934
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067

Add a column Region (values: S, N, N,S,S,S) between the Salesperson and Dolls columns to the given table Sort your table data by Region and within Region by Salesperson in ascending order:
In this exercise, you will add a new row to your table, place the word Total at the bottom of the Salesperson column, and sum the Dolls, Trucks, and Puzzles columns.

9. Wrapping of text around the image.

10. Following features of menu option must be covered

FILE Complete menu
EDIT Complete menu
VIEW Complete menu
INSERT Complete menu
FORMAT Complete menu
TABLE Complete menu
WINDOW Complete menu
HELP Complete menu
TOOLS All options except Online collaboration, Tools on Macro, Templates

MS Excel

1. Enter the Following data in Excel Sheet

REGIONAL SALES PROJECTION

State	Qtr1	Qtr2	Qtr3	QTR4	Qtr Total	Rate Amount
Delhi	2020	2400	2100	3000	15	
Punjab	1100	1300	1500	1400	20	
U.P.	3000	3200	2600	2800	17	
Haryana	1800	2000	2200	2700	15	
Rajasthan	2100	2000	1800	2200	20	

TOTAL
AVERAGE

(a) Apply Formatting as follow:

i. Title in TIMES NEW ROMAN

ii. Font Size - 14

iii. Remaining text - ARIAL, Font Size -10

iv. State names and Qtr. Heading Bold, Italic with Gray Fill Color.

v. Numbers in two decimal places.

vi. Qtr. Heading in center Alignment.

vii. Apply Border to whole data.

(b) Calculate State and Qtr. Total
(c) Calculate Average for each quarter
(d) Calculate Amount = Rate * Total .

2. Given the following worksheet

	A	B	C	D
1	Roll No.	Name	Marks	Grade
2	1001	Sachin	99	
3	1002	Sehwag	65	
4	1003	Rahul	41	
5	1004	Sourav	89	
6	1005	Har Bhajan	56	

Calculate the grade of these students on the basis of following guidelines:

If Marks	Then Grade
>= 80	A+
>= 60 < 80	A

>= 50 < 60	B
< 50	F

3. Given the following worksheet

	A	B	C	D	E	F	
1	**Salesman**			**Sales in (Rs.)**			
2	No.	Qtr1	Qtr2	Qtr3	Qtr4	Total	Commission
3	S001	5000	8500	12000	9000		
4	S002	7000	4000	7500	11000		
5	S003	4000	9000	6500	8200		
6	S004	5500	6900	4500	10500		
7	S005	7400	8500	9200	8300		
8	S006	5300	7600	9800	6100		

Calculate the commission earned by the salesmen on the basis of following Candidates:

If Total Sales	**Commission**
< 20000	0% of sales
> 20000 and < 25000	4% of sales
> 25000 and < 30000	5.5% of sales
> 30000 and < 35000	8% of sales
>= 35000	11% of sales

The total sales is sum of sales of all the four quarters.

4. A company XYZ Ltd. pays a monthly salary to its employees which consists of basic salary, allowances & deductions. The details of allowances and deductions are as follows:

Allowances

- HRA Dependent on Basic
  30% of Basic if Basic <=1000
  25% of Basic if Basic>1000 & Basic<=3000
  20% of Basic if Basic >3000
- DA Fixed for all employees, 30% of Basic
- Conveyance Allowance Rs. 50/- if Basic is <=1000
  Rs. 75/- if Basic >1000 & Basic<=2000
  Rs. 100 if Basic >2000
- Entertainment Allowance NIL if Basic is
  <=1000 Rs. 100/- if Basic > 1000

Deductions

- Provident Fund 6% of Basic
- Group Insurance Premium Rs. 40/- if Basic is <=1500
  Rs. 60/- if Basic > 1500 & Basic<=3000
  Rs. 80/- if Basic >3000

Calculate the following:

Gross Salary = Basic + HRA + DA + Conveyance + Entertainment
Total deduction = Provident Fund + Group Insurance Premium
Net Salary = Gross Salary – Total Deduction.

5. Create Payment Table for a fixed Principal amount, variable rate of interests and time in the format below:

No. of Installments	**5%**	**6%**	**7%**	**8%**	**9%**
3	XX	XX	XX	XX	XX
4	XX	XX	XX	XX	XX
5	XX	XX	XX	XX	XX
6	XX	XX	XX	XX	XX

6. Use an array formula to calculate Simple Interest for given principal amounts given the rate o

6. Use an array formula to calculate Simple Interest for given principal amount.Given the Rate of Interest and time.

Rate of Interest	8%
Time	5 Years
Principal	Simple Interest
1000	?
18000	?
5200	?

7. The following table gives year wise sale figure of five salesmen in Rs.

Salesman	2000	2001	2002	2003
S1	10000	12000	20000	50000
S2	15000	18000	50000	60000
S3	20000	22000	70000	70000
S4	30000	30000	100000	80000
S5	40000	45000	125000	90000

(a) Calculate total sale year wise.
(b) Calculate the net sale made by each salesman
(c) Calculate the maximum sale made by the salesman
(d) Calculate the commission for each salesman under the condition.
(i) If total sales >4,00,000 give 5% commission on total sale made by the salesman.
(ii) Otherwise give 2% commission.
(e) Draw a bar graph representing the sale made by each salesman.
(f) Draw a pie graph representing the sale made by salesman in 2000.

8. Enter the following data in Excel Sheet

PERSONAL BUDGET FOR FIRST QUARTER

Monthly Income (Net): 1,475

EXPENSES	JAN	FEB	MARCH	QUARTER TOTAL	QUARTER AVERAGE
Rent	600.00	600.00	600.00		
Telephone	48.25	43.50	60.00		
Utilities	67.27	110.00	70.00		
Credit Card	200.00	110.00	70.00		
Oil	100.00	150.00	90.00		
AV to Insurance	150.00				
Cable TV	40.75	40.75	40.75		

Monthly Total

Calculate Quarter total and Quarter average.

(a) Calculate Monthly total.

(b) Surplus = Monthly income - Monthly total.

(c) What would be total surplus if monthly income is 1500.

(d) How much does telephone expense for March differ from quarter average.

(e) Create a 3D column graph for telephone and utilities. (f) Create a pie chart for monthly expenses.

9. Enter the following data in Excel Sheet

TOTAL REVENUE EARNED FOR SAM'S BOOKSTALL

Publisher name	1997	1998	1999	2000	total
A	Rs.1000.00	Rs.1100.00	Rs.1300.00	Rs.800.00	
B	Rs.1500.00	Rs.700.00	Rs.1000.00	Rs.2000.00	
C	Rs.700.00	Rs.900.00	Rs.1500.00	Rs.600.00	
D	Rs.1200.00	Rs.500.00	Rs.200.00	Rs.1100.00	
E	Rs.800.00	Rs.1000.00	Rs.3000.00	Rs.560.00	

(a) Compute the total revenue earned.

(b) Plot the line chart to compare the revenue of all publisher for 4 years.

(c) Chart Title should be _Total Revenue of sam's Bookstall (1997-2000)'

(d) Give appropriate categories and value axis title.

10. Generate 25 random numbers between 0 & 100 and find their sum, average and count. How many no. are in range 50-60.

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)
இரண்டாம் பருவம்
(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)
(For I-UG Science Degree Classes) 16LSU201

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

- இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, ‘தமிழ் இலக்கிய வரலாறு’ குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித் துறையாகிய, ‘அறிவியல் தமிழ்’ ; ‘இணைய தமிழ்’ குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
- மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)

பகுதி – I, தமிழ் பருவம் II

16LAU201 : **தமிழ்** இரண்டாம் **தாள்** 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது**)**

அலகு – I : பக்தி **இலக்கியம்** **(10 மணிநேரம்)**

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. சைவம் - பெரியபுராணம் - திருமூலநாயனார் புராணம்.

2. வைணவம் - பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

அலகு – II : சங்க இலக்கியம் : **(15 மணிநேரம்)**

சங்க இலக்கியங்கள் அறிமுகம்

அ**). எட்டுத்தொகை**

நற்றிணை : பிரசம் கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு –

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : சுடர்த்தொடீ கேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு : அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி - 48

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள் – 'சிறுதினை மலரொடு' என்பதிலிருந்துதொடங்கி, 'அறிந்தவாறே' என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – 'தெய்வம் சான்ற' என்பதிலிருந்து தொடங்கி, 'நல்குமதி' என்பது வரையிலான தொடர்கள்: 286-295.

அலகு - III : காப்பியம் (6 மணிநேரம்)

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: **(21-29) –** கண்ணகியின் சிறப்பு:

'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி,

'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: **(207-234) -** சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: **(482-485) -** செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

அலகு – IV : சிறுகதை (10 மணிநேரம்)

1. **குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்**
2. காட்டில் ஒரு மான் - அம்பை
3. நாற்காலி – கி.ராஜநாராயணன்
4. **நகரம் – சுஜாதா**

அலகு- V : மொழிப்பயிற்சி (7 மணிநேரம்)

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Semester – II

16CTU201 **PROGRAMMING IN JAVA** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To understand the fundamental of Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)

After completion of this course, the students will be able to

1. Student will obtain knowledge of the structure and model of the Java programming language.
2. How to use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

UNIT-I

Introduction to Java Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods),

UNIT-II

Arrays, Strings and I/O Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files. **Object-Oriented Programming Overview** Principles of Object-Oriented

Programming, Defining & Using Classes, Controlling AITUess to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

UNIT-III

Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata

Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

UNIT-IV

Exception Handling, Threading, Networking and Database Connectivity Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

UNIT-V

Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, textfields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Suggested Readings:

1. Ken Arnold., James Gosling., & David Homes. (2005). The Java Programming Language (4th ed.).
2. James Gosling., Bill Joy., Guy, L. Steele Jr., Gilad Bracha., & Alex Buckley. (2014).The Java Language Specification, Java SE (8 ed.). Addison Wesley.
3. Joshua Bloch. (2008). Effective Java (2nd ed.). Addison-Wesley.
4. Cay, S. Horstmann,. GaryCornell. (2012).Core Java 2 Volume 1 (9th ed.). . New Delhi: Prentice Hall.
5. Cay, S. Horstmann., Gary Cornell. (2013). Core Java 2 Volume 2 - Advanced Features(9th ed.). New Delhi: Printice Hall.
6. Bruce Eckel. (2002). Thinking in Java (3rd ed.). New Delhi: PHI.
7. Balaguruswamy, E. (2009). Programming with Java (4th ed.). New Delhi: McGraw Hill.
8. Paul Deitel., & Harvey Deitel. (2011). Java: How to Program (10th ed.). New Delhi: Prentice Hall.
9. (2005).Head First Java (2nd ed.). Orielly Media Inc.
10. David, J. Eck. (2009). Introduction to Programming Using Java. New Delhi: CreateSpace Independent Publishing Platform.
11. John , R. Hubbard. (2004). Programming with JAVA, Schaum's Series, (2nd ed.).

WEB SITES

1. java.sun.com/docs/books/tutorial/
2. www.en.wikipedia.org/wiki/Java
3. www.java.net/

16CTU202 **DISCRETE STRUCTURES** **Semester – II** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To learn the basic concepts of sets, types of sets, functions and relations
- To understand about Pigeonhole principle, Permutation and Combination, Mathematical Induction
- To solve the problems using Recurrence relations and generating functions.
- To know the basic concepts of Logical Connectives, Graphs and Trees.
- To express ideas using mathematical notation
- To solve problems with the help of tools of mathematical analysis.

Course Outcomes (COs)

On successful completion of the course, students will be able to

1. Familiar with elementary algebraic set theory.
2. Acquire a fundamental understanding of the core concepts in growth of functions.
3. Describe the method of recurrence relations.
4. Get wide knowledge about graphs and trees
5. Initiate to knowledge from inference theory
6. Solve problems with the help of tools of mathematical analysis

UNIT I

Sets: Introduction, Sets , finite and infinite sets, uncountably infinite sets, functions, relations, properties of binary relations, closure, partial ordering relations, counting , Pigeonhole principle, Permutation and Combination, Mathematical Induction, Principle of inclusion and Exclusion.

UNIT II

Growth of Functions: Asymptotic Notations, Summation formulas and properties,Bounding Summations, approximation byIntegrals

UNIT III

Recurrences: Recurrence relations, generating functions, linear recurrence relations with constant coefficients and their solution, Substitution Method, recurrence trees, Master theorem.

UNIT IV

Graph Theory: Basic terminology, models and types, multigraphs and weighted graphs, graph representation, graph isomorphism, connectivity, Euler and Hamiltonian Paths and circuits, Planar graphs, graph coloring, trees, basic terminology and properties of trees, introduction to Spanning trees

UNIT V

Prepositional Logic: Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory.

Suggested Readings

1. Kenneth Rosen. (2006). Discrete Mathematics and Its Applications (6th ed.). New Delhi: McGraw Hill.
2. J.P.Tremblay & R.Manohar (1997). Discrete Mathematical Structures with Applications to Computer Science. New Delhi: McGraw-Hill Book Company.
3. T.H.Coremen, C.E. Leiserson, R. L. Rivest. (2009). Introduction to algorithms, (3rd ed.). Prentice Hall on India.
4. M.O. Albertson, and J.P.Hutchinson (1988). Discrete Mathematics with Algorithms . John wiley Publication.
5. J. L.Hein (2009). Discrete Structures, Logic, and Computability(3rd ed.). Jones and Bartlett Publishers.
6. D.J.Hunter (2008). Essentials of Discrete Mathematics. Jones and Bartlett Publishers.

Semester – III

16CTU203 DATABASE PROGRAMMING WITH ORACLE (SQL AND PL/SQL) **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the application development environment.
- To gain programming Skills and Database Creation in RDBMS.
- To understand SQL for storing and retrieving data from the RDBMS.
- To arrive at a normalized design of tables and other database objects in RDBMS.
- To investigate techniques for tuning your PL/SQL code
- To design modular applications using packages

Course Outcomes (COs)

After completion of this course, the students will be able to

1. Develop efficient PL/SQL programs to access Oracle databases
2. Use some of the Oracle supplied PL/SQL packages to generate screen and file outputs
3. Invoke native dynamic SQL to build runtime SQL statements
4. Manage data retrieval with cursors and cursor variables
5. Manage dependency issues and collect PL/Scope data
6. Create triggers to solve business challenges and enforce business rules

UNIT - I Understanding Database Fundamentals

Origin of database – database elements – design concepts – components ofDBMS – Advantages and disadvantages of DBMS. Database Models: flat file – hierarchical model – network model – relational model – object oriented model – Features of Object oriented Database Management system – Features of distributed DBMS – Comparison of DBMS & DDBMS – Object relational model. ER-model: entities – relationships - ERD symbols – cardinalities – sample ERD.

Unit - II Entities and Entity Relationships

Relational model: Introduction – Relational database: attributes and domain – Tuples – Relation and their schemes – Relation representation – keys – relationships – relational operations – Integrity rules. Relational algebra: Basic operations – Additional relational algebraic operations – some relational algebra queries. Functional Dependency: Reasoning about FD's – closure of set of FD's – Attribute closure.

Unit - III Objects

Relational database manipulation: Introduction – SQL: Data definition – Data manipulation: Basic data retrieval – condition specification – Arithmetic and aggregate operations. SQL joins – set manipulation – categorization – updates – views – index. Data Control language : grant, revoke – simple privileges.

Unit - IV Overview of PL/SQL

Declaration section – executable command section : conditional logic, loops, CASE statements – exception handling section: predefined and user defined exceptions. Triggers : definition – types : row level, statement level, before and after, instead of – syntax – enabling and disabling triggers - replacing and dropping triggers. Cursors – definition – open – fetch – close – cursor attributes- select for update – types : implicit, explicit. Procedures, Functions: Local and global – procedures vs functions – stored procedures, functions – create procedure syntax - create function syntax – calling procedures, functions. Replacing and dropping procedures, functions.

Unit - V Packages and Normalization

Package header – package body – calling package members - Replacing and dropping package. Overview of Normalization : advantages - disadvantages. Normal forms: first normal form – second normal form – third normal form – boyce codd normal form – Introduction to fourth, fifth and sixth normal forms – denormalization. Parallel Databases: Introduction – Design of Parallel Databases – Advantages and Disadvantages of Parallel Database.

Suggested Readings

1. Bipin C. Desai.(2013). An Introduction to Database Systems, New Delhi: Galgotia Publications.
2. Rajiv chopra (2013). Database Management systems (3rd ed.). S.Chand publications.
3. Steven Feurstein, Bill Pribyl (2014). Oracle PL/SQL Programming (6th ed.). O ‘ Reilly Media.
4. Shio Kumar Singh (2011). Database Management Systems – Concepts, design and Applications (2nd ed.). New Delhi: Pearson Education.
5. Ivan Byross (2010). SQL, Pl/SQL the Programming Language of Oracle Paperback. BPB Publications.
6. Rajeeb C. Chatterjee (2012). Learning Oracle SQL and Pl/SQL: A simplified Guide. Prentice Hall of India.

Web Sites

1. http://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. www.databasedir.com
3. http://plsql-tutorial.com/

Semester – I

16CTU211 PROGRAMMING IN JAVA - PRACTICAL 3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To understand the fundamental of Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)

After completion of this course, the students will be able to

1. Obtain knowledge of the structure and model of the Java programming language.
2. Use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. Use certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

List of Programs

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of .lenth in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(, setLength(), append(), insert(), concat()and equals().
9. Write a program to create a ―distance‖ class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer

10. Modify the ―distance‖ class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)
12. Write a program to show the difference between public and private aITUess specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
13. Write a program to show the use of static functions and to pass variable length arguments in a function.
14. Write a program to demonstrate the concept of boxing and unboxing.
15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
16. Write a program to create a multilevel package and also creates a reusable class to generate FibonaITUi series, where the function to generate fibonacii series is given in a different file belonging to the same package.
17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
18. Write a program ―DivideByZero‖ that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
21. Write a program to demonstrate priorities among multiple threads.
22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
23. Write a program to create URL object, create a URLConnection using the openConnection() method and then use it examine the different components of the URLand content.
24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
25. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet‘s window.
26. Write a program to get the URL/location of code (i.e. java code) and document(i.e. html file).
27. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
28. Write a program to demonstrate different keyboard handling events.

29. Write a program to generate a window without an applet window using main() function.
30. Write a program to demonstrate the use of push buttons.

		Semester – I
16CTU212	**DISCRETE STRUCTURES - PRACTICAL**	**3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To learn the basic concepts of sets, types of sets, functions and relations
- To understand about Pigeonhole principle, Permutation and Combination, Mathematical Induction
- To solve the problems using Recurrence relations and generating functions.
- To know the basic concepts of Logical Connectives, Graphs and Trees.
- To express ideas using mathematical notation
- To solve problems with the help of tools of mathematical analysis.

Course Outcomes (COs)

On successful completion of the course, students will be able to

1. Familiar with elementary algebraic set theory.
2. Acquire a fundamental understanding of the core concepts in growth of functions.
3. Describe the method of recurrence relations.
4. Get wide knowledge about graphs and trees
5. Initiate to knowledge from inference theory
6. Solve problems with the help of tools of mathematical analysis

List of Programs

1. Write a C Program to find the number of subsets of a set contains n elements.

2. Write a C Program to find transitive closure of a relation.

3. Write a C Program to prove
   $1/(1*2) + 1/(2*3) \ldots\ldots\ldots +1/(n(n+1)) = n/(n+1)$

4. Write a C Program to to perform the sum = 1+ (1+2) + (1+2+3) + … + (1+2…+n)

5. Write a C program to print Fibonacci series till Nth term using recursion

6. Write a program in c to calculate factorial of a number using recursion

7. Write a C Program to find a minimum spanning tree using Prim's algorithm

8. Write a C program to find the shortest path with the lower cost in a graph using Dijkstra's Algorithm

9. Write a C Program to construct the truth table for the following formula.

(i) $P \wedge Q \wedge \rceil R$ (ii) $P \wedge \rceil Q \wedge R$ (iii) $P \wedge Q \wedge \rceil R$

10. Write a C Program to prove De – Morgan's law.

		Semester – III
16CTU213	**DATABASE PROGRAMMING WITH ORACLE (SQL AND PL/SQL) - PRACTICAL**	**4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the application development environment.
- To gain programming Skills and Database Creation in RDBMS.
- To understand SQL for storing and retrieving data from the RDBMS.
- To arrive at a normalized design of tables and other database objects in RDBMS.
- To investigate techniques for tuning your PL/SQL code
- To design modular applications using packages

Course Outcomes (COs)

After completion of this course, the students will be able to

1. Develop efficient PL/SQL programs to access Oracle databases
2. Use some of the Oracle supplied PL/SQL packages to generate screen and file outputs
3. Invoke native dynamic SQL to build runtime SQL statements
4. Manage data retrieval with cursors and cursor variables
5. Manage dependency issues and collect PL/Scope data
6. Create triggers to solve business challenges and enforce business rules

List of Programs

Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

Field	**Type**	**NULL**	**KEY**	**DEFAULT**
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
Job_type	Varchar(50)	NO		NIL
Manager	Char(3)	Yes		NIL
Hire_date	Date	NO		NIL
Dno	Integer	Yes	FK	NIL
Commission	Decimal(10,2)	Yes		NIL
Salary	Decimal(7,2)	NO		NIL

DEPARTMENT Schema

Field	Type	NULL	KEY	DEFAULT
Dno	Integer	NO	PRI	NULL
Dname	Varchar(50)	Yes		NULL
Location	Varchar(50)	Yes		New Delhi

Query List

1. Query to display Employee Name, Hire Date, Employee Number; for each employee with the Employee number appearing first.
2. Query to display unique jobs from the Employe table
3. Query to display Employee Name concatenated by a job seperated by a comma.
4. Query to display Employee Name and salary of all the employees earning more than $2850.
5. Query to display Employee Name and department number for the employee no=7900.
6. Query to display Employee Name and salary for all employees whose salary is not in the range of $1500 and $2850
7. Query to display Employee Name and department no. of all the employees in dept 10 and Dept 30 in the alphabetical order by name.
8. Query to display Name and Hire date of every employee who was hired in 1981
9. Query to display Name and job of all employees who don’t have a current manager.
10. Query to display Name, salary and commission for all the employees who earn commission
11. Sort the data in descending order of salary and commission
12. Query to display Name of all the employees where the third letter of their name is A.
13. Query to display Name, salary and commission for all employees whose commission is 14 greater than their salary increased by 5%.
14. Query to display the current date
15. Query to display Name, hire date and salary review date which is the first Monday after 6 months of employment.
16. Query to display Name and calculate the number of months between today and the date each employee was hired.
17. Query to display the following for each employee <E-Name> earns <Salalry> monthly but wants <3 * current salary>. Label the column as Dream salary
18. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all employees whose name starts with _J’, ‘A’ and ‘M’.
19. Query to display unique listing of all jobs that are in dept #30.
20. Query to display Name, dept no. and salary of any employee whose department no. and salary matches both the department no. and the salary of any employee who earns a commission.
21. Query to display the department name, location name, number of employees and the average salary for all the employees in that department.
22. Query to display employee no. and name for all employees who earn more than the average salary.

PL/SQL

1. Write the PL/SQL program to find the factorial and fibonacci series of given numbers.

2.(i) Write the   PL/SQL program to check whether the string is Palindrome.
  (ii) Write the   PL/SQL program to reverse a number
  (iii) Write the   PL/SQL program to check whether the number is Armstrong

3. Write a PL/SQL block to create and handle user defined exception

clientmaster

Field name	Constraint	Type	Size
Client_id		Number	6
Client_name		Varchar2	30
Address		Varchar2	50
Phone		Number	10
Balance		Number	10,2

4. Create table with following fields:

Product table:

Field name	Constraint	Type	Size
Product_code	Primary key	Varchar2	7
Product_name		Varchar2	30
Price		Number	6,2
Quantity		Number	4

Vendor table:

Field name	Constraint	Type	Size
Vendor_name		Varchar2	30
Vendor address		Varchar2	30
Product_code	Foreign Key	Varchar2	7

Create a trigger to fire when the Record is deleted and inserted.

5. Create a table to store the salary details of the employees in a company. Declare the cursor id to contain empno, employee name and net salary. Use cursor to update the employee details.

Salary:

Field name	Constraint	Type	Size
Emp_no	Primary key	Number	4
Emp_name		Varchar2	30
Designation		Varchar2	25
Dept		Varchar2	30
Basic		Number	5

6. Create a table stock contains the itemcode varchar2(10), itemname varchar2(50), current_stock number(5), date_of_last_purchase date. Write a stored procedure to seek for an item using itemcode and delete it, if the date of last purchase is before 1 year from the current date. If not, update the curent stock.

7. Create a table to contain phone_number, user_name, address. Write a function to search for address using phone_number.

Semester – II

16ENU201	**ENGLISH – 1**	**4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

(For all undergraduate students admitted from 2016 onwards)

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcome:

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed.
6. Betterment of language competence

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman – Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT V
Short Story: The Bird – Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text
Rao, G. Chandralekha et al. (Spring 2013). Chennai: Emerald Publishers.

Suggested Reading:
Shyamala, V. (2006).English for Communication. Emerald Publishers: Chennai

16CTU301	**DATA STRUCTURES**	**Semester – III** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structures.
- To teach the concept of protection and management of data.
- To improve the logical ability

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Choose appropriate data structure as applied to specified problem definition.
2. Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Identify different parameters to analyze the performance of an algorithm.
4. Apply concepts learned in various domains like DBMS, compiler construction etc.
5. Use linear and non-linear data structures like stacks, queues, linked list etc.
6. Illustrate various technique to for searching, Sorting and hashing

UNIT-I

Arrays-Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation).Stacks Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack

UNIT-II

Linked Lists Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular, representation of Stack in Lists; Self Organizing Lists; Skip Lists Queues, Array and Linked representation of Queue, De-queue, Priority Queues

UNIT-III

Trees - Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion , Recursive and Iterative Traversals on Binary Search Trees); Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees).

UNIT-IV

Searching and Sorting,Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Insertion Sort, Shell Sort, Comparison of Sorting

Techniques

UNIT-V

Hashing - Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collusion by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing, Function.

Suggested Readings

1. Adam Drozdek. (2012). Data Structures and algorithm in C++(3rd ed.). Cengage Learning.
2. Sartaj Sahni. (2011). Data Structures, Algorithms and applications in C++(2nd ed.). Universities Press.
3. Aaron, M. Tenenbaum., Moshe, J. Augenstein., & Yedidyah Langsam. (2009). Data Structures Using C and C++(2nd ed.). PHI.
4. Robert, L. Kruse. (1999). Data Structures and Program Design in C++. Pearson.
5. D.S.Malik (2010). Data Structure using C++(2nd ed.). Cengage Learning,.
6. Mark Allen Weiss. (2011). Data Structures and Algorithms Analysis in Java (3rd ed.). Pearson Education.
7. Aaron M. Tenenbaum., Moshe, J. Augenstein., & Yedidyah Langsam. (2003). Data Structures Using Java. PHI.
8. Robert Lafore. (2003). Data Structures and Algorithms in Java(2nd ed.). Pearson/ Macmillan Computer Pub.
9. John Hubbard. (2009). Data Structures with JAVA(2nd ed.). McGraw Hill Education (India) Private Limited.
10. Goodrich, M., & Tamassia, R. (2013). Data Structures and Algorithms Analysis in Java(4th ed.). Wiley.
11. Herbert Schildt. (2014). Java The Complete Reference (English)(9th ed.). Tata McGraw Hill.
12. D. S.Malik, P.S.Nair (2003).Data Structures Using Java. .Course Technology.

Web Sites

http://en.wikipedia.org/wiki/Data_structure
http://www.cs.sunysb.edu/~skiena/214/lectures/
www.amazon.com/Teach-Yourself-Structures-Algorithms

16CTU302 PROGRAMMING WITH VISUAL BASIC **Semester – III** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- Understand the benefits of using Microsoft Visual Basic 6.0 for Windows as an application tool.
- Understand the Visual Basic event-driven programming concepts, terminology, and available tools.
- Learn the fundamentals of designing, implementing, and distributing a Visual Basic application.
- Learn to use the Visual Basic toolbox. Learn to modify object properties. Learn object methods.
- Use the menu design window. Understand proper debugging and error-handling procedures.
- Gain a basic understanding of database access and management using data bound controls. Obtain an introduction to ActiveX controls and the Windows Application Programming Interface (API).

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Demonstrate knowledge of programming terminology and how applied using Visual Basic (e.g., variables, selection statements, repetition statements, etc.)
2. Develop a Graphical User Interface (GUI) based on problem description
3. Develop an Event Planning Chart based on problem description so as to define the processing that is to occur based on specific events
4. Develop an Algorithm to verify processing is accurate
5. Develop and debug applications using Visual Basic 2010 (or version required for the course) that runs under Windows operating system
6. Develop programs that retrieve input from a file as opposed to input only provided by user

UNIT I

Beginning Visual Basic: Introduction to Visual Basic: Introduction Graphics User Interface (GUI), Programming Language (Procedural, Object oreinted, event driven), The Visual Basic environment IDE, Introduction to VB Controls: Textboxes, Frames, check boxes, options buttons, setting a border and style, the shape control, the line control, working with multiple controls and their properties, designing the user interface, keyboard access, tab controls. Default & controls property, coding for Controls, list box and combo box and their properties, filling the list box using property window/add item method, picture/image box and their properties.

UNIT II

Dealing with data: Operators-Variables-declaring variables- types of variables – data types – constants – arrays – declaring arrays – specifying arrays – Multidimensional arrays – dynamic arrays – arrays of arrays. Val function, Arithmetic operations, formatting data. Error functions and types. Introducing to Menu editor.

UNIT III
Writing Code: Control flow statements – If – Then – If-then-else – Nested control statements – Select case – Loop statements – Do-loop – For-Next – While Wend – Exit statement . Displaying message in Message box, testing whether input is valid or not. Collections – procedures – Subroutines – Functions – Calling procedures – Object Browser – Creating classes and Objects – I/O statements

UNIT IV
Working with forms and procedures: Introducing to forms and types of forms and setting form properties, creating, adding, removing forms in project, hide, show method, load, unload, statement, Me keywords, Referring to objects on a different forms. Creating an application using controls: What is on the toolbar – Textbox control – Picture box – Image box – Label box – Frame – List box – Option button – Combo box – Command Button – check box – The Drive, Directory, File list controls – Teh Line & Shape control – Scroll Box – Data – Timer.

UNIT V
Multiple Document Interface & Menus: Why MDI Forms – Features of an MDI forms – Loading MDI forms & child forms – creating a simple MDI forms –Accessing MDI froms – creating MENUS – POP-UP MENUS.
Data access controls: JET database Engine – ADODC – DAO Data control – ODBC Data Source Administrator – DATA REPORT.

Suggested Readings

1. Noel Jerke (2008). Visual Basic 6.0: Teh Complete Reference. Tata McGraw Hill Publishing Company Ltd.
2. Mohammed Azam. Programming with VB 6.0. Vikas Publishing.
3. Peter Wrights (1999). Beginning VB 6.0 (4^{th} ed.). New York:Springer-Verlag Incorporated.

16CTU303 **COMPUTER NETWORKS** **Semester – IV**
4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of osi model and tcp/ip model.
- To acquire knowledge of application layer and presentation layer paradigms and protocols.
- To study session layer design issues, transport layer services, and protocols.
- To gain core knowledge of network layer routing protocols and ip addressing.
- To study data link layer concepts, design issues, and protocols.
- To read the fundamentals and basics of Physical layer, and will apply them in real time applications.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
3. Describe the Session layer design issues and Transport layer services.
4. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
5. Describe the functions of data link layer and explain the protocols.
6. Explain the types of transmission media with real time applications

UNIT I

Introduction to Computer Networks : Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite. **Data Communication Fundamentals and Techniques**: Analog and digital signal; data-ratelimits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission;

UNIT – II

Digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media. **Networks Switching Techniques and Access mechanisms:** Circuit switching; packetswitching - connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

UNIT – III

Data Link Layer Functions and Protocol: Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.

UNIT – IV

Multiple Access Protocol and Networks: CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways; **Networks Layer Functions and Protocols**: Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols.

Unit V

Transport Layer Functions and Protocols: Transport services- error and flow control, Connection establishment and release- three way handshake; **Overview of Application layer protocol**: Overview of DNS protocol; overview of WWW &HTTP protocol.

Suggested Readings

2. B. A Forouzan (2007). Data Communications and Networking(4th ed.). THM.
3. A. S.Tanenbaum, (2002). Computer Networks (4th ed.). PHI.

WEB SITES

1. en.wikipedia.org/wiki/Internet_protocol_suite
2. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
3. www.yale.edu/pclt/COMM/TCPIP.HTM
4. www.w3schools.com/tcpip/default.asp

16CTU304A ANDROID PROGRAMMING **Semester – III**
3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce Android platform and its architecture.
- To learn activity creation and Android UI designing.
- To be familiarized with Intent, Broadcast receivers and Internet services.
- To work with SQLite Database and content providers.
- To integrate multimedia, camera and Location based services in Android Application.
- To explore Mobile security issues.

Course Outcomes (COs)

Upon completion of this course, the students will able to

1. Describe Android platform, Architecture and features.
2. Design User Interface and develop activity for Android App.
3. Use Internet, Broadcast receivers and Internet services in Android App.
4. Design and implement Database Application and Content providers.
5. Use multimedia, camera and Location based services in Android App.
6. Discuss various security issues in Android platform

UNIT-I

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.

UNIT-II

Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

UNIT-III

Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project– Hello Word, run on emulator, Deploy it on USB-connected Android device.

UNIT-IV

User Interface Architecture: Application context, intents, Activity life cycle, multiple screen size s.

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners(Combo boxes),Images, Menu, Dialog.

UNIT-V

Database:Understanding of SQLite database, connecting with the database.

Suggested Readings

1. James, C. Sheusi.(2013). Android application development for java programmers. Cengage Learning.

REFERENCES

1. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html
4. http://docs.oracle.com/javase/tutorial/index.htm(Available in the form of free downloadable ebooks also).
5. http://developer.android.com/guide/components/activities.html
6. http://developer.android.com/guide/components/fundamentals.html
7. http://developer.android.com/guide/components/intents-filters.html.
8. http://developer.android.com/training/multiscreen/screensizes.html
9. http://developer.android.com/guide/topics/ui/controls.html
10. http://developer.android.com/guide/topics/ui/declaring-layout.html
11. http://developer.android.com/training/basics/data-storage/databases.html

Semester – III

16CTU304B **PROGRAMMING IN MATLAB** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To familiarize of the syntax, semantics, data-types and library functions of numerical computing languages such as MATLAB and/or SCILAB
- To reinforce a structured, top-down approach to formulate and solve problems.
- To introduce common approaches, structures, and conventions for creating and evaluating computer programs, primarily in a procedural paradigm, but with a brief introduction to object-oriented concepts and terminology.
- To understand a variety of common numeric techniques to solve and visualize engineering-related computational problems.
- To introduce the MATLAB software environment.
- To implement/simulate and visualization of basic mathematical functions relevant to electronics applications.

Course Outcomes (Cos)

By the end of this course, students should be able to

1. Use MATLAB effectively to analyze and visualize data.
2. Apply numeric techniques and computer simulations to solve engineering-related problems.
3. Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives.
4. Design and document computer programs and analyses in a careful and complete manner so as to effectively communicate results, to facilitate evaluation and debugging by another programmer, and to anticipate and resolve user errors.
5. Demonstrate understanding and use of fundamental data structures (classes).
6. Create and control simple plot and user-interface graphics objects in MATLAB.

UNIT-I

Introduction to Programming: Components of a computer, working with numbers, Machine code, Software hierarchy.

UNIT-II

Programming Environment: MATLAB Windows, A First Program, Expressions, Constants, Variables and assignment statement, Arrays.

UNIT-III

Graph Plots: Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save. Procedures and Functions: Arguments and return values, M-files, Formatted console input-output , String handling,

UNIT-IV

Control Statements: Conditional statements: If, Else, Else-if, Repetition statements: While, for loop

UNIT-V

Manipulating Text: Writing to a text file, Reading from a text file, Randomising and sorting a list, searching a list. **GUI Interface**: Attaching buttons to actions, Getting Input, Setting Output

Suggested Readings

1. Amos Gilat (2004). MATLAB: An Introduction with Applications(2^{nd} ed). New Delhi: Wiley.

2. C.B. Moler (2004). Numerical Computing with MATLAB. SIAM.

16CTU311	**DATA STRUCTURES - PRACTICAL**	**Semester – III** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structures.
- To teach the concept of protection and management of data.
- To improve the logical ability

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Choose appropriate data structure as applied to specified problem definition.
2. Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Identify different parameters to analyze the performance of an algorithm.
4. Apply concepts learned in various domains like DBMS, compiler construction etc.
5. Use linear and non-linear data structures like stacks, queues, linked list etc.
6. Illustrate various technique to for searching, Sorting and hashing

List of Programs

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.

2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.

3. Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).

4. Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.

5. Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.

6. Perform Stack operations using Linked List implementation.

7. Perform Stack operations using Array implementation. Use Templates.

8. Perform Queues operations using Circular Array implementation. Use Templates.

9. Create and perform different operations on Double-ended Queues using Linked List implementation.

10. WAP to scan a polynomial using linked list and add two polynomial.

11. WAP to calculate factorial and to compute the factors of a given no. (i)using recursion, (ii) using iteration

12. (ii) WAP to display fibonaITUi series (i)using recursion, (ii) using iteration

13. WAP to calculate GCD of 2 number (i) with recursion (ii) without recursion

14. WAP to create a Binary Search Tree and include following operations in tree: (a) Insertion (Recursive and Iterative Implementation)

(b) Deletion by copying

(c) Deletion by Merging

(d) Search a no. in BST

(e) Display its preorder, postorder and inorder traversals Recursively

(f) Display its preorder, postorder and inorder traversals Iteratively

(g) Display its level-by-level traversals

(h) Count the non-leaf nodes and leaf nodes

(i) Display height of tree

(j) Create a mirror image of tree

(k) Check whether two BSTs are equal or not

15. WAP to convert the Sparse Matrix into non-zero form and vice-versa.

16. WAP to reverse the order of the elements in the stack using additional stack.

17. WAP to reverse the order of the elements in the stack using additional Queue.

18. WAP to implement Diagonal Matrix using one-dimensional array.

19. WAP to implement Lower Triangular Matrix using one-dimensional array.

20. WAP to implement Upper Triangular Matrix using one-dimensional array.

21. WAP to implement Symmetric Matrix using one-dimensional array.

22. WAP to create a Threaded Binary Tree as per inorder traversal, and implement operations like finding the suITUessor / predecessor of an element, insert an element, inorder traversal.

23. WAP to implement various operations on AVL Tree.

Semester – III

16CTU312 PROGRAMMING WITH VISUAL BASIC - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- Understand the benefits of using Microsoft Visual Basic 6.0 for Windows as an application tool.
- Understand the Visual Basic event-driven programming concepts, terminology, and available tools.
- Learn the fundamentals of designing, implementing, and distributing a Visual Basic application.
- Learn to use the Visual Basic toolbox. Learn to modify object properties. Learn object methods.
- Use the menu design window. Understand proper debugging and error-handling procedures.
- Gain a basic understanding of database access and management using data bound controls. Obtain an introduction to ActiveX controls and the Windows Application Programming Interface (API).

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Demonstrate knowledge of programming terminology and how applied using Visual Basic (e.g., variables, selection statements, repetition statements, etc.)
2. Develop a Graphical User Interface (GUI) based on problem description
3. Develop an Event Planning Chart based on problem description so as to define the processing that is to occur based on specific events
4. Develop an Algorithm to verify processing is accurate
5. Develop and debug applications using Visual Basic 2010 (or version required for the course) that runs under Windows operating system
6. Develop programs that retrieve input from a file as opposed to input only provided by user

List of Programs

Implement the following projects using Visual Basic Language

1. To calculate the Simple interest and compound interest
2. To perform the following string functions
   a. Upper to lower
   b. String concatenation
   c. String length

   d. String compare
   e. Bold, Italic and Underline
   f. Rtrim and Ltrim
   g. Change the backround of form

3. To draw different shapes and fill with different colors using MDI form
4. To implement a simple calculator
5. To create an ActiveX Control
6. To animate the picture using timer control
7. To convert text to voice
8. To simulate web browser
9. Develop a project for Railway Reservation System
10. Develop a project for Employee Payroll system
11. Develop a project for Student Information system. Generate data report for Student marklist
12. Develop a project to generate Barcode for Library applications

16CTU313	**COMPUTER NETWORKS - PRACTICAL**	**Semester – IV** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To acquire knowledge of Application layer and Presentation layer paradigms and protocols.
- To study Session layer design issues, Transport layer services, and protocols.
- To gain core knowledge of Network layer routing protocols and IP addressing.
- To study data link layer concepts, design issues, and protocols.
- To read the fundamentals and basics of Physical layer, and will apply them in real time applications.

Course Outcomes (COs)

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
3. Describe the Session layer design issues and Transport layer services.
4. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
5. Describe the functions of data link layer and explain the protocols.
6. Explain the types of transmission media with real time applications

List of Programs

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

Semester – III

16CTU314A ANDROID PROGRAMMING - PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce Android platform and its architecture.
- To learn activity creation and Android UI designing.
- To be familiarized with Intent, Broadcast receivers and Internet services.
- To work with SQLite Database and content providers.
- To integrate multimedia, camera and Location based services in Android Application.
- To explore Mobile security issues.

Course Outcomes (COs)

Upon completion of this course, the students will able to

1. Describe Android platform, Architecture and features.
2. Design User Interface and develop activity for Android App.
3. Use Internet, Broadcast receivers and Internet services in Android App.
4. Design and implement Database Application and Content providers.
5. Use multimedia, camera and Location based services in Android App.
6. Discuss various security issues in Android platform

List of Programs

1. Create ―Hello World‖ application. That will display ―Hello World‖ in the middle of the screen in the emulator. Also display ―Hello World in the middle of the screen in the Android Phone.
2. Create an application with login module. (Check username and password).
3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.
4. Create a menu with 5 options and and selected option should appear in text box.
5. Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen.
6. Create an application with three option buttons, on selecting a button colour of the screen will change.
7. Create and Login application as above. On successful login, pop up the message.
8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.

16CTU314B	**PROGRAMMING IN MATLAB - PRACTICAL**	**Semester – III** **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

- To familiarize of the syntax, semantics, data-types and library functions of numerical computing languages such as MATLAB and/or SCILAB
- To reinforce a structured, top-down approach to formulate and solve problems.
- To introduce common approaches, structures, and conventions for creating and evaluating computer programs, primarily in a procedural paradigm, but with a brief introduction to object-oriented concepts and terminology.
- To understand a variety of common numeric techniques to solve and visualize engineering-related computational problems.
- To introduce the MATLAB software environment.
- To implement/simulate and visualization of basic mathematical functions relevant to electronics applications.

Course Outcomes (Cos)

By the end of this course, students should be able to

1. Use MATLAB effectively to analyze and visualize data.
2. Apply numeric techniques and computer simulations to solve engineering-related problems.
3. Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives.
4. Design and document computer programs and analyses in a careful and complete manner so as to effectively communicate results, to facilitate evaluation and debugging by another programmer, and to anticipate and resolve user errors.
5. Demonstrate understanding and use of fundamental data structures (classes).
6. Create and control simple plot and user-interface graphics objects in MATLAB.

List of Programs

1. Write a program to assign the following expressions to a variable A and then to print out the value of A.

    a. (3+4)/(5+6)
    b. $2\Pi^2$
    c. $\sqrt{2}$
    d. (0.0000123 + 5.67×10-3) × 0.4567×10-4

2. Celsius temperatures can be converted to Fahrenheit by multiplying by 9, dividing by 5, and adding 32. Assign a variable called C the value 37, and implement this formula to assign a variable F the Fahrenheit equivalent of 37 Celsius.

3. Set up a vector called N with five elements having the values: 1, 2, 3, 4, 5. Using N, create assignment statements for a vector X which will result in X having these values:

    a. 2, 4, 6, 8, 10
    b. 1/2, 1, 3/2, 2, 5/2

c. 1, 1/2, 1/3, 1/4, 1/5
d. 1, 1/4, 1/9, 1/16, 1/25

4. A supermarket conveyor belt holds an array of groceries. The price of each product (in pounds) is [0.6, 1.2 ,0.5, 1.3] ; while the numbers of each product are [3, 2 ,1 ,5]. Use MATLAB to calculate the total bill.

5. The sortrows(x) function will sort a vector or matrix X into increasing row order. Use this function to sort a list of names into alphabetical order.

6. The ―identity‖ matrix is a square matrix that has ones on the diagonal and zeros elsewhere. You can generate one with the eye() function in MATLAB. Use MATLAB to find a matrix B, such that when multiplied by matrix A=[1 2; -1 0] the identity matrix I=[1 0; 0 1] is generated. That is A*B=I.

7. Create an array of N numbers. Now find a single MATLAB statement that picks out from that array the 1,4,9,16,…,√Nth entries, i.e. those numbers which have indices that are square numbers.

8. Draw a graph that joins the points (0,1), (4,3), (2,0) and (5,-2).

9. The seeds on a sunflower are distributed according to the formula below. Plot a small circle at each of the first 1000 co-ordinates :

$$r_n = \sqrt{n}$$

$$\theta_n = \frac{137.51}{180}\pi n$$

10. Calculate 10 approximate points from the function y=2x by using the formulae:
i. xn = n
ii. yn = 2n + rand - 0.5

Fit a line of best fit to these points using the function polyfit() with degree=1, and generate co-ordinates from the line of best fit using polyval(). Use the on-line help to find out how to use these functions. Plot the raw data and the line of best fit.

11. Calculate and replay 1 second of a sinewave at 500Hz with a sampling rate of 11025Hz. Save the sound to a file called ex35.wav. Plot the first 100 samples.

12. Calculate and replay a 2 second chirp. That is, a sinusoid that steadily increases in frequency with time, from say 250Hz at the start to 1000Hz at the end.

13. Build a square wave by adding together 10 odd harmonics: 1f, 3f, 5f, etc. The amplitude of the nth harmonic should be 1/n. Display a graph of one cycle of the result superimposed on the individual harmonics.

14. Write a function called FtoC (ftoc.m) to convert Fahrenheit temperatures into Celsius. Make sure the program has a title comment and a help page. Test from the command window with:

i. FtoC(96)
ii. lookfor Fahrenheit
iii. help FtoC

15. Write a program to input 2 strings from the user and to print out (i) the concatenation of the two strings with a space between them, (ii) a line of asterisks the same length as the concatenated strings, and (iii) the reversed concatenation. For example:

i. Enter string 1: Mark
ii. Enter string 2: Huckvale
iii. Mark Huckvale
iv. *************
v. elavkcuH kraM

Semester – III

16CTU401 **OPERATING SYSTEMS** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC. To understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- To study the need for special purpose operating system with the advent of new emerging technologies
- To understand the structure and organization of the file system

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Describe the important computer system resources and the
2. Perform the role of operating system in their management policies and algorithms.
3. Understand the process management policies and scheduling of processes by CPU
4. Evaluate the requirement for process synchronization and coordination handled by operating system
5. Describe and analyze the memory management and its allocation policies.
6. Identify use and evaluate the storage management policies with respect to different storage management technologies, identify the need to create the special purpose operating system.

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UNIT-I

Introduction to Operating System: Basic OS Functions-Resource Abstraction-Types of Operating Systems–Multiprogramming Systems-Batch Systems-Time Sharing Systems-Operating Systems for Personal Computers & Workstations-Process Control & Real Time Systems.

UNIT-II

Operating System Organization: Processor and user modes-Kernels-System Calls and System Programs. **Process Management:** System view of the process and resources-Process abstraction-Process hierarchy-Threads-Threading issues-Thread libraries-Process Scheduling-Non pre-emptive and Preemptive scheduling algorithms-Concurrent and processes-Critical Section-Semaphores-Methods for inter-process communication-Deadlocks.

UNIT-III

Memory Management: Physical and Virtual address space-Memory Allocation strategies –Fixed and Variable partitions-Paging-Segmentation-Virtual memory.

UNIT-IV

File and I/O Management: Directory structure-File operations-File Allocation methods-Device management.

UNIT-V

Protection and Security: Policy mechanism-Authentication-Internal aITUess Authorization.

Suggested Readings

1. A .Silberschatz, , P.B Galvin, G.Gagne (2008). Operating Systems Concepts, 8th ed.). John Wiley Publications.
2. A.S. Tanenbaum, (2007).Modern Operating Systems (3rd ed.). New Delhi: Pearson Education.
3. W. Stallings, (2008). Operating Systems, Internals & Design Principles (5th ed.). Prentice Hall of India.

Web Sites

1. www.cs.columbia.edu/~nieh/teaching/e6118_s00/
2. www.clarkson.edu/~jnm/cs644
3. pages.cs.wisc.edu/~remzi/Classes/736/Fall2002/

		Semester – IV
16CTU402	**SOFTWARE ENGINEERING**	**4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces. 4. To know basics of testing and understanding concept of software quality assurance and software configuration management process.
- To understand the need of project management and project management life cycle.
- To understand project scheduling concept and risk management associated to various type of projects.
- Implement a given software design using sound development practices.

Course Outcomes (COs)

1. Apply their knowledge of mathematics, sciences, and computer science to the modeling, analysis, and measurement of software artifacts.
2. Work effectively as leader/member of a development team to deliver quality software artifacts.
3. Analyze, specify and document software requirements for a software system.
4. Verify, validate, assess and assure the quality of software artifacts.
5. Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its Course Objectivesand risks, and estimate its cost and time.
6. Express and understand the importance of negotiation, effective work habits, leadership, and good communication with stakeholders, in written and oral forms, in a typical software development environment.

UNIT-I

Introduction: The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

UNIT-II

Requirement Analysis; Initiating Requirement EngineeringProcess- Requirement Analysis and Modeling Techniques- FlowOriented Modeling- Need for SRS-Characteristics and Components of SRS- Software Project Management: Estimation in Project Planning Process, Project Scheduling.

UNIT-III

Risk Management: Software Risks, Risk Identification Risk Projection and Risk Refinement, RMMM plan, **Quality Management-** Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects

UNIT-IV

Design Engineering-Design Concepts, Architectural Design Elements, Software Architecture,Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design

UNIT-V

Testing Strategies & Tactics: Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing Black-Box Testing, White-Box Testing and their type, Basis Path Testing

Suggested Readings

1. R.S. Pressman, (2009). Software Engineering: A Practitioner's Approach (7^{th} ed.). McGraw-Hill.
2. P.Jalote (2008). An Integrated Approach to Software Engineering (2^{nd} ed.). New Age International Publishers.
3. K.K. Aggarwal and Y.Singh (2008). Software Engineering (2^{nd} ed.). New Age International Publishers.
4. Sommerville (2006). Software Engineering (8^{th} ed.). Addison Wesley.
5. D.Bell (2005). Software Engineering for Students (4^{th} ed.) Addison-Wesley.
6. R.Mall (2004). Fundamentals of Software Engineering (2^{nd} ed.). Prentice-Hall of India.

WEB SITES

1. http://en.wikipedia.org/wiki/Software_engineering
2. http://www.onesmartclick.com/engineering/software-engineering.html
3. http://www.CC.gatech.edu/classes/AY2000/cs3802_fall/

16CTU403 INTERNETWORKING WITH TCP/IP **Semester – IV 4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

SCOPE

Build and understanding of the fundamental concepts of computer networking. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

OBJECTIVES

- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparting the student for entry advanced courses in computer networking.
- Understand various transmission media, their comparitive study, fiber optics and wireless media.

UNIT I

Introduction: History of Internet – Interconnecting devices – protocols and standards – TCP/IP protocol suite – internetworking devices – routing concept – classfull IP addressing – subnetting – supernetting – classless addressing.

UNIT II

ARP & RARP – Proxy ARP – ARP over ATM – ARP and RAPP protocol format. IP datagram – Fragmentation – Options – IP datagram format – Routing IP datagrams – Cheksum. ICMP – types of messages – message format – Error reporting – Query – Cheksum.

UNIT III

Group management – IGMP message – IGMP operation – process to process communication – UDP operation – TCP services – Flow control.

UNIT IV

BOOTP – DHCP – Address discovery and Binding. DNS – Name Space – DNS in Internet – Resolution – Resource Records.

UNIT V

Remote Login- FTP – SMTP – SNMP . IP over ATM Wan – Cells – Routing the Cells – ATMARP – Logical IP SUBNETS – VPN.%

Suggested Readings

1. Behrouz A. Forouzan (2010). TCP/IP protocol suite (4th ed.). New Delhi: Tata McGraw Hill publication.
2. Andrews S.Tanenbaum (2003). Computer Networks. (4th ed.). New Delhi: Prentice Hall of India Private Ltd.
3. Buck Graham (2007). TCP/IP addressing (2nd ed.). New Delhi: Harcount India Private Limited.
4. Douglas E. Comer (2000). Computer Networks and Internets (4th ed.). New Delhi: Pearson education Asia.
5. William Stallings (2007). Data and Computer Communication Network (8th ed.). New delhi: Tata McGraw Hill

Web sites

1. en.wikipedia.org/wiki/internet_protocol_suite
2. www.yale.edu/pclt/COMM/TCPIP.HTM
3. www.w3schools.com/tcpip/default.asp

16CTU404A	HTML PROGRAMMING	Semester – IV 3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces. 4. To know basics of testing and understanding concept of software quality assurance and software configuration management process.
- To understand the need of project management and project management life cycle.
- To understand project scheduling concept and risk management associated to various type of projects.
- Implement a given software design using sound development practices.

Course Outcomes (COs)

1. Apply their knowledge of mathematics, sciences, and computer science to the modeling, analysis, and measurement of software artifacts.
2. Work effectively as leader/member of a development team to deliver quality software artifacts.
3. Analyze, specify and document software requirements for a software system.
4. Verify, validate, assess and assure the quality of software artifacts.
5. Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its Course Objectivesand risks, and estimate its cost and time.
6. Express and understand the importance of negotiation, effective work habits, leadership, and good communication with stakeholders, in written and oral forms, in a typical software development environment.

UNIT – I

Introduction the basics: The Head, the Body,Colors, Attributes, Lists, ordered and unordered.

UNIT – II

Links Introduction: Relative links, absolute links, Link attributes, Using the ID attribute to Link within a Document.

UNIT – III

Images: Putting an image on a page, Using images as Links, Putting an image in the background.

UNIT – IV

Tables: Creating a table, Table headers, Captions, Spanning Multiple columns, styling Table.

UNIT – V

Forms: Basic input and attributes, other kinds of inputs, styling forms with CSS, Where to Go from Here.

Suggested Readings

1. Virginia DeBolt (2006). Integrated HTML and CSS A Smarter, Faster way to learn Wiley/Sybex.
2. Cassidy Williams, Camryn Williams (2015). Introduction to HTML and CSS, O'Reilly.

Websites

1. www.w3schools.com/
2. alecle.net/archives/category/web-technology
3. jmarshall.com/easy
4. www.php.net/
5. en.wikipedia.org/wiki/php
6. www.w3schools.com/PHP/DEfaULT.asp

Semester – IV

16CTU404B **XML PROGRAMMING** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To expose the students to the XML family of technologies, and the latest W3C and WS-I XML standards.
- To understand the various applications of XML in the areas of information representation, Presentation Oriented Publishing, Message Oriented computing, and Application Configuration.
- To expose the students to the combined use of XML and Java technologies
- To support the development of modern applications targeted to the evolving spectrum of distributed and decentralized enterprise platforms.
- To expose the students to the advanced XML-enabled capabilities of the Java 2 development environment for Enterprise Applications.
- To demonstrate the application of XML in distributed communications enabling, enterprise systems assurance, web enabling, application enabling, and enterprise data enabling.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Create a new webpage
2. Understand the fundamental features of web applications.
3. Understand the objects and components needed for a web designing.
4. Understand the current industry support for XML technologies.
5. Sharpen the students' practical development skills via focused assignments and projects.
6. Understand what is XML and how to parse and use XML Data

UNIT-I

Introduction: Understanding Mark-up Languages, Introduction to XML and its Goals.

UNIT-II

XML Basics: XML Structure and Syntax, Document classes and Rules.

UNIT-III

Other XML Concepts: Scripting XML

UNIT-IV

Other XML Concepts: XML as Data, Linking with XML

UNIT-V

XML with Style: XSL –Style Sheet Basics, XSL basics, XSL style sheets.

Suggested Readings

1. William, J. Pardi. XML in action web technology.
2. Michael, J. Young. Step by Step XML.

16CTU411	**OPERATING SYSTEMS - PRACTICAL**	**Semester – III** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC. To understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- To study the need for special purpose operating system with the advent of new emerging technologies
- To provide necessary skills for developing and debugging programs in UNIX environment.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Describe the important computer system resources and the
2. Perform the role of operating system in their management policies and algorithms.
3. Understand the process management policies and scheduling of processes by CPU
4. Evaluate the requirement for process synchronization and coordination handled by operating system
5. Describe and analyze the memory management and its allocation policies.
6. Identify, use and evaluate the storage management policies with respect to different storage management technologies, identify the need to create the special purpose operating system.

List of Programs

1. Write a program (using fork() and/or exec() commands) where parent and child execute:
    a) same program, same code.
    b) same program, different code.
    c) before terminating, the parent waits for the child to finish its task.
2. Write a program to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)
3. Write a program to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)

4. Write a program to print file details including owner access permissions, file access time, where file name is given as argument.
5. Write a program to copy files using system calls.
6. Write program to implement FCFS scheduling algorithm.
7. Write program to implement Round Robin scheduling algorithm.
8. Write program to implement SJF scheduling algorithm.
9. Write program to implement non-preemptive priority based scheduling algorithm.
10. Write program to implement preemptive priority based scheduling algorithm.
11. Write program to implement SRJF scheduling algorithm.
12. Write program to calculate sum of n numbers using thread library.
13. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

Semester – IV

16CTU412 SOFTWARE ENGINEERING - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces. 4. To know basics of testing and understanding concept of software quality assurance and software configuration management process.
- To understand the need of project management and project management life cycle.
- To understand project scheduling concept and risk management associated to various type of projects.
- To analyze, specify and document software requirements for a software system.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Apply their knowledge of mathematics, sciences, and computer science to the modeling, analysis, and measurement of software artifacts.
2. Work effectively as leader/member of a development team to deliver quality software artifacts.
3. Implement a given software design using sound development practices.
4. Verify, validate, assess and assure the quality of software artifacts.
5. Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its Course Objectivesand risks, and estimate its cost and time.
6. Express and understand the importance of negotiation, effective work habits, leadership, and good communication with stakeholders, in written and oral forms, in a typical software development environment.

List of Programs

S. No	**Practical Title**
1.	• Problem Statement • Process Model
2.	Requirement Analysis: • Creating a Data Flow • Data Dictionary, Use Cases

3.	Project Management: • Computing FP • Effort • Schedule, Risk Table, Timeline chart
4.	Design Engineering: • Architectural Design • Data Design, Component Level Design
5.	Testing: • Basis Path Testing

Sample Projects:

1. **Criminal Record Management**: Implement a criminal record management system for jailers, police officers and CBI officers

2. **DTC Route Information**: Online information about the bus routes and their frequency and fares

3. **Car Pooling**: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.

4. Patient Appointment and Prescription Management System

5. Organized Retail Shopping Management Software

6. Online Hotel Reservation Service System

7. Examination and Result computation system

8. Automatic Internal Assessment System

9. Parking Allocation System

10. Wholesale Management System

Semester – IV

16CTU413 **TCP/IP - PRACTICAL** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To acquire knowledge of Application layer and Presentation layer paradigms and protocols.
- To study Session layer design issues, Transport layer services, and protocols.
- To gain core knowledge of Network layer routing protocols and IP addressing.
- To study data link layer concepts, design issues, and protocols.
- To read the fundamentals and basics of Physical layer, and will apply them in real time applications.

Course Outcomes (COs)

After successful completion the student will be able to:

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
3. Describe the Session layer design issues and Transport layer services.
4. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
5. Describe the functions of data link layer and explain the protocols.
6. Explain the types of transmission media with real time applications

Implement the following Program

1. Simple router configuration
2. Access and utilize the router to set basic parameters.
3. Connect, configure, and verify operation status of a device interface.
4. Implement static and dynamic addressing services for hosts in a LAN environment.
5. Identify and correct common problems associated with IP addressing and host configurations.
6. Describe basic routing concepts (including: packet forwarding, router lookup process).
7. Configure, verify and troubleshoot RIPv2.
8. Perform and verify routing configuration tasks for a static or default route given
9. Configure, verify and troubleshoot DHCP and DNS operation on a router.
10. Configure and verify a PPP connection between routers.

16CTU414A	HTML PROGRAMMING - PRACTICAL	Semester – IV 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- Understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
- Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice.
- Develop skills in analyzing the usability of a web site.
- Understand how to plan and conduct user research related to web usability.
- Learn the language of the web: HTML and CSS.
- Develop basic programming skills using Javascript

Course Outcomes (Cos)

The students will be able to:

1. Analyze a web page and identify its elements and attributes.
2. Design a basic web site using HTML5 and CSS3 to demonstrate responsive web design
3. Implement dynamic web pages with validation using JavaScript objects by applying different event handling mechanism.
4. Create web pages using XHTML and Cascading Style Sheets.
5. Build dynamic web pages using JavaScript (Client side programming).
6. Create XML documents and Schemas

List of Programs

1. Create an HTML document with the following formatting options
   I. Bold
   II. Italics
   III. Underline
   IV. Headings (Using H1 to H6 heading styles)
   V. Font (Type, Sixe and Color)
   VI. Background (Colored background/Image in background)
   VII. Paragraph
   VIII. Line Break
   IX. Horizontal Rule
   X. Pre tag

2. Create an HTML document which consists of:
   I. Ordered List
   II. Unordered List
   III. Nested List
   IV. Image

3. Create an HTML document which implements Internal linkings as well as External linking
4. Create a table using HTML which consists of columns for Roll No., Student's name and grade

<table>
<tr><td colspan="3">Result</td></tr>
<tr><td>Roll No.</td><td>Name</td><td>Grade</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

5. Create a table with the following view

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="4"></td><td colspan="2" rowspan="2">Place an image here</td></tr>
<tr><td colspan="4"></td></tr>
</table>

6. Create a form using HTML which as the following types of controls:
   I. Text Box
   II. Option/radio buttons
   III. Check boxes
   IV. Reset and Submit buttons

7. Create HTML documents (having multiple frames) in the following three formats

<table>
<tr><td>Frame 1</td></tr>
<tr><td>Frame 2</td></tr>
</table>

<table>
<tr><td colspan="2">Frame 1</td></tr>
<tr><td>Frame2</td><td>Frame3</td></tr>
</table>

16CTU414B	**XML PROGRAMMING - PRACTICAL**	**Semester – IV** **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To expose the students to the XML family of technologies, and the latest W3C and WS-I XML standards.
- To understand the various applications of XML in the areas of information representation, Presentation Oriented Publishing, Message Oriented computing, and Application Configuration.
- To expose the students to the combined use of XML and Java technologies
- To support the development of modern applications targeted to the evolving spectrum of distributed and decentralized enterprise platforms.
- To expose the students to the advanced XML-enabled capabilities of the Java 2 development environment for Enterprise Applications.
- To demonstrate the application of XML in distributed communications enabling, enterprise systems assurance, web enabling, application enabling, and enterprise data enabling.

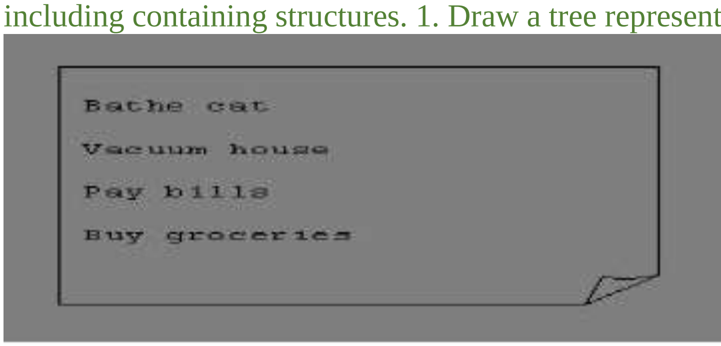
Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Create a new webpage
2. Understand the fundamental features of web applications.
3. Understand the objects and components needed for a web designing.
4. Understand the current industry support for XML technologies.
5. Sharpen the students' practical development skills via focused assignments and projects.
6. Understand what is XML and how to parse and use XML Data

1. Information Structure

In this exercise, student will practice identifying the structure of an information object. For the sample document provided below: Label the information structures you see, including containing structures. 1. Draw a tree representation of the structure.



2. Deconstructing an XML Document

In this exercise, student will practice identifying the explicit structure within an XML document. In a sense, this is the reverse of what you did in Exercise #1. For the sample

XML markup below, create a document-like representation (or a simple drawing) for the content contained within the XML tags:
<book>
<coverInfo>
<title>The XML Handbook</title>
<author>Charles F. Goldfarb</author>
<author>Paul Prescod</author>
<edition>Second</edition>
<description>The definitive XML resource: applications, products, and technologies. Revised and expanded—over 600 new pages. </description>
</coverInfo> </book>

3. Creating XML Markup
In this exercise, create some XML markup based on the tree representation from Exercise #1 above, and the content from the original sample document.

4. Well-Formedness
This exercise checks your understanding of the constraints for well-formedness. Are the following document instances well-formed? Explain any NO answers.
<list><title>The first list</title><item>An item</list>
<item>An item</item><item>Another item</item>
<para>Bathing a cat is a <emph>relatively</emph> easy task as long as the cat is willing.</para>
<bibl><title>How to Bathe a Cat<author></title>Merlin Bauer<author></bibl>

5. Well Formedness
This exercise is a bit more challenging than the previous example. Here is a fragment of an XML document instance. Identify all the places where it fails to match the constraints for well-formedness.
<PROCEDURE><TITLEHow to Bathe a Cat</TITLE>
<OVERVIEW> This procedure tells you how to bathe a cat.
<WARNING></OVERVIEW>Cats don't like to take baths. You could get hurt doing this. Be sure to obtain all the required protective gear before you start.
</WARNING><EQUIPEMENT><ITEM>Hockey Mask <ITEM>Padded Full-body Kevlar Armor</ITEM><ITEM>Tub full of warm water</ITEM><ITEM>Towels </ITEM><ITEM>First Aid kit</ITEM><ITEM>Cat Shampoo</ITEM>
<EQUIPMENT><INSTRUCTIONS> <STEP> Locate the cat, who by now is hiding under the bed.</STEP><STEP>Place the cat in the tub of water.</STEP> <ITEM>Using the First Aid kit, repair the damage to your head and arms.</STEP> <STEP>Place the cat back in the tub and hold it down.</STEP> <STEP>Wash it really fast, then make an effort to dry it with the towels.</STEP> <STEP>Decide not to do this again. </STEP>
</INSTRUCTIONS>

Semester – V

16CTU501A CRYPTOGRAPHY AND NETWORK SECURITY 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand basics of Cryptography and Network Security.
- To know about various encryption techniques.
- To understand the concept of Public key cryptography.
- To study about message authentication and hash functions
- To impart knowledge on Network security
- To understand various protocols for network security to protect against the threats in the networks.

Course Outcomes (COs)

After successful completion of the course, the learners would be able to:

1. Illustrate various Public key cryptographic techniques
2. Evaluate the authentication and hash algorithms
3. Provide security of the data over the network.
4. Do research in the emerging areas of cryptography and network security.
5. Implement various networking protocols.
6. Protect any network from the threats in the world

UNIT-I

Introduction to Cryptography – security attacks – Security services- security Algorithm – Stream cipher and Block cipher – Symmetric and Asymmetric – key cryptosystems; Symmetric key algorithms: Introduction – DES – Triple DES – AES – IDEA – Blowfish – RC5.

UNIT-II

Public key Cryptosystem: Introduction to Number Theory – RSA Algorithm – key management – Diffie-Hellman key exchange – Introduction to elliptic curve cryptography; message authentication and hash function – hash and MAC algorithm – digital signatures and authentication protocol.

UNIT-III

Network security practice: Authentication applications – kerberos – X.509 authentication services and encryption techniques:;E-mail security – PGP – S/MIME – IP security

UNIT-IV

Web security – secure socket layer – secure electronic transaction; System security – Intruders and viruses – Firewalls – Password security.

UNIT V

Case study : Implementation of Cryptographic algorithms – RSA – DSA – ECC (C/JAVA programming). Network forensic -Security audit; Other security mechanism:

Introduction to stegnography – quantum cryptography – Water marking – DNA cryptography.

Suggested Readings

1. William Stallings (2013). Cryptography and Network Security (6th ed.). Pearson education, New delhi.

2. Bruce Schneir (2016). Applied cryptography (2nd ed.). CRC Press, New delhi.
3. A.Menezes, P.Van Oorschot and S.Vanstone (2010). Handbook of applied cryptography (2nd ed.). CRC Press New delhi.
4. Ankit Fadia (2010). Network security (2nd ed.). McMillan India Ltd., New Delhi.

Websites

1. williamstallings.com/crypto3e.html
2. u.cs.biu.ac.il/~herzbea/book.html
3. www.flipkart.com/search-books/cryptography+and+network+security+William+stallings+ebook

Semester – V

16CTU501B **SOFTWARE TESTING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To learn the basic software debugging methods.
- To understand the White box and Black Box testing methods and techniques
- To design test plans.
- To discuss various software testing issues and solutions in software unit test, integration and system testing
- To learn the different testing tools (familiar with open source tools)
- To understand Quality Assurance models.

Course Outcomes (COs)

After completion of this course, the students will be able to

1. Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.
2. Implement various test processes for quality improvement
3. Design test planning.
4. Manage the test process
5. Apply the software testing techniques in commercial environment
6. Use practical knowledge of a variety of ways to test software and an understanding of some of the tradeoffs between testing techniques.

UNIT – I Testing Fundamentals

Examining the Specification: Getting started – Performing a high-level review of the specification – Low-level specification test techniques. Testing the software with blinders on: Dynamic Black-Box Testing- Test-to-Pass and Test-to-Fail- Equivalence Partitioning- Data testing – State testing – Other Black-box test techniques.

UNIT – II Examining the code

Static White-Box testing- Formal reviews – Coding Standards and Guidelines- Generic Code Review Checklist. Testing the software with X-Ray glasses: Dynamic White-Box testing- Dynamic White-Box testing versus Debugging-Testing the Pieces- Data Coverage- Code Coverage.

Flowgraphs and Path Testing

Path-testing Basics – Predicates, Path Predicates and Achievable Paths-Path sensitizing-Path Instrumentation-Implementation and Application of Path Testing

UNIT – III Transaction-Flow Testing and Data-Flow Testing

Transaction Flows-Transaction Flow Testing Techniques. Data-Flow Testing Basics-Data-Flow Testing Strategies-Application, Tools, Effectiveness

UNIT – IV Domain Testing
Domains and Paths-Domain Testing-Domains and Interface Testing-Domains and Testability

UNIT – V Logic-Based Testing and State Graphs
Motivational Overview-Decision Tables-Path Expressions Again-KV Charts-Specifications
State Graphs-Good State Graphs and Bad-State Testing

Suggested Readings

1. Boris Beizer (2009), Software Testing Techniques (2^{nd} ed.). New Delhi Dreamtech Press
2. Ron Patton (2002) Software Testing (2^{nd} ed.). New Delhi: Pearson Education
3. Dorothy Graham, Erik Van Veenendaal, Isabel Evans, Rex Black (2007). Foundations of Software Testing, ISTQB Certification.
4. Brian Hambling, Peter Morgan, Angelina Samaroo, Geoff Thompson (2010). Software Testing , (2^{nd} ed.). An ISEB Foundation, BCS
5. Renu Rajani, Pradeep Oak (2004). Software Testing- Effective Methods, Tools and Techniques, Tata McGraw Hill, New Delhi

Web Sites
1. www.testinggeek.com
2. www.softwaretestinghelp.com
3. www.softwaretestinginstitute.com

Semester – V

16CTU502A **. NET PROGRAMMING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To design, formulate, and construct applications with VB.NET
- To integrate variables and constants into calculations applying VB.NET
- To determine logical alternatives with VB.NET decision structures
- To implement lists and loops with VB.NET controls and iteration
- To separate operations into appropriate VB.NET procedures and functions
- To assemble multiple forms, modules, and menus into working VB.NET solutions

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Grasp the fundamentals of a programming language and know the basic differences between programming languages
2. Choose the architecture based on the problem to be solved.
3. Differentiate between the types of applications supported by .Net
4. Build, compile and execute a VB .Net program
5. Apply techniques to develop error-free software
6. To build integrated VB.NET solutions using files and structures with printing capabilities. Translate general requirements into data-related solutions using database concepts

UNIT I

Introduction to .NET: .NET framework features & architecture, CLR, common Type system, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB .Net – Menu bar, Tool bar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object browser. The environment:Editor tab, format tab, general tab, docking tab. Visual development & event driven programming – Methods and events.

UNIT II

The VB .Net Language: The VB .Net Language – Variabls- decalring variables, Data type of variables, forcing variables declarations, scope & lifetime of a variable, constants, arrays, types of arrays, control array, Structure programming – Modularity – Information hiding – abstraction – events – subroutines and functions – message box – input box. Control flow statement: conditional statement, loop statement.

UNIT III

Working with WPF: Introduction:Understanding Windows Graphics – WPF: A Higher Level API – The architecture of WPF. XAML:Basics, properties and events in XAML – loading and compiling – Layout. Classic controls: The Control class – content controls – text controls – list controls – Range based controls.

UNIT IV

Objects and Collections: Understanding objects, properties, methods. Understanding collections. Files: Introduction – classification of files – processing files – handling files and folder using class – directory class – file class.

UNIT V

Database programming with ADO .Net: overview of ADO, from ADO to ADO .Net, accessing data using server explorer. Creating connection, command, data adapter and data set with OLEDB and SQLDB. Display data on data bound controls, display data on a data grid. Generate reports using CrystalReportViewer.

Suggested Readings

1. Shrishchavan (2007). Visual Basic .Net (1st ed.). New Delhi: Pearson education.
2. Bryan Newsome (2012). Beginning Visual Basic. John Wiley & Sons, Inc.
3. Matthew MacDonald Pro (2008). Windows Presentation Foundtion with .Net 3.5 Apress
4. Duncan Mackenzie and Kent Sharkey (2006). Sams Teach Yourself Visual Basic .Net (1st ed.). New Delhi: Techmedia.
5. Ian Griffiths, Chris Shells (2005). Programming Windows Presentation Foundation (1st ed.). O'Reilly Publishers
6. Jeffrey R.Shapiro (2002). The Complete Reference Visual Basic .Net. New Delhi: Tata McGraw Hill Ed.

Websites

1. www.startvbdotnet.com
2. www.functionx.com
3. www.dotnetspider.com
4. www.developerfusion.com
5. http://www.wdftutorial.net/HelloWPF.html

Semester – V

16CTU502B NETWORK PROGRAMMING 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the 3-tier software architecture (presentation/client tier, application tier, data tier).
- To write web applications using a combination of client-side (JavaScript, HTML, XML, WML) and server-side technologies (JSP, JSF, SERVLETS).
- To write network applications using state-of-the-art RPC technologies including: RMI, CORBA, EJB, and Web Services (SOAP and UDDI).
- To understand e-mail programming (JavaMail, SMTP, POP, IMAP).
- To design and implement network applications through semester-long projects.
- To understand network routing (static and dynamic) and understand the process of implementing simple routed inter-networks.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Analyze the various transmission media, their comparative study, fiber optics and wireless media
2. Categorize the topologies of networks (LAN and WAN), Layered architecture (OSI and TCP/IP) and protocol suites.
3. TCP, UDP, SCTP protocols Ethernet and LAN administration.
4. Details of IP operations in the INTERNET and associated routing principles
5. Understand the key protocols which support the Internet
6. reate applications using techniques such as multiplexing, forking, multithreading

UNIT-I

Transport Layer Protocols: TCP, UDP, SCTP protocol.

UNIT-II

Socket Programming: Socket Introduction; TCP Sockets; TCP Client/Server Example ; signal handling

UNIT-III

I/O multiplexing using sockets; Socket Options; UDP Sockets; UDP client server example; Address lookup using sockets.

UNIT-IV

Network Applications: Remote logging; Email; WWW and HTTP.

UNIT-V

LAN administration: Linux and TCP/IP networking: Network Management and Debugging.

Suggested Readings

1. Richard Stevens, W., Bill Fenner., & Andrew, M. Rudoff. (2003). Unix Network Programming, The sockets Networking API, Vol. 1(3rd ed.). New Delhi: PHI.
2. Forouzan, B. A. (2003). Data Communications and Networking(4th ed.). New Delhi: THM Publishing Company Ltd.,
3. Nemeth Synder., & Hein. (2010). Linux Administration Handbook (2nd ed.), New Delhi: Pearson Education.
4. Steven, R. (1990). Unix Network Programming (2nd ed.). New Delhi: PHI.

Semester – V

16CTU503A INTRODUCTION TO DATA SCIENCE 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To practice statistical and programming best practices
- To develop professional skills: clear communication, creative thinking, critical thinking, self-directed learning, and effective teamwork
- To understand data analysis techniques and an interest in improving their ability to tackle data-rich problems in a systematic, principled way.
- To understand the basic concepts of big data, methodologies for analyzing structured and unstructured data with emphasis on the relationship between the Data Scientist and the business needs.
- To develop the skills required by organizations to support these functions has been grouped under the term "Data Sciences"

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Understand the problems solvable with data science and an ability to attack them from a statistical perspective.
2. Understand when to use supervised and unsupervised statistical learning methods on labeled and unlabeled data-rich problems.
3. Create data analytical pipelines and applications in Python.
4. Familiar data science ecosystem and the various tools needed to continue developing as a data scientist.
5. Develop the mindset to work like a data scientist, and follow a methodology to tackle different types of data science problems
6. Describe what data science and machine learning are, their applications & use cases, and various types of tasks performed by data scientists

UNIT-I

Data Scientist's Tool box: Turning data into actionable knowledge, introduction to the tools that will be used in buliding data analysis software; version control, markdown, git, GitHub, R and R-Studio.

UNIT-II

R Programming basics: Overview of R, R datatypes and Objects, reading and writing data, control structures, functions, scoping rules, dates and tiems, loop functions, dubugging tools, simualtion, code profiling.

UNIT-III

Getting and cleaning data: Obtaining data from the web, from API's , from database, and from colleagues in various formats. Basics of data cleaning and making data –tidy.

UNIT-IV

Exploratory data analysis: Essential exploratory techniques for summarzing data, applied before formal modelling commences, eliminating or sharpening potential hypotheses about the world that can be addresses by the data, common multivariate statistical techniques used to visualize high-dimensional data.

UNIT-V

Reproducible Research: Concepts and tools behind reporting modern data analysis in a reproducible manner, To write a document using R markdown, integrate live R code into a literate statistical program, compile R markdown documents using knitr and related tools, and organize a data analysis so that it is reproducible and accessible to others.

Suggested Readings

1. Rachel Schutt, Cathy O'Neil (2013). Doing data science: Straight Talk from the frontline. S.Chroff/O' Reilly
2. Foster Provost, Tom Fawcett (2013). Data science for Business – What you need to know about Datamining and Data Analytic Thinking. O'Reilly
3. John. W. Foreman (2013). Data Smart: Using Data science to transform inforamtion into insight. John Wiley and Sons.
4. Ian Ayres (2007). Super Crunchers: Why Thinking – By – Numbers is the New way to Be Smart (1st ed.). Bantam
5. Eric Seigel (2013). Predictive Analytics: The Power of Predict who will click, Buy Lie or Die (1st ed.). Wiley.
6. Matthew A.Russel (2013). Mining the social webL: Datamining Facebook, Twitter, LinkedIn, Google+, GitHub, and More (2nd ed.). O'Reilly Media

Semester – V

16CTU503B **DATA MINING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To be familiar with mathematical foundations of data mining tools.
- To understand and implement classical models and algorithms in data warehouses and data mining
- To characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- To master data mining techniques in various applications like social, scientific and environmental context.
- To develop skill in selecting the appropriate data mining algorithm for solving practical problems
- To develop research interest towards advances in data mining

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Introduce students to the basic concepts and techniques of Data Mining.
2. Develop skills of using recent data mining software for solving practical problems.
3. Gain experience of doing independent study and research.
4. Possess some knowledge of the concepts and terminology associated with database systems, statistics, and machine learning
5. Identify appropriate data mining algorithms to solve real world problems
6. Benefit the user experiences towards research and innovation. integration

UNIT-I

Overview: Predictive and descriptive data mining techniques

UNIT-II

Supervised and unsupervised learning techniques

UNIT-III

Process of knowledge discovery in databases, pre-processing methods

UNIT-IV

Data Mining Techniques: Association Rule Mining, classification and regression techniques, clustering

UNIT-V

Scalability and data management issues in data mining algorithms, measures of interestingness.

Suggested Readings

1. Pang-Ning Tan., Michael Steinbach.,& Vipin Kumar. (2005). Introduction to Data Mining. New Delhi: Pearson Education.
2. Richard Roiger., & Michael Geatz. (2003). Data Mining: A Tutorial Based Primer. New Delhi: Pearson Education.
3. Gupta, G.K. (2006). Introduction to Data Mining with Case Studies. New Delhi: PHI.
4. Soman, K. P., Diwakar Shyam., & Ajay, V. (2006). Insight Into Data Mining: Theory And Practice. New Delhi: PHI.

WEB SITES

1. Thedacs.Com
2. Dwreview.Com
3. Pcai.Com
4. Eruditionhome.Com

Semester – V

16CTU504A **DIGITAL IMAGE PROCESSING** **3H – 3C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To introduce to the students the basics of digital image processing.
- To learn the basic image transforms, segmentation algorithms and problems of object measurements.

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation techniques.

UNIT-I

Introduction: Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization. Spatial Domain Filtering: Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian.

UNIT-II

Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

UNIT-III:

Image Restoration, Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections, Image Compression-Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, DCT implementation using FFT, Run length coding.

UNIT – IV

FAX compression (CCITT Group-3 and Group-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG, Lossless predictive coding, Lossy predictive coding, Motion Compensation

Wavelet based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT),Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking

UNIT-V

Morphological Image Processing: Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons,pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion. Image Segmentation: Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding,Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation

Suggested Readings

1. Gonzalez, R. C., & Woods, R. E. (2008). Digital Image Processing(3rd ed.). New Delhi: Pearson Education.
2. Jain, A. K. (1989). Fundamentals of Digital image Processing. New Delhi: Prentice Hall of India.
3. Castleman, K. R. (1996). Digital Image Processing. New Delhi: Pearson Education.
4. Schalkoff. (1989). Digital Image Processing and Computer Vision. New York: John Wiley and Sons.
5. Rafael, C. Gonzalez., Richard, E. Woods.,& Steven Eddins. (2004). Digital Image Processing using MATLAB. New Delhi: Pearson Education.

16CTU504B MULTIMEDIA AND ITS APPLICATIONS

Semester – V
3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the multimedia communications systems, application and basic principles,
- To analyze of the multimedia streaming,
- To perform and establish multimedia communication terminals,
- To present multimedia communications
- Explore a brief history of multimedia in education
- Analyze instructional and informational media (print materials, audio/visual materials and/or web-based materials, games/simulations, etc.)

Course Outcomes (COs)

Upon successful completion the student will be able to:

1. Define multimedia to potential clients.
2. Identify and describe the function of the general skill sets in the multimedia industry.
3. Identify the basic components of a multimedia project.
4. Identify the basic hardware and software requirements for multimedia development and playback.
5. Describe the process of digitizing (quantization) of different analog signals (text, graphics, sound and video).
6. Use appropriate tools for the design, development and creation of digital media artefacts.

UNIT I

Multimedia – An overview: Introduction – Multimedia presentation and production – Characteristics of Multimedia presentation – Hardware and Software requirements – Uses of Multimedia. Text: Types of text – Font- Text file formats. Image: Image data representation – Image file formats – image processing software. Graphics: Advantages of graphics – Uses – Component of a graphics system.

UNIT II

Audio: Sound waves – types and properties of sound – components of audio system – Digital audio – Musical Instrument Digital Interface (MIDI) – Audio file formats – Audio processing software. Video: Motion video – Television systems – Video file formats – video processing software. Animation: Uses of animation – computer based animation - Animation file formats – Animation software.

UNIT III

Introducing photoshop elements: About elements – welcome screen – create mode – menu bar – toolbox – options bar – panels. Organizing images: Obtaining images -

tagging images – searching for images – opening and saving images. Selecting areas – Layers – Text and drawing tools.

UNIT IV

Understanding flash: Understanding flash basic elements – creating a simple animation. Learning Flash toolbox: Learning the toolbox – using tools. Learning flash panels: Understanding the panels. Using timeline and layers: Understanding how timeline works – Understanding layers. Drawing objects: Drawing lines and fills – using colors – Rotating, skewing and scaling – grouping objects. Creating animation – How animation works – creating motion tweens – creating shape tweens. Understanding masks – creating masks.

UNIT V

Creating symbols and using the library: Learning about symbols – creating symbols – using libraries. Learning Basic Actionscript concepts: Actionscript basics – data type basics. Learning basic actionscript programming: Applying Actionscript – Using Actionscript to control actions – Using Actionscript to control properties – Understanding Actions and Event Handlers.

Suggested Readings

1. Ranjan Parekh (2013). Principles of Multimedia (2nd ed.). TataMcGraw Hill.
2. Nick Vandome (2011). Photoshop Elements 9. TataMcGraw Hill.
3. Brian Underdahl (2002). Macromedia Flash MX – A Beginners Guide. Dreamtech Press.
4. Tay Vaughan (2002). Fundamentals of Multimedia (5th ed.). TataMcGraw Hill.
5. Bill Sanders (2001). Flash 5 Actionscript (1st ed.). New Delhi DreamTech Press.

Websites

1. en.wikipedia.org/wiki/Multimedia
2. www.arena-multimedia.com/
3. www.nextwavemultimedia.com/

Semester – V

16CTU511A **CRYPTOGRAPHY AND NETWORK SECURITY - PRACTICAL** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand basics of Cryptography and Network Security.
- To know about various encryption techniques.
- To understand the concept of Public key cryptography.
- To study about message authentication and hash functions
- To impart knowledge on Network security
- To understand various protocols for network security to protect against the threats in the networks.

Course Outcomes (COs)

After successful completion of the course, the learners would be able to:

1. Illustrate various Public key cryptographic techniques
2. Evaluate the authentication and hash algorithms
3. Provide security of the data over the network.
4. Do research in the emerging areas of cryptography and network security.
5. Implement various networking protocols.
6. Protect any network from the threats in the world

List of Programs

1. Write a program to convert your college name from plain text to cipher text using transposition cipher method of encryption
2. Write a program to convertyour name from plain text to cipher text using the One Time Pads method of encryption
3. Write a program to encrypt a paragraph using the data encryption standard algorithm
4. Write a program to encrypt yopur bio-data using the advanced encryption standard algorithm
5. Write a program to decrypt the “Network Security” theory syllabus using the RSA Algorithm.
6. Write a program that takes a binary file as input and performs bit stuffing and cyclic redundancy check computation.
7. Write a program to simulate the working of Sliding-window protocol
8. Write a program to find the shortest path in a network using Dijkstra’s Algorithm
9. Write a program to implement the token bucket algorithm for congestion control.
10. Write a program for the following chat applictions:

    One to One: Open a Socket connection and display what is written by one to another.

    Many to Many: Each client opens a socket connection to the client server and writes to the Socket. Whatever is written by one can be seen by all. Implement symmetric key cryptography.

Semester – V

16CTU511B **SOFTWARE TESTING - PRACTICAL** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces. 4. To know basics of testing and understanding concept of software quality assurance and software configuration management process.
- To understand the need of project management and project management life cycle.
- To understand project scheduling concept and risk management associated to various type of projects.
- Implement a given software design using sound development practices.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Apply their knowledge of mathematics, sciences, and computer science to the modeling, analysis, and measurement of software artifacts.
2. Work effectively as leader/member of a development team to deliver quality software artifacts.
3. Analyze, specify and document software requirements for a software system.
4. Verify, validate, assess and assure the quality of software artifacts.
5. Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its cost and time.
6. Express and understand the importance of negotiation, effective work habits, leadership, and good communication with stakeholders, in written and oral forms, in a typical software development environment.

List of Programs

1. Write a program that take three inputs (a,b and c) that represents the sides of a triangle and the output is one of the below four.
   a) Not a triangle
   b) Scalene triangle
   c) Isoceles triangle
   d) Equilateral triangle
   1.1 Generate test cases using boundary value analysis, equivalence class partitioning and decision table testing
   1.2 Generate test cases using basis path testing
   1.3 Run code coverage tool

2. Write a program that determines the nature of roots of a quadratic equation. Output should be one of the following
    - Not a quadratic equation
    - Complex roots
    - Real roots
    - Single roots

    1.1 Generate test cases using boundary value analysis, equivalence class partitioning and decision table testing

    1.2 Generate test cases using basis path testing

    1.3 Run code coverage tool
3. Write a program that checks whether the number is even or odd. Run code coverage tools and find the amount of code being covered.
4. Write a program that dynamically allocates memory to 10 integers using malloc() or calloc() and do not free memory leading to memory leaks. Verify the same using Valgrind. Now, free memory using free() at the end of the program to avoid memeory leaks. Verify the same using Valgring().
5. Using Selenium IDE, write a test suite containing minimum 4 test cases.
6. Conduct a test suite fro any two websites.
7. Write and test a program to login a specific webpage

Semester – V

16CTU512A .NET PROGRAMMING - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To design, formulate, and construct applications with VB.NET
- To integrate variables and constants into calculations applying VB.NET
- To determine logical alternatives with VB.NET decision structures
- To implement lists and loops with VB.NET controls and iteration
- To separate operations into appropriate VB.NET procedures and functions
- To assemble multiple forms, modules, and menus into working VB.NET solutions

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Grasp the fundamentals of a programming language and know the basic differences between programming languages
2. Choose the architecture based on the problem to be solved.
3. Differentiate between the types of applications supported by .Net
4. Build, compile and execute a VB .Net program
5. Apply techniques to develop error-free software
6. To build integrated VB.NET solutions using files and structures with printing capabilities. Translate general requirements into data-related solutions using database concepts

1. Write a VB .Net program to calculate simple interest and compound interest.
2. Write a VB .Net program to implement Calcolator.
3. Write a VB.Net program to implement Notepad
4. Write a VB.Net program to draw several shaps and fill with color.
5. Write a VB .Net program to perform the following in list box
    a) Add an item
    b) Delete an item
    c) List count
    d) Clear the list
6. Write a program to calculate the total marks of the student and print the grades.
7. Write a VB .Net program to implement employee payroll system
8. Write a VB .Net program to create and manipulate a file.
9. Write a program to implement a web browser

10. Write a program to maintain the details of doctors in a hospital with their specializations
11. Write a program to animate the picture using timer control.
12. Write a program to move the object from one location to another. Change the color and size of object at different time interval.
13. Write a program to place 10 pictures in the listbox. Using timer control the take the picture from listbox and change the form background after specific time interval.
14. Write a program to implement speaking program. Get the text input from the user and convert into voice.
15. Write a program to implement chatting

Semester – V

16CTU512B NETWORK PROGRAMMING - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the 3-tier software architecture (presentation/client tier, application tier, data tier).
- To write web applications using a combination of client-side (JavaScript, HTML, XML, WML) and server-side technologies (JSP, JSF, SERVLETS).
- To write network applications using state-of-the-art RPC technologies including: RMI, CORBA, EJB, and Web Services (SOAP and UDDI).
- To understand e-mail programming (JavaMail, SMTP, POP, IMAP).
- To design and implement network applications through semester-long projects.
- To understand network routing (static and dynamic) and understand the process of implementing simple routed inter-networks.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Analyze the various transmission media, their comparative study, fiber optics and wireless media
2. Categorize the topologies of networks (LAN and WAN), Layered architecture (OSI and TCP/IP) and protocol suites.
3. TCP, UDP, SCTP protocols Ethernet and LAN administration.
4. Details of IP operations in the INTERNET and associated routing principles
5. Understand the key protocols which support the Internet
6. Create applications using techniques such as multiplexing, forking, multithreading

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

Semester – V

16CTU513A INTRODUCTION TO DATA SCIENCE – PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To practice statistical and programming best practices
- To develop professional skills: clear communication, creative thinking, critical thinking, self-directed learning, and effective teamwork
- To understand data analysis techniques and an interest in improving their ability to tackle data-rich problems in a systematic, principled way.
- To understand the basic concepts of big data, methodologies for analyzing structured and unstructured data with emphasis on the relationship between the Data Scientist and the business needs.
- To develop the skills required by organizations to support these functions has been grouped under the term "Data Sciences"

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

7. Understand the problems solvable with data science and an ability to attack them from a statistical perspective.
8. Understand when to use supervised and unsupervised statistical learning methods on labeled and unlabeled data-rich problems.
9. Create data analytical pipelines and applications in Python.
10. Familiar data science ecosystem and the various tools needed to continue developing as a data scientist.
11. Develop the mindset to work like a data scientist, and follow a methodology to tackle different types of data science problems
12. Describe what data science and machine learning are, their applications & use cases, and various types of tasks performed by data scientists

List of Progrms

1. Write a program that prints 'Hello World' to the screen
2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n.
3. Write a program that prints multiplication table for numbers upto 12.
4. Write a function that returns the largest element in a list
5. Write a function that computes the running total of a list
6. Write a function that tests whether string is a palindrome.
7. Implement linear search
8. Implement binary search
9. Impelment matrix addition, subtraction and multiplication
10. Fifteen students were enrolled in a course
    There ages were : 20 20 20 20 20 21 21 21
    22 22 22 22 23 23 23
    i. Find the median age of all students under 22 years.

ii. find the median age of all students

iii. Find the mean age of all students

iv. Find the modal age of all students

v. Two more students enter tha class. The age of both students is 23. What is now mean, mode and median.

11. Following table gives frequency distribution of systolic blood pressure. Compute all the measures of dispersion.

Midpoint	95.5	105.5	115.5	125.5	135.5	145.5	155.5	165.5	175.5
Number	5	8	22	27	17	9	5	5	2

12. Obtain probability distribution of, where X is number of spots showing when a six-sided symmetric die (i.e. all six faces of the die are equally likely) is rolled.
    Simulate random samples of sizes 40,70 and 100 respectively and verify the frequency interpretation of probability.
13. Make visual representations of dats using the base, lattice abd ggplot2 plotting ssytems in R, apply basic principles of data graphics to create rich analytic graphics from available datasets.
14. Use Git/GitHub software to create Github Account. Also, create a repo using Github.

16CTU513B	**DATA MINING - PRACTICAL**	**Semester – V** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To be familiar with mathematical foundations of data mining tools.
- To understand and implement classical models and algorithms in data warehouses and data mining
- To characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- To master data mining techniques in various applications like social, scientific and environmental context.
- To develop skill in selecting the appropriate data mining algorithm for solving practical problems
- To develop research interest towards advances in data mining

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Introduce students to the basic concepts and techniques of Data Mining.
2. Develop skills of using recent data mining software for solving practical problems.
3. Gain experience of doing independent study and research.
4. Possess some knowledge of the concepts and terminology associated with database systems, statistics, and machine learning
5. Identify appropriate data mining algorithms to solve real world problems
6. Benefit the user experiences towards research and innovation. integration

List of Programs

1. Use the following learning schemes, with the default settings to analyze the weather data (in weather.arff). for test options, first choose "Use training set", then choose "Percentage split" using default 66% percentage split. Report model percent error rate.
2. Use iris dataset preprocess and classifyu it with j4.8 and Naive Bayes classifier. Examine the tree in the classifier output panel.
3. Using the dataset ReutersCorn – Train and ReutersGrain – Train. Classify articles using binary attributes and word count attributes.
4. Apply any two association rule based algorithm for the supermarket analysis.
5. Using weka experimenter perfrom comparison analysis of j4.8, oneR and ID3 for vote dataset.
6. Using weka experimenter perfrom comparison analysis of Naive Bayes with different datasets.
7. Apply ZeroR, OneR and j4.8, to classify the iris data in an experiment using 10 train and test runs, with 66% of the data used for 34% used for testing.
8. Using Weka Knowledge flow set up a flow to load an ARFF file (batch mode) and perform a cross-validation using j4.8 (WEKS's C4.5 implementation).

9. Draw multiple ROC curves in the same plot window, using j4.8 and RandomForest as classifiers.
10. Use any three clustering algorithm on Vehicle data set and find best among them.

Semester – V

16CTU514A DIGITAL IMAGE PROCESSING - PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To introduce to the students the basics of digital image processing.
- To learn the basic image transforms, segmentation algorithms and problems of object measurements.

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation techniques.
7.

List of Programs

1. Write program to read and display digital image using MATLAB or SCILAB
   a. Become familiar with SCILAB/MATLAB Basic commands
   b. Read and display image in SCILAB/MATLAB
   c. Resize given image
   d. Convert given color image into gray-scale image
   e. Convert given color/gray-scale image into black & white image
   f. Draw image profile
   g. Separate color image in three R G & B planes
   h. Create color image using R, G and B three separate planes
   i. Flow control and LOOP in SCILAB
   j. Write given 2-D data in image file

2. To write and execute image processing programs using point processing method
   a. Obtain Negative image b. Obtain Flip image
   b. Thresholding d. Contrast stretching

3. To write and execute programs for image arithmetic operations
   a. Addition of two images
   b. Subtract one image from other image

c. Calculate mean value of image
d. Different Brightness by changing mean value

4. To write and execute programs for image logical operations
   a. AND operation between two images
   b. OR operation between two images
   c. Calculate intersection of two images
   d. Water Marking using EX-OR operation
   e. NOT operation (Negative image)

5. To write a program for histogram calculation and equalization using
   a. Standard MATLAB function
   b. Program without using standard MATLAB functions
   c. C Program

6. To write and execute program for geometric transformation of image
   a. Translation
   b. Scaling
   c. Rotation
   d. Shrinking
   e. Zooming

7. To understand various image noise models and to write programs for
   a. image restoration
   b. Remove Salt and Pepper Noise
   c. Minimize Gaussian noise
   d. Median filter and Weiner filter

8. Write and execute programs to remove noise using spatial filters
   a. Understand 1-D and 2-D convolution process
   b. Use 3x3 Mask for low pass filter and high pass filter

9. Write and execute programs for image frequency domain filtering
   a. Apply FFT on given image
   b. Perform low pass and high pass filtering in frequency domain
   c. Apply IFFT to reconstruct image

10. Write a program in C and MATLAB/SCILAB for edge detection using different edge detection mask

11. Write and execute program for image morphological operations erosion and dilation.

12. To write and execute program for wavelet transform on given image and perform inverse wavelet transform to reconstruct image.

Semester – V

16CTU514B MULTIMEDIA AND ITS APPLICATIONS – PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the multimedia communications systems, application and basic principles,
- To analyze of the multimedia streaming,
- To perform and establish multimedia communication terminals,
- To present multimedia communications
- Explore a brief history of multimedia in education
- Analyze instructional and informational media (print materials, audio/visual materials and/or web-based materials, games/simulations, etc.)

Course Outcomes (COs)

Upon successful completion the student will be able to:

1. Define multimedia to potential clients.
2. Identify and describe the function of the general skill sets in the multimedia industry.
3. Identify the basic components of a multimedia project.
4. Identify the basic hardware and software requirements for multimedia development and playback.
5. Describe the process of digitizing (quantization) of different analog signals (text, graphics, sound and video).
6. Use appropriate tools for the design, development and creation of digital media artefacts.

List of Programs

1. Change a Shape to Another Shape. (Shape Animation)
2. Create a Man to walk with the help of Key Frame Animation.
3. Change the Colors of an object with the help of Animation.
4. Draw a Bird with Flash tools and make it fly with key Frame Animation.
5. Create a Shining Stones with the help of Movie Clip.
6. Create an animation to represent a growing moon using frame by frame animation
7. Create an animation to bounce a ball on steps.
8. Simulate movement of a cloud.
9. Create Morphing between two images.
10. Create an Action script to execute for an event in an application.
11. Create Water Drops using Photoshop.

12. Animate Plane Flying with the Clouds.
13. Create Plastic Surgery for Nose.
14. Create a Web Page using Photoshop
15. Given a picture of a flower with a background. Extract the flower and organize on a different background.
16. Display the given picture through your name using mask.

Semester – VI

16CTU601A PHP PROGRAMMING 4H – 4C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand how server-side programming works on the web.
- To learn PHP Basic syntax for variable types and calculations.
- To use PHP built-in functions and creating custom functions
- To understand POST and GET in form submission.
- To receive and process form submission data.
- To create a database in phpMyAdmin, to read and process data in a MySQL database

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Write PHP scripts to handle HTML forms.
2. Write regular expressions including modifiers, operators, and metacharacters.
3. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
4. Analyze and solve various database tasks using the PHP language.
5. Analyze and solve common Web application tasks by writing PHP programs
6. Get hands on experience on various techniques of web development and will be able to design and develop a complete website.

UNIT-I

Introduction to PHP:

PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.) -PHP with other technologies, scope of PHP Basic Syntax, PHP variables and constants-Types of data in PHP , Expressions, scopes of a variable (local, global)-PHP Operators: Arithmetic, Assignment, Relational, Logical operators, Bitwis , ternary and MOD operator.-PHP operator Precedence and associativity

UNIT-II

Handling HTML form with PHP:

Capturing Form Data -GETand POST form methods- Dealing with multi value fields -Redirecting a form after submission **-PHP conditional events and Loops:** PHP IF Else conditional statements (Nested IF and Else) -Switch case, while ,For and Do While Loop -Goto , Break ,Continue and exit

UNIT-III

PHP Functions:

Function, Need of Function , declaration and calling of a function-PHP Function with arguments, Default Arguments in Function-Function argument with call by value, call by reference-Scope of Function Global and Local

UNIT-IV

String Manipulation and Regular Expression: (3L)

- Creating and accessing String , Searching & Replacing String
- Formatting, joining and splitting String , String Related Library functions
- Use and advantage of regular expression over inbuilt function
- Use of preg_match(), preg_replace(), preg_split() functions in regular expression.

UNIT-V

Array:

- Anatomy of an Array ,Creating index based and Associative array ,Accessing array
- Looping with Index based array, with associative array using each() and foreach()
- Some useful Library function

Suggested Readings

1. Steven Holzner. (2007). PHP: The Complete Reference. New Delhi: McGraw Hill Education (India).
2. Timothy Boronczyk., & Martin, E. Psinas. (2008). PHP and MYSQL (Create-Modify-Reuse). New Delhi: Wiley India Private Limited.
3. Robin Nixon. (2014). Learning PHP, MySQL, JavaScript, CSS & HTML5 (3rd ed.). O'reilly.
4. Luke Welling.,& Laura Thompson.(2008). PHP and MySQL Web Development (4th ed.). Addition Paperback, Addison-Wesley Professsional.
5. David Sklar., & Adam Trachtenberg. PHP Cookbook: Solutions & Examples for PHP.

Semester – VI

16CTU601B UNIX / LINUX PROGRAMMING 4H – 4C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.
- To understand how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions
- To understand how the operating system abstractions can be implemented
- To understand the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software
- To understand basic resource management techniques (scheduling or time management, space management) and principles and how they can be implemented.
- These also include issues of performance and fairness, avoiding deadlocks, as well as security and protection.

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Develop software for Linux/UNIX systems.
2. Learn the C language and get experience programming in C.
3. Learn the important Linux/UNIX library functions and system calls.
4. Understand the inner workings of UNIX-like operating systems.
5. Obtain a foundation for an advanced course in operating systems.
6. Construct various shell scripts for simple applications

UNIT-I

Introduction What is Linux/Unix Operating systems, Difference between linux/unix and other operating systems , Features and Architecture, Various Distributions available in the market, Installation, Booting and shutdown process.

UNIT-II

System processes (an overview), External and internal commands, Creation of partitions in OS, Processes and its creation phases – Fork, Exec, wait

UNIT-III

User Management and the File System Types of Users, Creating users, Granting rights User management commands, File quota and various file systems available, File System Management and Layout, File permissions, Login process, Managing Disk Quotas, Links (hard links, symbolic links)

UNIT-IV

Shell introduction and Shell Scripting What is shell and various type of shell, Various editors present in Linux Different modes of operation in vi editor, What is shell script, Writing and executing the shell script , Shell variable (user defined and system variables)

UNIT-V

System calls, Using system calls Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell.
Functions, Utility programs (cut, paste, join, tr, uniq utilities), Pattern matching utility (grep)

Suggested Readings

1. Sumitabha, Das.(2006). Unix Concepts And Applications. New Delhi: Tata McGraw-Hill Education.
2. Michael Jang. (2011). RHCSA/ RHCE Red Hat Linux Certification: Exams (Ex200 & Ex300). Certification Press.
3. Nemeth Synder., & Hein.(2010). Linux Administration Handbook (2nd ed.). Pearson Education.
4. Richard Stevens, W. Bill Fenner., & Andrew, M. Rudoff. (2014). Unix Network Programming, The sockets Networking API, Vol. 1, (3rd ed.).

Semester – VI

16CTU602A E-COMMERCE TECHNOLOGIES 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce the concepts, vocabulary, and procedures associated with E-Commerce and the Internet.
- To gain an overview of all aspects of E-Commerce.
- To develop the Internet and E-Commerce, options available for doing business on the Internet, features of Web sites and the tools used to build an E-Commerce web site, marketing issues, payment options, security issues, and customer service.
- It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems
- Assess e-commerce strategies and applications, including online marketing, e-government, e-learning and global e-commerce

Course Outcomes (COs)

Upon successful completion of this course, the student will be able to:

1. Describe an example of system architecture for an e-Business.
2. List the seven major elements of web design.
3. Identify and explain fundamental web site tools including design tools, programming tools, and data processing tools.
4. Identify the major electronic payment issues and options.
5. Discuss security issues and explain procedures used to protect against security threats.
6. Identify and discuss management issues underlying e-Commerce issues including organizational structure, strategic planning, goal setting, corporate social responsibility, international arena, changing market intermediaries, resource allocation and customer service

UNIT I -An Introduction to Electronic commerce

What is E-Commerce (Introduction And Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce,Electronic Commerce Applications, Electronic Commerce and Electronic Business (C2C) (C2G, G2G, B2G, B2P, B2A, P2P, B2A, C2A, B2B, B2C)

UNIT II -The Internet and WWW

Evolution of Internet, Domain Names and Internet - Organization (.edu, .com, .mil, .gov, .net etc), Types of Network, Internet Service Provider, World Wide Web, Internet & Extranet, Role of Internet in B2B Application, building own website, cost, time, reach, registering a domain name, web promotion, Target email, Banner, Exchange, Shopping Bots.

UNIT III: Electronic data

Electronic data exchange introduction, concepts of EDI and Limitation, Apllication of eDI, Disadvantgaes of eDI, EDI model, Electronic Payment System: Introduction, Types of Electronic Payment system, Payment types, Value exchange system, credit card system electronic fund transfer, Paperless bill, modern payment cash, Electronic cash.

UNIT IV: Planning for Electronic Commerce

Palnnign Electronic commerce initiates, linking objectives to business strategies, measuring cost objectives, comparing benefits to Costs, strategies for developing electronic commerce web sites.

UNIT V : Internet marketing

The PROS and CONS of online shopping, the CONS of online shopping, Justify an internet business, Internet marketing techniques, The E-Cycle of Internet marketing, personalization e-commerce.

Suggested Readings

1.G.S.V.Murthy (2011). E-Commerce concepts, Models, Strategies. Himalaya Publishing house.
2. Gray. P. Schneider (2011). Electronic commerce International student edition.
3. Henry Cahn, Raymond Lee, Tharam Dillon, Elizabeth Chang. (2011). E-Commerce fundamentals and Applications. Wiley Student Edition.
4. Kamlesh K.Bajaj and Debjani Nag (2005).E-Commerce.
5. David Whitley (2000).E-Commerce-strategies, Technologies and Applications. TMH.

Websites

1. http://www.tutorialspoint.com/e_commerce/e_commerce_tutorial.pdf
2. http://www.dynamicwebs.com.au/tutorials/e-commerce.htm
3. http://www.htmlgoodies.com/beyond/webmaster/projects/electronic-commerce-tutorial.html

16CTU602B	**CLOUD COMPUTING**	**Semester – VI** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To learn how to use Cloud Services.
- To implement Virtualization
- To implement Task Scheduling algorithms.
- To apply Map-Reduce concept to applications.
- To build Private Cloud.
- To know the impact of engineering on legal and societal issues involved

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.
2. Design different workflows according to requirements and apply map reduce programming model.
3. Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
4. CO4: Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds
5. Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application
6. Broadly educate to know the impact of engineering on legal and societal issues involved in addressing the security issues of cloud computing.

UNIT-I

Overview of Computing Paradigm: Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing.**Introduction to Cloud Computing:** Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing.

UNIT-II

Cloud Computing Architecture: Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.

UNIT-III

Case Studies: Case study of Service model using Google App Engine, Microsoft Azure, Amazon EC2 , Eucalyptus.

UNIT-IV

Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing & AITUounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling.

UNIT-V

Cloud Security: Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing.

Suggested Readings

1. Barrie Sosinsky. (2010). Cloud Computing Bible. New Delhi: Wiley-India,
2. Rajkumar Buyya., James Broberg., & Andrzej, M. Goscinski Wile. Cloud Computing: Principles and Paradigms.
3. Nikos Antonopoulos., & Lee Gillam. (2012). Cloud Computing: Principles, Systems and Applications. Springer.
4. Ronald, L. Krutz., & Russell Dean Vines. (2010). Cloud Security: A Comprehensive Guide to Secure Cloud Computing.New Delhi: Wiley-India.
5. Gautam Shroff. (2010). Enterprise Cloud Computing Technology Architecture Applications. Adobe Reader ebooks available from eBooks.com.
6. Toby Velte., Anthony Velte., & Robert Elsenpeter.(2010). Cloud Computing, A Practical Approach. McGraw Hills.
7. Dimitris, N. Chorafas. (2010). Cloud Computing Strategies. CRC Press.

WEB SITES

1. en.wikipedia.org/wiki/Cloud_computing
2. www.ibm.com/cloud-computing/in/en/
3. www.oracle.com/CloudComputing
4. www.microsoft.com/en-us/cloud/default.aspx

16CTU603A	**SOFT COMPUTING**	**Semester – VI** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To familiarize with soft computing concepts.
- To introduce the fuzzy logic concepts, fuzzy principles and relations.
- To Basics of ANN and Learning Algorithms.
- Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- Genetic Algorithm and its applications to soft computing.
- Hybrid system usage, application and optimization

Course Outcomes (COs)

Upon completion of the course, the student will be able to :

1. List the facts and outline the different process carried out in fuzzy logic, ANN and Genetic Algorithms.
2. Explain the concepts and meta-cognitive of soft computing.
3. Apply Soft computing techniques the solve character recognition, pattern classification, regression and similar problems.
4. Outline facts to identify process/procedures to handle real world problems using soft computing.
5. Evaluate various techniques of soft computing to defend the best working solutions.
6. Design hybrid system to revise the principles of soft computing in various applications.

UNIT I

Neural Networks – 1 (Introduction a Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent metworks. Various learning techniques; perception and convergence rule, Auto associative and hetro-associative memory.

UNIT II

Neural Networks – II (Back propagation networks) architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model, back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting back propagation training, applications.

UNIT III

Fuzzy Logic – 1 (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp realtions, Fuzzy to Crisp conversion

UNIT IV

Fuzzy Logic II (Fuzzy membership, Rules) Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzifications, Fuzzy Controller, Industrial applications.

UNIT V

Genetic Algorithm (GA)

Basic concepts, working principle, procedures of GA, flowchart of GA, Genetic representations, (encoding) Initialization and selection, genetic operators, Mutation, Generational Cycle, applications

Suggested Readings

1. S.Rajasekaran & G.A. Vijayalakshmi Pai. Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications. Prentice Hall of India.
2. N.P.Padhy. Artificial Intelligence and Intelligent Systems. Oxford University Press.
3. Siman Haykin. Neural Networks. Prentice Hall of India
4. Timothy J.Ross. Fuzzy Logic with Engineering Applications. Wiley India.
5. Kumar Satish. Neural Networks. Tata McGraw Hill.

16CTU603B **SYSTEM PROGRAMMING** **Semester – VI**
3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce students the concepts and principles of system programming
- To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.
- To train students in developing skills for writing system software with the aid of sophisticated OS services, programming languages and utility tools.
- To understand the role and functioning of various system programs over application program.
- To understand the need to follow the syntax in writing an application program and to learn the how the analysis phase of compiler is designed to understand the programmer‘s requirements without ambiguity.
- To synthesize the analysis phase outcomes to produce the object code that is efficient in terms of space and execution time.

Course Outcomes (COs)

Upon completion of the subject, students will be able to

1. Organize the functionalities and components of a computer system into different layers, and have a good understanding of the role of system programming and the scope of duties and tasks of a system programmer
2. Grasp the concepts and principles, and be familiar with the approaches and methods of developing system-level software (e.g., compiler, and networking software)
3. Apply the knowledge and techniques learnt to develop solutions to realworld problems
4. Select and make use of the OS kernel functions and their APIs, standard programming languages, and utility tools
5. Organize and manage software built for deployment and demonstration
6. Analyze requirements and solve problems using systematic planning and development approaches

UNIT-I

Assemblers & Loaders, Linkers: One pass and two pass assembler design of an assembler, Absolute loader, relocation and linking concepts, relocating loader and Dynamic Linking., overview of compilation, Phases of a compiler.

UNIT-II

Lexical Analysis:

Role of a Lexical analyzer, Specification and recognition of tokens, Symbol table, lexical

UNIT-III

Parsing:

Bottom up parsing- LR parser, yaITU. **Intermediate representations: Three** address code generation, syntax directed translation, translation of types, control Statements.

UNIT-IV

Storage organization: Activation records stack allocation.

UNIT-V

Code Generation: Object code generation

Suggested Readings

1. Santanu Chattopadhyaya. (2011). Systems Programming. New Delhi: PHI.
2. Alfred, V. Aho., Monica, S. Lam., Ravi Sethi.,& Jeffrey, D. Ullman. (2006). Compilers: Principles, Techniques, and Tools (2nd ed.). New Delhi: Prentice Hall.
3. Dhamdhere, D. M. (2011). Systems Programming. New Delhi: Tata McGraw Hill.
4. Leland Beck., & Manjula, D. (2008). System Software: An Introduction to System Programming (3rd ed.). New Delhi: Pearson Education.
5. Grune, D., Van Reeuwijk, K., Bal, H. E., Jacobs, C. J. H., & Langendoen, K.(2012). Modern Compiler Design (2nd ed.). Springer.

Semester – V

16CTU611A PHP PROGRAMMING - PRACTICAL 4H –2C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand how server-side programming works on the web.
- To learn PHP Basic syntax for variable types and calculations.
- To use PHP built-in functions and creating custom functions
- To understand POST and GET in form submission.
- To receive and process form submission data.
- To create a database in phpMyAdmin, to read and process data in a MySQL database

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Write PHP scripts to handle HTML forms.
2. Write regular expressions including modifiers, operators, and metacharacters.
3. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
4. Analyze and solve various database tasks using the PHP language.
5. Analyze and solve common Web application tasks by writing PHP programs
6. Get hands on experience on various techniques of web development and will be able to design and develop a complete website.

List of Programs

1. Create a PHP page using functions for comparing three integers and print the largest number.

2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.

3. WAP to check whether the given number is prime or not.

4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.

5. Write a PHP function that checks if a string is all lower case.

6. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)

7. WAP to sort an array.

8. Write a PHP script that removes the whitespaces from a string.
Sample string : 'The quick   brown fox' Expected Output : Thequickbrownfox

9. Write a PHP script that finds out the sum of first n odd numbers.

10. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.

11. Write a PHP script that checks if a string contains another string.

12. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.

13. Create a script to construct the following pattern, using nested for loop.

*
* *
* * *
* * * *
* * * * *

14. Write a simple PHP program to check that emails are valid.

15. WAP to print first n even numbers.

16. $color = array('white', 'green', 'red")

Write a PHP script which will display the colors in the following way : Output :
white, green, red,
• green • red
• white

17. Using switch case and dropdown list display a ―Hello‖ message depending on the language selected in drop down list.

18. Write a PHP program to print Fibonacci series using recursion.

19. Write a PHP script to replace the first 'the' of the following string with 'That'.

Sample : 'the quick brown fox jumps over the lazy dog.'
Expected Result : That quick brown fox jumps over the lazy dog.

Semester – VI

16CTU611B UNIX / LINUX PROGRAMMING - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.
- To understand how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions
- To understand how the operating system abstractions can be implemented
- To understand the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software
- To understand basic resource management techniques (scheduling or time management, space management) and principles and how they can be implemented.
- These also include issues of performance and fairness, avoiding deadlocks, as well as security and protection.

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Develop software for Linux/UNIX systems.
2. Learn the C language and get experience programming in C.
3. Learn the important Linux/UNIX library functions and system calls.
4. Understand the inner workings of UNIX-like operating systems.
5. Obtain a foundation for an advanced course in operating systems.
6. Construct various shell scripts for simple applications

List of Programs

1. Write a shell script to check if the number entered at the command line is prime or not.
2. Write a shell script to modify ―call command to display calendars of the specified months.
3. Write a shell script to modify ―call command to display calendars of the specified range of months.
4. Write a shell script to aITUept a login name. If not a valid login name display message – ―Entered login name is invalid.
5. Write a shell script to display date in the mm/dd/yy format.
6. Write a shell script to display on the screen sorted output of ―who command along with the total number of users .
7. Write a shell script to display the multiplication table any number,
8. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
9. Write a shell script to find the sum of digits of a given number.
10. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.

11. Write a shell script to find the LCD (least common divisor) of two numbers.
12. Write a shell script to perform the tasks of basic calculator.
13. Write a shell script to find the power of a given number.
14. Write a shell script to find the binomial coefficient C(n , x).
15. Write a shell script to find the permutation P(n,x).
16. Write a shell script to find the greatest number among the three numbers.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not

Semester – VI

16CTU612A E-COMMERCE TECHNOLOGIES- PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce the concepts, vocabulary, and procedures associated with E-Commerce and the Internet.
- To gain an overview of all aspects of E-Commerce.
- To develop the Internet and E-Commerce, options available for doing business on the Internet, features of Web sites and the tools used to build an E-Commerce web site, marketing issues, payment options, security issues, and customer service.
- It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems
- Assess e-commerce strategies and applications, including online marketing, e-government, e-learning and global e-commerce

Course Outcomes (COs)

Upon successful completion of this course, the student will be able to:

1. Describe an example of system architecture for an e-Business.
2. List the seven major elements of web design.
3. Identify and explain fundamental web site tools including design tools, programming tools, and data processing tools.
4. Identify the major electronic payment issues and options.
5. Discuss security issues and explain procedures used to protect against security threats.
6. Identify and discuss management issues underlying e-Commerce issues including organizational structure, strategic planning, goal setting, corporate social responsibility, international arena, changing market intermediaries, resource allocation and customer service.

List of Programs

1. Write a HTML program to implement the use of Image map.
2. Write a CSS to implement selectors in HTML
3. Write a CSS to implement pesudo – classes with in-line styles
4. Write a Javascript program to validate a web form
5. Write a Javascript program to allow visitors to see history of visiting your page
6. Write a Javascript program to change random color each 5 seconds

7. Write a pearl program to read a list of n strings (from STDIN) into an array and print a random string from the list (Use srand;rand(@array))

8. Write a pearl program to read a list of n numeric's from STDIN and find the max, min, range, median and mode. Input size of the list n interactively.

9. Write a pearl program to read a file of words and replaces all words in the file with their uppercase equivalent (hint: use tr/a-z/A-Z/)

10. Write VBScript program to print Fibonacci series using Do..while loop and For loop.

11. Write VBScript program to generate date and time in defferent format

12. Write VBScript program to print student marklist

13. Develop an ASP code to retrieve information from forms

14. Develop an ASP code to reading and writing cookies information

15. Develop an ASP code using response object methods

Semester – VI

16CTU612B CLOUD COMPUTING -PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To learn how to use Cloud Services.
- To implement Virtualization
- To implement Task Scheduling algorithms.
- To apply Map-Reduce concept to applications.
- To build Private Cloud.
- To know the impact of engineering on legal and societal issues involved

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.
2. Design different workflows according to requirements and apply map reduce programming model.
3. Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
4. Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds
5. Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application
6. Broadly educate to know the impact of engineering on legal and societal issues involved in addressing the security issues of cloud computing.

List of Programs

1. Create virtual machines that access different programs on same platform.

2. Create virtual machines that aITUess different programs on different platforms.

3. Working on tools used in cloud computing online-

    a) Storage
    b) Sharing of data
    c) Manage your calendar, to-do lists,
    d) A document editing tool

4. Exploring Google cloud

5. Exploring Microsoft cloud

6. Exploring Amazon cloud

Semester – VI

16CTU613A SOFT COMPUTING - PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To familiarize with soft computing concepts.
- To introduce the fuzzy logic concepts, fuzzy principles and relations.
- To Basics of ANN and Learning Algorithms.
- Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- Genetic Algorithm and its applications to soft computing.
- Hybrid system usage, application and optimization

Course Outcomes (COs)

Upon completion of the course, the student will be able to :

1. List the facts and outline the different process carried out in fuzzy logic, ANN and Genetic Algorithms.
2. Explain the concepts and meta-cognitive of soft computing.
3. Apply Soft computing techniques the solve character recognition, pattern classification, regression and similar problems.
4. Outline facts to identify process/procedures to handle real world problems using soft computing.
5. Evaluate various techniques of soft computing to defend the best working solutions.
6. Design hybrid system to revise the principles of soft computing in various applications.

List of Programs

1. Implement OR, AND using Perceptron in C
2. Implement OR,AND using Perceptron in MATLAB Command-line Argument
3. Implement OR,AND using Perceptron in MATLAB GUI
4. Implement OR,AND, X-OR gate, using back propagation algorithm in MATLAB using Command-line Argument as well as GUI
5. Solve a given problem – 1 (Operatons) using Fuzzy Ligic in MATLAB
6. Solve a given problem – 1 (Max-Min Composition) using Fuzzy Ligic in MATLAB
7. To find the solution of the function Maximize, given the constraints using GA approach in C.
8. Solve a given problem – 1 using Fuzzy Logic in MATLAB GUI
9. Study GA tool in MATLAB.

Semester – VI

16CTU613B SYSTEM PROGRAMMING - PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce students the concepts and principles of system programming
- To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.
- To train students in developing skills for writing system software with the aid of sophisticated OS services, programming languages and utility tools.
- To understand the role and functioning of various system programs over application program.
- To understand the need to follow the syntax in writing an application program and to learn the how the analysis phase of compiler is designed to understand the programmer‛s requirements without ambiguity.
- To synthesize the analysis phase outcomes to produce the object code that is efficient in terms of space and execution time.

Course Outcomes (COs)

Upon completion of the subject, students will be able to

1. Organize the functionalities and components of a computer system into different layers, and have a good understanding of the role of system programming and the scope of duties and tasks of a system programmer
2. Grasp the concepts and principles, and be familiar with the approaches and methods of developing system-level software (e.g., compiler, and networking software)
3. Apply the knowledge and techniques learnt to develop solutions to realworld problems
4. Select and make use of the OS kernel functions and their APIs, standard programming languages, and utility tools
5. Organize and manage software built for deployment and demonstration
6. Analyze requirements and solve problems using systematic planning and development approaches

List of Programs

1. To implement an assembler for a hypothetical language.
2. To get familiar with lex: write a program to recognize numbers, identifiers.
3. To get familiar with yacc: write a desk calculator.

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)
முதல்பருவம்
(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)
(For I-UG Science Degree Classes) 16LSU101

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

- இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
- மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016-2017)

பகுதி – I, தமிழ் **பருவம் I**

16LAU101 : **தமிழ் முதல் தாள்** 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது**)**

அலகு – I : இக்கால இலக்கியம்: **(10 மணிநேரம்)**

கல்வி : மகாகவி பாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.
இன்றைய நிலை : கவிமணி தேசிக விநாயகம் பிள்ளை – ஒற்றுமையே உயிர்நிலை.
மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் –மலையாளக் காற்று.
சூழலியல் : கவிஞர் வைதீஸ்வரன் - விரல் மீட்டிய மழை.
பெண்ணியம் : கவிஞர் சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை.

அலகு – II : அற இலக்கியம்: **(10 மணிநேரம்)**

கொன்றை வேந்தன்: 1-50 பாடல்கள்
திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்
பழமொழி நானூறு: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: **(10 மணிநேரம்)**

மூவருலா: 1-26 கண்ணிகள்
திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்
கலிங்கத்துப் பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV : கட்டுரை: **(10 மணிநேரம்)**

1. **உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்**
2. **கட்டிடக்கலை** - அ. இராசமாணிக்கனார்
3. **வாழ்க்கை** - இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: **(8 மணிநேரம்)**

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Semester – I

16AEC101 ENVIRONMENTAL STUDIES 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **100** Total: **100**

Course Objectives (CO)

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- To apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- To reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

UNIT-I: Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

Unit II: Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources: Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fire works.

Unit III: Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV: Environmental Pollution - Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution , Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit V: Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

Suggested Readings

T1: Tripathy. S.N., & Sunakar Panda. (2004). Fundamentals of Environmental Studies (2nd ed.) . New Delhi: Vrianda Publications Private Ltd.

T2: Arvind Kumar. (2004). A Textbook of Environmental Science. New Delhi: APH Publishing Corporation.

T3:Verma, P.S., & Agarwal V.K. (2001). Environmental Biology (Principles of Ecology) . New Delhi: S.Chand and Company Ltd.

T4: Anubha Kaushik., & Kaushik, C.P. (2004). Perspectives in Environmental Studies. New Delhi: New Age International Pvt. Ltd. Publications.

R1: Singh, M.P., Singh, B.S., & Soma, S. Dey. (2004). Conservation of Biodiversity and Natural Resources. New Delhi: Daya Publishing House.

R2: Daniel, B. Botkin., & Edward, A. Keller. (1995). Environmental Science New York: John Wiley and Sons, Inc.,.

R3: Uberoi, N.K. (2005). Environmental Studies. New Delhi: Excel Books Publications.

Semester-I

16ITU101 Programming Fundamentals Using C / C++ 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int:**40** Ext : **60** Total: **100**

Course Objectives (CO)

- To impart adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basics of C Language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To teach the issues in file organization and the usage of file systems.
- To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
- To learn how to write inline functions for efficiency and performance.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Obtain the knowledge about the number systems this will be very useful for bitwise operations.
2. Develop programs using the basic elements like control statements, Arrays and Strings.
3. Understand about the dynamic memory allocation using pointers which is essential for utilizing memory
4. Understand about the code reusability with the help of user defined functions.
5. Develop advanced applications using enumerated data types, function pointers and nested structures, the basic object-oriented design principles in computer problem solving.
6. Learn the basics of file handling mechanism that is essential for understanding the concepts in database management systems, the uses of preprocessors and various header file directives, the characteristics of an object-oriented programming language in a program.

UNIT-I

Introduction to C and C++:

History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++.

Data Types, Variables, Constants, Operators and Basic I/O: Declaration, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators, Using Comments in programs, Character I/O, Formatted and Console I/O, Using Basic Header Files.

Expressions, Conditional Statements and Iterative Statements: Simple Expressions in C++, Understanding Operators Precedence in Expressions, Conditional Statements, Understanding syntax and utility of Iterative Statements, Use of break and continue in Loops, Using Nested Statements.

UNIT-II

Functions and Arrays: Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.

Creating and Using One Dimensional Arrays, Use Various types of arrays, Two-dimensional Arrays, Introduction to Multi-dimensional arrays.

UNIT-III

Derived Data Types (Structures and Unions): Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members.

Pointers and References in C++: Understanding a Pointer Variable, Simple use of Pointers, Pointers to Pointers, Pointers to structures, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions.

UNIT-IV

File I/O, Preprocessor Directives: Opening and closing a file, Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives, Macros.

UNIT-V

Using Classes in C++: Principles of Object-Oriented Programming, Defining & Using Classes, Constructors, Constructor Overloading, Function overloading and Operator overloading in classes, Class Variables & Functions, Access specifiers, Overview of Template classes and their use.

Inheritance, Polymorphism and Exception Handling: Introduction to Inheritance, Polymorphism, Basics Exceptional Handling.

Suggested Readings:

1. BjarneStroustrup, "Programming -- Principles and Practice using C++", 2nd Edition, Addison-Wesley 2014.

2. BjarneStroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley , 2013

3. Harry, H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide", First Create space Inc, O-D Publishing, LLC USA.2014

4. Stanley B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Published by Addison-Wesley, 5th Edition, 2012

5. Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.

6. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.

7. Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.

8 . Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.

9. Scott Meyers, "Effective C++", 3rd Edition, Published by Addison-Wesley, 2005.

WEB SITES

1. http://www.cs.cf.ac.uk/Dave/C/CE.html
2. http://www2.its.strath.ac.uk/courses/c/
3. http://www.iu.hio.no/~mark/CTutorial/CTutorial.html
4. http://www.cplusplus.com/doc/tutorial/
5. www.cplusplus.com/
6. www.cppreference.com/

Semester – I

16ITU102 COMPUTER SYSTEM ARCHITECTURE 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To enable the students to gain knowledge on the architecture of modern computer.
- To understand how computer stores positive and negative numbers and to perform arithmetic operation of positive and negative numbers.
- To learn about logic gates and solve problems using Boolean algebra.
- To understand the simplification of circuits like adders, subtractors, multiplexers, encoders.
- To understand the basic computer organization and design.
- To learn Cache memory and its importance

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Acquire a basic knowledge about computer system architecture, digital circuits and the low - level programming skills.
2. Understand the inner workings and performance capabilities of advanced microprocessors.
3. Solve the problems using Boolean algebra
4. Understand the basic computer organization and design.
5. Learn about Cache memory and its importance
6. Solve the binary arithmetic problems and conversion among the number systems

UNIT -I Introduction

Logic gates, Boolean algebra, circuit simplification, combinational circuits: Adders and Subtractors –Multiplexers and De multiplexers – Encoders and Decoders- sequential circuits: Flip Flop’s, registers, counters and memory units.

UNIT -II Data Representation and Basic Computer Arithmetic

Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

UNIT –III Basic Computer Organization and Design

Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

UNIT-IV Central Processing Unit

Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

UNIT –V Memory and Input-Output Organization

Cache memory, Associative memory, mapping Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

Suggested Readings:

1. Dos Reis, A. J. (2009). Assembly Language and Computer Architecture using C++ and JAVA. Course Technology
2. Stallings, W. (2010). Computer Organization and Architecture Designing for Performance (8th ed.) New Delhi: Prentice Hall of India,
3. Mano, M.M. (2013). Digital Design, New Delhi: Pearson Education Asia.
4. Carl Hamacher. (2012). Computer Organization (5th ed.). New Delhi: McGrawHill.

Semester – I

16ITU103 **DEVELOPING PROGRAMMING LOGIC AND TECHNIQUES** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To develop a basic understanding of many areas of information technology and how they are used
- To understand the basic structure of a program including sequence, decisions and looping
- To understand how to design a program to solve a simple program
- To introduce the basics of several programming language and understand the commonality and differences in languages
- To lay a basic foundation involving hardware, software, navigation, the Internet for future development
- To understand what a database is and how to design a working model

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Demonstrate knowledge of high-level structured programming logic and algorithm development.
2. Demonstrate knowledge of structured program design and modularity.
3. Demonstrate knowledge of file-based input/output operations, file manipulation and maintenance, extract reporting, and report writing.
4. Demonstrate knowledge of records, data types and structures, storage classes, addressable memory locations.
5. Demonstrate knowledge of table utilization, arrays and subscripts.
6. Demonstrate knowledge of arithmetic expressions, control structures, iteration techniques.

UNIT – I

Language Evolution Machine Language, Assembly Language, High Level Language. Translators: compiler, Interpreter and Assembler. The Compilation Process, Linker, Loader, Study of HLL, Characteristics of Good Language, Generation of Languages, Study of Programming Languages (Function Oriented, Object Oriented, Event-Based).

UNIT – II

Programming Construction Tools Problem Analysis, Process Analysis, Conceptual Development of Solution. Development Tools: Algorithm: Types of Algorithm, Algorithm of Analysis, Advantage and Disadvantage of Algorithm, Complexity of Algorithm, Big-O Notation.

UNIT – III

Flowcharts: Types of Flowcharts, Advantage and Disadvantage of Flowchart. Pseudocode: Definition and Its Characteristics Control Statements Basics of Programming Language: Usage of Character Set, Meaning of Keywords and Identifiers, Role of Data Types, Constants and Variables.

UNIT – IV

Importance of Casting, Different Types of Operators and their Precedence, Expressions, Conditional Statements (One-Way, Two-Way and Multi-Way Conditional), Looping Statements (For, While, do-while), Usage of Exit, continue, Break and Goto Statement.

UNIT – V

Arrays: Arrays, One dimensional array, Various operatio on Array (Inserting of Elements, Deleting of Element, Rotating List, Sorting, Searching, Merging Etc) and Two dimensional arrays (Matrix Addition, Transpose of Matrix, Matrix Multiplication), Modular programming and its features.

Suggested Readings:

1. 1.Anil V.Chouduri. The Art of Programming through Flowchart and Algorithms. Laxmi Publication.
2. Maureen Sprankle (2009). Problem Solving Programming Concepts (7th ed.). Pearson Education.
3. Behrouz Forouzan. Basic of Computer Science. Cengage Learning
4. Donald Knuth. The Art of Computer Programming Vol-I,II, III, Pearson.
5. Horowitz, Sahani. Fundamental of Computer Algorithm. Orient Longman.

Semester – I

16ITU111 PROGRAMMING FUNDAMENTALS USING C / C++ - PRACTICAL **3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To impart adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basics of C Language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To teach the issues in file organization and the usage of file systems.
- To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
- To learn how to write inline functions for efficiency and performance.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Obtain the knowledge about the number systems this will be very useful for bitwise operations.
2. Develop programs using the basic elements like control statements, Arrays and Strings.
3. Understand about the dynamic memory allocation using pointers which is essential for utilizing memory
4. Understand about the code reusability with the help of user defined functions.
5. Develop advanced applications using enumerated data types, function pointers and nested structures, the basic object-oriented design principles in computer problem solving.
6. Learn the basics of file handling mechanism that is essential for understanding the concepts in database management systems, the uses of preprocessors and various header file directives, the characteristics of an object-oriented programming language in a program

List of Programs

1. WAP to display Fibonacci series (i)using recursion, (ii) using iteration

2. WAP to compute the sum of the first n terms of the following series
S = 1+1/2+1/3+1/4+……

3. Write a program to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.

4. WAP to print the sum and product of digits of an integer.

5. WAP to reverse a number.

6. Write a program that checks whether a given string is Palindrome or not.

7. WAP to print a triangle of stars as follows (take number of lines from user):

```
*
***
*****
*******
*********
```

8. WAP to perform following actions on an array entered by the user:

i) Calculate and print the sum and average of the elements of array

ii) Print the maximum and minimum element of array

9. Write a program that swaps two numbers using pointers.

10. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.

11. Write a program to perform operations on strings.

12. Write a program to perform following Matrix operations (2-D array implementation):
a) Sum b) Difference c) Product

13. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.

14. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).

15.Copy the contents of one text file to another file using command line argument.

Semester – I

16ITU112 COMPUTER SYSTEM ARCHITECTURE - PRACTICAL 3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To enable the students to gain knowledge on the architecture of modern computer.
- To understand how computer stores positive and negative numbers and to perform arithmetic operation of positive and negative numbers.
- To learn about logic gates and solve problems using Boolean algebra.
- To understand the simplification of circuits like adders, subtractors, multiplexers, encoders.
- To understand the basic computer organization and design.
- To learn Cache memory and its importance

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Acquire a basic knowledge about computer system architecture, digital circuits and the low - level programming skills.
2. Understand the inner workings and performance capabilities of advanced microprocessors.
3. Solve the problems using Boolean algebra
4. Understand the basic computer organization and design.
5. Learn about Cache memory and its importance
6. Solve the binary arithmetic problems and conversion among the number systems

List of Experiments

1. Verification of Logic Gates
2. Code converters
3. Realization of Multiplexer using basic gates
4. Encoder and Decoder
5. Realization Half and Full adders
6. Realization of Subtractor
7. Realization of Parity generator
8. Flip-Flop Circuits
9. Digital to analog Converters
10. Demonstrate a Basic Arithmetic Computing operations

Semester – I

16ITU113 OFFICE AUTOMATION - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To identify types of computers, how they process information and how individual computers interact with other computing systems and devices.
- To identify the function of computer hardware components.
- To identify the factors that goes into an individual or organizational decision on how to purchase computer equipment.
- To identify how to maintain computer equipment and solve common problems relating to computer hardware.
- To identify how software and hardware work together to perform computing tasks and how software is developed and upgraded.
- To identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Understand the meaning and basic components of a computer system,
2. Define and distinguish Hardware and Software components of computer system,
3. Explain and identify different computing machines during the evolution of computer system, gain knowledge about five generations of computer system,
4. Identify and discuss the functional Units of a computer system, identify the various input and output Units and explain their purposes
5. Understand the role of CPU and its components, understand the concept and need of primary and secondary memory, discuss the advantages, limitations and applications of computers.
6. Understand the classification of computers, distinguish the computers on the basis of purpose, technology and size

List of Programs

Practical exercises based on MS Office/ Open Office tools using document preparation and spreadsheet handling packages.

<u>MS Word</u>

1. Prepare **a grocery list** having four columns (Serial number, The name of the product, quantity and price) for the month of April, 06.

- Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.
- The headings of the columns should be in 12-point and bold.
- The rest of the document should be in 10-point Times New Roman.
- Leave a gap of 12-points after the title.

2. Create a **telephone directory**.

- The heading should be 16-point Arial Font in bold
- The rest of the document should use 10-point font size
- Other headings should use 10-point Courier New Font.
- The footer should show the page number as well as the date last updated.

3. Design a **time-table form** for your college.

- The first line should mention the name of the college in 16-point Arial Font and should be bold.
- The second line should give the course name/teacher‘s name and the department in 14-point Arial.
- Leave a gap of 12-points.
- The rest of the document should use 10-point Times New Roman font.
- The footer should contain your specifications as the designer and date of creation.

4. BPB Publications plans to release a new book designed as per your syllabus. Design the **first page of the book** as per the given specifications.

- The title of the book should appear in bold using 20-point Arial font.
- The name of the author and his qualifications should be in the center of the page in 16-point Arial font.
- At the bottom of the document should be the name of the publisher and address in 16-point Times New Roman.
- The details of the offices of the publisher (only location) should appear in the footer.

5. Create the following one page documents.
   a. Compose a note inviting friends to a get-together at your house, Including a list of things to bring with them.
   b. Design a certificate in landscape orientation with a border around the document.
   c. Design a Garage Sale sign.
   d. Make a sign outlining your rules for your bedroom at home, using a numbered list.

6. Create the following documents:
   (a) A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.
   (b) Use a newsletter format to promote upcoming projects or events in your classroom or college.

7. Convert following text to a table, using comma as delimiter
   Type the following as shown (do not bold).
   Color, Style, Item
   Blue, A980, Van
   Red, X023, Car
   Green, YL724, Truck
   Name, Age, Sex
   Bob, 23, M
   Linda, 46, F
   Tom, 29, M

8. Enter the following data into a table given on the next page.

Salesperson	**Dolls**	**Trucks**	**Puzzles**
Kennedy, Sally	1327	1423	1193
White, Pete	1421	3863	2934
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067

Add a column Region (values: S, N, N,S,S,S) between the Salesperson and Dolls columns to the given table Sort your table data by Region and within Region by Salesperson in ascending order:
In this exercise, you will add a new row to your table, place the word Total at the bottom of the Salesperson column, and sum the Dolls, Trucks, and Puzzles columns.

9. Wrapping of text around the image.

10. Following features of menu option must be covered

   FILE Complete menu
   EDIT Complete menu
   VIEW Complete menu
   INSERT Complete menu
   FORMAT Complete menu
   TABLE Complete menu

WINDOW Complete menu
HELP Complete menu
TOOLS All options except Online collaboration, Tools on Macro, Templates

MS Excel

1. Enter the Following data in Excel Sheet

REGIONAL SALES PROJECTION						
State	**Qtr1**	**Qtr2**	**Qtr3**	**QTR4**	**Qtr Total**	**Rate Amount**
Delhi	2020	2400	2100	3000	15	
Punjab	1100	1300	1500	1400	20	
U.P.	3000	3200	2600	2800	17	
Haryana	1800	2000	2200	2700	15	
Rajasthan	2100	2000	1800	2200	20	

TOTAL
AVERAGE

(a) Apply Formatting as follow:

i. Title in TIMES NEW ROMAN

ii. Font Size - 14

iii. Remaining text - ARIAL, Font Size -10

iv. State names and Qtr. Heading Bold, Italic with Gray Fill Color.

v. Numbers in two decimal places.

vi. Qtr. Heading in center Alignment.

vii. Apply Border to whole data.

(b) Calculate State and Qtr. Total

(c) Calculate Average for each quarter

(d) Calculate Amount = Rate * Total .

2. Given the following worksheet

	A	**B**	**C**	**D**
1	Roll	Name	Marks	Grade

	No.			
2	1001	Sachin	99	
3	1002	Sehwag	65	
4	1003	Rahul	41	
5	1004	Sourav	89	
6	1005	Har Bhajan	56	

Calculate the grade of these students on the basis of following guidelines:

If Marks	Then Grade
>= 80	A+
>= 60 < 80	A
>= 50 < 60	B
< 50	F

3. Given the following worksheet

	A	**B**	**C**	**D**	**E**	**F**	
1	**Salesman**			**Sales in (Rs.)**			
2	No.	Qtr1	Qtr2	Qtr3	Qtr4	Total	Commission
3	S001	5000	8500	12000	9000		
4	S002	7000	4000	7500	11000		
5	S003	4000	9000	6500	8200		
6	S004	5500	6900	4500	10500		
7	S005	7400	8500	9200	8300		
8	S006	5300	7600	9800	6100		

Calculate the commission earned by the salesmen on the basis of following Candidates:

If Total Sales	**Commission**
< 20000	0% of sales
> 20000 and < 25000	4% of sales
> 25000 and < 30000	5.5% of sales
> 30000 and < 35000	8% of sales
>= 35000	11% of sales

The total sales is sum of sales of all the four quarters.

4. A company XYZ Ltd. pays a monthly salary to its employees which consists of basic salary, allowances & deductions. The details of allowances and deductions are as follows:

Allowances

• HRA Dependent on Basic

30% of Basic if Basic <=1000

25% of Basic if Basic>1000 & Basic<=3000
20% of Basic if Basic >3000

- DA Fixed for all employees, 30% of Basic
- Conveyance Allowance Rs. 50/- if Basic is <=1000
Rs. 75/- if Basic >1000 & Basic<=2000
Rs. 100 if Basic >2000
- Entertainment Allowance NIL if Basic is
<=1000 Rs. 100/- if Basic > 1000

Deductions

- Provident Fund 6% of Basic
- Group Insurance Premium Rs. 40/- if Basic is <=1500
Rs. 60/- if Basic > 1500 & Basic<=3000
Rs. 80/- if Basic >3000

Calculate the following:
Gross Salary = Basic + HRA + DA + Conveyance + Entertainment
Total deduction = Provident Fund + Group Insurance Premium
Net Salary = Gross Salary – Total Deduction.

5. Create Payment Table for a fixed Principal amount, variable rate of interests and time in the format below:

No. of Installments	**5%**	**6%**	**7%**	**8%**	**9%**
3	XX	XX	XX	XX	XX
4	XX	XX	XX	XX	XX
5	XX	XX	XX	XX	XX
6	XX	XX	XX	XX	XX

~~6. Use an array formula to calculate Simple Interest~~ for given principal amounts given the rate o

6. Use an array formula to calculate Simple Interest for given principal amount.Given the Rate of Interest and time.

Rate of Interest	8%
Time	5 Years
Principal	Simple Interest
1000	?
18000	?
5200	?

7. The following table gives year wise sale figure of five salesmen in Rs.

Salesman	2000	2001	2002	2003
S1	10000	12000	20000	50000
S2	15000	18000	50000	60000
S3	20000	22000	70000	70000
S4	30000	30000	100000	80000
S5	40000	45000	125000	90000

(a) Calculate total sale year wise.

(b) Calculate the net sale made by each salesman
(c) Calculate the maximum sale made by the salesman
(d) Calculate the commission for each salesman under the condition.
(i) If total sales >4,00,000 give 5% commission on total sale made by the salesman.
(ii) Otherwise give 2% commission.
(e) Draw a bar graph representing the sale made by each salesman.
(f) Draw a pie graph representing the sale made by salesman in 2000.

8. Enter the following data in Excel Sheet

PERSONAL BUDGET FOR FIRST QUARTER

Monthly Income (Net): 1,475

EXPENSES	**JAN**	**FEB**	**MARCH**	**QUARTER TOTAL**	**QUARTER AVERAGE**
Rent	600.00	600.00	600.00		
Telephone	48.25	43.50	60.00		
Utilities	67.27	110.00	70.00		
Credit Card	200.00	110.00	70.00		
Oil	100.00	150.00	90.00		
AV to Insurance	150.00				
Cable TV	40.75	40.75	40.75		
Monthly Total					

Calculate Quarter total and Quarter average.
(a) Calculate Monthly total.
(b) Surplus = Monthly income - Monthly total.
(c) What would be total surplus if monthly income is 1500.
(d) How much does telephone expense for March differ from quarter average.
(e) Create a 3D column graph for telephone and utilities. (f) Create a pie chart for monthly expenses.

9. Enter the following data in Excel Sheet

TOTAL REVENUE EARNED FOR SAM'S BOOKSTALL

Publisher name	**1997**	**1998**	**1999**	**2000**	**total**
A	Rs.1000.00	Rs.1100.00	Rs.1300.00	Rs.800.00	
B	Rs.1500.00	Rs.700.00	Rs.1000.00	Rs.2000.00	
C	Rs.700.00	Rs.900.00	Rs.1500.00	Rs.600.00	
D	Rs.1200.00	Rs.500.00	Rs.200.00	Rs.1100.00	
E	Rs.800.00	Rs.1000.00	Rs.3000.00	Rs.560.00	

(a) Compute the total revenue earned.

(b) Plot the line chart to compare the revenue of all publisher for 4 years.
(c) Chart Title should be ‗Total Revenue of sam‘s Bookstall (1997-2000)‘
(d) Give appropriate categories and value axis title.

10. Generate 25 random numbers between 0 & 100 and find their sum, average and count. How many no. are in range 50-60.

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)
இரண்டாம் பருவம்
(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)
(For I-UG Science Degree Classes) 16LSU201

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

- இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
- மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)

பகுதி – I, தமிழ் | பருவம் II

16LAU201 : **தமிழ்** இரண்டாம் **தாள்** 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

அலகு – I : பக்தி **இலக்கியம்** **(10 மணிநேரம்)**

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. **சைவம் -** பெரியபுராணம் - திருமூலநாயனார் புராணம்.
2. **வைணவம் -** பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

அலகு – II : சங்க இலக்கியம் : **(15 மணிநேரம்)**

சங்க இலக்கியங்கள் அறிமுகம்

அ). **எட்டுத்தொகை**

நற்றிணை : பிரசம் கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகா°ச்சிறப்பு –

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : சுடா°தொடீ கேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு : அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி - 48

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள் – 'சிறுதினை மலரொடு' என்பதிலிருந்துதொடங்கி, 'அறிந்தவாறே' என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – 'தெய்வம் சான்ற' என்பதிலிருந்து தொடங்கி, 'நல்குமதி' என்பது வரையிலான தொடர்கள்: 286-295.

அலகு - III : காப்பியம் (6 மணிநேரம்)

சிலப்பதிகாரம்;

மங்கல வாழ்த்துப் பாடல்; **(21-29) –** கண்ணகியின் சிறப்பு;

'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி,

'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: **(207-234) -** சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: **(482-485) -** செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

அலகு – IV : சிறுகதை (10 மணிநேரம்)

1. **குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்**
2. காட்டில் ஒரு மான் - அம்பை
3. நாற்காலி – கி.ராஜநாராயணன்
4. **நகரம் – சுஜாதா**

அலகு- V : மொழிப்பயிற்சி (7 மணிநேரம்)

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)

மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

16ITU201 PROGRAMMING IN JAVA **Semester – II** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To understand the fundamental of Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)

After completion of this course, the students will be able to

1. Obtain knowledge of the structure and model of the Java programming language.
2. Use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. Use certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems.

UNIT-I

Introduction to Java Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods),

UNIT-II

Arrays, Strings and I/O Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files. **Object-Oriented Programming Overview** Principles of Object-Oriented Programming, Defining & Using Classes, Controlling AITUess to Class Members, Class

Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

UNIT-III

Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata

Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

UNIT-IV

Exception Handling, Threading, Networking and Database Connectivity Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

UNIT-V

Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, textfields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Suggested Readings:

1. Ken Arnold., James Gosling., & David Homes. (2005). The Java Programming Language (4th ed.).
2. James Gosling., Bill Joy., Guy, L. Steele Jr., Gilad Bracha., & Alex Buckley. (2014).The Java Language Specification, Java SE (8 ed.). Addison Wesley.
3. Joshua Bloch. (2008). Effective Java (2nd ed.). Addison-Wesley.
4. Cay, S. Horstmann,. GaryCornell. (2012).Core Java 2 Volume 1 (9th ed.). . New Delhi: Prentice Hall.
5. Cay, S. Horstmann., Gary Cornell. (2013). Core Java 2 Volume 2 - Advanced Features(9th ed.). New Delhi: Printice Hall.
6. Bruce Eckel. (2002). Thinking in Java (3rd ed.). New Delhi: PHI.
7. Balaguruswamy, E. (2009). Programming with Java (4th ed.). New Delhi: McGraw Hill.
8. Paul Deitel., & Harvey Deitel. (2011). Java: How to Program (10th ed.). New Delhi: Prentice Hall.
9. (2005).Head First Java (2nd ed.). Orielly Media Inc.
10. David, J. Eck. (2009). Introduction to Programming Using Java. New Delhi: CreateSpace Independent Publishing Platform.
11. John , R. Hubbard. (2004). Programming with JAVA, Schaum's Series, (2nd ed.).

WEB SITES

1. java.sun.com/docs/books/tutorial/
2. www.en.wikipedia.org/wiki/Java
3. www.java.net/

Semester – II

16ITU202 **DISCRETE STRUCTURES** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To learn the basic concepts of sets, types of sets, functions and relations
- To understand about Pigeonhole principle, Permutation and Combination, Mathematical Induction
- To solve the problems using Recurrence relations and generating functions.
- To know the basic concepts of Logical Connectives, Graphs and Trees.
- To express ideas using mathematical notation
- To solve problems with the help of tools of mathematical analysis.

Course Outcomes (COs)

On successful completion of the course, students will be able to

1. Familiar with elementary algebraic set theory.
2. Acquire a fundamental understanding of the core concepts in growth of functions.
3. Describe the method of recurrence relations.
4. Get wide knowledge about graphs and trees
5. Initiate to knowledge from inference theory
6. Solve problems with the help of tools of mathematical analysis

UNIT I

Sets: Introduction, Sets , finite and infinite sets, uncountably infinite sets, functions, relations, properties of binary relations, closure, partial ordering relations, counting , Pigeonhole principle, Permutation and Combination, Mathematical Induction, Principle of inclusion and Exclusion.

UNIT II

Growth of Functions: Asymptotic Notations, Summation formulas and properties,Bounding Summations, approximation byIntegrals

UNIT III

Recurrences: Recurrence relations, generating functions, linear recurrence relations with constant coefficients and their solution, Substitution Method, recurrence trees, Master theorem.

UNIT IV

Graph Theory: Basic terminology, models and types, multigraphs and weighted graphs, graph representation, graph isomorphism, connectivity, Euler and Hamiltonian Paths and circuits, Planar graphs, graph coloring, trees, basic terminology and properties of trees, introduction to Spanning trees

UNIT V

Prepositional Logic: Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory.

Suggested Readings

1. Kenneth Rosen. (2006). Discrete Mathematics and Its Applications (6th ed.). New Delhi: McGraw Hill.
2. J.P.Tremblay & R.Manohar (1997). Discrete Mathematical Structures with Applications to Computer Science. New Delhi: McGraw-Hill Book Company.
3. T.H.Coremen, C.E. Leiserson, R. L. Rivest. (2009). Introduction to algorithms, (3rd ed.). Prentice Hall on India.
4. M.O. Albertson, and J.P.Hutchinson (1988). Discrete Mathematics with Algorithms . John wiley Publication.
5. J. L.Hein (2009). Discrete Structures, Logic, and Computability(3rd ed.). Jones and Bartlett Publishers.
6. D.J.Hunter (2008). Essentials of Discrete Mathematics. Jones and Bartlett Publishers.

Semester – II

16ITU203 FUNDAMENTALS OF WEB DESIGNING AND INTERNET 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- Understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
- Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice.
- Develop skills in analyzing the usability of a web site.
- Understand how to plan and conduct user research related to web usability.
- Learn the language of the web: HTML and CSS.
- Develop basic programming skills using Javascript

Course Outcomes (Cos)

The students will be able to:

1. Analyze a web page and identify its elements and attributes.
2. Design a basic web site using HTML5 and CSS3 to demonstrate responsive web design
3. Implement dynamic web pages with validation using JavaScript objects by applying different event handling mechanism.
4. Create web pages using XHTML and Cascading Style Sheets.
5. Build dynamic web pages using JavaScript (Client side programming).
6. Create XML documents and Schemas

Unit – I: Introduction to Web Technology

Introduction to Internet, Basic Internet Terms in Internet Addressing, Internet Tools, Services of Internet, Introduction to Worl Wide Web, Components of Web, Types of Websites, Role of Web Browser and Web server, Types of Web Browsers, Types of Web Server, Flow of Web Inforamtion, Objective of the Website, Basic Interface design, Various Types of URLs, Process of Web Publishing.

Unit- II: Creating Static Web Pages and Lists in HTML

Introduction to HTML, Features of HTML, Advantages and Disadvantages of HTML, Features of Static and Dynamic Web Page. Creating a Simple Static Web Page: Creating Web page using HTML, structure of HTML document, HTML Tags, tags attributes, Basic Elements: <html>, <head>, <title>, <p>, <br>, <h1> to <h6>, <pre>, <marquee>, <hr>, <br>,<center>, Text formatting tags, Using colors for the web, Physical and Logical Tags, Special Characters.

Lists in HTML: Ordered List, Unordered List, Definition List and Nested List.

Unit-III: Adding Links, Images, Background and table

Tables: Components of a tabls, basic table tags and their related attributes. Paths: Relative Path and Absolute path, Linking HTML Pages: Link Tag <a href...>, kinds of linking, linking to URLs.

Unit-IV: Adding Images and Image Maps

Adding images to HTL pages: Image formats for Internet and HTML, Image tag and theri related attributes, Inline images, Links to (external) images, images as hyperlinks, using images as background. Image Maps: What are image maps, tags used for image mapping, Client-side and server-side Image maps.

Unit-V: Forms, Frames and Embedding Multimedia

Frames: Introduction to Frame, <Frameset> and <frame> tag with its attributes, creating frames, linking frames, <noframes> tag, complex frameset, floating and inline frame. Forms: <Form> tag and its attributes,, <input> tag and its attributes, Form controls: Text controls, password fields, radio buttons, checkboxes, reset and submit buttons, Form control selection, Option processing and Text Area, Hidden fields. Embedding Multimedia: Introduction, Embedding Multimedia, inserting Sound/Audio Formats, Inserting video file formats.

Suggested Readings

1. Sean Mcmanus (2011). Web Designing in Easy Steps (5th ed.). TMH ISBN:9380071333566.
2. C. Xavier (2013) Web Technology and Design (1st ed.). New Age International Publishers, ISBN-81-224-1450-8.
3. B.P.Nagpal. Web Designing technology. S.Chand Publications, ISBN:9788121927635.
4. ISRD Group (2011). Internet Technology and Web Design. TMH, ISBN-0-07-107276-4.
5. James L.Mohler, Jon M.Duff (2008). Designing Interactive Web Site. Cengage Learning, ISBN-976-81-315-0570-0.
6. Thomas A.Powell (2010). The Complete Refernce HTML and CSS, (5th ed). Tata MC-Grw Hill Publications, New Delhi.
7. Achyut Godbole, atul Kahate (2013). Web Technologies (3rd ed). Tata McGraw Hill Publications.

Websites

1.www.w3schools.com/
2. www.htmlcodetutorial.com/
3. http://edutechwiki.unige.ch/en/Web_technology_and _web_design_tutorials
Jmarshall.com/easy

Semester – I

16ITU211 PROGRAMMING IN JAVA - PRACTICAL 3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To understand the fundamental of Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)

After completion of this course, the students will be able to

1. Obtain knowledge of the structure and model of the Java programming language.
2. Use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. Use certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

List of Programs

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of .lenth in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(, setLength(), append(), insert(), concat()and equals().

9. Write a program to create a ―distance‖ class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
10. Modify the ―distance‖ class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)
12. Write a program to show the difference between public and private aITUess specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
13. Write a program to show the use of static functions and to pass variable length arguments in a function.
14. Write a program to demonstrate the concept of boxing and unboxing.
15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
16. Write a program to create a multilevel package and also creates a reusable class to generate FibonaITUi series, where the function to generate fibonacii series is given in a different file belonging to the same package.
17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
18. Write a program ―DivideByZero‖ that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
21. Write a program to demonstrate priorities among multiple threads.
22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
23. Write a program to create URL object, create a URLConnection using the openConnection() method and then use it examine the different components of the URLand content.
24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
25. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet‘s window.
26. Write a program to get the URL/location of code (i.e. java code) and document(i.e. html file).

27. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
28. Write a program to demonstrate different keyboard handling events.
29. Write a program to generate a window without an applet window using main() function.
30. Write a program to demonstrate the use of push buttons.

16ITU212 DISCRETE STRUCTURES - PRACTICAL **Semester – I 3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To learn the basic concepts of sets, types of sets, functions and relations
- To understand about Pigeonhole principle, Permutation and Combination, Mathematical Induction
- To solve the problems using Recurrence relations and generating functions.
- To know the basic concepts of Logical Connectives, Graphs and Trees.
- To express ideas using mathematical notation
- To solve problems with the help of tools of mathematical analysis.

Course Outcomes (COs)

On successful completion of the course, students will be able to

1. Familiar with elementary algebraic set theory.
2. Acquire a fundamental understanding of the core concepts in growth of functions.
3. Describe the method of recurrence relations.
4. Get wide knowledge about graphs and trees
5. Initiate to knowledge from inference theory
6. Solve problems with the help of tools of mathematical analysis

List of Programs

1. Write a C Program to find the number of subsets of a set contains n elements.

2. Write a C Program to find transitive closure of a relation.

3. Write a C Program to prove
1/ (1*2) + 1/(2*3) ………+1/(n(n+1)) = n/(n+1)

4. Write a C Program to to perform the sum = 1+ (1+2) + (1+2+3) + … + (1+2…+n)

5. Write a C program to print Fibonacci series till Nth term using recursion

6. Write a Cprogram to calculate factorial of a number using recursion

7. Write a C Program to find a minimum spanning tree using Prim's algorithm

8. Write a C program to find the shortest path with the lower cost in a graph using Dijkstra's
Algorithm

9. Write a C Program to construct the truth table for the following formula.

(i) $P \wedge Q \wedge \urcorner R$ (ii) $P \wedge \urcorner Q \wedge R$ (iii) $P \wedge Q \wedge \urcorner R$

10. Write a C Program to prove De – Morgan’s law.

		Semester – I
16ITU213	**WEB DESIGNING - PRACTICAL**	**3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- Understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
- Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice.
- Develop skills in analyzing the usability of a web site.
- Understand how to plan and conduct user research related to web usability.
- Learn the language of the web: HTML and CSS.
- Develop basic programming skills using Javascript

Course Outcomes (Cos)

The students will be able to:

1. Analyze a web page and identify its elements and attributes.
2. Design a basic web site using HTML5 and CSS3 to demonstrate responsive web design
3. Implement dynamic web pages with validation using JavaScript objects by applying different event handling mechanism.
4. Create web pages using XHTML and Cascading Style Sheets.
5. Build dynamic web pages using JavaScript (Client side programming).
6. Create XML documents and Schemas

List of Programs

1. Create a simple HTML document about yourself or a topic of your choice using the basic tags such as Bold, Italic, Heading, images, horizontal rule and images.
2. Create a HTML document which includes an unordered list, ordered list, definition list to your document and create a link to Yahoo.
3. Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com. The website should consist of the following pages.
    - Home page
    - Registration and user login
    - User profile page
    - Items catalog
    - Shopping cart
    - Payment by credit card
    - Order confirmation
4. Create a table in HTML document with the following formats

- Table with no borders
- Display table headers
- To handle cells that have no content
- Table cells that span more than one row or one column

<table>
<tr><td></td><td></td></tr>
<tr><td rowspan="3"></td><td></td></tr>
<tr><td></td></tr>
<tr><td></td></tr>
</table>

- Adding background image to a table

5. Design a web page using CSS (Cascading Style Sheets) which includes the following:
   - Use different font, styles: In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.
   - Set a background image for both the page and single elements on the page.
   - Control the repetition of the image with the background-repeat property. As background-repeat:repeat Tiles the image until the entire page is filled, just like an ordinary background image in plain HTML.
   - Define styles for links as
     A:link
     A:visited
     A:active
     A:hover
   - Work with layers
   - Add a customized cursor: Selector {cursor:value}

6. Create and save an XML document at the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
7. Creation of a XML document of 20 students of III IT. Add their roll numbers, marks obtained in 5 subjects, total and percentage and save this XML document at the server. Write a program that takes students' roll number as an input and returns the students marks, total and percentage by taking the students' information from the XML document.
8. Write an XML file which will display the Book information which includes the following:
   - Title of the book
   - Author Name
   - ISBN number
   - Publisher name
   - Edition
   - Price

   Write a Document Type Definition (DTD) to validate the above XML file.
9. Develop a web page using Java script to perform the following information

- Input student information
- Display student results for a given roll number.

10. Develop a web page for online exam using Javascript
11. Add validations to the 3rd program of registration, user login, user profile and payment by creditr card using Java Scriot
12. Write a Java Script for selection sort
13. Create a web page using two image file which switch between one another as the mouse pointer moves over the image. Use the On Mouse Over and On Mouse event handler
14. Using VBScript to create a calculator
15. Create a HTML form that has number of text boxes when the form runs in the browser fill the textboxes with data. Write a Java script that verifies that all text boxes have been filled, if a text box has been left empty pop up an alert message indicating which box has been left empty. When Alerts OK button is clicked, set focus to that specific text box. If all the text boxes are filled, display thank you.

Semester – II

16ENU201 **ENGLISH – 1** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

(For all undergraduate students admitted from 2016 onwards)

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcome:

- Develop the four types of skills
- Reading and comprehending literary works
- Genres of literature to provide moral education
- Develop communication skills in business environment
- Interpersonal skills will be developed.

Betterment of language competence

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman – Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan

One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT V
Short Story: The Bird – Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text
Rao, G. Chandralekha et al. (Spring 2013). Chennai: Emerald Publishers.

Suggested Reading:
Shyamala, V. (2006).English for Communication. Emerald Publishers: Chennai

16ITU301	**DATA STRUCTURES**	**Semester – III** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structures.
- To teach the concept of protection and management of data.
- To improve the logical ability

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Choose appropriate data structure as applied to specified problem definition.
2. Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Identify different parameters to analyze the performance of an algorithm.
4. Apply concepts learned in various domains like DBMS, compiler construction etc.
5. Use linear and non-linear data structures like stacks, queues, linked list etc.
6. Illustrate various technique to for searching, Sorting and hashing

UNIT-I

Arrays-Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation).Stacks Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack

UNIT-II

Linked Lists Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular, representation of Stack in Lists; Self Organizing Lists; Skip Lists Queues, Array and Linked representation of Queue, De-queue, Priority Queues

UNIT-III

Trees - Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion , Recursive and Iterative Traversals on Binary Search Trees); Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees).

UNIT-IV

Searching and Sorting,Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Insertion Sort, Shell Sort, Comparison of Sorting

Techniques

UNIT-V

Hashing - Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collusion by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing, Function

Suggested Readings

1. Adam Drozdek. (2012). Data Structures and algorithm in C++(3rd ed.). Cengage Learning.
2. Sartaj Sahni. (2011). Data Structures, Algorithms and applications in C++(2nd ed.). Universities Press.
3. Aaron, M. Tenenbaum., Moshe, J. Augenstein., & Yedidyah Langsam. (2009). Data Structures Using C and C++(2nd ed.). PHI.
4. Robert, L. Kruse. (1999). Data Structures and Program Design in C++. Pearson.
5. D.S.Malik (2010). Data Structure using C++(2nd ed.). Cengage Learning,.
6. Mark Allen Weiss. (2011). Data Structures and Algorithms Analysis in Java (3rd ed.). Pearson Education.
7. Aaron M. Tenenbaum., Moshe, J. Augenstein., & Yedidyah Langsam. (2003). Data Structures Using Java. PHI.
8. Robert Lafore. (2003). Data Structures and Algorithms in Java(2nd ed.). Pearson/ Macmillan Computer Pub.
9. John Hubbard. (2009). Data Structures with JAVA(2nd ed.). McGraw Hill Education (India) Private Limited.
10. Goodrich, M., & Tamassia, R. (2013). Data Structures and Algorithms Analysis in Java(4th ed.). Wiley.
11. Herbert Schildt. (2014). Java The Complete Reference (English)(9th ed.). Tata McGraw Hill.
12. D. S.Malik, P.S.Nair (2003).Data Structures Using Java. .Course Technology.

Web Sites

http://en.wikipedia.org/wiki/Data_structure
http://www.cs.sunysb.edu/~skiena/214/lectures/
www.amazon.com/Teach-Yourself-Structures-Algorithms

Semester – III

16ITU302 OPERATING SYSTEMS 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC. To understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- To study the need for special purpose operating system with the advent of new emerging technologies
- To understand the structure and organization of the file system

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Describe the important computer system resources and the
2. Perform the role of operating system in their management policies and algorithms.
3. Understand the process management policies and scheduling of processes by CPU
4. Evaluate the requirement for process synchronization and coordination handled by operating system
5. Describe and analyze the memory management and its allocation policies.
6. Identify use and evaluate the storage management policies with respect to different storage management technologies, identify the need to create the special purpose operating system.

UNIT-I

Introduction to Operating System: Basic OS Functions-Resource Abstraction-Types of Operating Systems–Multiprogramming Systems-Batch Systems-Time Sharing Systems-Operating Systems for Personal Computers & Workstations-Process Control & Real Time Systems.

UNIT-II

Operating System Organization: Processor and user modes-Kernels-System Calls and System Programs. **Process Management:** System view of the process and resources-Process abstraction-Process hierarchy-Threads-Threading issues-Thread libraries-Process Scheduling-Non pre-emptive and Preemptive scheduling algorithms-Concurrent and processes-Critical Section-Semaphores-Methods for inter-process communication-Deadlocks.

UNIT-III

Memory Management: Physical and Virtual address space-Memory Allocation strategies –Fixed and Variable partitions-Paging-Segmentation-Virtual memory.

UNIT-IV

File and I/O Management: Directory structure-File operations-File Allocation methods-Device management.

UNIT-V

Protection and Security: Policy mechanism-Authentication-Internal aITUess Authorization.

Suggested Readings

1. A .Silberschatz, , P.B Galvin, G.Gagne (2008). Operating Systems Concepts, 8th ed.). John Wiley Publications.

2. A.S. Tanenbaum, (2007).Modern Operating Systems (3rd ed.). New Delhi: Pearson Education.

3. W. Stallings, (2008). Operating Systems, Internals & Design Principles (5th ed.). Prentice Hall of India.

Web Sites

1. www.cs.columbia.edu/~nieh/teaching/e6118_s00/
2. www.clarkson.edu/~jnm/cs644
3. pages.cs.wisc.edu/~remzi/Classes/736/Fall2002/

		Semester – III
16ITU303	**RELATIONAL DATABASE MANAGEMENT SYSTEM**	**4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Outcomes (COs)

- To describe a sound introduction to the discipline of database management systems.
- To give a good formal foundation on the relational model of data and usage of Relational Algebra.
- To introduce the concepts of basic SQL as a universal Database language.
- To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques.

Course Outcomes (COs)

Upon completion of the course, students will be able to

1. Explain the features of database management systems and Relational database.
2. Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra.
3. Create and populate a RDBMS for a real life application, with constraints and keys, using SQL.
4. Retrieve any type of information from a data base by formulating complex queries in SQL.
5. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.
6. Build indexing mechanisms for efficient retrieval of information from a database

UNIT - I Understanding Database Fundamentals

Origin of database – database elements – design concepts – components ofDBMS – Advantages and disadvantages of DBMS. Database Models: flat file – hierarchical model – network model – relational model – object oriented model – Features of Object oriented Database Management system – Features of distributed DBMS – Comparison of DBMS & DDBMS – Object relational model. ER-model: entities – relationships - ERD symbols – cardinalities – sample ERD.

Unit - II Entities and Entity Relationships

Relational model: Introduction – Relational database: attributes and domain – Tuples – Relation and their schemes – Relation representation – keys – relationships – relational operations – Integrity rules. Relational algebra: Basic operations – Additional relational algebraic operations – some relational algebra queries. Functional Dependency: Reasoning about FD's – closure of set of FD's – Attribute closure.

Unit - III Objects

Relational database manipulation: Introduction – SQL: Data definition – Data manipulation: Basic data retrieval – condition specification – Arithmetic and aggregate operations. SQL joins – set manipulation – categorization – updates – views – index. Data Control language : grant, revoke – simple privileges.

Unit - IV Overview of PL/SQL

Declaration section – executable command section : conditional logic, loops, CASE statements – exception handling section: predefined and user defined exceptions. Triggers : definition – types : row level, statement level, before and after, instead of – syntax – enabling and disabling triggers - replacing and dropping triggers. Cursors – definition – open – fetch – close – cursor attributes- select for update – types : implicit, explicit. Procedures, Functions: Local and global – procedures vs functions – stored procedures, functions – create procedure syntax - create function syntax – calling procedures, functions. Replacing and dropping procedures, functions.

Unit - V Packages and Normalization

Package header – package body – calling package members - Replacing and dropping package. Overview of Normalization : advantages - disadvantages. Normal forms: first normal form – second normal form – third normal form – boyce codd normal form – Introduction to fourth, fifth and sixth normal forms – denormalization. Parallel Databases: Introduction – Design of Parallel Databases – Advantages and Disadvantages of Parallel Database.

Suggested Readings

1. Bipin C. Desai.(2013). An Introduction to Database Systems, New Delhi: Galgotia Publications.
2. Rajiv chopra (2013). Database Management systems (3^{rd} ed.). S.Chand publications.
3. Steven Feurstein, Bill Pribyl (2014). Oracle PL/SQL Programming (6^{th} ed.). O ' Reilly Media.
4. Shio Kumar Singh (2011). Database Management Systems – Concepts, design and Applications (2^{nd} ed.). New Delhi: Pearson Education.
5. Ivan Byross (2010). SQL, Pl/SQL the Programming Language of Oracle Paperback. BPB Publications.
6. Rajeeb C. Chatterjee (2012). Learning Oracle SQL and Pl/SQL: A simplified Guide. Prentice Hall of India.

Web Sites

1. http://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. www.databasedir.com
3. http://plsql-tutorial.com/

16ITU304A	**ANDROID PROGRAMMING**	**Semester – III** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce Android platform and its architecture.
- To learn activity creation and Android UI designing.
- To be familiarized with Intent, Broadcast receivers and Internet services.
- To work with SQLite Database and content providers.
- To integrate multimedia, camera and Location based services in Android Application.
- To explore Mobile security issues.

Course Outcomes (COs)

Upon completion of this course, the students will able to

1. Describe Android platform, Architecture and features.
2. Design User Interface and develop activity for Android App.
3. Use Internet, Broadcast receivers and Internet services in Android App.
4. Design and implement Database Application and Content providers.
5. Use multimedia, camera and Location based services in Android App.
6. Discuss various security issues in Android platform

UNIT-I

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.

UNIT-II

Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

UNIT-III

Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project– Hello Word, run on emulator, Deploy it on USB-connected Android device.

UNIT-IV

User Interface Architecture: Application context, intents, Activity life cycle, multiple screen size s.

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners(Combo boxes),Images, Menu, Dialog.

UNIT-V

Database:Understanding of SQLite database, connecting with the database.

Suggested Readings

1. James, C. Sheusi.(2013). Android application development for java programmers. Cengage Learning.

REFERENCES

1. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html
4. http://docs.oracle.com/javase/tutorial/index.htm(Available in the form of free downloadable ebooks also).
5. http://developer.android.com/guide/components/activities.html
6. http://developer.android.com/guide/components/fundamentals.html
7. http://developer.android.com/guide/components/intents-filters.html.
8. http://developer.android.com/training/multiscreen/screensizes.html
9. http://developer.android.com/guide/topics/ui/controls.html
10. http://developer.android.com/guide/topics/ui/declaring-layout.html
11. http://developer.android.com/training/basics/data-storage/databases.html

Semester – III

16ITU304B PROGRAMMING IN MATLAB 3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To familiarize of the syntax, semantics, data-types and library functions of numerical computing languages such as MATLAB and/or SCILAB
- To reinforce a structured, top-down approach to formulate and solve problems.
- To introduce common approaches, structures, and conventions for creating and evaluating computer programs, primarily in a procedural paradigm, but with a brief introduction to object-oriented concepts and terminology.
- To understand a variety of common numeric techniques to solve and visualize engineering-related computational problems.
- To introduce the MATLAB software environment.
- To implement/simulate and visualization of basic mathematical functions relevant to electronics applications.

Course Outcomes (Cos)

By the end of this course, students should be able to

1. Use MATLAB effectively to analyze and visualize data.
2. Apply numeric techniques and computer simulations to solve engineering-related problems.
3. Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives.
4. Design and document computer programs and analyses in a careful and complete manner so as to effectively communicate results, to facilitate evaluation and debugging by another programmer, and to anticipate and resolve user errors.
5. Demonstrate understanding and use of fundamental data structures (classes).
6. Create and control simple plot and user-interface graphics objects in MATLAB.

UNIT-I

Introduction to Programming: Components of a computer, working with numbers, Machine code, Software hierarchy.

UNIT-II

Programming Environment: MATLAB Windows, A First Program, Expressions, Constants, Variables and assignment statement, Arrays.

UNIT-III

Graph Plots: Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save. Procedures and Functions: Arguments and return values, M-files, Formatted console input-output , String handling,

UNIT-IV

Control Statements: Conditional statements: If, Else, Else-if, Repetition statements: While, for loop

UNIT-V

Manipulating Text: Writing to a text file, Reading from a text file, Randomising and sorting a list, searching a list. **GUI Interface**: Attaching buttons to actions, Getting Input, Setting Output

Suggested Readings

1. Amos Gilat (2004). MATLAB: An Introduction with Applications(2^{nd} ed). New Delhi: Wiley.

2. C.B. Moler (2004). Numerical Computing with MATLAB. SIAM.

16ITU311	**DATA STRUCTURES - PRACTICAL**	**Semester – III** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structures.
- To teach the concept of protection and management of data.
- To improve the logical ability

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Choose appropriate data structure as applied to specified problem definition.
2. Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Identify different parameters to analyze the performance of an algorithm.
4. Apply concepts learned in various domains like DBMS, compiler construction etc.
5. Use linear and non-linear data structures like stacks, queues, linked list etc.
6. Illustrate various technique to for searching, Sorting and hashing

List of Programs

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.

2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.

3. Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).

4. Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.

5. Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.

6. Perform Stack operations using Linked List implementation.

7. Perform Stack operations using Array implementation. Use Templates.

8. Perform Queues operations using Circular Array implementation. Use Templates.

9. Create and perform different operations on Double-ended Queues using Linked List implementation.

10. WAP to scan a polynomial using linked list and add two polynomial.

11. WAP to calculate factorial and to compute the factors of a given no. (i)using recursion, (ii) using iteration

12. (ii) WAP to display fibonaITUi series (i)using recursion, (ii) using iteration

13. WAP to calculate GCD of 2 number (i) with recursion (ii) without recursion

14. WAP to create a Binary Search Tree and include following operations in tree: (a) Insertion (Recursive and Iterative Implementation)

(b) Deletion by copying

(c) Deletion by Merging

(d) Search a no. in BST

(e) Display its preorder, postorder and inorder traversals Recursively

(f) Display its preorder, postorder and inorder traversals Iteratively

(g) Display its level-by-level traversals

(h) Count the non-leaf nodes and leaf nodes

(i) Display height of tree

(j) Create a mirror image of tree

(k) Check whether two BSTs are equal or not

15. WAP to convert the Sparse Matrix into non-zero form and vice-versa.

16. WAP to reverse the order of the elements in the stack using additional stack.

17. WAP to reverse the order of the elements in the stack using additional Queue.

18. WAP to implement Diagonal Matrix using one-dimensional array.

19. WAP to implement Lower Triangular Matrix using one-dimensional array.

20. WAP to implement Upper Triangular Matrix using one-dimensional array.

21. WAP to implement Symmetric Matrix using one-dimensional array.

22. WAP to create a Threaded Binary Tree as per inorder traversal, and implement operations like finding the suITUessor / predecessor of an element, insert an element, inorder traversal.

23. WAP to implement various operations on AVL Tree.

Semester – III

16ITU312 OPERATING SYSTEMS - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC. To understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- To study the need for special purpose operating system with the advent of new emerging technologies
- To provide necessary skills for developing and debugging programs in UNIX environment.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Describe the important computer system resources and the
2. Perform the role of operating system in their management policies and algorithms.
3. Understand the process management policies and scheduling of processes by CPU
4. Evaluate the requirement for process synchronization and coordination handled by operating system
5. Describe and analyze the memory management and its allocation policies.
6. Identify, use and evaluate the storage management policies with respect to different storage management technologies, identify the need to create the special purpose operating system.

List of Programs

1. Write a program (using *fork()* and/or *exec()* commands) where parent and child execute:
   a) same program, same code.
   b) same program, different code.
   c) before terminating, the parent waits for the child to finish its task.
2. Write a program to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)
3. Write a program to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)

4. Write a program to print file details including owner access permissions, file access time, where file name is given as argument.
5. Write a program to copy files using system calls.
6. Write program to implement FCFS scheduling algorithm.
7. Write program to implement Round Robin scheduling algorithm.
8. Write program to implement SJF scheduling algorithm.
9. Write program to implement non-preemptive priority based scheduling algorithm.
10. Write program to implement preemptive priority based scheduling algorithm.
11. Write program to implement SRJF scheduling algorithm.
12. Write program to calculate sum of n numbers using *thread* library.
13. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

16ITU313 **RDBMS - PRACTICAL** **Semester – III** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Outcomes (COs)

- To describe a sound introduction to the discipline of database management systems.
- To give a good formal foundation on the relational model of data and usage of Relational Algebra.
- To introduce the concepts of basic SQL as a universal Database language.
- To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques.

Course Outcomes (COs)

Upon completion of the course, students will be able to

1. Explain the features of database management systems and Relational database.
2. Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra.
3. Create and populate a RDBMS for a real life application, with constraints and keys, using SQL.
4. Retrieve any type of information from a data base by formulating complex queries in SQL.
5. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.
6. Build indexing mechanisms for efficient retrieval of information from a database

List of Programs

1. Create a table with following fields:

   Employee table:

Field name	Constraint	Type	Size
Employee_no	Primary key	Character	6
Employee_name		Character	30
Address		Character	25
Designation		Character	15
Dob		Date	
Gender	Check	Character	1
Doj		Date	

Salary		Number	10,2

Queries:

a) Display name of the employees whose salary is greater than “10,000”.
b) Display the details of employees in ascending order according to Employee Code
c) Display the details of employees earning the highest salary
d) Display the names of employees who earn more than “Ravi”.

2. Create table named Student with following fields and insert the values:

Field name	**field type**	**field size**
Student Name	**Character**	15
Gender	**Character**	6
Roll No.	**Character**	10
Department Name	**Character**	15
Address	**Character**	25
Percentage of marks	**Number**	4,2

Queries:

a) Calculate tge average mark percentage of the students
b) Display the names of teh students whose percentage marks are grater than 80%
c) Display the details of the students who got the highest percentage of marks
d) Display the details of the students whose mark percentage between 50 and 70
e) Display the details of the students whose mark percentage is greater the the mark percentage of Roll No=12CA01

3. Create a table with following fields:

Staff table:

Field name	Constraint	Type	Size
Staff_no	Primary key	Character	6
Staff_name		Character	30
Dob		Date	
Dept_code	Foreign key	Character	4
Designation		Character	15
Basic		Number	7,2

Department table:

Field name	constraint	Type	Size
Dept_code	Primary key	Character	4
Dept_name		Character	30

Execute the following queries:

1. To list the staff who joined 2 years back.
2. To list the staff in computer science dept.
3. To list the staff_name and the dept_name in which he/she works.
4. To list the maximum and minimum salary in each dept.

5. To list the dept along with the total amount spent on salary
6. To list the name of the employees who draw the salary more than the average salary.

4. Create a table with the following fields:

Book table:

Field name	Constraint	Type	Size
Access_no	Primary key	Character	6
Title		Character	30
Author		Character	30
Publisher		Character	30
Subject		Character	10
Price		Number	6,2

Execute the following queries:

1. The title of C and C++ books.
2. The books written by a particular author.
3. The books which costs between Rs.300/- and Rs.500/-
4. The number of books available in each subject.
5. The books in the decreasing order of the cost.

5. Create two tables course and batch with following fields

COURSE: coursecodeno number(5), course name varchar(20), syllabus varchar(20)

BATCH: bcode number(5), coursecode number(5), starting_date date, duration number(3), coursefee number(10,2)

Perform the following queries

- Insert the details for course and batch tables with 10 records
- Show the description of the two tables
- Select all the fields from course & batch tables
- Select all the fields from course & batch tables where coursecode=10
- Select all the fields from batch table where starting date=march 10th
- Select batch code from batch table where net income>50000
- Select coursename, batch code & starting date from batch and course tables where course code of batch table and course code of course table are equal
- Select a syllabus from course wher coursecode=5

6. Create a table with the following fields:

Account table:

Field name	Constraint	Type	Size
Acc_no	Primary key	Number	4
Cust_name		Varchar2	30
Branch_name		Varchar2	30
Cust_city		Varchar2	30

Borrower table:

Field name	Constraint	Type	Size
Acc_no	Foreign key	Number	30
Branch_name		Varchar2	30
Amount		Number	8,2

Write queries to perform different types of join.

7. Write the PL/SQL program to find the factorial and fibonacci series of given numbers.

8.(i) Write the PL/SQL program to check whether the string is Palindrome.
(ii) Write the PL/SQL program to reverse a number
(iii) Write the PL/SQL program to check whether the number is Armstrong

9. Write a PL/SQL block to create and handle user defined exception
clientmaster

Field name	Constraint	Type	Size
Client_id		Number	6
Client_name		Varchar2	30
Address		Varchar2	50
Phone		Number	10
Balance		Number	10,2

10. Create table with following fields:
Product table:

Field name	Constraint	Type	Size
Product_code	Primary key	Varchar2	7
Product_name		Varchar2	30
Price		Number	6,2
Quantity		Number	4

Vendor table:

Field name	Constraint	Type	Size
Vendor_name		Varchar2	30
Vendor address		Varchar2	30
Product_code	Foreign Key	Varchar2	7

Create a trigger to fire when the Record is deleted and inserted.

11. Write a PL/SQL trigger to update the records while deleting the one record in another table.
Voters_master:

Field name	Constraint	Type	Size
Voterid	Primary key	Number	5
Name		Varchar2	30
Ward_no	Primary Key	Number	4
Dob		Date	
Address		Varchar2	150

New_list

Field name	Constraint	Type	Size
Voterid		Number	5
Ward_no		Number	4

Name		Varchar2	30
Description		Character	50

12. Create a table to store the salary details of the employees in a company. Declare the cursor id to contain empno, employee name and net salary. Use cursor to update the employee details.

Salary:

Field name	Constraint	Type	Size
Emp_no	Primary key	Number	4
Emp_name		Varchar2	30
Designation		Varchar2	25
Dept		Varchar2	30
Basic		Number	5

13. Create a table stock contains the itemcode varchar2(10), itemname varchar2(50), current_stock number(5), date_of_last_purchase date. Write a stored procedure to seek for an item using itemcode and delete it, if the date of last purchase is before 1 year from the current date. If not, update the curent stock.

14. Create a table to contain phone_number, user_name, address. Write a function to search for address using phone_number.

Semester – III

16ITU314A ANDROID PROGRAMMING - PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce Android platform and its architecture.
- To learn activity creation and Android UI designing.
- To be familiarized with Intent, Broadcast receivers and Internet services.
- To work with SQLite Database and content providers.
- To integrate multimedia, camera and Location based services in Android Application.
- To explore Mobile security issues.

Course Outcomes (COs)

Upon completion of this course, the students will able to

1. Describe Android platform, Architecture and features.
2. Design User Interface and develop activity for Android App.
3. Use Internet, Broadcast receivers and Internet services in Android App.
4. Design and implement Database Application and Content providers.
5. Use multimedia, camera and Location based services in Android App.
6. Discuss various security issues in Android platform

List of Programs

1. Create ―Hello World‖ application. That will display ―Hello World‖ in the middle of the screen in the emulator. Also display ―Hello World in the middle of the screen in the Android Phone.
2. Create an application with login module. (Check username and password).
3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.
4. Create a menu with 5 options and and selected option should appear in text box.
5. Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen.
6. Create an application with three option buttons, on selecting a button colour of the screen will change.
7. Create and Login application as above. On successful login, pop up the message.
8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.

Semester – III

16ITU314B PROGRAMMING IN MATLAB - PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To familiarize of the syntax, semantics, data-types and library functions of numerical computing languages such as MATLAB and/or SCILAB
- To reinforce a structured, top-down approach to formulate and solve problems.
- To introduce common approaches, structures, and conventions for creating and evaluating computer programs, primarily in a procedural paradigm, but with a brief introduction to object-oriented concepts and terminology.
- To understand a variety of common numeric techniques to solve and visualize engineering-related computational problems.
- To introduce the MATLAB software environment.
- To implement/simulate and visualization of basic mathematical functions relevant to electronics applications.

Course Outcomes (Cos)

By the end of this course, students should be able to

1. Use MATLAB effectively to analyze and visualize data.
2. Apply numeric techniques and computer simulations to solve engineering-related problems.
3. Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives.
4. Design and document computer programs and analyses in a careful and complete manner so as to effectively communicate results, to facilitate evaluation and debugging by another programmer, and to anticipate and resolve user errors.
5. Demonstrate understanding and use of fundamental data structures (classes).
6. Create and control simple plot and user-interface graphics objects in MATLAB.

List of Programs

1. Write a program to assign the following expressions to a variable A and then to print out the value of A.

    a. (3+4)/(5+6)
    b. $2\Pi^2$
    c. $\sqrt{2}$
    d. (0.0000123 + 5.67×10-3) × 0.4567×10-4

2. Celsius temperatures can be converted to Fahrenheit by multiplying by 9, dividing by 5, and adding 32. Assign a variable called C the value 37, and implement this formula to assign a variable F the Fahrenheit equivalent of 37 Celsius.

3. Set up a vector called N with five elements having the values: 1, 2, 3, 4, 5. Using N, create assignment statements for a vector X which will result in X having these values:

    a. 2, 4, 6, 8, 10

b. 1/2, 1, 3/2, 2, 5/2
c. 1, 1/2, 1/3, 1/4, 1/5
d. 1, 1/4, 1/9, 1/16, 1/25

4. A supermarket conveyor belt holds an array of groceries. The price of each product (in pounds) is [0.6, 1.2 ,0.5, 1.3] ; while the numbers of each product are [3, 2 ,1 ,5]. Use MATLAB to calculate the total bill.

5. The sortrows(x) function will sort a vector or matrix X into increasing row order. Use this function to sort a list of names into alphabetical order.

6. The ―identity‖ matrix is a square matrix that has ones on the diagonal and zeros elsewhere. You can generate one with the eye() function in MATLAB. Use MATLAB to find a matrix B, such that when multiplied by matrix A=[1 2; -1 0] the identity matrix I=[1 0; 0 1] is generated. That is A*B=I.

7. Create an array of N numbers. Now find a single MATLAB statement that picks out from that array the 1,4,9,16,…,√Nth entries, i.e. those numbers which have indices that are square numbers.

8. Draw a graph that joins the points (0,1), (4,3), (2,0) and (5,-2).

9. The seeds on a sunflower are distributed according to the formula below. Plot a small circle at each of the first 1000 co-ordinates :

$$r_n = \sqrt{n}$$

$$\theta_n = \frac{137.51}{180}\pi n$$

10. Calculate 10 approximate points from the function y=2x by using the formulae:
i. xn = n
ii. yn = 2n + rand - 0.5

Fit a line of best fit to these points using the function polyfit() with degree=1, and generate co-ordinates from the line of best fit using polyval(). Use the on-line help to find out how to use these functions. Plot the raw data and the line of best fit.

11. Calculate and replay 1 second of a sinewave at 500Hz with a sampling rate of 11025Hz. Save the sound to a file called ex35.wav. Plot the first 100 samples.

12. Calculate and replay a 2 second chirp. That is, a sinusoid that steadily increases in frequency with time, from say 250Hz at the start to 1000Hz at the end.

13. Build a square wave by adding together 10 odd harmonics: 1f, 3f, 5f, etc. The amplitude of the nth harmonic should be 1/n. Display a graph of one cycle of the result superimposed on the individual harmonics.

14. Write a function called FtoC (ftoc.m) to convert Fahrenheit temperatures into Celsius. Make sure the program has a title comment and a help page. Test from the command window with:

i. FtoC(96)
ii. lookfor Fahrenheit
iii. help FtoC

15. Write a program to input 2 strings from the user and to print out (i) the concatenation of the two strings with a space between them, (ii) a line of asterisks the same length as the concatenated strings, and (iii) the reversed concatenation. For example:

i. Enter string 1: Mark
ii. Enter string 2: Huckvale
iii. Mark Huckvale
iv. *************
v. elavkcuH kraM

16ITU401	COMPUTER NETWORKS	Semester – IV 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of osi model and tcp/ip model.
- To acquire knowledge of application layer and presentation layer paradigms and protocols.
- To study session layer design issues, transport layer services, and protocols.
- To gain core knowledge of network layer routing protocols and ip addressing.
- To study data link layer concepts, design issues, and protocols.
- To read the fundamentals and basics of Physical layer, and will apply them in real time applications.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
3. Describe the Session layer design issues and Transport layer services.
4. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
5. Describe the functions of data link layer and explain the protocols.
6. Explain the types of transmission media with real time applications

UNIT I

Introduction to Computer Networks : Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite. **Data Communication Fundamentals and Techniques**: Analog and digital signal; data-ratelimits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission;

UNIT – II

Digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media. **Networks Switching Techniques and Access mechanisms:** Circuit switching; packetswitching - connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

UNIT – III

Data Link Layer Functions and Protocol: Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.

UNIT – IV

Multiple Access Protocol and Networks: CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways; **Networks Layer Functions and Protocols**: Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols.

Unit V

Transport Layer Functions and Protocols: Transport services- error and flow control, Connection establishment and release- three way handshake; **Overview of Application layer protocol**: Overview of DNS protocol; overview of WWW &HTTP protocol.

Suggested Readings

1. B. A Forouzan (2007). Data Communications and Networking(4^{th} ed.). THM.
2. A. S.Tanenbaum, (2002). Computer Networks (4^{th} ed.). PHI.

WEB SITES

1. en.wikipedia.org/wiki/Internet_protocol_suite
2. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
3. www.yale.edu/pclt/COMM/TCPIP.HTM
4. www.w3schools.com/tcpip/default.asp

		Semester – IV
16ITU402	**SOFTWARE ENGINEERING**	**4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces. 4. To know basics of testing and understanding concept of software quality assurance and software configuration management process.
- To understand the need of project management and project management life cycle.
- To understand project scheduling concept and risk management associated to various type of projects.
- Implement a given software design using sound development practices.

Course Outcomes (COs)

1. Apply their knowledge of mathematics, sciences, and computer science to the modeling, analysis, and measurement of software artifacts.
2. Work effectively as leader/member of a development team to deliver quality software artifacts.
3. Analyze, specify and document software requirements for a software system.
4. Verify, validate, assess and assure the quality of software artifacts.
5. Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its Course Objectivesand risks, and estimate its cost and time.
6. Express and understand the importance of negotiation, effective work habits, leadership, and good communication with stakeholders, in written and oral forms, in a typical software development environment.

UNIT-I

Introduction: The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

UNIT-II

Requirement Analysis; Initiating Requirement EngineeringProcess- Requirement Analysis and Modeling Techniques- FlowOriented Modeling- Need for SRS-Characteristics and Components of SRS- Software Project Management: Estimation in Project Planning Process, Project Scheduling.

UNIT-III

Risk Management: Software Risks, Risk Identification Risk Projection and Risk Refinement, RMMM plan, **Quality Management-** Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects

UNIT-IV

Design Engineering-Design Concepts, Architectural Design Elements, Software Architecture,Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design

UNIT-V

Testing Strategies & Tactics: Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing Black-Box Testing, White-Box Testing and their type, Basis Path Testing

Suggested Readings

1. R.S. Pressman, (2009). Software Engineering: A Practitioner's Approach (7^{th} ed.). McGraw-Hill.
2. P.Jalote (2008). An Integrated Approach to Software Engineering (2^{nd} ed.). New Age International Publishers.
3. K.K. Aggarwal and Y.Singh (2008). Software Engineering (2^{nd} ed.). New Age International Publishers.
4. Sommerville (2006). Software Engineering (8^{th} ed.). Addison Wesley.
5. D.Bell (2005). Software Engineering for Students (4^{th} ed.) Addison-Wesley.
6. R.Mall (2004). Fundamentals of Software Engineering (2^{nd} ed.). Prentice-Hall of India.

WEB SITES

1. http://en.wikipedia.org/wiki/Software_engineering
2. http://www.onesmartclick.com/engineering/software-engineering.html
3. http://www.CC.gatech.edu/classes/AY2000/cs3802_fall/

Semester – IV

16ITU403 PROGRAMMING WITH VISUAL BASIC 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- Understand the benefits of using Microsoft Visual Basic 6.0 for Windows as an application tool.
- Understand the Visual Basic event-driven programming concepts, terminology, and available tools.
- Learn the fundamentals of designing, implementing, and distributing a Visual Basic application.
- Learn to use the Visual Basic toolbox. Learn to modify object properties. Learn object methods.
- Use the menu design window. Understand proper debugging and error-handling procedures.
- Gain a basic understanding of database access and management using data bound controls. Obtain an introduction to ActiveX controls and the Windows Application Programming Interface (API).

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Demonstrate knowledge of programming terminology and how applied using Visual Basic (e.g., variables, selection statements, repetition statements, etc.)
2. Develop a Graphical User Interface (GUI) based on problem description
3. Develop an Event Planning Chart based on problem description so as to define the processing that is to occur based on specific events
4. Develop an Algorithm to verify processing is accurate
5. Develop and debug applications using Visual Basic 2010 (or version required for the course) that runs under Windows operating system
6. Develop programs that retrieve input from a file as opposed to input only provided by user

UNIT I

Beginning Visual Basic: Introduction to Visual Basic: Introduction Graphics User Interface (GUI), Programming Language (Procedural, Object oreinted, event driven), The Visual Basic environment IDE, Introduction to VB Controls: Textboxes, Frames, check boxes, options buttons, setting a border and style, the shape control, the line control, working with multiple controls and their properties, designing the user interface, keyboard access, tab controls. Default & controls property, coding for Controls, list box and combo box and their properties, filling the list box using property window/add item method, picture/image box and their properties.

UNIT II

Dealing with data: Operators-Variables-declaring variables- types of variables – data types – constants – arrays – declaring arrays – specifying arrays – Multidimensional arrays – dynamic arrays – arrays of arrays. Val function, Arithmetic operations, formatting data. Error functions and types. Introducing to Menu editor.

UNIT III

Writing Code: Control flow statements – If – Then – If-then-else – Nested control statements – Select case – Loop statements – Do-loop – For-Next – While Wend – Exit statement . Displaying message in Message box, testing whether input is valid or not. Collections – procedures – Subroutines – Functions – Calling procedures – Object Browser – Creating classes and Objects – I/O statements

UNIT IV

Working with forms and procedures: Introducing to forms and types of forms and setting form properties, creating, adding, removing forms in project, hide, show method, load, unload, statement, Me keywords, Referring to objects on a different forms. Creating an application using controls: What is on the toolbar – Textbox control – Picture box – Image box – Label box – Frame – List box – Option button – Combo box – Command Button – check box – The Drive, Directory, File list controls – Teh Line & Shape control – Scroll Box – Data – Timer.

UNIT V

Multiple Document Interface & Menus: Why MDI Forms – Features of an MDI forms – Loading MDI forms & child forms – creating a simple MDI forms –Accessing MDI froms – creating MENUS – POP-UP MENUS.

Data access controls: JET database Engine – ADODC – DAO Data control – ODBC Data Source Administrator – DATA REPORT.

Suggested Readings

1. Noel Jerke (2008). Visual Basic 6.0: Teh Complete Reference. Tata McGraw Hill Publishing Company Ltd.
2. Mohammed Azam. Programming with VB 6.0. Vikas Publishing.
3. Peter Wrights (1999). Beginning VB 6.0 (4^{th} ed.). New York:Springer-Verlag Incorporated.

16ITU404A	**INTERNET TECHNOLOGIES**	**Semester – IV** **4H – 4C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To define terms related to the Internet.
- To describe how the Internet is changing the world.
- To understand how computers are connected to the Internet.
- To understand the principles of Internet services such as Listserv Mailing Lists, Usenet Newsgroups, and Instant Messaging.
- To understand methods for citing Internet resources.
- To understand how Web pages are designed and created

Course Outcomes (COs)

Upon successful completion of the course, the student should be able to:

1. Demonstrate the ability to use the World Wide Web, Understand and apply Internet Etiquette.
2. Demonstrate an understanding of and the ability to use electronic mail.
3. Understand and use common types of files found on the internet.
4. Demonstrate the ability to download a variety of resources from the internet.
5. Demonstrate an ability to create basic Web pages with HTML.
6. Understand societal issues and emerging technologies.

UNIT – I

Java: Use of Objects, Array and ArrayList class JavaScript: Datatypes, operators, functions, control structures, events and event handling.

UNIT – II

JDBC: JDBC fundamentals, Establishing Connectivity and working with connection interface, working with statements, creating and executing SQL statements, working with ResultSet objects.

UNIT – III

JSP: Introduction to JavaServerPages, HTTP and Servlet Basics, The Problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment.

UNIT – IV

JSP: Implicit Objects, conditional processing, displaying values, Using an expression to Set an Attribute, declaring variables and methods, error handling and debugging, sharing data between JSP pages, Requests, and Users, Database Access.

UNIT – V

Java beans: Jaba Beans Fundamentals, JAR Files, Introspection, Developing a simple Bean, Connecting to DB.

Suggested Readings

1. Ivan Bayross (2009). Web Enabled Commercial Application Development Using Html, Dhtml, Javascript, Perl Cgi. BPB Publications.
2. Cay Hortstmann (2009). BIG Java (3rd ed.). Wiley Publication
3. Herbert Schildt (2009). Java 7 The Complete Reference (8th ed.).
4. Jim Keogh (2002). The Complete Reference J2EE. TMH.
5. Hans Bergsten (2003). Java ServerPages (3rd ed.). O'Reilly.

Semester – IV

16ITU404B **XML PROGRAMMING** **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To expose the students to the XML family of technologies, and the latest W3C and WS-I XML standards.
- To understand the various applications of XML in the areas of information representation, Presentation Oriented Publishing, Message Oriented computing, and Application Configuration.
- To expose the students to the combined use of XML and Java technologies
- To support the development of modern applications targeted to the evolving spectrum of distributed and decentralized enterprise platforms.
- To expose the students to the advanced XML-enabled capabilities of the Java 2 development environment for Enterprise Applications.
- To demonstrate the application of XML in distributed communications enabling, enterprise systems assurance, web enabling, application enabling, and enterprise data enabling.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Create a new webpage
2. Understand the fundamental features of web applications.
3. Understand the objects and components needed for a web designing.
4. Understand the current industry support for XML technologies.
5. Sharpen the students' practical development skills via focused assignments and projects.
6. Understand what is XML and how to parse and use XML Data

UNIT-I

Introduction: Understanding Mark-up Languages, Introduction to XML and its Goals.

UNIT-II

XML Basics: XML Structure and Syntax, Document classes and Rules.

UNIT-III

Other XML Concepts: Scripting XML

UNIT-IV

Other XML Concepts: XML as Data, Linking with XML

UNIT-V

XML with Style: XSL –Style Sheet Basics, XSL basics, XSL style sheets.

Suggested Readings

1. William, J. Pardi. XML in action web technology.
2. Michael, J. Young. Step by Step XML.

16ITU411	**COMPUTER NETWORKS - PRACTICAL**	**Semester – IV** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To acquire knowledge of Application layer and Presentation layer paradigms and protocols.
- To study Session layer design issues, Transport layer services, and protocols.
- To gain core knowledge of Network layer routing protocols and IP addressing.
- To study data link layer concepts, design issues, and protocols.
- To read the fundamentals and basics of Physical layer, and will apply them in real time applications.

Course Outcomes (COs)

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
3. Describe the Session layer design issues and Transport layer services.
4. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
5. Describe the functions of data link layer and explain the protocols.
6. Explain the types of transmission media with real time applications

List of Programs

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

Semester – IV

16ITU412 SOFTWARE ENGINEERING - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces. 4. To know basics of testing and understanding concept of software quality assurance and software configuration management process.
- To understand the need of project management and project management life cycle.
- To understand project scheduling concept and risk management associated to various type of projects.
- To analyze, specify and document software requirements for a software system.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Apply their knowledge of mathematics, sciences, and computer science to the modeling, analysis, and measurement of software artifacts.
2. Work effectively as leader/member of a development team to deliver quality software artifacts.
3. Implement a given software design using sound development practices.
4. Verify, validate, assess and assure the quality of software artifacts.
5. Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its Course Objectivesand risks, and estimate its cost and time.
6. Express and understand the importance of negotiation, effective work habits, leadership, and good communication with stakeholders, in written and oral forms, in a typical software development environment.

List of Programs

S. No	Practical Title
1.	• Problem Statement • Process Model
2.	Requirement Analysis: • Creating a Data Flow • Data Dictionary, Use Cases

3.	Project Management: • Computing FP • Effort • Schedule, Risk Table, Timeline chart
4.	Design Engineering: • Architectural Design • Data Design, Component Level Design
5.	Testing: • Basis Path Testing

Sample Projects:

1. **Criminal Record Management**: Implement a criminal record management system for jailers, police officers and CBI officers

2. **DTC Route Information**: Online information about the bus routes and their frequency and fares

3. **Car Pooling**: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.

4. Patient Appointment and Prescription Management System

5. Organized Retail Shopping Management Software

6. Online Hotel Reservation Service System

7. Examination and Result computation system

8. Automatic Internal Assessment System

9. Parking Allocation System

10. Wholesale Management System

Semester – IV

16ITU413 PROGRAMMING WITH VISUAL BASIC - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- Understand the benefits of using Microsoft Visual Basic 6.0 for Windows as an application tool.
- Understand the Visual Basic event-driven programming concepts, terminology, and available tools.
- Learn the fundamentals of designing, implementing, and distributing a Visual Basic application.
- Learn to use the Visual Basic toolbox. Learn to modify object properties. Learn object methods.
- Use the menu design window. Understand proper debugging and error-handling procedures.
- Gain a basic understanding of database access and management using data bound controls. Obtain an introduction to ActiveX controls and the Windows Application Programming Interface (API).

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Demonstrate knowledge of programming terminology and how applied using Visual Basic (e.g., variables, selection statements, repetition statements, etc.)
2. Develop a Graphical User Interface (GUI) based on problem description
3. Develop an Event Planning Chart based on problem description so as to define the processing that is to occur based on specific events
4. Develop an Algorithm to verify processing is accurate
5. Develop and debug applications using Visual Basic 2010 (or version required for the course) that runs under Windows operating system
6. Develop programs that retrieve input from a file as opposed to input only provided by user

Implement the following projects using Visual Basic Language

1. To calculate the Simple interest and compound interest
2. To perform the following string functions
   a. Upper to lower
   b. String concatenation
   c. String length
   d. String compare

   e. Bold, Italic and Underline
   f. Rtrim and Ltrim
   g. Change the backround of form
3. To draw different shapes and fill with different colors using MDI form
4. To implement a simple calculator
5. To create an ActiveX Control
6. To animate the picture using timer control
7. To convert text to voice
8. To simulate web browser
9. Develop a project for Railway Reservation System
10. Develop a project for Employee Payroll system
11. Develop a project for Student Information system. Generate data report for Student marklist
12. Develop a project to generate Barcode for Library applications

Semester – IV

16ITU414A INTERNET TECHNOLOGIES - PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To define terms related to the Internet.
- To describe how the Internet is changing the world.
- To understand how computers are connected to the Internet.
- To understand the principles of Internet services such as Listserv Mailing Lists, Usenet Newsgroups, and Instant Messaging.
- To understand methods for citing Internet resources.
- To understand how Web pages are designed and created

Course Outcomes (COs)

Upon successful completion of the course, the student should be able to:

1. Demonstrate the ability to use the World Wide Web, Understand and apply Internet Etiquette.
2. Demonstrate an understanding of and the ability to use electronic mail.
3. Understand and use common types of files found on the internet.
4. Demonstrate the ability to download a variety of resources from the internet.
5. Demonstrate an ability to create basic Web pages with HTML.
6. Understand societal issues and emerging technologies.

Create event driven program for the following:

1. Print a table of numbers from 5 to 15 and their squares and cubes using alert.
2. Print the largest of three numbers
3. Find the fatorial of a number n
4. Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.
5. A person deposits Rs.1000 in a fixed account yielding 5%interest. Compute the amount in the account at the end of each year for n years.
6. Read n numbers. Count the number of negative numbers, positive numbers and zeroes in the list.

16ITU414B	**XML PROGRAMMING - PRACTICAL**	**Semester – IV** **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To expose the students to the XML family of technologies, and the latest W3C and WS-I XML standards.
- To understand the various applications of XML in the areas of information representation, Presentation Oriented Publishing, Message Oriented computing, and Application Configuration.
- To expose the students to the combined use of XML and Java technologies
- To support the development of modern applications targeted to the evolving spectrum of distributed and decentralized enterprise platforms.
- To expose the students to the advanced XML-enabled capabilities of the Java 2 development environment for Enterprise Applications.
- To demonstrate the application of XML in distributed communications enabling, enterprise systems assurance, web enabling, application enabling, and enterprise data enabling.

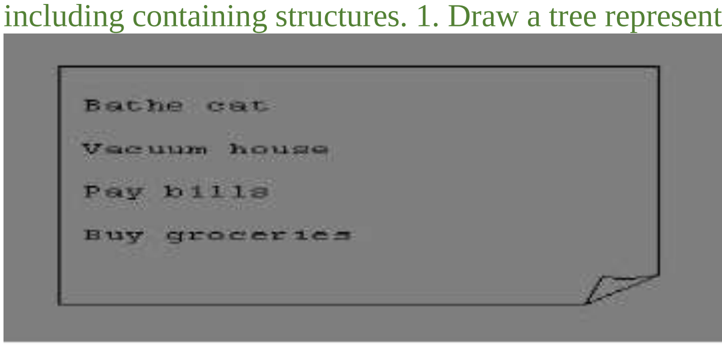
Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Create a new webpage
2. Understand the fundamental features of web applications.
3. Understand the objects and components needed for a web designing.
4. Understand the current industry support for XML technologies.
5. Sharpen the students' practical development skills via focused assignments and projects.
6. Understand what is XML and how to parse and use XML Data

1. Information Structure

In this exercise, student will practice identifying the structure of an information object. For the sample document provided below: Label the information structures you see, including containing structures. 1. Draw a tree representation of the structure.



2. Deconstructing an XML Document

In this exercise, student will practice identifying the explicit structure within an XML document. In a sense, this is the reverse of what you did in Exercise #1. For the sample XML markup below, create a document-like representation (or a simple drawing) for the content contained within the XML tags:

<book>
<coverInfo>
<title>The XML Handbook</title>
<author>Charles F. Goldfarb</author>
<author>Paul Prescod</author>
<edition>Second</edition>
<description>The definitive XML resource: applications, products, and technologies. Revised and expanded—over 600 new pages. </description>
</coverInfo> </book>

3. Creating XML Markup

In this exercise, create some XML markup based on the tree representation from Exercise #1 above, and the content from the original sample document.

4. Well-Formedness

This exercise checks your understanding of the constraints for well-formedness. Are the following document instances well-formed? Explain any NO answers.

<list><title>The first list</title><item>An item</list>
<item>An item</item><item>Another item</item>
<para>Bathing a cat is a <emph>relatively</emph> easy task as long as the cat is willing.</para>
<bibl><title>How to Bathe a Cat<author></title>Merlin Bauer<author></bibl>

5. Well Formedness

This exercise is a bit more challenging than the previous example. Here is a fragment of an XML document instance. Identify all the places where it fails to match the constraints for well-formedness.

<PROCEDURE><TITLEHow to Bathe a Cat</TITLE>
<OVERVIEW> This procedure tells you how to bathe a cat.
<WARNING></OVERVIEW>Cats don't like to take baths. You could get hurt doing this. Be sure to obtain all the required protective gear before you start.
</WARNING><EQUIPEMENT><ITEM>Hockey Mask <ITEM>Padded Full-body Kevlar Armor</ITEM><ITEM>Tub full of warm water</ITEM><ITEM>Towels </ITEM><ITEM>First Aid kit</ITEM><ITEM>Cat Shampoo</ITEM>
<EQUIPMENT><INSTRUCTIONS> <STEP> Locate the cat, who by now is hiding under the bed.</STEP><STEP>Place the cat in the tub of water.</STEP> <ITEM>Using the First Aid kit, repair the damage to your head and arms.</STEP> <STEP>Place the cat back in the tub and hold it down.</STEP> <STEP>Wash it really fast, then make an effort to dry it with the towels.</STEP> <STEP>Decide not to do this again. </STEP>
</INSTRUCTIONS>

		Semester – V
16ITU501A	**COMPUTER GRAPHICS**	**4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objecyives (CO)

- To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
- To learn the basic principles of 3- dimensional computer graphics.
- Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
- Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.
- To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.
- To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles, and applications.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. List the basic concepts used in computer graphics.
2. Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
3. Describe the importance of viewing and projections.
4. Define the fundamentals of animation, virtual reality and its related technologies,
5. Understand a typical graphics pipeline
6. Design an application with the principles of virtual reality

UNIT – I Testing Fundamentals

Examining the Specification: Getting started – Performing a high-level review of the specification – Low-level specification test techniques. Testing the software with blinders on: Dynamic Black-Box Testing- Test-to-Pass and Test-to-Fail- Equivalence Partitioning- Data testing – State testing – Other Black-box test techniques.

UNIT – II Examining the code

Static White-Box testing- Formal reviews – Coding Standards and Guidelines- Generic Code Review Checklist. Testing the software with X-Ray glasses: Dynamic White-Box testing- Dynamic White-Box testing versus Debugging-Testing the Pieces- Data Coverage- Code Coverage.

Flowgraphs and Path Testing

Path-testing Basics – Predicates, Path Predicates and Achievable Paths-Path sensitizing-Path Instrumentation-Implementation and Application of Path Testing

UNIT – III Transaction-Flow Testing and Data-Flow Testing

Transaction Flows-Transaction Flow Testing Techniques. Data-Flow Testing Basics-Data-Flow Testing Strategies-Application, Tools, Effectiveness

UNIT – IV Domain Testing

Domains and Paths-Domain Testing-Domains and Interface Testing-Domains and Testability

UNIT – V Logic-Based Testing and State Graphs

Motivational Overview-Decision Tables-Path Expressions Again-KV Charts-Specifications
State Graphs-Good State Graphs and Bad-State Testing

Suggested Readings

1. Boris Beizer (2009), Software Testing Techniques (2nd ed.). New Delhi Dreamtech Press
2. Ron Patton (2002) Software Testing (2nd ed.). New Delhi: Pearson Education
3. Dorothy Graham, Erik Van Veenendaal, Isabel Evans, Rex Black (2007). Foundations of Software Testing, ISTQB Certification.
4. Brian Hambling, Peter Morgan, Angelina Samaroo, Geoff Thompson (2010). Software Testing , (2nd ed.). An ISEB Foundation, BCS
5. Renu Rajani, Pradeep Oak (2004). Software Testing- Effective Methods, Tools and Techniques, Tata McGraw Hill, New Delhi

Web Sites

1. www.testinggeek.com
2. www.softwaretestinghelp.com
3. www.softwaretestinginstitute.com

Semester – V

16ITU502A . NET PROGRAMMING 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To design, formulate, and construct applications with VB.NET
- To integrate variables and constants into calculations applying VB.NET
- To determine logical alternatives with VB.NET decision structures
- To implement lists and loops with VB.NET controls and iteration
- To separate operations into appropriate VB.NET procedures and functions
- To assemble multiple forms, modules, and menus into working VB.NET solutions

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Grasp the fundamentals of a programming language and know the basic differences between programming languages
2. Choose the architecture based on the problem to be solved.
3. Differentiate between the types of applications supported by .Net
4. Build, compile and execute a VB .Net program
5. Apply techniques to develop error-free software
6. To build integrated VB.NET solutions using files and structures with printing capabilities. Translate general requirements into data-related solutions using database concepts

UNIT I

Introduction to .NET: .NET framework features & architecture, CLR, common Type system, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB .Net – Menu bar, Tool bar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object browser. The environment:Editor tab, format tab, general tab, docking tab. Visual development & event driven programming – Methods and events.

UNIT II

The VB .Net Language: The VB .Net Language – Variabls- decalring variables, Data type of variables, forcing variables declarations, scope & lifetime of a variable, constants, arrays, types of arrays, control array, Structure programming – Modularity – Information hiding – abstraction – events – subroutines and functions – message box – input box. Control flow statement: conditional statement, loop statement.

UNIT III

Working with WPF: Introduction:Understanding Windows Graphics – WPF: A Higher Level API – The architecture of WPF. XAML:Basics, properties and events in XAML – loading and compiling – Layout. Classic controls: The Control class – content controls – text controls – list controls – Range based controls.

UNIT IV

Objects and Collections: Understanding objects, properties, methods. Understanding collections. Files: Introduction – classification of files – processing files – handling files and folder using class – directory class – file class.

UNIT V

Database programming with ADO .Net: overview of ADO, from ADO to ADO .Net, accessing data using server explorer. Creating connection, command, data adapter and data set with OLEDB and SQLDB. Display data on data bound controls, display data on a data grid. Generate reports using CrystalReportViewer.

Suggested Readings

1. Shrishchavan (2007). Visual Basic .Net (1st ed.). New Delhi: Pearson education.
2. Bryan Newsome (2012). Beginning Visual Basic. John Wiley & Sons, Inc.
3. Matthew MacDonald Pro (2008). Windows Presentation Foundtion with .Net 3.5 Apress
4. Duncan Mackenzie and Kent Sharkey (2006). Sams Teach Yourself Visual Basic .Net (1st ed.). New Delhi: Techmedia.
5. Ian Griffiths, Chris Shells (2005). Programming Windows Presentation Foundation (1st ed.). O'Reilly Publishers
6. Jeffrey R.Shapiro (2002). The Complete Reference Visual Basic .Net. New Delhi: Tata McGraw Hill Ed.

Websites

1. www.startvbdotnet.com
2. www.functionx.com
3. www.dotnetspider.com
4. www.developerfusion.com
5. http://www.wdftutorial.net/HelloWPF.html

Semester – V

16ITU502B **NETWORK PROGRAMMING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the 3-tier software architecture (presentation/client tier, application tier, data tier).
- To write web applications using a combination of client-side (JavaScript, HTML, XML, WML) and server-side technologies (JSP, JSF, SERVLETS).
- To write network applications using state-of-the-art RPC technologies including: RMI, CORBA, EJB, and Web Services (SOAP and UDDI).
- To understand e-mail programming (JavaMail, SMTP, POP, IMAP).
- To design and implement network applications through semester-long projects.
- To understand network routing (static and dynamic) and understand the process of implementing simple routed inter-networks.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Analyze the various transmission media, their comparative study, fiber optics and wireless media
2. Categorize the topologies of networks (LAN and WAN), Layered architecture (OSI and TCP/IP) and protocol suites.
3. TCP, UDP, SCTP protocols Ethernet and LAN administration.
4. Details of IP operations in the INTERNET and associated routing principles
5. Understand the key protocols which support the Internet
6. reate applications using techniques such as multiplexing, forking, multithreading

UNIT-I

Transport Layer Protocols: TCP, UDP, SCTP protocol.

UNIT-II

Socket Programming: Socket Introduction; TCP Sockets; TCP Client/Server Example ; signal handling

UNIT-III

I/O multiplexing using sockets; Socket Options; UDP Sockets; UDP client server example; Address lookup using sockets.

UNIT-IV

Network Applications: Remote logging; Email; WWW and HTTP.

UNIT-V

LAN administration: Linux and TCP/IP networking: Network Management and Debugging.

Suggested Readings

1. Richard Stevens, W., Bill Fenner., & Andrew, M. Rudoff. (2003). Unix Network Programming, The sockets Networking API, Vol. 1(3rd ed.). New Delhi: PHI.
2. Forouzan, B. A. (2003). Data Communications and Networking(4th ed.). New Delhi: THM Publishing Company Ltd.,
3. Nemeth Synder., & Hein. (2010). Linux Administration Handbook (2nd ed.), New Delhi: Pearson Education.
4. Steven, R. (1990). Unix Network Programming (2nd ed.). New Delhi: PHI.

Semester – V

16ITU503A **MACHINE LEARNING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To develop an appreciation for what is involved in learning from data.
- To understand a wide variety of learning algorithms.
- To understand how to perform evaluation of learning algorithms and model selection.
- To introduce students to the basic concepts and techniques of Machine Learning.
- To become familiar with regression methods, classification methods, clustering methods.
- To become familiar with Dimensionality reduction Techniques.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Have a broad understanding of machine learning algorithms and their use in data-driven knowledge discovery and program synthesis.
2. Design and implement several machine learning algorithms in Java.
3. Identify, formulate and solve machine learning problems that arise in practical applications.
4. Have knowledge of the strengths and weaknesses of different machine learning algorithms (relative to the characteristics of the application domain) and be able to adapt or combine some of the key elements of existing machine learning algorithms to design new algorithms as needed.
5. Identify machine learning techniques suitable for a given problem
6. Solve the problems using various machine learning techniques

UNIT-I

Introduction: Concept of Machine Learning, Applications of Machine Learning, Key elements of Machine Learning, Supervised vs. Unsupervised Learning, Statistical Learning: Bayesian Method, The Naive Bayes Classifier

UNIT-II

Softwares for Machine Learning and Linear Algebra Overview : Plotting of Data, Vectorization, Matrices and Vectors: Addition, Multiplication, Transpose and Inverse using available tool such as MATLAB.

UNIT-III

Linear Regression: Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, Linear Regression with multiple variables, Polynomial Regression, Feature Scaling/Selection. Logistic Regression: Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables.

UNIT-IV

Regularization: Regularization and its utility: The problem of Overfitting, Application of Regularization in Linear and Logistic Regression, Regularization and Bias/Variance.

UNIT-V

Neural Networks: Introduction, Model Representation, Gradient Descent vs. Perceptron Training, Stochastic Gradient Descent, Multilayer Perceptrons, Multiclass Representation, Backpropagation Algorithm.

Suggested Readings

1. Santanu Chattopadhyaya. (2011). Systems Programming. New Delhi: PHI.
2. Alfred, V. Aho., Monica, S. Lam., Ravi Sethi.,& Jeffrey, D. Ullman. (2006). Compilers: Principles, Techniques, and Tools (2nd ed.). New Delhi: Prentice Hall.
3. Dhamdhere, D. M. (2011). Systems Programming. New Delhi: Tata McGraw Hill.
4. Leland Beck., & Manjula, D. (2008). System Software: An Introduction to System Programming (3rd ed.). New Delhi: Pearson Education.
5. Grune, D., Van Reeuwijk, K., Bal, H. E., Jacobs, C. J. H., & Langendoen, K.(2012). Modern Compiler Design (2nd ed.). Springer.

Semester – V

16ITU503B **DATA MINING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To be familiar with mathematical foundations of data mining tools.
- To understand and implement classical models and algorithms in data warehouses and data mining
- To characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- To master data mining techniques in various applications like social, scientific and environmental context.
- To develop skill in selecting the appropriate data mining algorithm for solving practical problems
- To develop research interest towards advances in data mining

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Introduce students to the basic concepts and techniques of Data Mining.
2. Develop skills of using recent data mining software for solving practical problems.
3. Gain experience of doing independent study and research.
4. Possess some knowledge of the concepts and terminology associated with database systems, statistics, and machine learning
5. Identify appropriate data mining algorithms to solve real world problems
6. Benefit the user experiences towards research and innovation. integration

UNIT-I

Overview: Predictive and descriptive data mining techniques

UNIT-II

Supervised and unsupervised learning techniques

UNIT-III

Process of knowledge discovery in databases, pre-processing methods

UNIT-IV

Data Mining Techniques: Association Rule Mining, classification and regression techniques, clustering

UNIT-V

Scalability and data management issues in data mining algorithms, measures of interestingness.

Suggested Readings

1. Pang-Ning Tan., Michael Steinbach.,& Vipin Kumar. (2005). Introduction to Data Mining. New Delhi: Pearson Education.
2. Richard Roiger., & Michael Geatz. (2003). Data Mining: A Tutorial Based Primer. New Delhi: Pearson Education.
3. Gupta, G.K. (2006). Introduction to Data Mining with Case Studies. New Delhi: PHI.
4. Soman, K. P., Diwakar Shyam., & Ajay, V. (2006). Insight Into Data Mining: Theory And Practice. New Delhi: PHI.

WEB SITES

1. Thedacs.Com
2. Dwreview.Com
3. Pcai.Com
4. Eruditionhome.Com

Semester – V

16ITU504A **DIGITAL IMAGE PROCESSING** **3H – 3C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To introduce to the students the basics of digital image processing.
- To learn the basic image transforms, segmentation algorithms and problems of object measurements.

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation techniques.

UNIT-I

Introduction: Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization. Spatial Domain Filtering: Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian.

UNIT-II

Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

UNIT-III:

Image Restoration, Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections, Image Compression-Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, DCT implementation using FFT, Run length coding.

UNIT – IV

FAX compression (ITUITT Group-3 and Group-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG, Lossless predictive coding, Lossy predictive coding, Motion Compensation

Wavelet based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT),Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking

UNIT-V

Morphological Image Processing: Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons,pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion. Image Segmentation: Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding,Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation

Suggested Readings

1. Gonzalez, R. C., & Woods, R. E. (2008). Digital Image Processing(3rd ed.). New Delhi: Pearson Education.
2. Jain, A. K. (1989). Fundamentals of Digital image Processing. New Delhi: Prentice Hall of India.
3. Castleman, K. R. (1996). Digital Image Processing. New Delhi: Pearson Education.
4. Schalkoff. (1989). Digital Image Processing and Computer Vision. New York: John Wiley and Sons.
5. Rafael, C. Gonzalez., Richard, E. Woods.,& Steven Eddins. (2004). Digital Image Processing using MATLAB. New Delhi: Pearson Education.

Semester – V

16ITU504B MULTIMEDIA AND ITS APPLICATIONS 3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the multimedia communications systems, application and basic principles,
- To analyze of the multimedia streaming,
- To perform and establish multimedia communication terminals,
- To present multimedia communications
- Explore a brief history of multimedia in education
- Analyze instructional and informational media (print materials, audio/visual materials and/or web-based materials, games/simulations, etc.)

Course Outcomes (COs)

Upon successful completion the student will be able to:

1. Define multimedia to potential clients.
2. Identify and describe the function of the general skill sets in the multimedia industry.
3. Identify the basic components of a multimedia project.
4. Identify the basic hardware and software requirements for multimedia development and playback.
5. Describe the process of digitizing (quantization) of different analog signals (text, graphics, sound and video).
6. Use appropriate tools for the design, development and creation of digital media artefacts.

UNIT I

Multimedia – An overview: Introduction – Multimedia presentation and production – Characteristics of Multimedia presentation – Hardware and Software requirements – Uses of Multimedia. Text: Types of text – Font- Text file formats. Image: Image data representation – Image file formats – image processing software. Graphics: Advantages of graphics – Uses – Component of a graphics system.

UNIT II

Audio: Sound waves – types and properties of sound – components of audio system – Digital audio – Musical Instrument Digital Interface (MIDI) – Audio file formats – Audio processing software. Video: Motion video – Television systems – Video file formats – video processing software. Animation: Uses of animation – computer based animation - Animation file formats – Animation software.

UNIT III

Introducing photoshop elements: About elements – welcome screen – create mode – menu bar – toolbox – options bar – panels. Organizing images: Obtaining images - tagging images – searching for images – opening and saving images. Selecting areas – Layers – Text and drawing tools.

UNIT IV

Understanding flash: Understanding flash basic elements – creating a simple animation. Learning Flash toolbox: Learning the toolbox – using tools. Learning flash panels: Understanding the panels. Using timeline and layers: Understanding how timeline works – Understanding layers. Drawing objects: Drawing lines and fills – using colors – Rotating, skewing and scaling – grouping objects. Creating animation – How animation Works – creating motion tweens – creating shape tweens. Understanding masks – creating masks.

UNIT V

Creating symbols and using the library: Learning about symbols – creating symbols – using libraries. Learning Basic Actionscript concepts: Actionscript basics – data type basics. Learning basic actionscript programming: Applying Actionscript – Using Actionscript to control actions – Using Actionscript to control properties – Understanding Actions and Event Handlers.

Suggested Readings

1. Ranjan Parekh (2013). Principles of Multimedia (2nd ed.). TataMcGraw Hill.
2. Nick Vandome (2011). Photoshop Elements 9. TataMcGraw Hill.
3. Brian Underdahl (2002). Macromedia Flash MX – A Beginners Guide. Dreamtech Press.
4. Tay Vaughan (2002). Fundamentals of Multimedia (5th ed.). TataMcGraw Hill.
5. Bill Sanders (2001). Flash 5 Actionscript (1st ed.). New Delhi DreamTech Press.

Websites

1. en.wikipedia.org/wiki/Multimedia
2. www.arena-multimedia.com/
3. www.nextwavemultimedia.com/

Semester – V

16ITU511A COMPUTER GRAPHICS - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objecyives (CO)

- To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
- To learn the basic principles of 3- dimensional computer graphics.
- Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
- Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.
- To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.
- To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles, and applications.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. List the basic concepts used in computer graphics.
2. Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
3. Describe the importance of viewing and projections.
4. Define the fundamentals of animation, virtual reality and its related technologies,
5. Understand a typical graphics pipeline
6. Design an application with the principles of virtual reality

List of Programs

1. Write a program to implement Bresenham‘s line drawing algorithm.

2. Write a program to implement mid-point circle drawing algorithm.

3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.

4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.

5. Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).

6. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.

7. Write a program to draw Hermite/Bezier curve.

Semester – V

16ITU511B SOFTWARE TESTING - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces. 4. To know basics of testing and understanding concept of software quality assurance and software configuration management process.
- To understand the need of project management and project management life cycle.
- To understand project scheduling concept and risk management associated to various type of projects.
- Implement a given software design using sound development practices.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Apply their knowledge of mathematics, sciences, and computer science to the modeling, analysis, and measurement of software artifacts.
2. Work effectively as leader/member of a development team to deliver quality software artifacts.
3. Analyze, specify and document software requirements for a software system.
4. Verify, validate, assess and assure the quality of software artifacts.
5. Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its cost and time.
6. Express and understand the importance of negotiation, effective work habits, leadership, and good communication with stakeholders, in written and oral forms, in a typical software development environment.

1. Write a program that take three inputs (a,b and c) that represents the sides of a triangle and the output is one of the below four.
   a) Not a triangle
   b) Scalene triangle
   c) Isoceles triangle
   d) Equilateral triangle
   a) Generate test cases using boundary value analysis, equivalence class partitioning and decision table testing
   b) Generate test cases using basis path testing
   c) Run code coverage tool

2. Write a program that determines the nature of roots of a quadratic equation. Output should be one of the following
   - Not a quadratic equation
   - Complex roots
   - Real roots
   - Single roots

   a) Generate test cases using boundary value analysis, equivalence class partitioning and decision table testing
   b) Generate test cases using basis path testing
   c) Run code coverage tool
3. Write a program that checks whether the number is even or odd. Run code coverage tools and find the amount of code being covered.
4. Write a program that dynamically allocates memory to 10 integers using malloc() or calloc() and do not free memory leading to memory leaks. Verify the same using Valgrind. Now, free memory using free() at the end of the program to avoid memeory leaks. Verify the same using Valgring().
5. Using Selenium IDE, write a test suite containing minimum 4 test cases.
6. Conduct a test suite fro any two websites.
7. Write and test a program to login a specific webpage

Semester – V

16ITU512A **.NET PROGRAMMING - PRACTICAL** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To design, formulate, and construct applications with VB.NET
- To integrate variables and constants into calculations applying VB.NET
- To determine logical alternatives with VB.NET decision structures
- To implement lists and loops with VB.NET controls and iteration
- To separate operations into appropriate VB.NET procedures and functions
- To assemble multiple forms, modules, and menus into working VB.NET solutions

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Grasp the fundamentals of a programming language and know the basic differences between programming languages
2. Choose the architecture based on the problem to be solved.
3. Differentiate between the types of applications supported by .Net
4. Build, compile and execute a VB .Net program
5. Apply techniques to develop error-free software
6. To build integrated VB.NET solutions using files and structures with printing capabilities. Translate general requirements into data-related solutions using database concepts

1. Write a VB .Net program to calculate simple interest and compound interest.
2. Write a VB .Net program to implement Calcolator.
3. Write a VB.Net program to implement Notepad
4. Write a VB.Net program to draw several shaps and fill with color.
5. Write a VB .Net program to perform the following in list box
    a) Add an item
    b) Delete an item
    c) List count
    d) Clear the list
6. Write a program to calculate the total marks of the student and print the grades.
7. Write a VB .Net program to implement employee payroll system
8. Write a VB .Net program to create and manipulate a file.
9. Write a program to implement a web browser

10. Write a program to maintain the details of doctors in a hospital with their specializations
11. Write a program to animate the picture using timer control.
12. Write a program to move the object from one location to another. Change the color and size of object at different time interval.
13. Write a program to place 10 pictures in the listbox. Using timer control the take the picture from listbox and change the form background after specific time interval.
14. Write a program to implement speaking program. Get the text input from the user and convert into voice.
15. Write a program to implement chatting

Semester – V

16ITU512B NETWORK PROGRAMMING - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the 3-tier software architecture (presentation/client tier, application tier, data tier).
- To write web applications using a combination of client-side (JavaScript, HTML, XML, WML) and server-side technologies (JSP, JSF, SERVLETS).
- To write network applications using state-of-the-art RPC technologies including: RMI, CORBA, EJB, and Web Services (SOAP and UDDI).
- To understand e-mail programming (JavaMail, SMTP, POP, IMAP).
- To design and implement network applications through semester-long projects.
- To understand network routing (static and dynamic) and understand the process of implementing simple routed inter-networks.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Analyze the various transmission media, their comparative study, fiber optics and wireless media
2. Categorize the topologies of networks (LAN and WAN), Layered architecture (OSI and TCP/IP) and protocol suites.
3. TCP, UDP, SCTP protocols Ethernet and LAN administration.
4. Details of IP operations in the INTERNET and associated routing principles
5. Understand the key protocols which support the Internet
6. Create applications using techniques such as multiplexing, forking, multithreading

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

Semester – V

16ITU513A MACHINE LEARNING - PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To develop an appreciation for what is involved in learning from data.
- To understand a wide variety of learning algorithms.
- To understand how to perform evaluation of learning algorithms and model selection.
- To introduce students to the basic concepts and techniques of Machine Learning.
- To become familiar with regression methods, classification methods, clustering methods.
- To become familiar with Dimensionality reduction Techniques.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Have a broad understanding of machine learning algorithms and their use in data-driven knowledge discovery and program synthesis.
2. Design and implement several machine learning algorithms in Java.
3. Identify, formulate and solve machine learning problems that arise in practical applications.
4. Have knowledge of the strengths and weaknesses of different machine learning algorithms (relative to the characteristics of the application domain) and be able to adapt or combine some of the key elements of existing machine learning algorithms to design new algorithms as needed.
5. Identify machine learning techniques suitable for a given problem
6. Solve the problems using various machine learning techniques

List of Programs

1. Perform elementary mathematical operations in Octave/MATLAB like addition, multiplication, division and exponentiation.

2. Perform elementary logical operations in Octave/MATLAB (like OR, AND, Checking for Equality, NOT, XOR).

3. Create, initialize and display simple variables and simple strings and use simple formatting for variable.

4. Create/Define single dimension / multi-dimension arrays, and arrays with specific values like array of all ones, all zeros, array with random values within a range, or a diagonal matrix.

5. Use command to compute the size of a matrix, size/length of a particular row/column, load data from a text file, store matrix data to a text file, finding out variables and their features in the current scope.

6. Perform basic operations on matrices (like addition, subtraction, multiplication) and display specific rows or columns of the matrix.

7. Perform other matrix operations like converting matrix data to absolute values, taking the negative of matrix values, additing/removing rows/columns from a matrix, finding the maximum or minimum values in a matrix or in a row/column, and finding the sum of some/all elements in a matrix.

8. Create various type of plots/charts like histograms, plot based on sine/cosine function based on data from a matrix. Further label different axes in a plot and data in a plot.

9. Generate different subplots from a given plot and color plot data.

10. Use conditional statements and different type of loops based on simple example/s.

11. Perform vectorized implementation of simple matrix operation like finding the transpose of a matrix, adding, subtracting or multiplying two matrices.

12. Implement Linear Regression problem. For example, based on a dataset comprising of existing set of prices and area/size of the houses, predict the estimated price of a given house.

13. Based on multiple features/variables perform Linear Regression. For example, based on a number of additional features like number of bedrooms, servant room, number of balconies, number of houses of years a house has been built – predict the price of a house.

14. Implement a classification/ logistic regression problem. For example based on different features of students data, classify, whether a student is suitable for a particular activity. Based on the available dataset, a student can also implement another classification problem like checking whether an email is spam or not.

15. Use some function for regularization of dataset based on problem 14.

16. Use some function for neural networks, like Stochastic Gradient Descent or back propagation - algorithm to predict the value of a variable based on the dataset of problem

16ITU513B	**DATA MINING - PRACTICAL**	**Semester – V** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To be familiar with mathematical foundations of data mining tools.
- To understand and implement classical models and algorithms in data warehouses and data mining
- To characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- To master data mining techniques in various applications like social, scientific and environmental context.
- To develop skill in selecting the appropriate data mining algorithm for solving practical problems
- To develop research interest towards advances in data mining

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Introduce students to the basic concepts and techniques of Data Mining.
2. Develop skills of using recent data mining software for solving practical problems.
3. Gain experience of doing independent study and research.
4. Possess some knowledge of the concepts and terminology associated with database systems, statistics, and machine learning
5. Identify appropriate data mining algorithms to solve real world problems
6. Benefit the user experiences towards research and innovation. integration

List of Programs

1. Use the following learning schemes, with the default settings to analyze the weather data (in weather.arff). for test options, first choose "Use training set", then choose "Percentage split" using default 66% percentage split. Report model percent error rate.
2. Use iris dataset preprocess and classifyu it with j4.8 and Naive Bayes classifier. Examine the tree in the classifier output panel.
3. Using the dataset ReutersCorn – Train and ReutersGrain – Train. Classify articles using binary attributes and word count attributes.
4. Apply any two association rule based algorithm for the supermarket analysis.
5. Using weka experimenter perfrom comparison analysis of j4.8, oneR and ID3 for vote dataset.
6. Using weka experimenter perfrom comparison analysis of Naive Bayes with different datasets.
7. Apply ZeroR, OneR and j4.8, to classify the iris data in an experiment using 10 train and test runs, with 66% of the data used for 34% used for testing.
8. Using Weka Knowledge flow set up a flow to load an ARFF file (batch mode) and perform a cross-validation using j4.8 (WEKS's C4.5 implementation).

9. Draw multiple ROC curves in the same plot window, using j4.8 and RandomForest as classifiers.
10. Use any three clustering algorithm on Vehicle data set and find best among them.

Semester – V

16ITU514A DIGITAL IMAGE PROCESSING - PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To introduce to the students the basics of digital image processing.
- To learn the basic image transforms, segmentation algorithms and problems of object measurements.

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation techniques.

List of Programs

1. Write program to read and display digital image using MATLAB or SCILAB
    a. Become familiar with SCILAB/MATLAB Basic commands
    b. Read and display image in SCILAB/MATLAB
    c. Resize given image
    d. Convert given color image into gray-scale image
    e. Convert given color/gray-scale image into black & white image
    f. Draw image profile
    g. Separate color image in three R G & B planes
    h. Create color image using R, G and B three separate planes
    i. Flow control and LOOP in SCILAB
    j. Write given 2-D data in image file

2. To write and execute image processing programs using point processing method
    a. Obtain Negative image b. Obtain Flip image
    b. Thresholding d. Contrast stretching

3. To write and execute programs for image arithmetic operations
    a. Addition of two images
    b. Subtract one image from other image
    c. Calculate mean value of image

d. Different Brightness by changing mean value

4. To write and execute programs for image logical operations
   a. AND operation between two images
   b. OR operation between two images
   c. Calculate intersection of two images
   d. Water Marking using EX-OR operation
   e. NOT operation (Negative image)

5. To write a program for histogram calculation and equalization using
   a. Standard MATLAB function
   b. Program without using standard MATLAB functions
   c. C Program

6. To write and execute program for geometric transformation of image
   a. Translation
   b. Scaling
   c. Rotation
   d. Shrinking
   e. Zooming

7. To understand various image noise models and to write programs for
   a. image restoration
   b. Remove Salt and Pepper Noise
   c. Minimize Gaussian noise
   d. Median filter and Weiner filter

8. Write and execute programs to remove noise using spatial filters
   a. Understand 1-D and 2-D convolution process
   b. Use 3x3 Mask for low pass filter and high pass filter

9. Write and execute programs for image frequency domain filtering
   a. Apply FFT on given image
   b. Perform low pass and high pass filtering in frequency domain
   c. Apply IFFT to reconstruct image

10. Write a program in C and MATLAB/SCILAB for edge detection using different edge detection mask

11. Write and execute program for image morphological operations erosion and dilation.

12. To write and execute program for wavelet transform on given image and perform inverse wavelet transform to reconstruct image.

Semester – V

16ITU514B MULTIMEDIA AND ITS APPLICATIONS – PRACTICAL 3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand the multimedia communications systems, application and basic principles,
- To analyze of the multimedia streaming,
- To perform and establish multimedia communication terminals,
- To present multimedia communications
- Explore a brief history of multimedia in education
- Analyze instructional and informational media (print materials, audio/visual materials and/or web-based materials, games/simulations, etc.)

Course Outcomes (COs)

Upon successful completion the student will be able to:

1. Define multimedia to potential clients.
2. Identify and describe the function of the general skill sets in the multimedia industry.
3. Identify the basic components of a multimedia project.
4. Identify the basic hardware and software requirements for multimedia development and playback.
5. Describe the process of digitizing (quantization) of different analog signals (text, graphics, sound and video).
6. Use appropriate tools for the design, development and creation of digital media artefacts.

List of Programs

1. Change a Shape to Another Shape. (Shape Animation)
2. Create a Man to walk with the help of Key Frame Animation.
3. Change the Colors of an object with the help of Animation.
4. Draw a Bird with Flash tools and make it fly with key Frame Animation.
5. Create a Shining Stones with the help of Movie Clip.
6. Create an animation to represent a growing moon using frame by frame animation
7. Create an animation to bounce a ball on steps.
8. Simulate movement of a cloud.
9. Create Morphing between two images.
10. Create an Action script to execute for an event in an application.
11. Create Water Drops using Photoshop.

12. Animate Plane Flying with the Clouds.
13. Create Plastic Surgery for Nose.
14. Create a Web Page using Photoshop
15. Given a picture of a flower with a background. Extract the flower and organize on a different background.
16. Display the given picture through your name using mask.

Semester – VI

16ITU601A PHP PROGRAMMING 4H – 4C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand how server-side programming works on the web.
- To learn PHP Basic syntax for variable types and calculations.
- To use PHP built-in functions and creating custom functions
- To understand POST and GET in form submission.
- To receive and process form submission data.
- To create a database in phpMyAdmin, to read and process data in a MySQL database

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Write PHP scripts to handle HTML forms.
2. Write regular expressions including modifiers, operators, and metacharacters.
3. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
4. Analyze and solve various database tasks using the PHP language.
5. Analyze and solve common Web application tasks by writing PHP programs
6. Get hands on experience on various techniques of web development and will be able to design and develop a complete website.

UNIT-I

Introduction to PHP:

PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.) -PHP with other technologies, scope of PHP Basic Syntax, PHP variables and constants-Types of data in PHP , Expressions, scopes of a variable (local, global)-PHP Operators: Arithmetic, Assignment, Relational, Logical operators, Bitwis , ternary and MOD operator.-PHP operator Precedence and associativity

UNIT-II

Handling HTML form with PHP:

Capturing Form Data -GETand POST form methods- Dealing with multi value fields - Redirecting a form after submission **-PHP conditional events and Loops:** PHP IF Else conditional statements (Nested IF and Else) -Switch case, while ,For and Do While Loop -Goto , Break ,Continue and exit

UNIT-III

PHP Functions:

Function, Need of Function , declaration and calling of a function-PHP Function with arguments, Default Arguments in Function-Function argument with call by value, call by reference-Scope of Function Global and Local

UNIT-IV

String Manipulation and Regular Expression: (3L) Creating and accessing String , Searching & Replacing String-Formatting, joining and splitting String , String Related Library functions -Use and advantage of regular expression over inbuilt function-Use of preg_match(), preg_replace(), preg_split() functions in regular expression.

UNIT-V

Array:

Anatomy of an Array ,Creating index based and Associative array ,Accessing array
-Looping with Index based array, with associative array using each() and foreach()
-Some useful Library function

Suggested Readings

1. Steven Holzner. (2007). PHP: The Complete Reference. New Delhi: McGraw Hill Education (India).
2. Timothy Boronczyk., & Martin, E. Psinas. (2008). PHP and MYSQL (Create-Modify-Reuse). New Delhi: Wiley India Private Limited.
3. Robin Nixon. (2014). Learning PHP, MySQL, JavaScript, CSS & HTML5 (3rd ed.). O'reilly.
4. Luke Welling.,& Laura Thompson.(2008). PHP and MySQL Web Development (4th ed.). Addition Paperback, Addison-Wesley Professsional.
5. David Sklar., & Adam Trachtenberg. PHP Cookbook: Solutions & Examples for PHP.

Semester – VI

16ITU601B **UNIX / LINUX PROGRAMMING** **4H – 4C**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.
- To understand how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions
- To understand how the operating system abstractions can be implemented
- To understand the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software
- To understand basic resource management techniques (scheduling or time management, space management) and principles and how they can be implemented.
- These also include issues of performance and fairness, avoiding deadlocks, as well as security and protection.

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Develop software for Linux/UNIX systems.
2. Learn the C language and get experience programming in C.
3. Learn the important Linux/UNIX library functions and system calls.
4. Understand the inner workings of UNIX-like operating systems.
5. Obtain a foundation for an advanced course in operating systems.
6. Construct various shell scripts for simple applications

UNIT-I

Introduction What is Linux/Unix Operating systems, Difference between linux/unix and other operating systems , Features and Architecture, Various Distributions available in the market, Installation, Booting and shutdown process.

UNIT-II

System processes (an overview), External and internal commands, Creation of partitions in OS, Processes and its creation phases – Fork, Exec, wait

UNIT-III

User Management and the File System Types of Users, Creating users, Granting rights User management commands, File quota and various file systems available, File System Management and Layout, File permissions, Login process, Managing Disk Quotas, Links (hard links, symbolic links)

UNIT-IV

Shell introduction and Shell Scripting What is shell and various type of shell, Various editors present in Linux Different modes of operation in vi editor, What is shell script, Writing and executing the shell script , Shell variable (user defined and system variables)

UNIT-V

System calls, Using system calls Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell.
Functions, Utility programs (cut, paste, join, tr, uniq utilities), Pattern matching utility (grep)

Suggested Readings

1. Sumitabha, Das.(2006). Unix Concepts And Applications. New Delhi: Tata McGraw-Hill Education.
2. Michael Jang. (2011). RHCSA/ RHCE Red Hat Linux Certification: Exams (Ex200 & Ex300). Certification Press.
3. Nemeth Synder., & Hein.(2010). Linux Administration Handbook (2nd ed.). Pearson Education.
4. Richard Stevens, W. Bill Fenner., & Andrew, M. Rudoff. (2014). Unix Network Programming, The sockets Networking API, Vol. 1, (3rd ed.).

Semester – VI

16ITU602A E-COMMERCE TECHNOLOGIES 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce the concepts, vocabulary, and procedures associated with E-Commerce and the Internet.
- To gain an overview of all aspects of E-Commerce.
- To develop the Internet and E-Commerce, options available for doing business on the Internet, features of Web sites and the tools used to build an E-Commerce web site, marketing issues, payment options, security issues, and customer service.
- It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems
- Assess e-commerce strategies and applications, including online marketing, e-government, e-learning and global e-commerce

Course Outcomes (COs)

Upon successful completion of this course, the student will be able to:

1. Describe an example of system architecture for an e-Business.
2. List the seven major elements of web design.
3. Identify and explain fundamental web site tools including design tools, programming tools, and data processing tools.
4. Identify the major electronic payment issues and options.
5. Discuss security issues and explain procedures used to protect against security threats.
6. Identify and discuss management issues underlying e-Commerce issues including organizational structure, strategic planning, goal setting, corporate social responsibility, international arena, changing market intermediaries, resource allocation and customer service

UNIT I -An Introduction to Electronic commerce

What is E-Commerce (Introduction And Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce,Electronic Commerce Applications, Electronic Commerce and Electronic Business (C2C) (C2G, G2G, B2G, B2P, B2A, P2P, B2A, C2A, B2B, B2C)

UNIT II -The Internet and WWW

Evolution of Internet, Domain Names and Internet - Organization (.edu, .com, .mil, .gov, .net etc), Types of Network, Internet Service Provider, World Wide Web, Internet & Extranet, Role of Internet in B2B Application, building own website, cost, time, reach, registering a domain name, web promotion, Target email, Banner, Exchange, Shopping Bots.

UNIT III: Electronic data

Electronic data exchange introduction, concepts of EDI and Limitation, Apllication of eDI, Disadvantgaes of eDI, EDI model, Electronic Payment System: Introduction, Types of Electronic Payment system, Payment types, Value exchange system, credit card system electronic fund transfer, Paperless bill, modern payment cash, Electronic cash.

UNIT IV: Planning for Electronic Commerce

Palnnign Electronic commerce initiates, linking objectives to business strategies, measuring cost objectives, comparing benefits to Costs, strategies for developing electronic commerce web sites.

UNIT V : Internet marketing

The PROS and CONS of online shopping, the CONS of online shopping, Justify an internet business, Internet marketing techniques, The E-Cycle of Internet marketing, personalization e-commerce.

Suggested Readings

1.G.S.V.Murthy (2011). E-Commerce concepts, Models, Strategies. Himalaya Publishing house.
2. Gray. P. Schneider (2011). Electronic commerce International student edition.
3. Henry Cahn, Raymond Lee, Tharam Dillon, Elizabeth Chang. (2011). E-Commerce fundamentals and Applications. Wiley Student Edition.
4. Kamlesh K.Bajaj and Debjani Nag (2005).E-Commerce.
5. David Whitley (2000).E-Commerce-strategies, Technologies and Applications. TMH.

Websites

1. http://www.tutorialspoint.com/e_commerce/e_commerce_tutorial.pdf
2. http://www.dynamicwebs.com.au/tutorials/e-commerce.htm
3. http://www.htmlgoodies.com/beyond/webmaster/projects/electronic-commerce-tutorial.html

16ITU602B	**CLOUD COMPUTING**	**Semester – VI** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To learn how to use Cloud Services.
- To implement Virtualization
- To implement Task Scheduling algorithms.
- To apply Map-Reduce concept to applications.
- To build Private Cloud.
- To know the impact of engineering on legal and societal issues involved

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.
2. Design different workflows according to requirements and apply map reduce programming model.
3. Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
4. CO4: Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds
5. Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application
6. Broadly educate to know the impact of engineering on legal and societal issues involved in addressing the security issues of cloud computing.

UNIT-I

Overview of Computing Paradigm: Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing.**Introduction to Cloud Computing:** Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing.

UNIT-II

Cloud Computing Architecture: Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.

UNIT-III

Case Studies: Case study of Service model using Google App Engine, Microsoft Azure, Amazon EC2 , Eucalyptus.

UNIT-IV

Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing & AITUounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling.

UNIT-V

Cloud Security: Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing.

Suggested Readings

1. Barrie Sosinsky. (2010). Cloud Computing Bible. New Delhi: Wiley-India,
2. Rajkumar Buyya., James Broberg., & Andrzej, M. Goscinski Wile. Cloud Computing: Principles and Paradigms.
3. Nikos Antonopoulos., & Lee Gillam. (2012). Cloud Computing: Principles, Systems and Applications. Springer.
4. Ronald, L. Krutz., & Russell Dean Vines. (2010). Cloud Security: A Comprehensive Guide to Secure Cloud Computing.New Delhi: Wiley-India.
5. Gautam Shroff. (2010). Enterprise Cloud Computing Technology Architecture Applications. Adobe Reader ebooks available from eBooks.com.
6. Toby Velte., Anthony Velte., & Robert Elsenpeter.(2010). Cloud Computing, A Practical Approach. McGraw Hills.
7. Dimitris, N. Chorafas. (2010). Cloud Computing Strategies. CRC Press.

WEB SITES

1. en.wikipedia.org/wiki/Cloud_computing
2. www.ibm.com/cloud-computing/in/en/
3. www.oracle.com/CloudComputing
4. www.microsoft.com/en-us/cloud/default.aspx

16ITU603A	NUMERICAL METHODS	Semester – VI 3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

SCOPE

It exposes the students to study numerical techniques as powerful tools in scientific computing

OBJECTIVES

This course a deep knowledge to the learners to understand the basic concepts of numerical methods which utilize computers to solve Engineering problems that are not easily solved or even impossible to solve by analytical means.

UNIT I

Floating point representation and computer arithmetic – significant digits. Errors: round-off error – local truncation error – global truncation error – order of a method convergence and terminal conditions – efficient computations – bisection method – secant methods – Regula-Falsi method – Newton – Raphson method – Newton's method for solving non-linear systems.

UNIT II

Gauss elimination method (with row pivoting) and Gauss-Jordan method – Gauss thomas method for tridiagonal systems. Interative methods: Jacobi and Gauss-seidal interative methods.

UNIT III

Interpolation: Lagrange's form and Newton's form – Finite difference operators – Gregory Newton forward and backward differences inerpolation Piecewise polynomial interpolation: Linear interpolation – Cubic spline interpolation (only method).

UNIT IV

Numerical differentiation: First derivatives and second order derivates – Richardson extrapolation. Numerical integration: traphezoid rule – simpson's rule (only method) – newton – Cotes open formulas.

UNIT V

Extrapolation method : Romberg integration- Cosine quadrature. Ordinary differential equations: Euler's method modified Euler's methods – Heun method and mid-point method – Runge-kutta second methods – Heun method without iteration – mid-point method and Ralston's method – classical 4th order Runge-Kutta method.

Suggested Readings

1. Laurence V. Fausett (2012). Applied Numerical analysis using MATLAB. Pearson.
2. M.K.Jain, S.R.K.Iyengar, R.K.Jain (2012). Numerical methods for scientific and engineering computation. New Age International Publisher.
3. Steven C. Chopra (2010). Applied Numerical methods with MATLAB for Engineers and Scientists. Tata McGraw Hill.

16ITU603B **SYSTEM PROGRAMMING** **Semester – VI**
3H – 3C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce students the concepts and principles of system programming
- To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.
- To train students in developing skills for writing system software with the aid of sophisticated OS services, programming languages and utility tools.
- To understand the role and functioning of various system programs over application program.
- To understand the need to follow the syntax in writing an application program and to learn the how the analysis phase of compiler is designed to understand the programmer‘s requirements without ambiguity.
- To synthesize the analysis phase outcomes to produce the object code that is efficient in terms of space and execution time.

Course Outcomes (COs)

Upon completion of the subject, students will be able to

1. Organize the functionalities and components of a computer system into different layers, and have a good understanding of the role of system programming and the scope of duties and tasks of a system programmer
2. Grasp the concepts and principles, and be familiar with the approaches and methods of developing system-level software (e.g., compiler, and networking software)
3. Apply the knowledge and techniques learnt to develop solutions to realworld problems
4. Select and make use of the OS kernel functions and their APIs, standard programming languages, and utility tools
5. Organize and manage software built for deployment and demonstration
6. Analyze requirements and solve problems using systematic planning and development approaches

UNIT-I

Assemblers & Loaders, Linkers: One pass and two pass assembler design of an assembler, Absolute loader, relocation and linking concepts, relocating loader and Dynamic Linking., overview of compilation, Phases of a compiler.

UNIT-II

Lexical Analysis:

Role of a Lexical analyzer, Specification and recognition of tokens, Symbol table, lexical

UNIT-III

Parsing:

Bottom up parsing- LR parser, yaITU. **Intermediate representations: Three** address code generation, syntax directed translation, translation of types, control Statements.

UNIT-IV

Storage organization: Activation records stack allocation.

UNIT-V

Code Generation: Object code generation

Suggested Readings

1. Santanu Chattopadhyaya. (2011). Systems Programming. New Delhi: PHI.
2. Alfred, V. Aho., Monica, S. Lam., Ravi Sethi.,& Jeffrey, D. Ullman. (2006). Compilers: Principles, Techniques, and Tools (2nd ed.). New Delhi: Prentice Hall.
3. Dhamdhere, D. M. (2011). Systems Programming. New Delhi: Tata McGraw Hill.
4. Leland Beck., & Manjula, D. (2008). System Software: An Introduction to System Programming (3rd ed.). New Delhi: Pearson Education.
5. Grune, D., Van Reeuwijk, K., Bal, H. E., Jacobs, C. J. H., & Langendoen, K.(2012). Modern Compiler Design (2nd ed.). Springer.

Semester – V

16ITU611A PHP PROGRAMMING - PRACTICAL 4H –2C

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand how server-side programming works on the web.
- To learn PHP Basic syntax for variable types and calculations.
- To use PHP built-in functions and creating custom functions
- To understand POST and GET in form submission.
- To receive and process form submission data.
- To create a database in phpMyAdmin, to read and process data in a MySQL database

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Write PHP scripts to handle HTML forms.
2. Write regular expressions including modifiers, operators, and metacharacters.
3. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
4. Analyze and solve various database tasks using the PHP language.
5. Analyze and solve common Web application tasks by writing PHP programs
6. Get hands on experience on various techniques of web development and will be able to design and develop a complete website.

List of Programs

1. Create a PHP page using functions for comparing three integers and print the largest number.

2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.

3. WAP to check whether the given number is prime or not.

4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.

5. Write a PHP function that checks if a string is all lower case.

6. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)

7. WAP to sort an array.

8. Write a PHP script that removes the whitespaces from a string.
Sample string : 'The quick   brown fox' Expected Output : Thequickbrownfox

9. Write a PHP script that finds out the sum of first n odd numbers.

10. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.

11. Write a PHP script that checks if a string contains another string.

12. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.

13. Create a script to construct the following pattern, using nested for loop.

```
*
* *
* * *
* * * *
* * * * *
```

14. Write a simple PHP program to check that emails are valid.

15. WAP to print first n even numbers.

16. $color = array('white', 'green', 'red")

Write a PHP script which will display the colors in the following way : Output :
white, green, red,
• green • red
• white

17. Using switch case and dropdown list display a ―Hello‖ message depending on the language selected in drop down list.

18. Write a PHP program to print Fibonacci series using recursion.

19. Write a PHP script to replace the first 'the' of the following string with 'That'.

Sample : 'the quick brown fox jumps over the lazy dog.'
Expected Result : That quick brown fox jumps over the lazy dog.

		Semester – VI
16ITU611B	**UNIX / LINUX PROGRAMMING - PRACTICAL**	**4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.
- To understand how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions
- To understand how the operating system abstractions can be implemented
- To understand the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software
- To understand basic resource management techniques (scheduling or time management, space management) and principles and how they can be implemented.
- These also include issues of performance and fairness, avoiding deadlocks, as well as security and protection.

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Develop software for Linux/UNIX systems.
2. Learn the C language and get experience programming in C.
3. Learn the important Linux/UNIX library functions and system calls.
4. Understand the inner workings of UNIX-like operating systems.
5. Obtain a foundation for an advanced course in operating systems.
6. Construct various shell scripts for simple applications

List of Programs

1. Write a shell script to check if the number entered at the command line is prime or not.
2. Write a shell script to modify ―call command to display calendars of the specified months.
3. Write a shell script to modify ―call command to display calendars of the specified range of months.
4. Write a shell script to aITUept a login name. If not a valid login name display message – ―Entered login name is invalid.
5. Write a shell script to display date in the mm/dd/yy format.
6. Write a shell script to display on the screen sorted output of ―who command along with the total number of users .
7. Write a shell script to display the multiplication table any number,
8. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
9. Write a shell script to find the sum of digits of a given number.
10. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.

11. Write a shell script to find the LCD (least common divisor) of two numbers.
12. Write a shell script to perform the tasks of basic calculator.
13. Write a shell script to find the power of a given number.
14. Write a shell script to find the binomial coefficient C(n , x).
15. Write a shell script to find the permutation P(n,x).
16. Write a shell script to find the greatest number among the three numbers.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not

Semester – VI

16ITU612A E-COMMERCE TECHNOLOGIES- PRACTICAL 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce the concepts, vocabulary, and procedures associated with E-Commerce and the Internet.
- To gain an overview of all aspects of E-Commerce.
- To develop the Internet and E-Commerce, options available for doing business on the Internet, features of Web sites and the tools used to build an E-Commerce web site, marketing issues, payment options, security issues, and customer service.
- It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems
- Assess e-commerce strategies and applications, including online marketing, e-government, e-learning and global e-commerce

Course Outcomes (COs)

Upon successful completion of this course, the student will be able to:

1. Describe an example of system architecture for an e-Business.
2. List the seven major elements of web design.
3. Identify and explain fundamental web site tools including design tools, programming tools, and data processing tools.
4. Identify the major electronic payment issues and options.
5. Discuss security issues and explain procedures used to protect against security threats.
6. Identify and discuss management issues underlying e-Commerce issues including organizational structure, strategic planning, goal setting, corporate social responsibility, international arena, changing market intermediaries, resource allocation and customer service.

List of Programs

1. Write a HTML program to implement the use of Image map.
2. Write a CSS to implement selectors in HTML
3. Write a CSS to implement pesudo – classes with in-line styles
4. Write a Javascript program to validate a web form
5. Write a Javascript program to allow visitors to see history of visiting your page
6. Write a Javascript program to change random color each 5 seconds

7. Write a pearl program to read a list of n strings (from STDIN) into an array and print a random string from the list (Use srand;rand(@array))
8. Write a pearl program to read a list of n numeric's from STDIN and find the max, min, range, median and mode. Input size of the list n interactively.
9. Write a pearl program to read a file of words and replaces all words in the file with their uppercase equivalent (hint: use tr/a-z/A-Z/)
10. Write VBScript program to print Fibonacci series using Do..while loop and For loop.
11. Write VBScript program to generate date and time in defferent format
12. Write VBScript program to print student marklist
13. Develop an ASP code to retrieve information from forms
14. Develop an ASP code to reading and writing cookies information
15. Develop an ASP code using response object methods

Semester – VI

16ITU612B **CLOUD COMPUTING -PRACTICAL** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To learn how to use Cloud Services.
- To implement Virtualization
- To implement Task Scheduling algorithms.
- To apply Map-Reduce concept to applications.
- To build Private Cloud.
- To know the impact of engineering on legal and societal issues involved

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.
2. Design different workflows according to requirements and apply map reduce programming model.
3. Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
4. Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds
5. Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application
6. Broadly educate to know the impact of engineering on legal and societal issues involved in addressing the security issues of cloud computing.

List of Programs

1. Create virtual machines that access different programs on same platform.

2. Create virtual machines that aITUess different programs on different platforms.

3. Working on tools used in cloud computing online-

    a) Storage

    b) Sharing of data

    c) Manage your calendar, to-do lists,

    d) A document editing tool

4. Exploring Google cloud

5. Exploring Microsoft cloud

6. Exploring Amazon cloud

Semester – VI

16ITU613A **NUMERICAL METHODS-PRACTICAL** **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Int : **40** Ext : **60** Total: **100**

1. Find the roots of the equation by bisection method
2. Find the roots of the equation by secant/Regula-Falsi method.
3. Find the roots of the equation by Newton's method
4. Find the solution of a system of nonlinear equation using Newton's method
5. Find the solution of tridiagonal system using Gauss Thomas method
6. Find the solution of system of equations using Jacobi/Gauss-Seidal method
7. Find the cubic spline interpolating function
8. Evaluate the approximate value of finite integrals using Gaussian/Romberg itegration
9. Solve the boundary value problem using Finite difference method

Note: Programming is to be done in any one of computer algebra systems: MATLAB/MATHEMATICA/MAPLE

16ITU613B **SYSTEM PROGRAMMING - PRACTICAL** **Semester – VI**
3H – 1C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Int : **40** Ext : **60** Total: **100**

Course Objectives (CO)

- To introduce students the concepts and principles of system programming
- To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.
- To train students in developing skills for writing system software with the aid of sophisticated OS services, programming languages and utility tools.
- To understand the role and functioning of various system programs over application program.
- To understand the need to follow the syntax in writing an application program and to learn the how the analysis phase of compiler is designed to understand the programmer‘s requirements without ambiguity.
- To synthesize the analysis phase outcomes to produce the object code that is efficient in terms of space and execution time.

Course Outcomes (COs)

Upon completion of the subject, students will be able to

1. Organize the functionalities and components of a computer system into different layers, and have a good understanding of the role of system programming and the scope of duties and tasks of a system programmer
2. Grasp the concepts and principles, and be familiar with the approaches and methods of developing system-level software (e.g., compiler, and networking software)
3. Apply the knowledge and techniques learnt to develop solutions to realworld problems
4. Select and make use of the OS kernel functions and their APIs, standard programming languages, and utility tools
5. Organize and manage software built for deployment and demonstration
6. Analyze requirements and solve problems using systematic planning and development approaches

List of Programs

1. To implement an assembler for a hypothetical language.
2. To get familiar with lex: write a program to recognize numbers, identifiers.
3. To get familiar with yacc: write a desk calculator.

கற்பகம் உயர்கல்வி கலைக்கழகம்

தமிழ்த்துறை

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)

முதல்பருவம்

(இளநிலை கலையியல் பட்ட வகுப்புகளுக்குரியது)

(For I-UG Arts Degree Classes) 16LAU101

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. **மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்**

தாள்கள் வரிசையும் தேர்வுச் செயல்திட்டமும் பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
ஒன்று	I	6	3	40 / 60	100	4

அலகு – I :இக்காலஇலக்கியம்: **(20 மணிநேரம்)**

கல்வி: மகாகவிபாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.

இன்றைய நிலை : கவிமணிதேசிய விநாயகம் -ஒற்றுமையே உயிர்நிலை

: கவிஞர் அப்துல்ரகுமான் - கால வழு

மனிதநேயம்:கவிஞர்சிற்பிபாலசுப்பிரமணியன் – மலையாளக்

காற்று**கவிஞர் தாமரை**– மழைக்குறிப்பு

சூழலியல்:கவிஞர் வைதீஸ்வரன் -விரல் மீட்டிய மழை

பெண்ணியம் :கவிஞர் சுகந்தி சுப்பிரமணியம் – புதையுண்ட

வாழ்க்கை**கவிஞர்** வைரமுத்து – அம்மா

வாழ்க்கை:கவிஞர் தருமுசிவராம்– வாழ்வுப் பாடல்

இயற்கை:பாவேந்தர்பாரதிதாசன் – அழகின்சிரிப்பு – வான்.

அலகு – II :அறஇலக்கியம்: (15 மணிநேரம்)

கொன்றை வேந்தன்: 1 - 50 பாடல்கள்

திருக்குறள்: பண்புடைமை, வினைத்திட்பம் -20 குறள்கள்

பழமொழி நானூறு: 5 பாடல்கள்

வேதநாயகம்பிள்ளை நீதிநூல்: 74 -78 பாடல்கள்

பெருவாயின் முள்ளியார் ஆசாரக்கோவை: 5 பாடல்கள்

அலகு - III :சிற்றிலக்கியம்: (15 மணிநேரம்)

மூவருலா: 1-26 கண்ணிகள்

திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்

குற்றாலக்குறவஞ்சி: 5 பாடல்கள்

முக்கூடற்பள்ளு : 5 பாடல்கள்

கலிங்கத்துப் பரணி: போர்பாடியது- 9 பாடல்கள்

அலகு – IV :கட்டுரை: (10 மணிநேரம்)

1. **உயர்தனிச் செம்மொழி- பரிதிமாற்கலைஞர்**
2. **கட்டிடக்கலை-** அ.இராசமாணிக்கனார்
3. **வாழ்க்கை-**இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஶ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V :மொழிப்பயிற்சி: (12 மணிநேரம்)

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. எழுத்து, சொல், பொருள் இலக்கணப் பயிற்சிகள்

Semester - I

16ENU101 **ENGLISH – I** **4H – 4C**

(For all undergraduate students admitted from 2016 onwards)

Instruction Hours / week L: 4 T: 0 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcome:

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed.
6. Betterment of language competence

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman – Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions

Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT V

Short Story: The Bird – Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. *Spring* 2013**.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala, V. *English for Communication*. 2006. Emerald Publishers: Chennai

Semester - I

16BAU101	FUNDAMENTALS OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR	L	T	P	C
		4	-	-	4

Instruction Hours / week L: 4 T: 0 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES:

To make the student

- To demonstrate the concepts of management.
- To compose the knowledge in the functions of management.
- To identify human behaviour concepts
- To infer the knowledge on various factors involved in human behaviour
- To interpret about the organizational climate
- To analyze individual and group behavior in organizations

COURSE OUTCOMES:

Learners should be able to

1. Demonstrate the concepts of management and the functions of management and organizational behavior.
2. Compose the managerial functions of planning, organizing and controlling in a variety of circumstances.
3. Assess the impact of the personality traits and their perception in day to day performance.
4. Exhibit the leadership skills whenever required and work in groups and teams by motivating and resolving conflict arising in groups and adapting to change.
5. Assess insight to the students regarding individual and group behaviour in organizations**.**
6. Understand and exhibit the communication skills to convey the thoughts and ideas to the individuals and group.

UNIT I

Basic forms of Business Ownership - Special forms of ownership - Franchising -Licensing- Leasing- Choosing a form of Business ownership - Corporate Expansion -mergers and acquisitions -Diversification, forward and backward integration -Jointventures, Strategic alliance - Evolution of Management Theory - Managerial functions andRoles. Insights from Indian practices and ethos.

UNIT II

Overview of Planning - Types of Plans and The planning process - Decision making: Process - Types and Techniques - Control - Functions, Process and types of Control; Principles of organizing - Common organsational structures - Delegation and Decentralization- Factors affecting the extent of decentralization - Process and Principles of delegation- Line and Staff Function.

UNIT III

Importance of organizational Behaviour - Perception and Attribution - Concept, Nature, Process, Personality: Personality - Learning - Concept and Theories of Learning, Reinforcement, Motivation - Concepts and their application, Need, Content and Process Theories, Contemporary Leadership issues: Charismatic, Transformational Leadership. Emotional Intelligence.

UNIT IV

Groups and Teams - Definition, Difference between Groups and teams - Stages of Group Development - Group Cohesiveness - Types of teams - Analysis of Interpersonal Relationship: Transactional Analysis - Johari WindowOrganisational Power and Politics - Nature of organisational politics.

UNIT V

Conflict: Concept, Sources- Types, Stages of conflict - Management of conflict, Organisational Change: Concept, Resistance to change, Managing resistance to change, Implementing Change -Kurt Lewin Theory of Change - Managing Stress: Insights from Indian ethos.

SUGGESTED READINGS:

TEXT BOOKS

1. Dinkar Pagare. (2015).*Principles of Management*. New Delhi: S.Chand and Co Ltd.
2. Aswathappa, K. (2014). *Organizational Behaviour*. Mumbai: Himalaya Publishing House.

REFERENCES

1. Gilbert. (2011).*Principles of Management*. New Delhi: Tata McGraw Hill Publishers Pvt. Ltd.
2. Jerald Greenberg. (2011). *Behavior in Organizations*. New Delhi: Pearson Prentice Hall of India.
3. Vijay Kumar Kaul. (2011).*Business Organization and Management:* Text and Cases. New Delhi : Pearson Education India.
4. Vijay Kumar Kaul. (2016).*Principles and Practices of Management*. New Delhi: Vikas Publication.
5. Kavita Singh. (2015).*Organizational Behaviour: Text and Cases* (3^{rd} ed.).New Delhi: Vikas Publications.
6. Koontz.,& Heinz Weihrich. (2010).*Essential of Management.* New Delhi: McGraw Hill.
7. Fred Luthans. (2005). *Organizational Behaviour*(10^{th} ed.). New Delhi: Tata McGraw - Hill Education.
8. Mc Shane,L., Steven, Glinow Mary Ann Von & Sharma Radha, R.(2008). *Organisational Behaviour*., New Delhi: Tata McGraw Hill Publishers Pvt. Ltd.
9. New strom John, W. (2006).*Organisational Behaviour* (12^{th} ed.).New Delhi: McGraw Hill Higher Education.
10. Richard L., Daft. (2008).*Principles of Management* (8^{th} ed.).New Delhi: Cengage Learning India.
11. Robbins Stephen, P. (2014). *Organisational Behaviour*(7^{th} ed.).New Delhi: Pearson Prentice Hall of India.
12. Stephen P Robbins., David, A., DeCenzo, Mary Coulter & Ian Anderson, (2013).*Fundamentals of Management* (7^{th} ed.).New Delhi: Pearson Education.

13. Bhushan, Y.K. (2013).*Fundamentals of Business Organization and Management* (19th ed.).New Delhi: Sultan Chand and Sons.

Semester I

		L	T	P	C
16BAU102	**CORE –STATISTICS FOR BUSINESS DECISIONS**	**5**	**-**	**-**	**5**

Instruction Hours / week L: 5 T: 0 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES:
To make the students

- To understand the concept of statistics
- To acquire the knowledge of summary statistics
- To know the concepts of central tendency and dispersion
- To understand the correlation and regression concepts
- To be aware of the index numbers and trend analysis
- To be aware on time series analysis

COURSE OUTCOMES:
Learners should be able to

1. Utilize the concept of statistics to solve business problems
2. Calculate and apply the measure of central tendency and dispersion in decision making.
3. Evaluate the relationship and association between variables to formulate the strategy in business.
4. Apply the concept of index numbers and trend analysis in business decisions.
5. Demonstrate capabilities as problem-solving, critical thinking, and communication skills related to the discipline of statistics.
6. Exhibit the knowledge on Index and time series analysis

UNIT I

Measures of Central Value: Characteristics of an ideal measure; Measures of Central Tendency - mean, median, mode, harmonic mean and geometric mean. Merits, Limitations and Suitability of averages. Relationship between averages. Measures of Dispersion: Meaning and Significance. Absolute and Relative measures of dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation, Moments, Skewness, Kurtosis.

UNIT II

Correlation Analysis: Meaning and significance. Correlation and Causation, Types of correlation. Methods of studying simple correlation - Scatter diagram, Karl Pearson’s coefficient of correlation, Spearman’s Rank correlation coefficient, Regression Analysis: Meaning and significance, Regression vs. Correlation. Linear Regression, Regression lines (X on Y, Y on X) and Standard error of estimate.

UNIT III

Analysis of Time Series: Meaning and significance. Utility, Components of time series, Models (Additive and Multiplicative), Measurement of trend: Method of least squares, Parabolic trend and logarithmic trend.

UNIT IV

Index Numbers: Meaning and significance, problems in construction of index numbers, methods of constructing index numbers-weighted and un weighted, Test of adequacy of index numbers, chain index numbers, base shifting, splicing and deflating index number.

UNIT V

Probability: Meaning and need. Theorems of addition and multiplication. Conditional probability. Bayes' theorem, Random Variable- discrete and continuous. Probability Distribution: Meaning, characteristics (Expectation and variance) of Binomial, Poisson, and Normal distribution. Central limit theorem.

SUGGESTED READINGS:

TEXT BOOKS

1. Gupta, S.P. *Statistical Methods*(34^{th} ed.).New Delhi: Sultan Chand & Sons.
2. Richard Levin & David Rubin . *Statistics for management*. New Delhi: Prentice Hall.
3. Anderson, Sweeny,& Williams. *Statistics for Business and Economics.* South Western.

REFERENCES

1. Navnitham , P.A .(2004). *Business Mathematics and Statistics.* Trichy: Jai Publications.
2. Pillai, R.S.N., &Bagavathi , V.(2002). *Statistics* . New Delhi: S. Chand & Company Ltd
3. Srivastava, T N., & Shailaja Rego.(2012).*Statistics for Management*. New Delhi: Mc Graw Hill Education .
4. Amir, D., Aczel & Jayavel Sounder pandian. (2012).*Complete Business Statistics*(7^{th} ed.).New Delhi: Mc Graw Hill Education.
5. Dr.Arora, P.N. (1997).*A foundation course statistics*. New Delhi: S.chand & Company Ltd.

16BAU111 **CORE - MS OFFICE (PRACTICAL)**

L	T	P	C
-	-	4	2

Instruction Hours / week L: 0 T: 0 P : 4 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES:

To make the students

- To compose the knowledge in MS Office to manage the business.
- To identify the MS-Excel function and its application
- To be aware of the MS-Power point and its usage.
- To demonstrate the usage of MS-Access and its applications
- To develop skill in basic file management
- To Indicate the names and functions of the Word interface components

COURSE OUTCOMES:

Learners should be able to

1. Demonstrate an insight into the basic knowledge on MS Office.
2. Preparation of word documents, excel sheet and power point presentation.
3. Exhibit the fundamentals of managing and administering business through the knowledge of MS office, so as to improve the effectiveness of managing organization.
4. Design the presentations for the business meetings
5. Store, retrieve data and make decisions based on the information
6. Exhibit the communication skills to convey the outputs produced.

WORD

1. Type Chairman's speech/ Auditor's report / Minutes/ Agenda and perform the following operations:
   Bold, Underline, Font Size, Style, Background color, Text color, Line spacing, Spell Check, Alignment, Header & Footer, Inserting pages and page numbers, Find and Replace.
2. Prepare an invitation for the college function using Text boxes and Clip Art.
3. Design an invoice and Account sales by using Drawing tool bar, Clip Art, Word Art, Symbols, Borders and Shading.
4. Prepare a Class Time Table and perform the following operations:
   Inserting the table, Data Entry, Alignment of Rows and Columns, Inserting and Deleting the Rows and Columns and Change of Table Format.
5. Prepare a Shareholders meeting letter for 10 members using mail merge operation.
6. Prepare Bio-Data by using Wizard/Templates.

MS EXCEL

1. Prepare a mark list of your class (minimum of 5 subjects) and perform the following operations:
   Data Entry, Total, Average, Result and Ranking by using arithmetic and logical functions and sorting.

2. Prepare Final Accounts (Trading Account, Statement of Profit & Loss and Balance Sheet) by using formula.
3. Draw the different type of charts (Line, Pie, Bar) to illustrate year-wise performance of sales, purchase, profit of a company by using chart wizard.
4. Prepare a statement of Bank customer's account showing simple and compound interest calculations for 10 different customers using mathematical and logical functions.
5. Prepare a Product Life Cycle which should contain the following stages:
   Introduction, Growth, Maturity, Saturation, Decline.

MS POWERPOINT

1. Design presentation slides for a product of your choice. The slides must include name, brand name, type of product, characteristics, special features, price, special offer etc. Add voice if possible to explain the features of the product. The presentation should work in manual mode.
2. Design presentation slides for organization details for 5 levels of hierarchy of a company by using organization chart.
3. Design slides for the Headline News of a popular TV Channel. The Presentation Should contain the following transactions: Top down, Bottom up, Zoom in and Zoom out. - The presentation should work in custom mode.
4. Design presentation slides about an organization and perform frame movement by interesting clip arts to illustrate running of an image automatically.
5. Design presentation slides for the Seminar/Lecture Presentation using animation effects and perform the following operations: Creation of different slides, changing background color, font color using word art.

MS ACCESS

1. Prepare a payroll for employee database of an organization with the following Details:
   Employee id, Employee name, Date of Birth, Department and Designation, Date of appointment, Basic pay, Dearness Allowance, House Rent Allowance and other deductions if any. Perform queries for different categories.
2. Create mailing labels for student database which should include at least three Table must have at least two fields with the following details: Roll Number, Name, Course, Year, College Name, University, Address, Phone Number.
3. Gather price, quantity and other descriptions for five products and enter in the Access table and create an invoice in form design view.
4. Create forms for the simple table ASSETS.
5. Create report for the PRODUCT database.

TEXT BOOKS

1. Taxali,R.K. (2010).*P.C.Software Made Simple*.New Delhi: Tata McGraw-Hill Publishing Company Ltd.

16BAU112 CORE –STATISTICAL PACKAGE USING SPSS(PRACTICAL)

L	T	P	C
-	-	3	1

Instruction Hours / week L: 0 T: 0 P : 3 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES:
To make the students

- To understand the concept of statistics
- To acquire the knowledge of summary statistics
- To know the concepts of central tendency and dispersion
- To understand the correlation and regression concepts
- To be aware of the index numbers and trend analysis
- To be aware on time series analysis

COURSE OUTCOMES:
Learners should be able to

1. Utilize the concept of statistics to solve business problems
2. Calculate and apply the measure of central tendency and dispersion in decision making.
3. Evaluate the relationship and association between variables to formulate the strategy in business.
4. Apply the concept of index numbers and trend analysis in business decisions.
5. Demonstrate capabilities as problem-solving, critical thinking, and communication skills related to the discipline of statistics.
6. Exhibit the knowledge on Index and time series analysis

LIST OF PRACTICAL

1. Introduction to SPSS Package
2. Working with windows of SPSS
3. Defining variables in variable view window in SPSS
4. Drawing of Simple and multiple bar diagrams in SPSS Package
5. Drawing of Histogram and Pie diagram
6. Calculation of Mean for individual, discrete series using SPSS Package.
7. Mean for continuous series using SPSS Package.
8. Median for individual and discrete series using SPSS Package..
9. Median for continuous series using SPSS Package..

10. Mode for individual and discrete series using SPSS Package..
11. Standard deviation for individual and discrete series using SPSS Package.
12. Coefficient of variation for individual and discrete series using SPSS Package.
13. Karl Pearson’s Correlation using SPSS Package.
14. Rank Correlation Coefficient using SPSS Package.

16AEC101	BUSINESS COMMUNICATION	L	T	P	C
		4	-	-	4

Instruction Hours / week L: 4 T: 0 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES :

To make the students

- To equip students effectively to acquire skills in reading, writing, comprehension and
- communication, as also to use electronic media for business communication.
- To acquire knowledge on the different business correspondence used in organization
- To build aware of the different types of reports prepared for the organization.
- To illustrate the importance of vocabulary in business communication
- Identify key principles in business communication
- 6.To put in use the basic mechanics of Grammar

COURSE OUTCOMES:

Learners should be able to

1. Demonstrate and communicate effectively with the optimal mix of verbal and nonverbal communication mitigating the barriers.
2. Draft business correspondence for the organization requirement.
3. Draft the resume and develop skills to face the interview
4. Exhibit the communication skills to convey the thoughts and ideas to the individuals and group.
5. Prepare business reports for organization needs and use appropriate technology for business communication.
6. Assess the importance of ethical communication Ethics in Business communication

UNIT I

Nature of Communication: Process of Communication, Types of Communication (verbal & Non Verbal), Importance of Communication, Different forms of Communication; Barriers to

Communication Causes, Linguistic Barriers, Psychological Barriers, Interpersonal Barriers, Cultural Barriers, Physical Barriers, Organizational Barriers

UNIT II

Business Correspondence: Letter Writing, presentation, Inviting quotations, Sending quotations, Placing orders, Inviting tenders, Sales letters, claim & adjustment letters and social correspondence, Memorandum, Inter -office Memo, Notices, Agenda, Minutes.

UNIT III

Report Writing: Business reports, Types, Characteristics, Importance, Elements of structure, Process of writing, Order of writing, the final draft, and check lists for reports.

UNIT IV

Application Letters – Preparation of Resume – Interview: Meaning – Objectives and Techniques of various types of interviews – public speech – Characteristics of a good Speech- Business Report Presentations.

UNIT V

Oral Presentation: Importance, Characteristics, Presentation Plan, Power point presentation, Visual aids.

SUGGESTED READINGS:

TEXT BOOKS

1. Rajendra Pal, J.S. Korlhalli, (2008), Essentials of Business Communication, Sultan.Chand & Sons, New Delhi.

REFERENCES

1. Bovee, and Thill, Business Communication Today, Pearson Education
2. Shirley Taylor, Communication for Business, Pearson Education
3. Locker and Kaczmarek, Business Communication: Building Critical Skills, TMH
4. Leena Sen, Communication Skills, PHI Learning

கற்பகம் உயர்கல்வி கலைக்கழகம்

தமிழ்த்துறை

பகுதி - I தமிழ்ப் பாடத்திட்டம் (2016 - 2017)

இரண்டாம் பருவம்

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

(For I-UG Arts Degree Classes) 16LAU201

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, ‘தமிழ் இலக்கிய வரலாறு’ குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, ‘அறிவியல் தமிழ்’ ; ‘இணைய தமிழ்’ குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. **மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்**

தாள்கள் வரிசையும் தேர்வுச் செயல்திட்டமும் பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
இரண்டு	II	6	3	40 / 60	100	4

அலகு – I :பக்தி இலக்கியம் (10 மணிநேரம்)

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு

1.சைவம்-பெரியபுராணம் - திருமூலநாயனார் புராணம்.

2.வைணவம்- பெரியாழ்வார் திருமொழி: 10 பாடல்கள்

அலகு – II :சங்கஇலக்கியம் : (25 மணிநேரம்)

சங்க இலக்கியங்கள் அறிமுகம்

அ). **எட்டுத்தொகை**

நற்றிணை :1. பிரசம் கலந்த – பாலை-110

2.தடமருப்பு எருமை- மருதம்-130

குறுந்தொகை : 1.கருங்கட்டாக் கலை – குறிஞ்சி- 69 2. உள்ளது சிதைப்போர்- பாலை-283

ஐங்குறுநூறு :1. நெய்தல்-தொண்டிப்பத்து: திரைஇமிழ் இன்னிசை-171

2. அன்னாய் வாழி வேண்டன்னை-203

பதிற்றுப்பத்து: 1. சிதைந்தது மன்ற-27

2. மீன்வயின் நிற்ப-90

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு:

உலகம்ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை:1.குறிஞ்சிக்கலி-சுடர்தொடீ -15

2. முல்லைக்கலி-தீம்பால் -11

அகநானூறு:1.அன்னாய் வாழி வேண்டன்னை-குறிஞ்சி-17

புறநானூறு :1. யாதும் ஊரே யாவரும் கேளிர்-பொதுவியல்-192

2.கெடுக சிந்தை கடிதிவள் துணிவே-279

ஆ).பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள்: சிறுதினை மலரொடு:218-275.

முருகன் அருள்புரிதல்: 286-295.

அலகு - III :காப்பியம் (12 மணிநேரம்)

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29)– கண்ணகியின் சிறப்பு: 'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி, 'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234)- சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485)- செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்:‘என்னே’ என்பதிலிருந்து தொடங்கி, ‘விசும்பில் தோன்றுமால்’ என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை:பத்தினிப் பெண்டிர் எழுவர் கதை: ‘நீர்வார் கண்ணை’ என்பதிலிருந்து தொடங்கி, ‘புகாரென் பதியே’ என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை:‘வன்னி மரமும்’ என்பதிலிருந்து தொடங்கி, ‘பதிப்பிறந்தேன்’ என்பது வரையிலான தொடர்கள்.

சூளாமணி:மந்திர சாலைச் சருக்கம் (தேர்ந்தெடுக்கப்பெற்ற 25 பாடல்கள்)

அலகு – IV :சிறுகதை **(15 மணிநேரம்)**

1. **குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்**
2. **காட்டில் ஒரு மான் - அம்பை**
3. **நாற்காலி – கி.ராஜநாராயணன்**
4. **நகரம் – சுஜாதா**
5. **எஸ்தர் – வண்ண நிலவன்**
6. **மரப்பாச்சி – உமா மகேஸ்வரி**

அலகு- V :மொழிப்பயிற்சி **(10 மணிநேரம்)**

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை,கட்டுரை, உரைநடை)
மொழிபெயர்ப்பு

Semester - II

Part II - English II

(For all undergraduate students admitted from 2016 onwards) 4H – 4C

Instruction Hours / week L: 4 T: 0 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

Course Objectives:

- To enable the learners to acquire English language skills.
- To familiarize them with English literature.
- To attain basic knowledge on Grammar .
- To help learners imbibe cultural values.
- To gain knowledge of making correct sentences.
- To reflect originality on the application of soft skills and express in writing their views.

Course Outcome:

1. Acquire to enjoy the ecstasy of literature.
2. The select literary pieces will develop the confidence level of the learners.
3. Develop the social values.
4. Recognize the importance of communication
5. Get sound knowledge in English
6. Communicate well for business purpose.

UNIT I

Prose: The Unexpected- Robert Lynd
Poetry: The Village Schoolmaster – Oliver Goldsmith
Short Story: The Lion's Share – Arnold Bennett
Vocabulary: Homonyms
Grammar: Irregular Verb

UNIT II

Prose: Travel by Train – J. B. Priestley
Poetry: The Gift of India – Sarojini Naidu
Grammar: Sentence pattern

UNIT III

Prose: Women's Education is Almost More Important than the Education of Boys and

Men – Indira Gandhi

Short Story: The Necklace – Guy De Maupassant

One-Act Play: The Referee – W.H. Andrews and Geoffrey Dearmer

Vocabulary: Similes

Grammar: Discourse Markers

UNIT IV

Poetry: Ozymandias – P.B. Shelley

One-Act Play: The Pot of Broth- W.B. Yeats

Vocabulary: Collective Noun

Grammar: Correction of Sentences

UNIT V

Short Story: The Silver Butterfly– Pearl S. Buck

One-Act Play: The Bear – Anton Chekov

Vocabulary: Acronym

Grammar: Question Tag

Prescribed Text:

Wings of Communication 2014. Board of Directors. Emerald Publishers: Chennai

Suggested Reading:

Syamala, V. *English for Communication*. 2006. Emerald Publishers: Chennai.

		L	T	P	C
16BAU201	**CORE –MANAGERIAL ECONOMICS**	**8**	**-**	**-**	**6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES :

To make the students

- Equip the students with the knowledge of pricing under different market conditions
- Develop the students skills in managing capital and profit
- Impart students knowledge in national income analysis
- Integrate the basic concepts of economics with the tools of mathematics and statistics
- Give insight into how markets function.
- Develop the ability to apply the concepts, tools and techniques of economics .

COURSE OUTCOMES:

Learners should be able to

1. Apply the demand and supply concept in managerial decisions
2. Formulate the pricing strategies based on the market structure.
3. Demonstrate capabilities as problem-solving, critical thinking, and communication skills.
4. Gain familiarity on the macro level business components
5. Calculate the Cost, Revenue and breakeven point and apply it in decision making process.
6. Analyze operations of markets under varying competitive positions

UNIT I

Demand, Supply and Market equilibrium: Individual demand, Market demand -Individual supply -Market supply - Market equilibrium - Elasticities of demand and supply - Price elasticity of demand, income elasticity of demand, cross price elasticity of demand, elasticity of supply; Theory of consumer behavior: cardinal utility theory, ordinal utility theory(indifference curves, budget line, consumer choice, price effect, substitution effect, income effect for normal, inferior and giffen goods) - revealed preference theory.

UNIT II

Producer and optimal production choice: optimizing behavior in short run(Geometry of product curves, law of diminishing marginal productivity, three stages of production), Optimizing behavior in long run (isoquants, isocost line, optimal combination of resources) Costs and scale : Traditional theory of cost (short run and long run, geometry of cost curves, envelope curves) - Modern theory of cost (short run and long run) -Economies of scale - Economies of scope.

UNIT III

Theory of Firm and Market Organization : Perfect Competition (Basic features, short run equilibrium of firm/industry, long run equilibrium of firm/industry, effect of changes in demand, cost and imposition of taxes) - Monopoly (Basic features, short run equilibrium, long run equilibrium, effect of changes in demand, cost and imposition of taxes, comparison with perfect competition, welfare cost of monopoly) – Price discrimination, multi plant monopoly; Monopolistic Competition (Basic features, demand and cost, short run equilibrium, long run equilibrium, excess capacity) - Oligopoly(Cournot's model, kinked demand curve model, dominant price leadership model, prisoner's dilemma)

UNIT IV

Factor Market : Demand for a factor by a firm under marginal productivity theory(Perfect Competition in the product market, monopoly in the product market) -Market Demand for a factor - Supply of labour - Market supply of labour - Factor Market Equilibrium.

UNIT V

National Income Analysis - Theories of Income, Output and Employment - Classical - Keynesian theory - Theory of Trade Cycle-Concept and Causes of Trade Cycle -Measures to Control Trade Cycle - Macro Economic Policy - Monetary and Fiscal -Theories of Inflation-Causes and Control of Inflation.

SUGGESTED READINGS:

TEXT BOOKS

1. Maheshwari, Y. (2012) .*Managerial Economics*(3rd ed.). New Delhi:PHI Learning Pvt., Ltd.

REFERENCES

1. Dominick Salvatore. (2009).*Principles of Micro Economics*(5th ed.). Mumbai: Oxford University Press.
2. Richard, G.,&Lipsey, K., Alec Chrystal. (2007).*Economics*. Mumbai: Oxford University Press.
3. Pindyck, Rubinfeld,& Mehta. (2009).*Micro Economics*(7th ed.).New Delhi: Pearson Prentice Hall of India.
4. Sundaram, K.P., & Sundaram, E. (2008). *Business Economics*. New Delhi: Sultan Chand & Sons.

16BAU202	CORE –BUSINESS ACCOUNTING	L	T	P	C
		4	-	-	4

Instruction Hours / week L: 4 T: 0 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES :

To make the students

- Exhibit the concepts and conventions of accounting and basic accounting framework
- Expose the students to the fundamentals of accounting procedure
- To compose the inventory valuation techniques.
- To acquire the knowledge of the partnership accounting.
- To comprehend the difference between capital and revenue expenditure.
- To acquire knowledge on preparing the reconciliation statement

COURSE OUTCOMES:

Learners should be able to

1. Comprehend the accounting concepts, principles and to comply the accounting standards.
2. Prepare and Analysis the final accounts.
3. Calculate the asset depreciation using different methods
4. Evaluate the inventory value using different methods.
5. Demonstrate capabilities as problem-solving, critical thinking, and communication skills related to the accounting discipline.
6. Analyze and solve business problems and to take advantage of business opportunities

UNIT I

Accounting - Meaning - Definition - Concepts - Conventions - Accounting as an Information System- Importance -Scope- Limitations - Users of Accounting Information - Generally accepted Accounting Principles - Accounting Equation - Nature of Accounts - Rules of Debit and Credit - Recording Transactions in General Journal - Ledger - Trial balance- Subsidiary Books.

UNIT II

International Financial Reporting Standards (IFRS) – Understanding Accounting Standards issued by the ICAI related to Disclosure of Accounting Policies. Depreciation Accounting - Revenue Recognition - Methods of charging Depreciation-Straight-line Method - Written-down-value Method- Bank Reconciliation Statement.

UNIT III

Final Accounts - Preparing Trading Account, Statement of Profit and Loss and Balance Sheet for a Sole Proprietor - Understanding contents of Financial Statements of a Joint Stock Company as per Companies Act 2013 - Understanding the contents of a Corporate Annual Report.

UNIT IV

Analyzing Financial Statements - Objectives of Financial Statement Analysis - Sources of Information - Standards of Comparison - Techniques of Financial Statement Analysis - Horizontal Analysis - Vertical Analysis - Ratio Analysis - Meaning and Usefulness of Financial Ratios - Analysis of Financial Ratios from the perspective of different Stakeholders like Investors- Lenders - Short-term Creditors - Profitability Ratio -Solvency Ratio - Liquidity Ratio -Turnover Ratio - Limitations of Ratio Analysis.

UNIT V

Partnership Accounts: Past adjustments and guarantees- Basic concepts of Admission, Retirement and death of a partner including treatment of goodwill.

Note: Distribution of marks between problems and theory shall be 80% and 20%.

SUGGESTED READINGS:

TEXT BOOKS

1. Gupta, R.L., & Gupta, V.K. (2014).*Financial Accounting.* New Delhi: Sultan Chand & Sons.
2. Jain, S.P.,& Narang.(2007).*Financial Accounting*. Ludhiana: Kalyani Publishers.

REFERENCES

1. Maheshwari, S.N., Suneel, K., Maheshwari, & Sharad, K., Maheshwari. (2013).*An Introduction to Accountancy* (11th ed.). New Delhi:Vikas Publishing House Pvt., Ltd.R. Narayanaswamy, R. (2011).*Financial Accounting*: *A Managerial Perspective* (4th ed.). New Delhi: PHI Learning Pvt. Ltd.
2. Charles,T., Horngren, Gart, L., Sundem, John, A., Elliott, & Donna, R., Philbrick. (2013).*Introduction to Financial Accounting*, (11th ed.). New Delhi: Pearson Prentice Hall of India.
3. Monga, J.R. (2002).*Financial Accounting*: *Concepts and Applications*(11th ed.). Second Volume. New Delhi: MayurPaperbacks.
4. Ghosh, T.P. (2014).*Financial Accounting forManagers* (4th ed.). New Delhi: Taxmann Allied Services PvtLtd.
5. Vinayakam, N. (2011). *Financial Accounting*. New Delhi: S.Chand and Company Ltd.
6. Grewal, T.S. (2010). *Introduction to Accountancy*. New Delhi: S.Chand and Company Ltd.
7. Grewal, T.S., Gupta, S.C., & Shukla, M.C. (2013).*Advanced Accountancy*. New Delhi: Sultan Chand and Sons.

8. Narang, K.L.& Maheswari, S.N. (2012).*Advanced Accountancy*, Ludhiyana: Kalyani Publishers.

BBA		**2016 - 2017** **Semester – II**
16BAU211	**CORE –TALLY (PRACTICAL)**	**L T P C** **4 - - 2**

Instruction Hours / week L: 0 T: 0 P : 4 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES :

To make the students

- To infer the practical knowledge about the accounting package
- To acquire knowledge in computerization of accounts
- To interpret the inventory valuations methods available in the software
- To understand various financial statements that are built in the software
- Create vouchers by understanding the reason for posting under different heads
- Calculate valuation of assets using the software

COURSE OUTCOMES:

Learners should be able to

1.Compose the different knowledge of accounting package.

2. Create vouchers by understanding the reason for posting under different heads

3. Calculate valuation of assets using the software

4. Prepare and Analyse the financial statements and retrieve ratios

5. Apply the knowledge of quantitative tools & techniques in the interpretation of data for managerial decision making.

6. Develop computer skills of recording financial transactions, preparation of annual accounts and reports.

Practical List

1. Create a new company in integrate accounts mode and account with inventory mode
2. Create a primary and sub groups using single or multiple ledger mode

3. Create minimum 10 ledgers using single or multiple ledger, and alter and delete any 2 ledger
4. Enter the following voucher
    - Payment vouchers
    - Receipt
    - Purchase
    - Sales
    - Credit note
    - Debit note
    - Journals
    - Memo
    - Optional
5. Create stock, stock groups and enter the vouchers
6. Prepare inventory statements using (calculate inventory using all methods)
    - FIFO
    - LIFO
    - Simple Average Method
    - Weighted Average Method
7. Prepare the following ratio analysis
    - Financial ratio
    - Operating ratio
    - Investment ratio
8. Prepare the following
    - Cash flow statement
    - Fund flow statement
9. Preparation of reports for the following
    - Trial Balance
    - Profit & Loss A/c
    - Balance sheet
    - Bank reconciliation statement
    - Back up and restore the company information

TEXT BOOKS

1. Nellai Kannan. (2010).*Tally*.New Delhi : Nels Publishing Company.

16AEC201	ENVIRONMENTAL STUDIES	L	T	P	C
		4	-	-	4

Instruction Hours / week L: 4 T: 0 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES:

To make the students

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate the public to participate in environment protection and improvement.
- To be aware of the different pollution that affects the environment.
- To demonstrate the social issues prevailing in the environment.
- To understand and address complex environmental issues

COURSE OUTCOMES:
Learners should be able to

1. Understand the awareness among the people to know about various renewable and non renewable resources of the region, enables environmentally literate citizens.
2. Preserve the non – renewable energy and effectively utilize the renewable energy.
3. Illustrate to prevent pollution in the environment
4. Assess to appropriate judgments and decisions for the protection and improvement of the earth.
5. Demonstrate an integrative approach to environmental issues with a focus on sustainability;
6. Understand and evaluate the global scale of environmental problems

UNIT-I: Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

Unit II: Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources: Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fire works.

Unit III: Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Bio geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV: Environmental Pollution - Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit V: Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

SUGGESTED READINGS:

TEXT BOOKS

1. Tripathy, S.N.,& Sunakar Panda. (2004). *Fundamentals of Environmental Studies* (2nd ed.). New Delhi: Vrianda Publications Private Ltd.

2. Arvind Kumar. (2004). *A Textbook of Environmental Science.* New Delhi: APH Publishing Corporation.

3.Verma, P.S., & Agarwal, V.K.(2001). *Environmental Biology (Principles of Ecology*). New Delhi: S.Chand and Company Ltd.

4. Anubha Kaushik &Kaushik,C.P. (2004). *Perspectives in Environmental Studies*. New Delhi: New Age International Pvt. Ltd. Publications.

REFERENCES

1.Singh, M.P., Singh, B.S., & Soma S., Dey. (2004).*Conservation of Biodiversity and Natural Resources.* New Delhi: Daya Publishing House.

2. Daniel BBotkin,& Edward A Keller. (1995). *Environmental Science* .New York: John Wiley and Sons, Inc.

3. Uberoi, N.K., (2005).*Environmental Studies.* New Delhi : Excel Books Publications of India.

16ENU301	**ENGLISH-III - COMMUNICATIVE ENGLISH**	**L T P C** **8 - - 6**

Instruction Hours / week L: 4 T: 0 P : 4 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

Course Objectives:

- To develop confidence to respond in English during situations where the use of English is imperative.
- To develop fluency in actual conversation in the English language.
- To develop knowledge about business communication.
- To develop knowledge about business writing.
- To acquire knowledge on communication for different purpose.
- To get knowledge to communicate in day to affairs.

Course Outcome:

1. Students learnt the basics and purposes of listening skill.
2. Students will know the importance of speaking.
3. Students developed the speaking skills on telephone, business and also in travel
4. Acquired knowledge on effective vocabulary learning strategies.
5. Students will able to communicate clearly and effectively and handle their day to day affairs well with their knowledge of language skills.

UNIT I: Listening

Listening and its types, Basic Listening Lessons, Critical Listening Lessons, Advanced Listening Lessons, and Note Taking

UNIT II: Speaking

Basics of speaking, Regular English, Business English, Interview English, and Travel English

UNIT III: Reading

Reading and its purposes, Types of Reading, Reading Techniques, Reading Comprehension, Note Making

UNIT IV: Writing

Writing defined, Types of Writing, Components of Writing, Writing Contexts, Language and Style with accordance to the contexts

UNIT V: Vocabulary Enrichment

Synonyms, Antonyms, Homonyms, Phrasal Verbs, Idioms and Phrases, One Word Substitutes, and Affixes

Suggested Reading:

Learning to Learn: Study Skills in English Cambridge, 2015
Advanced Skills; Simon Harenes – CUP. 2015
Business Results, Woodward, OUP. 2015
Function in English. Jonathan Middlemiss et al, OUP

16BAU301	CORE –PRINCIPLES OF MARKETING	L	T	P	C
		8	-	-	6

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES:

To make the students

- To compose knowledge in the concepts and functions of marketing
- To acquire knowledge in the strategies of marketing
- To exhibit knowledge on promotional steps in marketing
- To understand the 'Marketing mix' elements and the strategies
- To comprehend the knowledge of marketing process and segmentation
- To be aware on the brand and branding strategies

COURSE OUTCOMES:

Learners should be able to

1. Understand the Principles of Marketing represent the marketing environment, consumer behaviour and product life cycle.
2. Assess the results in developing best products in terms of goods and services that brings consumer satisfaction. This paper presents the marketing functions.
3. Demonstrate knowledge of the individual components of a marketing mix.
4. Identify the organisational processes involved in the planning, implementation and control of marketing activities.
5. Understand the marketing terminology and concepts.
6. Demonstrate knowledge of key business communication strategies within the marketing field.

UNIT I

Introduction: Nature, Scope and Importance of Marketing - Evolution of Marketing - Core marketing concepts - Company orientation - Production concept -Product concept - Selling concept - Marketing concept - Holistic marketing concept -Marketing Environment -Demographic- Economic- Political- Legal - Socio cultural -Technological Environment - Portfolio approach – Boston Consultative Group (BCG) matrix.

UNIT II

Segmentation - Targeting and Positioning - Levels of Market Segmentation -Basis for Segmenting Consumer Markets - Difference between Segmentation -Targeting and Positioning.

UNIT III

Product and Pricing Decisions - Concept of Product Life Cycle (PLC) – PLC marketing strategies - Product Classification - Product Line Decision - Product Mix Decision - Branding Decisions -

Packaging and Labeling - New Product Development -Pricing Decisions - Determinants of Price - Pricing Methods - Adapting Price.

UNIT IV

Promotion Mix - Factors determining promotion mix - Promotional Tools -Basics of Advertisement - Sales Promotion - Public Relations and Publicity and Personal Selling - Place (Marketing Channels) - Channel functions - Channel Levels - Types of Intermediaries - Types of Retailers - Types of Wholesalers.

UNIT V

Marketing of Services - Unique Characteristics of Services - Marketing strategies for service firms - 7Ps - Customer Relationship Management (CRM) - Consumer Protection Act -E- Marketing.

SUGGESTED READINGS:

TEXT BOOKS

1.Rajan Nair. (2005).*Marketing Management.* New Delhi: Sultan Chand & Sons.

REFERENCES

1. Kotler, P.,& Keller, K. L. (2009).*Marketing Management*(13th ed.). New Delhi: Pearson Prentice Hall.
2. Kotler, P., Armstrong, G.,Agnihotri, P. Y., &UlHaq, E. (2010).*Principles of Marketing: A South Asian Perspective*(13th ed.). New Delhi: Pearson India.
3. Ramaswamy,V.S.,&Namakumari,S. (2009). *Marketing Management: Global Perspective-Indian Context* (13th ed.). New Delhi: Macmillan Publishers India Limited .
4. Grahame Robert Dowling M. (2004).*The Art and Science of Marketing* (1st ed.).Chennai: Oxford University Press.
5. Varshney, R.L. & Bhattacharya, B. (2007).*International Marketing Management*. New Delhi. Sultan Chand and Sons.
6. Mamoria , C.B.& Satish Mamoria. (2013).*Marketing Management*. Patna: Kitab Mahal.
7. Philip Kotler, & Gary Armstrong. (2011).*Principles of Marketing*. New Delhi. Prentice Hall of India Pvt. Ltd.

		L	T	P	C
16BAU302	**CORE –MANAGEMENT ACCOUNTING**	**8**	**-**	**-**	**6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES:

To make the students

- To acquire knowledge in the concepts of cost and management accounting
- To Impart the knowledge in financial statement analysis and budget preparations
- To examine the fund flow and cash flow statement
- To solve the problems and take decisions based on the result.
- To communicate orally and in written form the concepts and solutions.
- To Understan the preparation of financial statement for decision making

COURSE OUTCOMES:
Learners should be able to

1. Understand the nature and scope of management accounting, difference between cost and management accounting and various elements of cost.
2. Acquire the knowledge of marginal costing, budgetary control, cash flow and fund flow statement.
3. Comprehend on the contemporary issues relevant to accounting concepts.
4. Analyse the alternatives using appropriate tools and techniques.
5. Solve the problems and take decisions based on the result.
6. Communicate orally and in written form the concepts and solutions

UNIT I
Management Accounting - Meaning - Definition - Nature - Scope of Management Accounting - Comparison of Management Accounting with Cost Accounting and Financial Accounting. Cost concepts - Meaning - Scope - Objectives - Importance of Cost Accounting - Cost - Costing - Cost Control, and Cost Reduction - Elements of Cost -Components of total Cost - Classification of Costs - Fixed Variable -Semi Variable -Step Costs - Product - Period Costs - Direct - Indirect Costs- Preparation of Cost Sheet in Lieu with Cost Accounting Standard.

UNIT II

Cost Volume Profit Analysis - Contribution - Profit Volume Ratio - Margin of safety – Cost Break-even Point - Composite Break-even Point - Cash Break-even Point - Key Factor -Break-even Analysis - Relevant Costs - Decision Making - Pricing - Product Profitability -Make or Buy - Exploring new markets - Export Order - Sell or Process Further - Shut down Vs. Continue.

UNIT III

Budgets and Budgetary Control - Meaning - Types of Budgets - Steps in Budgetary Control -Fixed and Flexible Budgeting - Cash Budget - Responsibility Accounting- Concept -Significance - Different responsibility centers - Divisional performance – Financial measures - Transfer pricing.

UNIT IV

Standard Costing and Variance Analysis - Meaning of Standard Cost – Standard Costing, Advantages -Limitations and Applications - Material - Labour - Overhead and Sales variances. Introduction to Target Costing - Life Cycle Costing - Quality Costing - Activity Based Costing.

UNIT V

Funds Flow Statement - Schedule of Changes in Working Capital - Calculation of Funds from Operation - Sources and Applications of Funds. Cash Flow Statement - Cash from Operation - Inflow and Outflow of Funds.

Note: Distribution of marks between problems and theory shall be 80% and 20%.

SUGGESTED READINGS:

TEXT BOOKS

1. Maheswari,S.N. (2009).*Management Accounting*. New Delhi: Sultan Chand & Sons.

REFERENCES

1. Horngren, C.T., Gary, L., Sundem, Jeff, O., Schatzberg, & Dave Burgstahler. (2008).*Introduction to Management Accounting*, (10th ed.). New Delhi: Pearson Prentice Hall.
2. Arora, M.N. (2009). *A Textbook of Cost and Management Accounting*(8th ed.). New Delhi:Vikas Publishing House Pvt Ltd.
3. Khan, M.Y.,& Jain, P.K. (2013).*Management Accounting: Text Problems and Cases*(6th ed.). Mumbai: Tata McGraw-Hill Education.
4. Maheshwari, S.N., & Maheshwari, S.K. (2009).*A Textbook of Accounting for Management* (1st ed.).New Delhi: Vikas Publishing House Pvt. Limited.

16BAU303A SEC - 1 FINANCIAL MANAGEMENT

L	T	P	C
6	-	-	4

Instruction Hours / week L: 5 T: 1 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES:

To make the students

- To enable the students to acquire knowledge in financial management
- To Impart the knowledge in finance functions, cost of capital, capital structure, capital budgeting and leverage.
- To access the concept of cost of capital and capital structure.
- To understand the importance of financial data in preparing report
- To Provide an in-depth view of the process in financial management of the firm.
- To Develop knowledge on the allocation of resources.

COURSE OUTCOMES:

Learners should be able to

1. Understand the funds are managed and their reflections on the fundamental decisions to be taken by the corporate world.
2. Apply the basics of Finance functions and working capital management.
3. Demonstrate an understanding of the overall role and importance of the finance function.
4. Communicate effectively using standard business terminology.
5. Demonstrate basic finance management knowledge.
6. Observe and interpret financial markets to uncover potential opportunities

UNIT I

Financial Management - Finance and related disciplines - Scope of Financial Management - Functions of Finance -Traditional and Modern Approach in Finance Decisions, Investment Decision and Dividend Decision - Objectives of Financial Management - Profit Maximization - Wealth Maximization- Organisation of Finance Function - Concept of Time Value of Money - Present Value - Future value - annuity - Risk and Return - Historical return - Expected return - Absolute return - Holding period return -Annualized return - Arithmetic and Geometric return - Systematic Risk - Unsystematic risk - Sources and Measures.

UNIT II

Long term investment decisions: Capital Budgeting - Principles and Techniques – Nature and meaning of capital budgeting - Estimation of relevant cash flows and terminal value -Evaluation techniques - Accounting Rate of Return - Net Present Value - Internal Rate of Return and MIRR - Net Terminal Value -Profitability Index Method.

UNIT III

Cost of Capital - Explicit and Implicit costs – Measurement of cost of capital - Cost of debt - Cost of perpetual debt - Cost of Equity Share - Cost of Preference Share - Cost of Retained Earning - Computation of overall cost of capital based on Historical and Market weights.

UNIT IV

Capital Structure - Approaches to Capital Structure Theories - Net Income approach – Net Operating Income approach - Modigliani-Miller (MM) approach - Traditional approach -Capital Structure and Financial Distress - Trade-Off Theory - Dividend Policy Decision - Dividend and Capital - The Irrelevance of dividend - General, MM hypothesis - Relevance of dividend - Walter's Model - Gordon's Model -Leverage Analysis - Operating and Financial Leverage - EBIT /EPS analysis – Combined Leverage.

UNIT V

Working Capital Management -Determination of Working Capital - Management of Cash - Preparation of Cash Budgets-Cash management technique -Receivables Management -Objectives - Credit Policy - Cash Discount – Debtors Outstanding and Ageing Analysis - Costs - Collection Cost - Capital Cost - Default Cost -Delinquency Cost - Inventory Management -Techniques - ABC Analysis – Minimum Level - Maximum Level - Reorder Level - Safety Stock- EOQ.

SUGGESTED READINGS:

TEXT BOOKS

1. Maheswari, S.N. (2014).*Financial Management*. New Delhi: Sultan Chand and Sons.

REFERENCES

1. Khan, M.Y.,& Jain, P.K. (2007).*Financial Management Text Problem and Cases*(5th ed.). New Delhi: Tata McGraw Hill Publishing Co. Ltd.
2. Rustogi, R. P. (2011).*Financial Management: Theory Concepts and Practices*(5th ed.). New Delhi: Taxmann Publication.
3. Pandey,I.M. (2009).*Financial Management: Theory and Practices*(19th ed.).New Delhi: Vikas Publishing House Pvt Ltd.
4. Brealey,R.A.,Myers, S.C.,Allen,F.,&Mohanty,P. (2002).*Principles of Corporate Finance*(17th ed.).New Delhi: Tata McGraw Hill Publications.
5. Horne,J.V., & Wachowicz,J.M. (2009).*Fundamentals of Financial Management*, (13th ed.).New Delhi: Prentice Hall of India Publication.
6. Kulkarni, P.V. (2011).*Financial Management*. Mumbai: Himalaya publishing house.

BBA **2016 – 2017**
Semester - III

16BAU303B	**SEC - 1 MANAGEMENT INFORMATION SYSTEM**	**L**	**T**	**P**	**C**
		6	**-**	**-**	**4**

Instruction Hours / week L: 5 T: 1 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES :
To make the students

- To impart the management information systems and their applications in Management.
- To demonstrate the knowledge in telecommunication revolution
- To develop the applications of MIS in various fields
- To provide the theoretical models used in database management systems
- To describe the role of information technology and decision support systems in business.
- To Understand at how to use and manage information system

COURSE OUTCOMES:
Learners should be able to

1. An Exposure to the concepts, theories and practices in the field of MIS.
2. Acquire the relationship among and between information systems and management, analyze how technology can be used to synthesize complex data to make sound business decisions.
3. Critically analyse and evaluate the use of DSS, AI in supporting management decision
4. Communicate orally and in written form the understanding of the usage of information system in management decision.
5. Understand the security and ethical issues pertaining to use of information technology in management decision making.
6. Demonstrate Knowledge of Information Systems and Business

UNIT I
Introduction to Information Systems - Definition - Features - Steps in Implementation of MIS - Need for Information - Information System for Decision making- MIS as Competitive Advantages – MIS Structures.

UNIT II
MIS - Strategic Information System - MIS Support for Planning - Organising - controlling - MIS for Specific Functions - Personnel - Finance - Marketing Inventory Production Data Base Management System Models - Hierarchical - Network - Relational - Modular.

UNIT III
Computer Hardware - Description of Electronic Computers - CPU Operations - Classification of Computers - Main - Mini - Workstations - Micro Computers - Super Computers - Personal

Computers. Computer Software - Types of Software - Data Representation in Computers - Introduction to Client-Server.

UNIT IV

Input Devices - Mouse - Touch Screens - MICR - OCR - Keyboard - Pen Based Input - Digital Scanners - Voice Input Devices - Sensors. Output Devices - Impact Printers - Non-Impact Printers - Video Display Terminals - Plotters - Voice Output Devices. Secondary Storage Devices - Magnetic Disk, Floppy, Magnetic Tape, Optical Disk Storage - DROM

UNIT V

Telecommunication Revolution - Introduction to Email- Internet - Intranet - Teleconferencing - www Architecture - Introduction to E-Commerce - Models B_B, B_C, and EDI, EDI Applications in Business - Electronic Payment Cash - Smart Cards - Credit Cards - Fundamentals of ERP- Information Technology Act, 2000.

SUGGESTED READINGS:

TEXT BOOKS

1. James O Brien, (2014). *Management Information System*. New Delhi: Tata Mc Grew Hill.

REFERENCES

1. Kenneth Laudon,& Jane Laudon . (2011).*Management Information System- A contemporary perspective*. New Delhi: Pearson Prentice Hall of India.

2. Gordon B Davis. (2012). *Management Information System*. New Delhi. Tata Mc Grew Hill.

3. Sudalaimuthu S. (2014).*Computer applications in business.* Mumbai: Himalaya Publishing House Pvt. Ltd.

ENGLISH IV (THEORY & PRACTICAL)

(Communication Lab/BEC/IELT) EC-4

L	T	P	C
8	-	-	6

(For all undergraduate students admitted from 2016 onwards)

Instruction Hours / week L: 4 T: 0 P : 4 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

Course Objectives:

- To train students in understanding the concepts of communication.
- To be familiar with the four basic skills of English.
- To train students in developing their written communication.
- To train students in developing their presentation skills.
- To acquire the skill of making grammatically correct sentences.
- To reflect originality on the application of soft skill views and express in writing their views.

Course Outcome:

1. Students have acquired proficiency in communication.
2. Students have become adept in written communication and presentation skills.
3. Developed the skill of writing in English and that of public speaking.
4. Establish and maintain social relationships.
5. Develop communication skills in business environment.
6. Enhanced communication competency through LSRW skills.

UNIT I: Integrated Skills

Development of speaking, listening and grammar skills.

UNIT II: Advanced Reading Skills

Outcomes include improved reading speed, increased reading fluency and increased vocabulary.

UNIT III: Advanced Writing Skills

Planning and writing complex tasks

UNIT IV: News and World Affairs

Newspapers, magazines, the Internet, TV and radio are used to develop listening, reading and discussion skills.

UNIT V: Project Work

The class works together to write and produce a group project. This class is particularly useful for building confidence in using English and improving pronunciation.

Suggested Reading:

In Business; CUP
Oxford Handbook of Writing: St. Martins handbook of Writing
Sound Business. Julian Treasure OUP

BBA **2016 - 2017**
Semester – IV

		L	T	P	C
16BAU401	**CORE - BUSINESS RESEARCH**	**8**	**-**	**-**	**6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES:

To make the students

- To impart knowledge in the concept of research methodology.
- To exhibit in sampling techniques
- To impart student's knowledge in writing a good research report.
- To familiarize students with basic of research and the research process.
- To comprehend the knowledge of social research
- To familiarize the concept of report writing,

COURSE OUTCOMES:
Learners should be able to

1. Understand the concept of research process, research design, sampling techniques
2. Assess the various research tools and techniques in order to facilitate the research work
3. Calculate and apply the measure of central tendency and dispersion in decision making
4. Understand and Exhibit the statistical tools applied in research
5. Analyse the research problem and design the blue print to capture data and analyse the same using appropriate statistical techniques and apply the learning lifelong.
6. Design a report to communicate the findings and suggestion to make business decision

UNIT I
Research - Role of Research indecision making - Applications of Research – Types of Research – The Research process - Steps in the research process - the research proposal – Problem Formulation- Review of Literature - Management decision problem Vs. Marketing Research problem.

UNIT II

Research Design - Exploratory- Descriptive- Causal - Secondary Data Research - Advantages and Disadvantages of Secondary Data - Criteria for evaluating secondary sources - Secondary sources of data - Syndicated Research - Sampling - Sampling techniques - Determination of sample size.

UNIT III

Primary Data Collection - Survey Vs. Observations - Comparison of self administered -telephone - Mail - email techniques. Qualitative Research Tools – Depth Interviews focus groups and projective techniques - Measurement and Scaling – Primary scales of Measurement-Nominal - Ordinal - Interval and Ratio. Scaling techniques paired comparison - Rank order - constant sum - Semantic differential - Itemized rating -Likert Scale – Questionnaire.

UNIT IV

Hypothesis - Meaning - Sources Types - Formulation - Data Analysis -Z test (mean, diff. of mean, diff. of proportion) - t-test (mean) - Paired t-test - Chi square test -Introduction to theoretical concept of ANOVA - Factor Analysis and Discriminant Analysis.

UNIT V

Interpretation - Meaning - Techniques of Interpretation - Report writing - Significance - Report Writing - Steps in Report Writing - Layout of report - Types of Reports - Oral Presentation - Executive Summary - Mechanics of Writing Research Report - Precautions for Writing Report - Norms for using Tables - Charts - and Diagrams - Appendix - Norms for using Index and Bibliography.

SUGGESTED READINGS:

TEXT BOOKS

1. Kothari, C.R**.** (2009) .*Research Methodology*. New Delhi: Wishwa Prakashan, Publications.

REFERENCES

1. Zikmund, Babin, & Carr. (2009).*Business Research Methods*(8th ed.).New Delhi: South-Western.
2. Naresh Malhotra. (2012).*Basic Marketing Research*: *Integration of Social Media*. New Delhi: Pearson Publisher.
3. Mark, N.K., Saunders, Philip Lewis,& Adrian Thornhill. (2015).*Research Methods for Business Students*.(7th ed.).Vikas Publisher.
4. Rao, K.V. (2012) *Research methods for management and commerce*. Sterling Publishers Pvt., Ltd., Mumbai: Himalaya Publishing house.
5. Donald R.Cooper, &Pamela S. Schindler. (2008).*Business Research Methods*. New Delhi:

Tata McGraw Hill.

6. Uma Sekaran. (2007).*Research Methods for Business*. New Delhi: Wiley Publications.

BBA **2016 - 2017**
Semester - IV

		L	T	P	C
16BAU402	**CORE -HUMAN RESOURCE MANAGEMENT**	**8**	**-**	**-**	**6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES:

To make the students

- To exhibit knowledge in the functions of personnel management
- To compose the wage and salary administration and trade union
- To realize the importance of groups and teamwork and managing of conflict between the members of the organization
- To apply the understanding of Human Resource Management, Human Resource Planning, Recruitment, performance appraisal and employee relations in lifelong practice.
- To understand and apply wage and salary principles and policies
- To gain knowledge on induction and training and Development

COURSE OUTCOMES:

Learners should be able to

1. Understand the roles and responsibilities of HR professionals, the primary functional aspect of the broader business strategy.
2. Gain familiarity on manpower planning, performance appraisal and industrial relations.
3. Analyse the case studies, HR process and apply the theoretical learning into lifelong practice.
4. Critically evaluate the appropriate alternatives methods for HR practices and select the best methods suiting the situation.
5. Communicate in oral and written form and prepare report
6. Exhibit the knowledge of Human Resource Strategy and Planning

UNIT I

Human Resource Management - Concept - Functions- Roles -Skills and competencies - HRD- Definition -Goals and challenges - The changing environment of HRM -Globalization - Cultural Environment - Technological advances - Workforce Diversity - Corporate Downsizing - Changing skill requirement - HRM support for improvement programs Work life balance - HR role in strategy formulation and gaining competitive advantage - HRM issues in Indian Organizations.

UNIT II
Human Resource Planning - Process - Forecasting demand and supply - Skill inventories Human Resource Information System (HRIS) succession planning - Job analysis - Uses, methods, Job description and Job specifications - HR accounting and Human Resource Development (HRD) audit concept. Recruitment, Selection and Orientation - Internal and External sources, E- recruitment - Selection process - Orientation process.

UNIT III
Training - Concept - Needs - Systematic approach to training - Methods of training -Management Development - Concept and Methods - Performance Management System -Performance Appraisal - Performance Management Methods -Factors that Distort appraisal - Appraisal Interview.

UNIT IV
Career Planning - Career Anchors - Career Life Stages -Compensation - Steps of determining compensation - Job evaluation -Components of pay structure - Factors influencing compensation levels - Wage differentials and incentives – Profit sharing -Gain sharing -Employees' stock option plans -Social Security -Health -Retirement - other benefits.

UNIT V
Industrial Relations - Introduction to Industrial Relations - Trade unions role -Types -Functions - Problems - Industrial dispute - Concept - Causes and Machinery for settlement of disputes - Grievance, Concepts, Causes and grievance redressal machinery – Discipline concept, aspect of discipline and disciplinary procedure, Collective Bargaining - Concept -Types, Process- Problems - Essentials of Effective Collective Bargaining.

SUGGESTED READINGS:

TEXT BOOKS

1. Memoria, C.B. (2014). *Personnel Management and Industrial Relations*. Mumbai:

   Himalaya Publishing House.

REFERENCES

1. De Cenzo, D.A.,& Robbins. (2012).*Fundamentals of Human Resource Management* (11^{th} ed.). New York: John Wiley and Sons.
2. Dessler, G. (2011).*Human Resource Management* (12^{th} ed.).New Delhi: Pearson India.
3. Arun Monappa, MirzaSaiyadain. (2001).*Personnel Management* (2^{nd} ed.).New Delhi: Tata McGraw Hill.
4. Rao, V.S.P. (2013).*Human Resource Management- Text and Cases*. New Delhi: Excel Books. Konark Publishers Pvt. Ltd.
5. Wayne Mondy, R., & Rober M Noe. (2015). *Human Resource Management*(10^{th} ed.).New Delhi: Pearson.
6. Nair,N.G., & Latha Nair. (2004). *Personnel Management and Industrial Relations* New Delhi: S.Chand and Company Ltd.
7. Kapoor, N.D. (2015). *Elements of Industrial Law*. New Delhi: Sultan Chand and Sons.

8. Tripathy. (2013). *Personnel Management and Industrial Relations*. New Delhi: Sultan Chand and Sons.

BBA **2016 - 2017**
Semester - IV

16BAU403A	**SEC -2 INSURANCE PRINCIPLES AND PRACTICE**	**L**	**T**	**P**	**C**
		6	**-**	**-**	**4**

Instruction Hours / week L: 5 T: 1 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES:

To make the students

- To enhance the knowledge in insurance mechanism
- To enlighten the knowledge towards the principles and practice of insurance
- To be aware of various claim available in insurance.
- To provide a basic understanding of the Insurance Mechanism.
- To understand the technological development of insurance agancies
- To comprehend the knowledge of insurance law

COURSE OUTCOMES:
Learners should be able to

1. Understand the concept of risk and uncertainty
2. Apply the laws relevant to insurance
3. Calculate the various insurance claims.
4. Apply the Concept of insurance, its products in lifelong practice.
5. Gain knowledge of various types of insurance and insurance business in India.
6. Aware of insurance legislation in India

UNIT I
Risk and Uncertainty - Definition - Classification of risk - Sources of Risk - External and Internal Insurance - Meaning - Nature - Significance - Essential Requirements and Principles of Risk Insurance - Reinsurance - Privatization of Insurance Business in India - Insurance Regulatory Development Authority - Recent Developments in the Insurance Sector.

UNIT II

Life Insurance - Law Relating to Life Insurance - General Principles of Life Insurance Contract - Proposal and Policy - Assignment and Nomination - Title and claims - Concept of trust in life policy - LIC - Role and Functions.

UNIT III

General Insurance - Law relating to general insurance - Different types of general insurance - General Insurance Vs Life Insurance - Nature of Fire Insurance - various types of Fire Policy subrogation - Double Insurance - Contribution - Proximate cause - Claims of Recovery - Accident and Motor Insurance - Nature, Disclosure, Terms and Conditions Claims And Recovery - Third Party Insurance - Compulsory Motor Vehicle Insurance - Accident Insurance.

UNIT IV

Deposit and Credit Insurance - Nature - Terms and Conditions - claim - Recovery etc., Public Liability Insurance - Emergency Risk Insurance Structure and Power, function of General Insurance Corporation of India - Deposit Insurance and Credit Guarantee Corporation.

UNIT V

Marine Insurance - Law relating to Marine Insurance - Scope and Nature - Types of Policy - Insurable Interest - Disclosure and Representation - Insured Perils - Proximity Cause - Voyage - Warranties - Measurement - Subrogation - Contribution - Under Insurance.

SUGGESTED READINGS:

TEXT BOOKS

1. Mishra, M.N. (2012). *Insurance Principles and Practices.* New Delhi: S.Chand and Co.

REFERENCES

1. Kapoor ,N.D. (2010).*Elements of Business Law*. New Delhi: Sulthan Chand & Sons.

2. Murthy. (2012).*Principles and Practices of Insurance*. Mumbai: Margham Publications.

3. Senthi Jyotsna, & Bhatia Nishwa. (2008).*Elements of Banking and Insurance*. New Delhi: PHI India Pvt., Ltd.

7. Periyasamy , P. (2010). *Principles and Practices of Insurance.* New Delhi: Himalaya Publishing house.

BBA		2016 - 2017 Semester - IV

16BAU403B	SEC - 2 E -COMMERCE	L T P C 3 - - 3

Instruction Hours / week L: 3 T: 0 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES :

To make the students

- To compose the knowledge in the fundamental concepts of E-Commerce
- To examine various concepts regarding Business-to-Business Model
- To realize the importance of CRM in E commerce
- To gain knowledge of various types of E commerce
- To aware the technological developments of Ecommerce
- To gain knowledge of E Retailing

COURSE OUTCOMES:

Learners should be able to

1. Understand the concept of electronic commerce and B2B Model
2. Analyze the applications of intranet and extranet and electronic marketing.
3. The underlying used technologies with emphasis on Internet Technologies
4. Demonstrate the knowledge of different types of E commerce
5. Exhibit the knowledge of Internet marketing techniques
6. Apply the understanding of Business to Business e-commerce

UNIT I

Introduction to e-commerce - Meaning -Concept of e-commerce -e-commerce Vs e-business - Advantages and Disadvantages of e-commerce-Value chain in e-commerce -Porter's value chain model - Competitive advantage and competitive strategy –Different types of e-commerce like B2B - B2C - C2C - C2B -G2C.

UNIT II

Technology in e-commerce - An overview of the internet - Basic network architecture and the layered model -Internet architecture -Network hardware and software considerations -Intranets and extranets - The making of world wide web -Web system architecture - ISP -URL's and HTTP -Cookies.

UNIT III

Building and Hosting website - Choosing an ISP - Registering a domain name – Web promotion - Internet marketing techniques - e-cycle of internet marketing -Personalization -Mobile agents - Tracking customers - Customer service - CRM and E-value - Web page design using HTML and CSS - Overview of HTML -Basic structure of an HTML document -Basic text formatting- Links - Images- Tables - Frames - Form and introduction to CSS.

UNIT IV

Security Threats - Security in cyberspace - Kinds of threats and crimes - Client threat - Communication channel threat - Server threat - Other programming threats - Frauds and Scams Basic cryptography for enabling security in e-commerce -Encryption - Public and Private key encryption - Authentication and trust using digital signature and digital certificates -Internet security using VPN –Firewalls – SSL -Internet payment systems - Features of payment methods - 4C payment methods –Electronic money - ACID and ICES test - Payment gateway - SET protocol for credit card payment -Electronic payment media - e-cash and e-wallet - E-check, Credit card - Debit card - Smartcard - EFT and ACH

UNIT V

Business to Business e-commerce - Meaning - Benefits and opportunities in B2B, B2Bbuilding blocks and their relationship to supply chain management - Key B2B models and their main functions, EDI as a B2B tool -Consumer oriented e-commerce: traditional retailing and e-retailing - Benefits and key success factors for e-retailing - Models for e-retailing like specialized and generalized e-stores -e-mall - Direct selling by manufacturer -Supplementary distribution channel - e-broker and e-services like web-enabling services - Matchmaking services -Information selling on the web -Entertainment services and auction services -e-core values - ethical issues - Legal issues - Taxation issues and international issues.

SUGGESTED READINGS:

TEXT BOOKS

1. Joseph, P. T. (2012).*E-Commerce: An Indian Perspective*(4th ed.).New Delhi: PHI learning Pvt. Ltd.
2. Ravi Kalakota, &Andrew Winston. (2009).*Frontiers or Electronic Commerce*. New Delhi: Addision Wesley.

REFERENCES

1. Dave Chaffey.(2013).*E-Business and E-Commerce Management*: *Strategy, Implementation and Practice*. New Delhi: Pearson Education.
2. Turban, E fraim, King, David, Lang, &Judy (2009).*Introduction to Electronic Commerce*(6th ed.).New Delhi: Prentice Hall.

3. Kalyanam, Kirthi, Hanson, & Ward A. (2012).*Internet Marketing &E-Commerce* (2nd ed.).New Delhi: Thomson Learning.
4. Debjani Nag. (2005).*E-Commerce: The Cutting Edge of Business* (2nd ed.). New Delhi: Mcgraw Hill Education.
5. Jaiwal, S. (2010).*E – Commerce*. New Delhi: Galgota Publications Pvt. Ltd.
6. Geg Holden. (2007).*Starting an E-Commerce Business for Dummies.* New Delhi: IDG Books India Pvt. Ltd.

BBA **2016 - 2017**
Semester - IV

		L	T	P	C
16BAU411	**SEC – 2 E-COMMERCE (PRACTICAL)**	**3**	**-**	**-**	**1**

Instruction Hours / week L: 0 T: 0 P : 3 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES:

To make the students

- To impart the application of e-Commerce for Business administration.
- To develop numerical abilities of students.
- To inculcate writing skills and business correspondence.
- To Gain knowledge of online business transactions
- To aware of procedures of booking of train tickets and air tickets.
- To impart knowledge of HTML

COURSE OUTCOMES:

Learners should be able to

1. Acquire practical skills related with banking and other business.
2. Produce employable E-Commerce designers and Practical experience of designing E-Commerce software.
3. Understand theoretical and practical issues of conducting business over the internet and the Web
4. Apply basic terms of integration in solving practical problems field of as of business
5. Understand the process of e-mail communication & minutes of meeting
6. Exhibit knowledge of modern computing infrastructures from the perspective of the internet and organisations

Practical List

1. Prepare Electronic Commerce Catalogs or directories with consumer data interface.

2. Create advertisement and prepare marketing process based through network

3. Procedures for e-payment through Smart card, Credit card, Debit card and e-money

4. Wireless delivery technology and switching methods

5. Online business Transaction - Online Shopping

6. Procedures for online share trading

7. Procedures for booking Railway/Air tickets

8. Desktop video conferencing

9. Create an e-mail id in your name.

10. Search and Download the Business Information / Reports.

11. Online Application Form Filling for RTGS / NEFT

12. Procedure for Fund Transfer through RTGS / NEFT

13. Create Web page designing using HTML

14. Create text formatting, Tables and images

15. Create Hypertext Links to pages

BBA	**2016 - 2017** **Semester - V**

16BAU501A	**DSE - 1: INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT**	**L**	**T**	**P**	**C**
		8	**-**	**-**	**6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES :

To make the students

- To expose knowledge about various investment alternatives.
- To stress the need of portfolio management and its application.
- To impart knowledge in the fundamentals of valuation of securities.
- To aware the concept of EIC framework
- To understand the investor profile in decision making
- To comprehend knowledge of various types of charts

COURSE OUTCOMES:

Learners should be able to

1. Understand the determinants and behavior of asset prices,
2. Exhibit the financial theory and the analytical tools needed to make good investment decisions, and to model the relationship between risk and return, optmal portfoliio selection.
3. Characterize the implications of the market efficiency evidence on active portfolio management
4. Analyse the EIC framework make decisions based on investing in different avenues.
5. Critically evaluate the risk return parameters and select the best alternative.
6. Communicate in written form and prepare report

UNIT I

Investment - Meaning - Importance - Investment Vs. Speculation – Investment Alternatives -Basics of risk and return -Concept of returns - Application of standard deviation – Coefficient of variation -Beta - Alpha - Bonds - Present value of a bond - Yield to maturity - Yield to call -Yield to put - Systematic risk - Price risk - Interest rate risk - Default risk - Yield curve and theories regarding shape of yield curve - Unsystematic risk and non-risk factors that influence yields - Duration and modified duration - Immunization of a bond portfolio.

UNIT II

Fundamental analysis - EIC framework - Economic Analysis- Leading lagging and coincident macro-economic indicators - Expected direction of movement of stock prices with macroeconomic variables in the Indian context - Industry analysis -Stages of life cycle -Porter's five forces model - SWOT analysis - Financial analysis of an industry – Company analysis.

UNIT III

Share Valuation - Dividend discount models- No growth - Constant growth - Two stage growth model - Multiple stages - Relative valuation models using P/E ratio - Book value to market value- Technical analysis - Meaning - Assumptions - Difference between technical and fundamental analysis - Price indicators- Dow theory - Advances and declines –New highs and lows - Circuit filters - Volume indicators - Dow Theory - Small investor volumes -Other indicators - Futures, Institutional activity - Trends - Resistance - Support - Consolidation - Momentum - Charts - Line chart - Bar chart - Candle chart, point and figure chart. Patterns- Head and shoulders, Triangle – Rectangle – Flag - Cup and Saucer - Double topped - Double bottomed –Indicators - Moving averages - Efficient market hypothesis - Concept of efficiency -Random walk - Three forms of EMH and implications for investment decisions. (Nonumerical in EMH and technical analysis)

UNIT IV

Portfolio Analysis -Portfolio risk and return - Markowitz portfolio model - Risk and return for 2 and 3 asset portfolios - Concept of efficient frontier and optimum portfolio – Market Model - Concept of beta systematic and unsystematic risk - Investor risk and return preferences - Indifference curves and the efficient frontier - Traditional portfolio management for individuals - Objectives - Constraints - Time horizon - Current wealth – Tax considerations - Liquidity requirements and anticipated inflation - Asset allocation – Asset allocation pyramid - Investor life cycle approach - Portfolio management services - Passive - Index funds -Systematic investment plans - Active - Market timing - Style investing.

UNIT V

Capital Asset Pricing Model (CAPM) - Efficient frontier with a combination of risky and risk free assets - Assumptions of single period classical CAPM model - Characteristic line -Capital Market Line - Security market Line - Expected return - Required return – Overvalued and undervalued assets - Mutual Funds - Introduction - Calculation of Net Asset Value(NAV) of a Fund - Classification of mutual fund schemes by structure and objective -Advantages and disadvantages of investing through mutual funds - Performance Evaluation using Sharpe's Treynor's and Jensen's Measures.

SUGGESTED READINGS:

TEXT BOOKS

1. Preethi Singh. (2015).*Investment Management*. Mumbai: Himalaya Publications.

REFERENCES

1. Singh, R. (2009).*Security Analysis and Portfolio Management*(1st ed.). New Delhi: Excel Books.

2. Nagarajan, K.,& Jayabal, G. (2011).*Security Analysis and Portfolio Management* Edition (1st ed.). Kochi: New Age International Publisher.
3. Frank K Reilly,& Keith C Brown. (2011). *Investment Analysis and Portfolio Management*(10th ed.). New Delhi: Cengage India Pvt. Ltd.
4. Avadhani. (2014). *Investment Management*. Mumbai: Himalaya Publications.
5. Jack Clark Francis. (2001).*Investments Analysis and Management*. Singapore: Mc Graw Hill International Edition.
6. Srivatsava, R.M. (2010).*Management of Indian Financial Institution*. Mumbai: Himalaya Publishing House.
7. Bhalla, V.K. (2010).*Investment Management*. New Delhi: Sultan Chand and Sons.

BBA **2016 – 2017**
Semester - V

	L	T	P	C
16BAU501B DSE – 1: INVESTMENT BANKING AND FINANCIAL SERVICES	**8**	**-**	**-**	**6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES:

To make the students

- To exhibit the knowledge about the structure and functioning of money market and capital market
- To impart the growth and functioning of financial institutions in India
- To understand the importance of venture capital
- To gain knowledge of IRDA
- To expose and aware the concept of leasing and hire purchase
- To comprehend knowledge of responsibilities of lead managers

COURSE OUTCOMES:
Learners should be able to

1. Understand the General structure of various institutional structure
2. Develop and employ theoretical valuation methods to price these financial instruments.
3. Exhibit the importance of credit rating agency
4. Apply financial concepts, theories and tools in financial decision making
5. Evaluate the legal, ethical and economic environment related to financial services.
6. Acquire the skills necessary to participate in managing a financial services company

UNIT- 1
Indian Financial System - Investment Banking in India -Recent Developments and Challenges ahead - Institutional structure and Functions of Investment/ Merchant Banking - SEBI guidelines

for Merchant Bankers- Registration -Obligations and responsibilities of Lead Managers - Regulations regarding Continuance of Association of Lead Manager with an issue.

UNIT II

Issue Management - Public Issue - Classification of companies - Eligibility - Issue pricing - promoter's contribution -Minimum public offer - Prospectus -Allotment – Preferential allotment - Private placement - Book Building process - Designing and pricing - Green Shoe Option - Right Issue - Promoter's contribution - Minimum subscription- Advertisements -Contents of offer document - Bought out Deals - Post issue work and obligations – Investor protection, Broker - Sub broker and underwriters.

UNIT III

Leasing and Hire Purchase - Concepts of leasing - Types of leasing - Financial and operating lease - Direct lease and sales and lease back - Advantages and limitations of leasing – Lease rental determination - Finance lease evaluation problems – Hire Purchase interest and Installment - Difference between Hire Purchase and Leasing – Choice criteria between Leasing and Hire Purchase mathematics of HP - Factoring - Forfeiting and its arrangement - Housing Finance - Meaning and rise of housing finance in India – Fixing the amount of loan– Re pricing of a loan - Floating Vs. Fixed rate - Practical problems on housing finance.

UNIT IV

Venture Capital - Concept -History and evolution of venture capital - Venture Investment Process - Various steps in venture financing -Incubation financing -Insurance - Concept - Classification - principles of insurance - IRDA and different regulatory norms -Operation of General Insurance - Health Insurance - Life Insurance -Credit Ratings – Introduction - Types of credit rating - Advantages and disadvantages of credit ratings - Credit rating agencies and their methodology - International credit rating practices.

UNIT V

Securitization- Concept - Securitization as a funding mechanism - Traditional and Non traditional Mortgages - Graduated-Payment Mortgages (GPMs) - Pledged-Account Mortgages (PAMs) - Centralized Mortgage Obligations (CMOs) - Securitization of nonmortgage assets - Securitization in India.

SUGGESTED READINGS:

TEXT BOOKS

1. Meir Kohn. (2013) . *Financial Institutions and Markets.* New Delhi: Tata McGraw Hill Publication.

REFERENCES

1. Khan, M.Y. (2015).*Financial Services*(8th ed.).New Delhi: Tata McGraw - Hill.
2. Machiraju. (2010).*Indian Financial System*(4th ed.).New Delhi:Vikas Publishing House.

3. Bhole, L M. (2006).*Financial Institutions and Markets*. New Delhi: Tata Mcgrah Hill Publication.
4. Vasantha desai . (2002).*The Indian Financial System.* New Delhi: Himalaya Publishing House.
5. Khan, M .Y.(2004). Indian Financial *System.* New Delhi : Tata Mcgrah Hill Publication.
6. Varshney ,P. N., & Mittal, D.K . (2010). *Indian Financial System.* New Delhi : Sulthan Chand and Sons.
7. Gardon, E., &Natarajan, K. (2004).*Financial Markets and Services.* New Delhi : Himalaya Publishing House.

BBA **2016 - 2017**
Semester – V

		L	T	P	C
16BAU502A	**DSE – 2: ADVERTISING AND BRAND MANAGEMENT**	**8**	**-**	**-**	**6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES:
To make the students

- To aware about the advertisement functions.
- To demonstrate various types of advertisements
- To aware teams and exhibit leadership skills.
- To understand the media planning and selection in business
- To access the consumer perspective and value
- To acquire the knowledge in brand management and sales promotional strategies

COURSE OUTCOMES:
Learners should be able to

1. Analyze advertising and branding techniques and apply them to a variety of different issues;
2. In calculate and prepare presentations on advertising and brand management issues.
3. Examine knowledge in development and management of customer-based brand equity.
4. Examine advertising and its functions in relation to brand success
5. Evaluate the criteria for the best advertisements and brands and apply in lifelong practice.
6. Work in teams and exhibit leadership skills.

UNIT I
Advertising - Need and importance - Definition and growth of modern advertising –Advertising and the marketing mix - Types and classification of advertisement - Advertising spiral - Social andeconomic aspects of advertising - Marketing communication models - AIDA - Hierarchy of

effect - Innovation adoption model - Action first model -Quick decision model – Planning framework of promotional strategy.

UNIT II

How advertising works - Exposure - Salience - Familiarity - Low involvement - Central route and Peripheral Route and Cognitive Learning - Positioning strategies - Associating feelings with a brand - Developing brand personality - Creating copy strategies - Rational and emotional approaches - Selection of an endorser -Creative strategy and style - Brand image - Execution -USP - Common touch and entertainment -Message design strategy - Format and formulae for presentation of appeals (slice of life, testimonials, etc.,) - Different types of copy - Art and layout of an advertisement - Principles of design - Layout stages - Difference in designing of television -Audio and print advertisement.

UNIT III

Media planning and scheduling - Introduction to broadcast and non broadcast media -Budgeting decision rule - Percentage of sales method - Objective to task method -Competitive parity and all you can afford - Key factors influencing media planning – Media decisions - Media class - media vehicle and media option- Scheduling - Flighting -Pulsing and continuous.

UNIT IV

Management of sales promotion - Importance and need for sales promotion -Planning for consumer schemes and contests - Different types of consumer schemes -Introduction to brands and brand management - Concept of a brand - Brand evolution -Branding challenges and opportunities - Strategic brand management process.

UNIT V

Identifying and establishing brand positioning and values - Brand building – Brand positioning and values brand repositioning -Designing and implementing brand strategies - Brand extension - Brand hierarchy Kapfrer -Brand equity - Brand personality - Brand image - Managing brands overtime - Integrating advertising and brand management.

SUGGESTED READINGS:

TEXT BOOKS

1. Sontaki, C.N. (2007). *Advertising and Sales Management*. Ludhiana: Kalyani Publishers.

REFERENCES

1. Aaker, Myers,& Batra. (2002).*Advertising Management*(5th ed.). New Delhi: Prentice Hall.
2. Wells, Moriarity,& Burnett.(2007). *Advertising Principles and practices*(7th ed.). New Delhi: Prentice Hall.
3. Ronald Lane WKane,Whitehill king,& Thomas Russell,J. (2008). *Kleppner's Advertising Procedure*(16th ed.).New Delhi: Pearson Education.
4. George E.Belch & Michael A., Balch. (2011).*Advertising and Promotion*(16th ed.). New Delhi: Tata McGraw - Hill Education.

5. Kazmi, S.H.H., & SatishK.Batra. (2008).*Advertising and sales promotion*(3rd ed.). New Delhi: Excel books.
6. Jean Noel Kampferer. (2012).*Strategic Brand Management*(5th ed.). Mumbai: Kapferer Free Press.
7. David Aaker. (2002*). Brand Leadership.(* Canadian Edition). Noida : Simon and Schuster.
8. Wright, winter, Ziegler. (2009).*Advertising*(2nd ed.).New Delhi: Atlantic Publishers and Dist.
9. Chunawalla, Reddy, Appanaiah. (2014). *An Introduction to Advertising and Marketing Research.* Mumbai: Himalaya Publishing House.
10. Chunuwalla,S.A.,& Sethia. (2011). *Foundations of Advertising Theory and Practice.*Mumbai : Himalaya Publishing House.
11. Julian Cummins. (2010). *Sales Promotion.*New Delhi: Universal Book Stall.
12. Sandage Fryburger Rotzoll. (2013). *Advertising Theory and Practice*. New Delhi: A.I.T.B.S Publishers and Distributors.

BBA **2016 - 2017**
Semester - V

			L	T	P	C
16BAU502B	**DSE - 2:**	**RETAIL MANAGEMENT**	8	-	-	6

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES :
To make the students

- To exhibit the features of retailing
- To develop the knowledge in the theories of retail development
- To understand the concept on retails space management
- To be aware on retail market segmentation.
- To comprehend knowledge of Retail Outlet
- To compose the knowledge in global retail markets.

COURSE OUTCOMES:
Learners should be able to

1. Assess the understand the ways that retailers use marketing tools and techniques to ...
2. Develop an in-depth understanding of retail and services management as well as non-store retailing
3. Use foundational skills knowledge to remain current with marketing and management strategies and trends and employ them in new business environments.
4. Understand the functions of retail business and various retail formats and retail channels.
5. Exhibit the knowledge of design, implementation, and assessment of retailing strategies based on consumer needs.

6. Critically analyse and evaluate the criteria for the functioning of the retail store and growth of retail sector in India.

UNIT I

Introduction to Retailing - Definition - Characteristics -Evolution of Retailing in India -Retailing in India - Emerging Trends in Retailing - Factors Behind the change of Indian Retail Industry.

UNIT II

Retail Formats - Retail Sales by ownership - On the basis of Merchandise offered – Non store Based retail mix and Non traditional selling.

UNIT III

Store Planning - Design and Layout - Location Planning and its importance - Retailing image mix - Effective Retail Space Management - Floor Space Management.

UNIT VI

Retail Marketing - Advertising and Sales Promotion - Store Positioning - Retail Marketing -Mix - CRM - Advertising in Retailing -Retail Merchandising - Buying function - Markups and Markdown in merchandise management -Shrinkage in Retail merchandise management.

UNIT V

Merchandise Pricing - Concept of Merchandise Pricing - Pricing Options – Pricing Strategies - Pricing Objectives - Types of Pricing -Retail Operation - Elements/Components of Retail Store Operation - Store Administration -Store Manager - Responsibilities - Inventory Management - Management of Receipts -Customer Service - Management of Retail Outlet/Store - Store Maintenance – Store Security.

SUGGESTED READINGS:

TEXT BOOKS

1. Swapna Pradhan. (2014).*Retailing Management*(4th ed.).New Delhi: The Mc GrawHill Companies.

REFERENCES

1. Cullen,& Newman. (2006).*Retailing – Environment and Operations*(1st ed.). New Delhi: Cengage Learning EMEA.
2. Berman,& Evarv. (2012).*Retail Management*(12th ed.). New Delhi: Prentice Hall.
3. Bajaj, Tuli,& Srivastava. (2010).*Retail Management*.(2nd ed.). New Delhi: Oxford University Publications.
4. Gibson G Vedamani. (2012).*Retail Management*: *Functional Principles and Practices*. (4thed.). New Delhi: Jaico Publishing House.
5. Harjit Singh. (2011).*Retail Management*.(2nded.). New Delhi: S. Chand Publication.
6. Burman barry, & Joel Evan. (2006). *Retail Management*. New Delhi: Macmillan.

7. Geroge H. Lucas., Robert P. Bush, & Larry G. Gresham. (2004). *Retailing.* New Delhi: All India Publishers.

BBA **2016 - 2017**
Semester - V

16BAU503A	**SEC – 3 TAXATION - I**	**L T P C** **6 - - 4**

Instruction Hours / week L: 5 T: 1 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES :

To make the students

- To interpret the knowledge in direct tax
- To familiarize the concept of Income tax law
- To infer the concepts of tax authorities
- To gain knowledge of GST
- To aware of income tax authorities
- To gain knowledge of procedures for collection of tax

COURSE OUTCOMES:

Learners should be able to

1. Understand the income tax laws in India and be able to do tax planning.
2. Interpret and exhibit the assessment procedure of individuals and computation of tax liability.
3. Formulate the Income Tax calculations by critically analyzing the assessee's situation under various income heads and deductions and acquire a Lifelong practice for computation of Tax under various income heads and deductions for any assessee

4. Comprehend on the assessment of the GST
5. Communicate orally and in written form the income tax, GST and customs law and computations of IT.
6. Understand with the laws pertaining to the Income Tax and apply it lifelong.

UNIT I

Income Tax Act - Definition - Income - Agricultural Income - Assessee - Previous year - Assessment year - Residential status - Scope of Total Income - Exempted Incomes -Heads of income.

UNIT II

Computation of Income from Salaries - Allowances -Perquisites - Deductions out of gross salary - Income from House Property - Annual value - Net annual value.

UNIT III

Computation of Profits and Gains of Business or Profession - Capital Gain- Long term Capital Gain - Short term Capital Gain - Exempted Capital Gain.

UNIT IV

Computation of Income from other sources - Set-Off and Carry Forward of Losses - Deduction from Gross Total Income - Assessment of Individuals

UNIT V

Income Tax Authorities - Procedures for assessment - Collection of Tax

Note: Theory and problems shall be distributed at 40% and 60% respectively.

SUGGESTED READINGS:

TEXT BOOKS

1. Gaur,& Narang. (2016).*Income Tax Law and Practice.*Ludhiana: Kalyani Publishers.

REFERENCES

1. Dingare Pagare. (2016).*Business Taxation.* New Delhi: Sultan Chand & Sons.
2. Dinkar Pagare.(2016).*Law and Practice of Income Tax.* New Delhi: Sultan Chand & Sons.
3. Bhagavathi Prasad. (2016).*Income Tax Law and Practice*. New Delhi: Wishwa Prakshan Publishers.

4. Manoharan, T.N. (2016). *Students Handbook on Income Tax Law*. Mumbai: Snow White Publications Pvt. Ltd.

BBA **2016 - 2017**
Semester - V

		L	T	P	C
16BAU503B	**SEC - 3 COMPANY LAW AND SECRETARIAL PRACTICE**	**6**	**-**	**-**	**4**

Instruction Hours / week L: 5 T: 1 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

To make the students

- To compose knowledge on formation of company, Documents required and company meetings.
- To impart students knowledge in the area of secretarial practice
- To examine the role and responsibilities of company secretary.
- To gain knowledge on Companies Act
- To comprehend knowledge about the concept of secretarial practice
- To analyse the powers of company scretary

COURSE OUTCOMES

Learners should be able to

1. Understand the companies requirements as a company secretary
2. Practices according to the law in companies
3. Exhibit the importance of company secretary in formation of a company
4. Develop the knowledge about the concept and procedures of secretarial practice

5. Understand the role and functions of the company secretary
6. Gain knowledge on formation of company, documents required and Acts pertaining to it.

UNIT I

Companies Act 1956 Vs Companies Act 2013 - Formation of Companies - Promotion - Meaning - Promoters - Functions - Duties of Promoters - Incorporation - Meaning - Certificate of Incorporation - Memorandum of Association - Meaning - Purpose - Alteration of Memorandum - Doctrine of Ultra virus - Articles of Association - Meaning - Forms - Contents - Alteration of Articles.

UNIT II

Directors - Qualification and Disqualification of Directors - Appointment of Directors - Removal of Directors - Director's remuneration - Powers of Directors – Duties of Directors - Liabilities of Directors.

UNIT III

Company Meetings - Kinds - Board of Directors Meeting - Statutory Meeting - Annual General Meeting - Extra Ordinary General Meeting - Drafting of Correspondence - Relating to the Meetings - Notices - Agenda - Chairman's Speech - Writing of Minutes.

UNIT IV

Company Secretary - Meaning - Definition - Types - Positions - Qualities - Qualifications - Appointment and Dismissal - Power - Rights - Duties - Liabilities of a Company Secretary - Role of a Company Secretary

UNIT V

Accounts of Companies - Audit and Auditors' - Prevention of Oppression and Mismanagement - Winding up - Official Liquidators - National Company Law Tribunal.

SUGGESTED READINGS:

TEXT BOOKS

1. Kapoor, N.D. (2010).*Elements of Company Law.* New Delhi: Sultan Chand & Sons.

REFERENCES

1. Shukla, M.C., & Gulshan, S.S. (2010).*Principles of Company Law*. New Delhi: S.Chand and Co.

2. Kuchhal, M.C. (2008).*Secretarial Practice*. New Delhi: Vikas Publications.

3. Avtar Singh. (2014). *Introduction to Company Law.* New Delhi: Eastern book Company.

		L	T	P	C
16BAU504A	**GE-1 ENTREPRENEURSHIP DEVELOPMENT**	**8**	**-**	**-**	**6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

To make the students

- To compose awareness among the students about the concepts of Entrepreneurship.
- To develop the skills of entrepreneurship and project management
- To impart knowledge about the financial Institutions and financial markets.
- To develop the knowledge of business and management principles
- To apply basic terms of integration in solving practical problems field entrepreneurship
- To acquire knowledge on skill of entrepreneurship

COURSE OUTCOMES

Learners should be able to

1. Understand the Concept of entrepreneurship, entities of business, creating ideas, mobilizing funds and support from government.
2. Communicate orally and in written form the Concept of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government.
3. Apply the understanding of entrepreneurship, types of entrepreneurs, entities of business, creating ideas, mobilizing funds and support from government in lifelong practice.
4. Exhibit with the skills of entrepreneur
5. Preparation and evaluation of business plan and Project formulations

6. Develop and implement advanced knowledge and skills of project and programme management in establishing a new enterprise.

UNIT I

Entrepreneurial Management - The evolution of the concept of entrepreneurship - John Kao's Model on Entrepreneurship -Idea Generation - Identifying opportunities and Evaluation - Building the Team /Leadership -Strategic planning for business - Steps in strategic planning - Forms of ownerships - Sole proprietorship - Partnership - Limited liability partnership and corporation form of ownership - Advantages/Disadvantages - Franchising - Advantages/ Disadvantages of franchising - Types of franchise arrangements - Franchise contracts - Franchise evaluation checklist - Financing entrepreneurial ventures - Managing growth - Valuation of a new company - Harvesting and Exit Strategies - Corporate Entrepreneurship.

UNIT II

Entrepreneurship - Creativity and Innovation - Stimulating Creativity - Organisational actions that enhance/hinder creativity – Managerial responsibilities - Creative Teams - Sources of Innovation in Business – Managing Organizations for Innovation and Positive Creativity.

UNIT II

Social Entrepreneurship - Introduction to Social Entrepreneurship - Characteristics and Role of Social Entrepreneurs - Innovation and Entrepreneurship in a Social Context - Start-Up and Early Stage Venture Issues in creating and Sustaining a Non-profit Organization – Financing and Risks; Business Strategies and Scaling up.

UNIT IV

Family Business and Entrepreneurship -The Entrepreneur - Role and personality - Family Business: Concept - Structure and kinds of family firms - Culture and evolution of family firm - Managing Business -Family and shareholder relationships - Conflict and conflict resolution in family firms – Managing Leadership - Succession and continuity - Women's issues in the family business - Encouraging change in the family business system.

UNIT V

Financing the Entrepreneurial Business -Arrangement of funds - Traditional sources of financing - Loan syndication – Consortium finance - Role played by commercial banks - Appraisal of loan applications by financial institutions - Venture capital - MSMED Act.

SUGGESTED READINGS:

TEXT BOOKS

1. Vasant Desai. (2013). *Dynamics of Entrepreneurial Development and Management*. Mumbai:Himalaya Publishing House.

REFERENCES

1. Burns, P. (2011).*Entrepreneurship and Small Business*(4th ed.). Chennai: New Jersey: Palgrave.
2. Drucker, P. F. (2007). *Innovation and entrepreneurship: Practice and Principles*. Gurgoan: USA: Elsevier.
3. Hisrich, R.,& Peters, M. (2002). *Entrepreneurship*. New Delhi: Tata McGraw Hill.
4. Holt, D. H. (2008). *Entrepreneurship new venture creation*. New Delhi: Prentice Hall of India.
5. Kaplan, J. (2009). *Patterns of entrepreneurship* (3rd ed.).New Delhi: John Wiley and Sons.

6. Khandwalla, P. (2003). *Corporate creativity*. New Delhi. Tata McGraw Hill .
7. Mullins, J. (2014). *New business Road Test* (4th ed.).New Delhi. Prentice Hall.
8. Nicholls, A. (2006). *Social Entrepreneurship New Models of Sustainable Social Change*. New Delhi: Oxford University Press.
9. Prahalad, C. K. (2014). *Fortune at the bottom of the Pyramid*: *Eradicating Poverty through Profits* (5th ed.).New Delhi: Pearson Education.
10. Scarborough,& Zimmerer, (2011).*Effective Small Business Management*(10th ed.).New Delhi: Pearson Education.
11. Stevenson,H.(2007).*Perspective on Entrepreneurship*. Mumbai: Boston: Harvard Business Press.
12. Khanka, S.S. (2012). *Entrepreneurial Development*. New Delhi: Sultan Chand and Sons.
13. Gupta, C.B.,& Srinivasan, N.P. (2007). *Entrepreneurial Development*. New Delhi: Sultan Chand and sons.
14. Saravanavel,P. (2001). *Entrepreneurial Development*. Madras: Ess Pee Kay Publishing House.
15. Gangadhara Rao, M. (2001).Entrepreneurship and Entrepreneurial Development. New Delhi. Kanishka publishing house.

BBA **2016 - 2017**
Semester - V

16BAU504B GE-1 PRODUCTION AND OPERATIONS MANAGEMENT

L	T	P	C
8	-	-	6

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

To make the students

- To understand the concepts and functions of production and operations management
- To impart the knowledge in the concept of inventory
- To develop the knowledge in purchase procedure and quality control
- To be aware of technological **practices** and relevant social issues
- To gain knowledge of applying a quality management TQM tools to improve organizational effectiveness
- To acquire knowledge on methods of production and operations management

COURSE OUTCOMES

Learners should be able to

1. Analyze the entire process of manufacturing a product or a service
2. Understand the concept of optimum utilization of resources and minimization of cost
3. Exhibit and Understand the materials management, concept of inventory and quality control.
4. Critically evaluate the project completion cycle using operation techniques and solve the

problem.
5. formulate the production planning and control systems and ensure efficient scheduling for production
6. Obtain the knowledge of applying a quality management TQM tools to improve organizational effectiveness.

UNIT I

Introduction to Production and Operations Management – Definition - Need - Responsibilities -Key decisions of OM -Goods Vs. Services - Operations as a key functional area in an organization - Operation Strategies-Definition- Relevance - Strategy formulation process - Order qualifying and order winning attribute. Maintenance Management - Need of maintenance management - Equipment life cycle(Bathtub curve) - Measures for maintenance performance (MTBF, MTTR and availability) -Lean production - Definition of lean production - Lean Demand Pull logic - Waste in operations - Elements that address elimination of waste - 2 card Kanban Production Control system.

UNIT II

Forecasting - Definition - Types - Qualitative (grass roots, market research and Delphi method) and quantitative approach (simple moving average method, weighted moving average and single exponential smoothing method) - Forecast error - MAD -Scheduling - Operation scheduling - Goals of short term scheduling - Job sequencing (FCFS,SPT, EDD, LPT, CR) and Johnson's rule on two machines - Gantt charts.

UNIT III

Process Selection - Definition - Characteristics that influence the choice of alternative processes (volume and variety) - Type of processes - Job shop - Batch - Mass and Continuous -Product-Process Design Matrix and Services Design Matrix -Technology issues in process design - Flexible Manufacturing Systems (FMS) - Computer Integrated Manufacturing(CIM).

UNIT IV

Layout Decision - Layout planning - Benefits of good layout -Importance - Different types of layouts (Process, Product, Group technology and Fixed position layout). Assembly line balancing by using LOT rule - Location Decisions and Models - Facility Location -Objective - Factors that influence location decision -Location evaluation methods – Factor Rating Method. Capacity Planning - Definition - Measures of capacity (input and output) - Types of planning over time horizon - Decision Tree Analysis.

UNIT V

Aggregate Planning - Definition- Nature - Strategies of aggregate planning - Methods of aggregate planning - Statistical Quality control - Variations in process- Control charts - Total Quality Management - Total Productive Maintenance - KAIZEN Concept

SUGGESTED READINGS:

TEXT BOOKS

1. Khanna, O.P. (2010).*Industrial Engineering and Management*. New Delhi: Dhanpat Rai Publications Pvt. Ltd.

REFERENCES

1. Mahadevan, B. (2015).*Operations Management Theory and Practice*(3rd ed.).New Delhi: Pearson Education.
2. Heizer Jay,& Render Barry. (2016).*Production and Operations Management*(3th ed.). New Delhi: Pearson Education.
3. Gupta, S.P. (2012).*Statistical methods*(28th ed.). New Delhi: Sultan Chand and Sons.
4. Adam, E.E.,& Ebert. (2009).*Production and operations Management*(5th ed.).New Delhi: Prentice Hall of India.
5. Chary,S.N. (2013). *Production and Operations Management*(5th ed.).New Delhi: Tata McGraw Hill.
6. Buffa E S., &Sarin R K. (2007).*Modern Production / Operations Management*(8th ed.).New Delhi: John Wiley publication.
7. Gupta,P. K., Man Mohan,& KantiSwarup. (2014).*Operations Research.*New Delhi: Sultan Chand and Sons.
8. Kapoor,V. K. (2006).*Operations Research.* New Delhi: Sultan Chand and Sons.
9. Banga,T.R. (2007). *Industrial Engineering and Management Science.*New Delhi: Khanna Publishers.

BBA **2016 – 2017**
Semester - VI

		L	T	P	C
16BAU601A	**DSE – 3: HRD: SYSTEMS AND STRATEGIES**	**8**	**-**	**-**	**6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

To make the students

- To acquire the knowledge in the concepts and functions of HRD
- To identify the principles and practices of developing human resources
- To access the qualities of HR manager
- To gain knowledge of implementation of HR
- To be aware of International HRM
- To comprehend knowledge of HR Audit

COURSE OUTCOMES

To learn the students

1. Exhibit the role of and effectiveness of HR
2. Understand the emerging trends in HRD

3. Analyze the HR experiences in India
4. Collaborate with others, in the development, implementation, and evaluation of organizational and health and safety policies and practices.
5. Research and analyze information needs and apply current and emerging information technologies to support the human resources function.
6. Develop, implement, and evaluate organizational development strategies aimed at promoting organizational effectiveness.

UNIT I

Human Resource Development (HRD) - Concept - Origin and Need -Relationship between human resource management and human resource development -HRD as a Total System - Activity Areas of HRD - Training - Education and Development -Roles and competencies of HRD professionals.

UNIT II

HRD Process - Assessing need for HRD - Designing and developing effective HRD programs - Implementing HRD programs - Evaluating HRD programs.

UNIT III

HRD Interventions - Integrated Human Resource Development Systems -Staffing for HRD - Physical and Financial Resources for HRD - HRD and diversity management - HRD Climate - HRD Audit.

UNIT IV

HRD Applications - Coaching and mentoring - Career management and development - Employee counselling - Competency mapping - High Performance Work Systems - Balanced Score Card - Appreciative inquiry - Integrating HRD with technology.

UNIT V

Evaluating the HRD Effort - Data Gathering - Analysis and Feedback -Industrial relations and HRD - HRD Experience in Indian Organizations – International HRD experience - Future of HRD.

SUGGESTED READINGS:

TEXT BOOKS

1. Rao,V.S.P. (2011).*Human Resource Development*. New Delhi : I K International Publishing House Pvt. Ltd.

REFERENCES

1. Rao, T.V. (2000).*Reading in human Resource Development.* Mumbai: Oxford IBH Publication Ltd.

2. Kapur.,& Sashi.(2008).*Human resource Development and Training in Practice*. New Delhi : Beacon Books.
3. Lynton Rolf P.,& Pareek Udai. (2011).*Training for Development*. New Delhi: Vistaar publication.
4. Mankin, D . (2009).*Human Resource Development.* New Delhi: Oxford University Press India.
5. Haldar, U. K. (2009).*Human Resource Development.* New Delhi: Oxford University Press India.
6. Rao, T.V. (2009*). Future of HRD.* New Delhi: Macmillan Publishers India.
7. Kandula, S.R. (2004).*Strategic Human Resource Development*. New Delhi: Prentice Hall Publications.
8. Pareek Udai., & Rao,T.V. (2011).*Designing and Managing Human Resource Systems*. New Delhi: Oxford and IBH.
9. ILO. (2013).*An introductory course in Teaching and Training Methods for Management Development.* New Delhi: Sterling Publishers Private Limited.

BBA **2016 - 2017**
Semester - VI

			L	T	P	C
16BAU601B	**DSE – 3:**	**MANAGEMENT OF INDUSTRIAL RELATIONS**	**8**	**-**	**-**	**6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

To make the students

- To acquaint knowledge with concepts of Industrial Relations
- To impart knowledge about trade union act.
- To infer legislations related to Labour Welfare and Industrial Relations.
- To aware of the present state of Industrial relations in India.
- To understand and apply the concept of industrial relations and the system in which it operates.
- To demonstrate the understanding of legal aspects pertaining to industrial relations and labour welfare.

COURSE OUTCOMES

Learners should be able to

1. Demonstrate descriptive knowledge of the field of industrial relations.
2. Apply the essential concepts of industrial relations and their interrelationship at the personal, organizational and national levels.
3. Investigate solutions to industrial relations and labor problems based on legal code.
4. Communicate your knowledge of industrial relations in both written and verbal formats.
5. Understand critique the concept of employee engagement
6. Developing role of human resources in the global arena

UNIT I

Concept of Industrial Relations -Aspects of industrial relations - Conflict and cooperation - Parties in industrial relations - Workers employers and government –Trade unions - Objectives collective bargaining.

UNIT II

Workers Participation in Management - Levels of participation - Mode of participation Works Committee - Joint Management councils - Worker Director – Grievance Procedure - Quality Circles.

UNIT III

Trade Union Act 1926 - Immunity granted to Registered Trade Unions -Recognition of Trade Unions - The Industrial Employment (Standing Orders) Act 1946 -Scope - Coverage - certification process- Modification - Interpretation and Enforcement - The Industrial Disputes Act 1947 - Forum for settlement of disputes - Instruments of economic coercion - Strikes, lockouts and closure.

UNIT IV

Salient Features - Coverage of employees and employers - Rules and benefits relating to the Payment of Wages Act 1936 - The Payment of Gratuity Act 1972 – The Minimum Wages Act 1948 - The Payment of Bonus Act 1965 - Provident Fund

UNIT V

The Factories Act 1948- Definition- Approval - Licensing and registration – Health, Safety and Welfare measures - Employment of women and young persons - Leave with wages and weekly holidays - Employees Compensation Act, 1923.

SUGGESTED READINGS:

TEXT BOOKS

1. Srivastava, . S C. (2012).*Industrial Relations and Labour Laws.* New Delhi: Vikas Publishing House.

REFERENCES

1. Chhabra,T. N. (2007).*Industrial Relations and Labour Laws*. New Delhi: Dhanpat Rai PublishingHouse
2. Nair, N.G., & Latha Nair. (2004).*Personnel Management and Industrial Relations*. New Delhi: S.Chand and Company Ltd.
3. Kapoor, N.D. (2015).*Elements of Industrial Law*. New Delhi: Sultan Chand and Sons.
4. Tripathy. (2013).*Personnel Management and Industrial Relations.* New Delhi: Sultan Chand and Sons.

BBA **2016 - 2017**
Semester - VI

16BAU602A	**DSE – 4: GLOBAL BUSINESS ENVIRONMENT**	**L**	**T**	**P**	**C**
		8	**-**	**-**	**6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

To make the students

- To interpret the present economic environment in India and abroad.
- To acquire knowledge on issues involved in the macro management of the economy
- To infer knowledge in trade and fiscal policy
- To gain knowledge of fiscal and monetary policy
- To be aware of WTO
- To comprehend knowledge of BOP

COURSE OUTCOMES

Learners should be able to

1. Infer knowledge on economic environment
2. Access the trends in sustainable development
3. Exhibit in various trade policy
4. Understand the knoeledge of Indutrialpolicy
5. Assess issues in Indian Economy
6. understand the concept of WTO and IMF

UNIT I

Introduction - Concept of Economic Environment - Nature and scope - Macro variables -Income - Employment - Money Supply - Price Level - Interest rates - Saving and Investment -Movement and Interrelationship between different variables - Trends in Macro variables in India.

UNIT II

Institutional Framework of Economic Environment - Role of state - State Vs Markets -Fiscal Policy - Concept and Implications - Monetary Policy – Concept and Implications -Commercial Policy - Concept and Implications

UNIT III

Structure of Indian Economy - Growth Strategy in plans - Industrial Policy - Public sector and Private sector Monetary Policy - Fiscal Policy -Infrastructure Development - Issues in Indian Economy - Poverty- Unemployment - Regional Dimensions – Productivity and Modernisation, Environment and Sustainable Development - Human Resource Development

UNIT IV:

Open Economy Management - Balance of Payments -Role of Foreign Trade and Policy –Role of Foreign Capital and Policy -Exchange Rate Policy and Exchange Controls – External Debt - International Linkages -Globalization - Concept- Implications- Policy – Regional Integration - EU, etc.

UNIT V

World Trade Organization -World Bank - IMF, etc., - Other Emerging Economies - China, Brazil, Russia. Global Orientation of Indian Economy - Growth and Evolution of Indian MNC's - Current crises in US/Europe/Asia and its impact on economic growth of India - SAARC, ASEAN and India.

SUGGESTED READINGS:

TEXT BOOKS

1. Bimal Jalan. (2004).*The Indian Economy*; *Problems and Prospects*. Gurgaon: Penguin Books.

REFERENCES

1. Puri,V.K. (2014).*Indian Economy*.Bengaluru: Himalya Publishing House.

2. Janet Morrison. (2011).*The Global Business Environment* (3rd ed.). Chennai: Palgrave Macmillan.
3. Andrew Harrison. (2014).*Business Environment in Global Content*.(2nd ed.). New Delhi: Oxford University Press.
4. Marianne M. Jennings. (2012).*Business: Its Legal, Ethical, and Global Environment* (10th ed.). New Delhi: Cengage Learning Publisher.
5. Janet Morrison. (2006).*International Business Environment: Global and Local Marketplaces in a Changing World* (2nd ed .).Chennai: Palgrave Macmillan.

BBA		**2016 - 2017** **Semester - VI**
16BAU602B	**DSE – 4: INTERNATIONAL TRADE POLICY AND STRATEGY**	**L T P C** **8 - - 6**

Instruction Hours / week L: 6 T: 2 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To interpret the basis of international trade policy and strategies.
- To relate global institutional structure and trade strategies of developing countries
- To define the trade partners of India
- To gain knowledge of WTO
- To be aware of Export and Import strategies
- To understand guidelines towards Trade policy.

COURSE OUTCOMES

Learners should be able to

1. Infer knowledge on fundamentals of trade theory and its application to policy**.**
2. Examine international trade laws and regulations
3. Analyse the trends in Indias Export and Import.

4. Understand the Concept of Export, EXIM strategies, custom clearance and Export incentive schemes.
5. Communicate orally and in written form the understanding of Export, EXIM strategies, custom clearance and Export incentive schemes.
6. Apply the understanding of Export, EXIM strategies, custom clearance and Export incentive schemes.

UNIT I

Review of Economic Theory on International Trade - Basis for international trade -Gains from trade -Distributional issues - Policy instruments and their impact –Political economy -Trends in Global Trade and Balance of Payments with special reference to India -Historical roots of today's international trade – Composition -Origin and destination of global exports and imports - Trade in invisibles - Balance of payments - Current account and Capital account - Capital flows and foreign exchange revenues - External Debt.

UNIT II

The Global Institutional Structure - GATT (General Agreement on Trade and Tariffs) - WTO (World Trade Organization) - Regional Trade Blocks and Trade Agreements.

UNIT III

India's Industrialization Strategy and International Trade - Review of Economic planning strategies and issues - Early phase; the 1970s and 1980 - Policies since 1991 -Exim policy - Structure of tariffs and restrictions -Currency depreciation and convertibility -Export Promotion Zones, Special Economic Zones, Importer and Exporter Code (IE Code).

UNIT IV

Experience of Select Developing Countries - Analysis of the trade strategy and the policy framework in two select large countries and comparison with India - Impact of trade on growth - agriculture - inequality - poverty and other developmental indicators – Case Studies on Trade Strategies of Emerging Economies- China and ASEAN (Association of South East Asian Nations).

UNIT V

Exchange Control Regulations - RBI Guide Lines - Authorized Dealers -FEMA, Permitted Currencies - ACU - Export Realization - Procedure and Related documents - Trends in India's Exports and Imports.

SUGGESTED READINGS:

TEXT BOOKS

1. Balagopal, T.A.S .(2010).*Export Management.* Mumbai : Himalaya Publications.

REFERENCES

1. Srinivasan,T. N., & Suresh D Tendulkar. (2003).*Reintegrating India with the World Economy*. Washington: Institute for International Economics.
2. Connor & David, E. O. (2006). *Encyclopedia of the Global Economy*: *A guide for students and researchers*. New Delhi: Academic Foundation.
3. Bibek Debroy,& Debashis Chakraborty. (2007).*The Trade Game: Negotiation trends at WTO and concerns of developing countries*. New Delhi: Academic Foundation.
4. Paul R., Krugman, Maurice Obstfeld.,& Marc Melitz. (2016).*International Economics: Theory and Policy* (10^{th}ed.).New Delhi: Pearson Education.
5. Rajiv Sikri. (2013).*Challenge and Strategy: Rethinking India's Foreign Policy*. New Delhi: SAGE Publication India Pvt., Ltd.
6. Francis Cherunilam. (2013*). International Trade and Export Management*. Mumbai: Himalaya Publications.
7. Varma & Agarwal. (2006).*Foreign Trade Management: Forward Book Depot*. New Delhi: Academic Foundation.
8. Manab Adhikary, (2011).*Global Business Management*. New Delhi: Macmillan India Limited.

BBA		**2016 - 2017** **Semester - VI**
16BAU603A	**SEC-4 TAXATION - II**	**L T P C** **6 - - 4**

Instruction Hours / week L:5 T: 1 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

To make the students

- To infer knowledge in indirect tax
- To acquire knowledge in the fundamentals of indirect tax
- To compose the procedures of taxation of India
- To understand the concept of forward charge mechanism, reverse charge mechanism
- To gain expert knowledge of the principles of the indirect tax laws
- To familiarize the concept of VAT ands TIN

COURSE OUTCOMES

Learners should be able to

1. Interpret the concepts in central sales tax and VAT
2. Computation of taxation with procedures
3. Infer knowledge in central and customs act
4. Analyse and evaluate the effect of an indirect tax on consumers and producers.
5. Gain expert knowledge of the principles of the indirect tax laws and the relevant rules.
6. Understand various concepts of Goods & Service Tax.

UNIT I

OVERVIEW OF GST

Overview of GST – GST international Scenario – GST in India – History of GST – GST Council – Framework of GST – Registration of GST – Introduction to CGST Act, 2017 – Important Definitions – Levy of GST – Liability under GST.

UNIT – II

SUPPLY

Supply – Characteristics of supply – Schedule I under CGST – Schedule II under CGST – Activities which are not supply – Composite and Mixed Supply – Composition levy – Meaning – Condition & Restriction – Time of Supply of Services – Time of supply in case of change in rate of tax – Value of supply.

UNIT III

ITC & REGISTRATION

Input Tax Credit – Meaning – Input Tax Credit Restrictions – Job work – Accounts and Records – Tax Invoice, Credit and Debit Notes – Registration – Persons liable to register – Persons not liable to register – Returns – Payment – Utilization of ITC – Refunds.

UNIT IV

IGST

Introduction to IGST Act, 2017 – Important definitions – Nature of Supply – Inter State Supply – Intra State Supply – Suppliers in Territorial waters – Place of Supply of goods – Place of Supply of Services – Union Territory Goods and Services Act, 2017 – Introduction to GST (Compensation to States) Act, 2017.

UNIT V

CUSTOMS ACT, 1962

Customs duty – Prohibition and exportation of goods detection of illegally imported and exported goods and their prevention – Levy and exemption from custom duty – Valuation of goods under Customs Act – Clearance of imported goods and exports goods – Draw back – Conditions and procedure of availing of draw back – Powers on Customs Officers – Search and seizure – Confiscation of goods – offences and penalties appeals – E-way bill.

SUGGESTED READINGS:

TEXT BOOKS

1. Dingare Pagare. (2014). *Business Taxation*. New Delhi: Sultan Chand & Sons.

REFERENCES

1. Datey,V.S. (2015). *Indirect Taxes Law and Practices*. New Delhi: Taxmann Publications(P) Ltd.
2. Balachandran. (2014). *Indirect Taxation*. New Delhi: Sultan Chand and Sons.
3. Gupta, R.L., Gupta, V.K. (2012). *Indirect Tax*. New Delhi: Sultan Chand and Co.
3. Dhingra Joy. (2014). *Indirect Taxes*. New Delhi: Kalyani Publication.
4. Amit Arora, C.A. (2010). *Indirect Taxes*. New Delhi: Bharat Law House Pvt. Ltd.

BBA **2016 – 2017**
Semester - VI

		L	T	P	C
16BAU603B	**SEC-4 STRATEGIC MANAGEMENT**	**6**	**-**	**-**	**4**

Instruction Hours / week L: 5 T: 1 P : 0 **Marks: Internal: 40 External: 60 Total: 100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

To make the students

- To interpret the strategic principles and practice
- To impart knowledge in culture and strategic advantages
- To access the concept of core competency
- To be aware of Strategy formulation process and frameworks
- To demonstrate the knowledge and abilities in formulating strategies and strategic plans
- To gain knowledge of practical and integrative model of strategic management

COURSE OUTCOMES

Learners should be able to

1. Understand the strategic decisions that organisations make and have an ability to engage in strategic planning.
2. Exhibit the strategic management practices used by top management
3. Analyze the matrix in strategic management
4. Impart and implement strategic principles and practice
5. Exhibit the basic concepts, principles and practices associated with strategy formulation and implementation
5. Understand the principles of strategy. formulation, implementation and control in organizations.

UNIT I

Introduction-concept of Strategy - Need - Dimensions - Strategic Planning – Process- Benefits - McKinsey's 7S Model - Strategic vision - Corporate Mission - Objectives - Goals - Social Responsibility - Business ethics - Linking Strategies with ethics - Social audit.

UNIT II

Environmental analysis - Need - Scanning - Approaches - Forecasting - Techniques - Internal Analysis - Need - SWOT analysis - Value Chain - Functional Analysis - Grid approach - Criteria for evaluating internal capabilities.

UNIT III

Strategic Decision Framework - Developing alternatives - Strategy Options - Diversification strategies - Retrenchment Strategy - Factors Influencing Strategy - generic strategy - Cultural context of strategy - Comparing alternatives - BCG Model.

UNIT IV

Implementation - Role of top management - Process - Matching Structure of Strategy - Resource allocation - Planning and Controlling system. Evaluation - Criteria - Quantitative and Qualitative factors - Feedback and Information - Industry attractiveness - Application of 9 Cell Matrix.

UNIT V

Core Competencies - Building core competencies - Building Strategic Supportive Corporate Culture Strategic advantage - Managing Strategic Change - Strategic Change Process -Diagnosing change need.

SUGGESTED READINGS:

TEXT BOOKS

1. Ghosh,P.K. (2013).*Strategic Planning and Management.* New Delhi: Sultan Chand and Sons.

REFERENCES

1. Ramaswamy, V.S.& Namakumari,S. (2007).*Strategic Planning – Formulation of Corporate Strategy*.New Delhi: Macmillan Business Books.
2. John A Pearce, Richard B Robinson. (2006).*Strategic Management*. New Delhi: AITBS Educational Books.
3. Micheal E Porter. (2004).*Competitive Strategy*. New Delhi: Prentice Hall Publications.

BBA **2016 - 2017**
Semester - VI

		L	T	P	C
16BAU691	**PROJECT**	**8**	**-**	**-**	**6**

Instruction Hours / week L: 0 T: 0 P : 8

COURSE OBJECTIVES:

- To make the students
- To identify an issue to be analysed and to be solved in a business setup or real time scenario using primary or secondary data collection.
- To understand the application of Research process in the area of accounting/Finance/Marketing/HR/International business etc.
- To analyse the data and critically evaluate the result and formulate the suggestion for the problem identified.
- To apply the theoretical and practical learning of doing research into lifelong practice.
- To Communicate in oral and written form and prepare report
- To Work in team and exhibit leadership skills
- To utilize the IT application for analysis and preparation of report.

COURSE OUTCOMES:

Learners should be able to

1. Identify an issue to be analysed and to be solved in a business setup or real time scenario using primary or secondary data collection.
2. Understand the application of Research process in the area of accounting/Finance/Marketing/HR/International business etc.
3. Analyse the data and critically evaluate the result and formulate the suggestion for the problem identified.
4. Apply the theoretical and practical learning of doing research into lifelong practice.
5. Communicate in oral and written form and prepare report
6. Work in team and exhibit leadership skills
7. Utilize the IT application for analysis and preparation of report.

The students should select a problem in Accounting, Finance, Marketing, Human Resource Management, international business or any other areas.

Report should contain

- Introduction
  - Introduction about the industry
  - Introduction about the Company
  - Review of literature – Minimum 10 papers from referred journal
  - Need for the Study
  - Objectives
- Research Methodology
  - Research Design
  - Sampling Design
  - Sources of Data Collection
  - Tools used for analysis
  - Limitation
- Data analysis and interpretation
- Findings and Suggestions
- Conclusion
- Bibliography (APA format)

KARPAGAM UNIVERSITY

Karpagam Academy of Higher Education

(Deemed University, Established Under Section 3 of UGC Act, 1956)

FACULTY OF ARTS, SCIENCE AND HUMANITIES

POST-GRADUATE PROGRAMME

MASTER OF BUSINESS ADMINISTRATION

(GENERAL MANAGEMENT)

(REGULAR PROGRAMME)

Regulation, Curriculum & Syllabus(2016)

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KARPAGAM UNIVERSITY

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FACULTY OF ARTS, SCIENCE AND HUMANITIES

POST-GRADUATE PROGRAMME

MASTER OF BUSINESS ADMINISTATION

(REGULAR PROGRAMME)

REGULATIONS
(2016)

CHOICE BASED CREDIT SYSTEM (CBCS)

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KARPAGAM UNIVERSITY

Karpagam Academy of Higher Education

(Deemed University Established under Section 3 of UGC Act, 1956)

Coimbatore - 641 021, INDIA

FACULTY OF ARTS, SCIENCE AND HUMANITIES

MBA DEGREE PROGRAMME

REGULAR PROGRAMME
REGULATIONS 2016
CHOICE BASED CREDIT SYSTEM (CBCS)

The following Regulations are effective from the academic year 2016-2017 and are applicable to the students admitted in MBA programme in the Faculty of Arts, Science, and Humanities, Karpagam University from the academic year 2016 – 2017 onwards.

1. ELIGIBILITY FOR ADMISSION TO THE PROGRAM

Candidates who have passed the Undergraduate Degree Examination of this University or an examination of any other University recognized by the Karpagam University as equivalent thereto are eligible for admission to Post-Graduate degree in Management (**MBA).**

2. DURATION OF THE PROGRAM

The minimum duration of a regular MBA program is two years and its maximum duration is four years. Each academic year shall be divided into two semesters, the First and Third semesters from July to November and the Second and Fourth semester from December to April. Each semester shall have 90 working days (6 Hrs / Day) or 540 hours.

3. MEDIUM OF INSTRUCTION

The medium of instruction for all courses, examinations, seminars, presentations and project/reports shall be in English.

4. CREDITS

The prescribed credits required for the award of MBA degree shall be 104.

5. STRUCTURE OF THE PROGRAM

The program consist of Core, Elective, Summer Internship, Project (Major) and Industrial Visits/Field Visits/Out Bound Training.

- **a. Core**

  Core consists of thirteen theory courses and two practical courses.

- **b. Elective**

- Specializations are offered in ten functional areas.
- They are Finance, Marketing, Human Resources, Systems, Entrepreneurship, Banking Management, Retail Management, International Business, Production Management and Insurance Management.
- A candidate has to select any two specialization of his/her choice.
- Each specialization consists of three electives each in third semester andfourth semester respectively.
- A candidate has to select two electives in the third and fourth semester.

c. Summer Internship

During second semester vacation each student shall undertake a Summer Internship for 30 Days. The summer internship may be a general study of all functional areas of a company or may be a functional focus on a specialized functional area of management in a company. The students shall bring the attendance certificate from the company. He /She shall also submit a detailed report for *Viva-voce* Examination.

d. Project Work (Major)

Candidates shall undergo for a Project work for a period of 25 working days during the IV semester. On completion of the project work he/she shall submit the report to the Head of the Department. The candidate shall bring the attendance certificate from the place of project work carried out. The Project Report prepared according to approved guidelinesand duly signed by the supervisor(s) shall be submitted to HoD for *Viva Voce* Exam. The report should be well documented as per the following approved guidelines,

1. Cover & Title Page
2. Certificate, Company Certificate and Declaration
3. Acknowledgement
4. List of Contents, List of Tables and List of Charts
5. Introduction of the Study
6. Review of Literature
7. Research Methodology
8. Data Analysis and Interpretation
9. Findings, Suggestions & Conclusion
10. Bibliography and Appendix

e. Industrial Visits / Field Visits/Out Bound Training

The students shall undertake Industrial Visits / Field Visits/ Out Bound Training duringFirst, Second and Third semesters respectively.

6. MAXIMUM MARKS

The maximummarks assigned to different courses shall be as follows:

Each of the theory and practical courses shall carry a maximum of 100 marks. Out of which 40 marks is for Continuous Internal Assessment (CIA) and 60 marks for End Semester Examinations (ESE).

7. REQUIREMENTS TO APPEAR FOR THE END SEMESTER EXAMINATION (ESE)

Attendance shall be considered semester wise pattern (Not annually).

a. Ideally every student is expected to attend all classes and secure 100% attendance. However, in order to allow for certain unavoidable circumstances, the student is expected to attend at least 75% of the classes and the conduct of the candidate has been satisfactory during the course.

b. A candidate who has secured attendance between 65% and 74% (both included), due to medical reasons (Hospitalization / Accident / Specific Illness) or due to participation in University / District / State / National / International level sports or due to participation in Seminar / Conference / Workshop /Training Programme / Voluntary Service / Extension activities or similar programmeswith prior permission from the Registrar shall be given exemption from prescribed attendance requirements and shall be permitted to appear for the examination on the recommendation of the Head of the Department concerned and Dean to condone the lack of attendance. The Head of the Department has to verify and certify the genuineness of the case before recommending to the Dean. However, the candidate has to pay the prescribed condonation fee to the University.

c. However, a candidate who has secured attendance less than 64% in the current semester due to any reason shall not be permitted to appear for the current semester examinations. But he/she will be permitted to appear for his/her supplementary examinations, if any and he/she has to re-do the same semester with the approval of the "Students' Affairs Committee" and Registrar.

8. FACULTY TUTOR

To help students in planning their course of study and for general advice on the academic program, the HoD shall allot a certain number of students to a faculty to whom they shall function as faculty tutor throughout their period of study. Faculty tutors shall advise the students and monitor their conduct of behavior and academics. Problems if any, they should be counseled periodically. The Faculty tutor is also responsible to inform the parents of their wards progress. Faculty tutor shall display the cumulative attendance particulars of his / her ward students' periodically (once in 2 weeks) on the Notice Board to enable the students to know their attendance status and satisfy the **clause 7** of this regulation.

9. CLASS COMMITTEE

Every class shall have a class committee consisting of teachers of the class concerned, student representatives (Minimum 2 boys and 2 girls of various capabilities and Maximum of 6 members) and the concerned HoD / senior faculty as a Chairperson. The objective of the Class Committee Meeting is to improve the teaching – learning process. Class committee may be convened at least once in a month. The functions of the class committee include

- Analyzing and solving problems experienced by students in the class room and in the laboratories.
- Analyzing the performance of the students of the class after each test and finding the ways and means to improve the performance.
- The class committee of a particular class of any department is normally constituted by the HoD / Chairperson of the class committee. However, if the students of different departments are mixed in a class, the class committee is to be constituted by the respective Faculty Dean.
- The class committee shall be constituted within the first week of each semester.
- The HoD/ Chairperson of the class committee may convene the meeting of the class committee.
- The respective Faculty Dean may participate in any class committee meeting.
- The Chairperson is required to prepare the minutes of every meeting, and submit the same to Dean within two days after having convened the meeting. Serious issues if any shall be brought to the notice of the Registrar by the HoD / Chairperson.

10. CONTINUOUS INTERNAL ASSESSMENT (CIA)

CIA: The performance of students in each course will be continuously assessed by the respective faculty as per the guidelines given below:

Theory Courses:

S. No.	Category	Maximum Marks
1.	Attendance	5
2.	Test – I (First 2 ½ units)	10

3.	Test – II (Last 2 ½ units)	10
4.	One Journal PaperPresentation*	15
Continuous Internal Assessment : Total		40

***TheJournal Paper Presentation Evaluation comprises of Subject Matter = 5 marks, Presentation = 4 marks, Visual Aids = 2 marks, Question and Discussion = 4 Marks.

Pattern of CIA Question Paper:

Instruction	**Remarks**
Maximum Marks	50 Marks for all Courses.
Duration	2 hrs
Part - A	15 One mark Questions (**15 x 1 = 15 Marks**) Question No. 1 to 15 Multiple Choice Questions
Part- B	3 Eight mark Questions **(3 x 8 = 24 Marks)** Question No. 16 to 18 will be **'either-or'** type, Question No. 16: either 16 (a) or 16 (b), Question No. 17: either 17 (a) or 17 (b), Question No. 18: either 18 (a) or 18 (b)
Part- C Compulsory	One Eleven mark Question **(1 x 11 = 11 Marks)** Question No.19: **Case Study**

Practical Courses:

S. No	**Category**	**Maximum Marks**
1.	Attendance	5
2.	Observation work	5
3.	Record work	5
4.	Model Examination	20
5.	Viva – voce Examination	5
Continuous Internal Assessment: Total		**40**

Mark Distribution for Attendance

S. No.	**Attendance %**	**Maximum Marks**
1	91 and above	5.0
2	86 – 90	4.0
3	81 – 85	3.0
4	75 - 80	2.0
5	Less than 75	0

11. END SEMESTER EXAMINATIONS (ESE)

ESE will be held at the end of each semester for each course. The question paper is for a maximum of 60 marks.

Pattern of ESE Question Paper:

Instruction	Remarks (with online)
Maximum Marks	60Marks
Duration	½ Hr for Online & 2 ½ Hours ESE
Part - A	20 One mark Questions (**20x 1 = 20 Marks**) Question No. 1 to 20 Online Multiple Choice Questions
Part- B	5 Two mark Questions **(5 x 2 =10 Marks)** Question No. 21 to 25 will be compulsory questions, covering all five units of the syllabus; i.e., Question No. 21: Unit - I, Question No. 22: Unit - II, Question No. 23: Unit - III, Question No. 24: Unit - IV, Question No. 25: Unit – V.
Part- C	4Five mark Questions **(4 x 5 =20 Marks)** Question No. 26 to 29 will be '**either-or'** type, one Question each from any four units of the syllabus; i.e., Question No. 26: either 26 (a) or 26 (b), Question No. 27: either 27 (a) or 27 (b), Question No. 28: either 28 (a) or 28 (b), Question No. 29: either 29 (a) or 29 (b)
Part- D Compulsory	One Ten mark Question **(1 x 10 = 10 Marks)** Question No.30: **Case Study**from the remaining one unit

a. Practical

The practical examination shall be conducted at the end of each semester. There shall be combined valuation. The pattern of distribution of marks shall be as given below.

Experiments	:	40 Marks
Record	:	10 Marks
Viva-voce	:	10 Marks
Total	**:**	60 Marks

Record Notebooks for Practical Examination

Candidate taking the Practical Examination should submit Bonafide Record Notebook prescribed for the Practical Examination. Otherwise the candidate will not be permitted to take the Practical Examination.

In case of failures in Practical Examination, the marks awarded for the record at the time of first appearance of the Practical Examination should remain the same at the subsequent appearance by the candidate.

c. Summer Internship/Project

The marks awarded for project shall be as follows

Summer Internship: 100 marks (4 credits) comprising of Internal 40 and External 60**.**

Project: 200 marks (6 credits) comprising of Internal 80and External120.

The evaluation of the Summer Internship/Project will be based on the Summer Internship/project report submitted and a *Viva-Voce* Examination by a team consisting of the supervisor, who will be the Internal Examiner and an External Examiner who shall be appointed by the University. In case anyone examiner is not available, the HoD/a Faculty nominated by the HoD shall act as an Examiner.

If a candidate fails to submit the Summer Internship/project report on or before the specified date, candidate is deemed to have failed in the Summer Internship/Project Work and shall re-appear for the same in a subsequent semester. Copy of the approved Summer Internship/project report after the successful completion of viva examinations shall be kept in the University library.

12. PASSING REQUIREMENTS

a) Passing minimum:

- CIA: 20 marks out of 40 marks.
- ESE: 30 marks out of 60 marks.

b) If a candidate fails to secure a pass in a particular course (either CIA or ESE or Both) as per clause 12.a, it is mandatory that the candidate has to register and reappear for the examination in that course during the subsequent semester when examination is conducted for the same till a pass is secured both in CIA and ESE (vide Clause 2).

c) Candidate failed in CIA will be permitted to improve CIA marks in the subsequent semesters by writing tests and by submitting Assignments.

d) CIA marks(if it is pass) obtained by the candidate in the first appearance shall be retained by the Office of the Controller of Examinations and considered valid for all subsequent attempts till the candidate secures a pass in ESE.

e) A candidate who is absent in ESE in a Course / Practical / Project Work after having enrolled for the same shall be considered to have**failed**in that examination.

13. AWARD OF LETTER GRADES

All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate in each course as detailed below:

Letter grade	Marks Range	Grade Point	Description
O	91 - 100	10	OUTSTANDING
A+	81- 90	9	EXCELLENT
A	71-80	8	VERY GOOD
B+	66- 70	7	GOOD
B	61 – 65	6	ABOVE AVERAGE
C	55 - 60	5	AVERAGE
D	50 - 54	4	PASS
RA	<50	-	REAPPEARANCE
AB/AAA		-	ABSENT

14. GRADE SHEET

After the declaration of the results, Grade Sheets will be issued to each student which will contain the following details:

i. The list of courses enrolled during the semester and the corresponding grade scored.

i. The Grade Point Average (**GPA**) for the semester and

iii. The Cumulative Grade Point Average (**CGPA**) of all courses enrolled from first semester onwards.

GPA of a Semester and CGPA of a program will be calculated as follows.

$$\textbf{GPA} \text{ of a Semester} = \frac{\text{Sum of the product of the GP by the corresponding credits of the courses offered in that Semester}}{\text{Sum of the credits of the courses of that Semester}}$$

$$\frac{\sum_i CiGPi}{\sum_i Ci}$$

i.e.**GPA** of a Semester=

CGPAof the entire program = $\dfrac{\text{Sum of the product of the GPs by the corresponding credits of the courses offered for the entire program}}{\text{Sum of the credits of the courses of the entire program}}$

i.e. **CGPA**of the entire program = $\dfrac{\sum_n \sum_i CniGPni}{\sum_n \sum_i Cni}$

where,

Ci is the credit fixed for the course 'i' in any semester
GPi is the grade point obtained for the course 'i' in any semester
'n' refers to the Semester in which such courses are credited

Note: RA grade will be excluded for calculating GPA and CGPA.

15. REVALUATION

Candidate can apply for revaluation and re totaling of his / her semester examination answer script (**theory courses only**), within 2 weeks from the declaration of results, on payment of a prescribed fee. For the same, the prescribed application has to be sent to the Controller of Examinations through the HoD. **A candidate can apply for revaluation of answer scripts not exceeding 5 courses at a time.** The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate through the concerned HoD**.** Revaluation is not permitted for supplementary theory courses.

16. TRANSPARENCY AND GRIEVANCE COMMITTEE

Revaluation and Re-totaling is allowed on representation (clause 15).

Student may get the Xerox copy of the answer script on payment of prescribed fee, if he / she wishes. The student may represent the grievance, if any, to the Grievance Committee, which consists of Dean of the Faculty, (if Dean is HoD, the Dean of another Faculty nominated by the University), HoD of the Department concerned, the faculty of the course and Dean from other discipline nominated by the University and the COE. If the Committee feels that the grievance is genuine, the script may be sent for external valuation; the marks awarded by the External examiner will be final. The student has to pay the prescribed fee for the same.

17. ELIGIBILITY FOR THE AWARD OF THE DEGREE

A student shall be declared to be eligible for the conferment of the Degree if he / she hassuccessfully completed all the components in clause 5 and gained the required number of total credits as specified in the curriculum corresponding to his / her Program within the stipulated period.

- No disciplinary action is pending against him / her.
- The award of the degree must be approved by the Board of Management.

18. CLASSIFICATION OF THE DEGREE AWARDED

a) Candidate who qualifies for the award of the Degree (vide clause 18) having passed the examination in all the courses in his / her first appearance, within the specified minimum number of semesters and securing a **CGPA not less than 8.0** shall be declared to have passed the examination in **First Class with Distinction.**

b) Candidate who qualifies for the award of the Degree (vide clause 12) having passed the examination in all the courses within the specified maximum number of semesters (vide clause 2); securing a **CGPA not less than 6.5** shall be declared to have passed the examination in **First Class**.

c) All other candidates (not covered in clauses 18.a and 18.b) who qualify for the award of the degree (vide Clause 17) shall be declared to have passed the examination in **Second Class**.

19. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

a) A candidate, may for valid reasons and on prior application, be granted permission to withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.

b) Such withdrawal shall be permitted only once during the entire period of study of the degree program.

c) Withdrawal of application is valid only if it is made within 10 days prior to the commencement of the examination in that course or courses and recommended by the HoD/ Dean concerned and approved by the Registrar.

d) Notwithstanding the requirement of mandatory TEN days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merits of the case.

e) Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction. This provision is not applicable to those who seek withdrawal during IV semester.

f) Withdrawal from the End semester examination is **NOT** applicable to arrears subjects of previous semesters.

g) The candidate shall reappear for the withdrawn courses during the examination conducted in the subsequent semester.

20. PROVISION FOR AUTHORIZED BREAK OF STUDY

a)Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree program. However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for the break of study. If a candidate intends to temporarily discontinue the program in the middle of the semester for valid reasons, and to rejoin the program in a subsequent year, permission may be granted based on the merits of the case provided he / she applies to the Registrar, but not later than the last date for registering for the end semester examination of the semester in question, through the HoD stating the reasons therefore and the probable date of rejoining the program.

b) The candidate thus permitted to rejoin the Program after the break shall be governed by the Curriculum and Regulations in force at the time of rejoining. Such candidates may have to do additional courses as per the Regulations in force at that period of time.

c) The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification. (Vide Clause 18). However, additional break of study granted will be counted for the purpose of classification.

d) The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 2 irrespective of the period of break of study (vide clause 20.c) in order that he/she may be eligible for the award of the degree.

e) If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted ‘Break of Study’ or ‘Withdrawal’ (Clause 19 and 20) is not applicable for this case.

21. RANKING

A candidate who qualifies for the PG Degree program passing all the Examinations in the first attempt, within the minimum period prescribed for the program of study from Semester I through Semester IV to the program shall be eligible for ranking. Such ranking will be confined to 10% of the total number of candidates qualified in that particular program of Study subject to a maximum of 10 ranks.

22. SUPPLEMENTARY EXAMINATION

Supplementary Examination will be conducted only for the final semester students within ten days from the date of publication of results for students who have failed in one theory course only. Such students shall apply with prescribed fee to the Controller of Examinations within the stipulated time.

23. DISCIPLINE

a) Every student is required to observe disciplined and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the University. The erring students will be referred to the disciplinary committee constituted by the University, to enquire into acts of indiscipline and recommend the University about the disciplinary action to be taken.

b) If a student indulges in malpractice in any of the University / Internal Examination he / she shall be liable for punitive action as prescribed by the university from time to time.

24. REVISION OF REGULATIONS AND CURRICULUM

The university may revise, amend or change the Regulations and Scheme of Examination, if found necessary.

PREAMBLE

Karpagam University (earlier known as Karpagam Arts and Science College) was established in the year 1995 with an objective to impart students in the latest theories and technologies and mould the students into a complete citizen in order to face the outside world. The University is approved by the University Grants Commission, New Delhi as a Deemed University from the year 2008. It is blossomed into an institution at par of excellence in the education hub of Coimbatore. It is located in a congenial atmosphere, about 10 km away from Coimbatore city in a sprawling campus on the Coimbatore – Pollachi main road at Eachanari.

The Department of Management Studies and Research was the first Post –Graduate course started by the institution in the year 1996. It is offering two year full time MBA programme leading to a Master’s degree in Management Studies, along with M.Phil and Ph.Dprogrammes leading to a Research Degree. The Department has an exclusive facility which is endowed with excellent infrastructure and a dedicated team of faculty members in order to train the students to meet the growing needs of the society. The Department follows a Multidisciplinary approach to provide the necessary knowledge, skill and training to the students. The activities of the school are directed towards the all round development of the individual keeping in mind the expectations of the recruiters and the challenges of the environment.

OBJECTIVE OF THE PROGRAMME:

- To build in the skills necessary for the potential managers in all the functional areas of management and to create an exposure to the latest management concepts.
- To provide an integrated approach to problem solving and decision making.
- To mould the personality of the young minds.
- To inculcate good business practices
- To expose the students to the diverse knowledge in the business environment.
- To promote the spirit of entrepreneurship among the participants.

Today the demand for business managers and leaders who can lead the business to the forefront in the competitive environment is high. Our Department fosters the knowledge and skills of the students in preparing them to face the challenges of the competitive environment and succeed, which gives them the critical edge among competition. Our challenge is to inspire and motivate the students to enable them in achieving their goals both personal and professional.

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FACULTY OF ARTS, SCIENCE AND HUMANITIES

POST-GRADUATE PROGRAMME

MASTER OF BUSINESS ADMINISTRATION

(GENERAL MANAGEMENT)

(REGULAR PROGRAMME)

Curriculum & Syllabus
(2016)

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CHOICE BASED CREDIT SYSTEM (CBCS)

DEPARTMENT OF MANAGEMENT FACULTY OF ARTS, SCIENCE AND HUMANITIES
PG PROGRAM (CBCS) – M.B.A. CURRICULUM
(2016–2018 Batch and onwards)

Course code	Name of the course	Objectives and outcomes		Instruction hours / week			Credit(s)	Maximum Marks		
		PEOs	POs	L	T	P		CIA	ESE	Total
								40	60	100
SEMESTER – I										
16MBAP101	Management Principles and Organizational Behavior	I	a/b/g	4	0	0	4	40	60	100
16MBAP102	Managerial Economics	V	c/e/h	4	0	0	4	40	60	100
16MBAP103	Legal Environment for Business	I	a/b/g	4	0	0	4	40	60	100
16MBAP104	Accounting for Managers	I	a/b/g	4	1	0	4	40	60	100
16MBAP105	Quantitative Methods for Management	I	a/b/g	4	1	0	4	40	60	100
16MBAP106	#Management Practice I	V	c/f/h	2	0	0	1	50	-	50
16MBAP107	#Communication Practice I	V	c/f/h	2	0	0	1	50	-	50
16MBAP111	Computer Lab I: MS Office & Tally	I	a/b/g	0	0	4	2	40	60	100
-	**Article Re-presentation	-	-	2	0	0	-	-	-	-
-	Library	-	-	3	0	0	-	-	-	-
Semester Total				**29**	**2**	**4**	**24**	**340**	**360**	**700**
SEMESTER – II										
16MBAP201	Operations Management	I	a/b/g	4	0	0	4	40	60	100
16MBAP202	Marketing Management	II	d/f/i	4	0	0	4	40	60	100
16MBAP203	Human Resource Management	V	c/e/h	4	0	0	4	40	60	100

Course code	Name of the course	Objectives and outcomes		Instruction hours / week			Credit(s)	Maximum Marks		
		PEOs	POs	L	T	P		CIA	ESE	Total
								40	60	100
16MBAP204	Financial Management	I	a/b/g	4	1	0	4	40	60	100
16MBAP205	Banking and Insurance Management	I	a/b/g	4	1	0	4	40	60	100
16MBAP206	Research Methods for Management	III	c/e/h	4	0	0	4	40	60	100
16MBAP207	#Management Practice II	V	c/e/h	2	0	0	1	50	-	50
16MBAP208	#Communication Practice II	V	c/e/h	2	0	0	1	50	-	50
16MBAP211	Computer Lab – II: SPSS	I	a/b/g	0	0	4	2	40	60	100
-	**Article Re-presentation	-	-	2	0	0	-	-	-	-
Semester Total				**30**	**1**	**4**	**28**	**380**	**420**	**800**
SEMESTER – III										
16MBAP301	Strategic Business Management	I	a/b/g	4	0	0	4	40	60	100
16MBAP302	Business Ethics, Corporate Governance & Social Responsibility	I	a/b/g	4	0	0	4	40	60	100
	+Specialization I Elective 1			4	0	0	4	40	60	100
	+Specialization I Elective 2			4	0	0	4	40	60	100
	+Specialization II Elective 1			4	0	0	4	40	60	100
	+Specialization II Elective 2			4	0	0	4	40	60	100
16MBAP321	Summer Internship and Viva Voce	V	c/e/h	4	0	0	4	40	60	100
16MBAP304	#Management Practice III	V	c/e/h	2	1	0	1	50	-	50
16MBAP305	#Communication Practice III	V	c/e/h	2	0	0	1	50	-	50

Course code	Name of the course	Objectives and outcomes		Instruction hours / week			Credit(s)	Maximum Marks		
		PEOs	POs	L	T	P		CIA	ESE	Total
								40	60	100
-	**Article Re-presentation	-	-	2	0	0	-	-	-	-
Semester Total				**34**	**1**	**0**	**30**	**380**	**420**	**800**
SEMESTER – IV										
	+Specialization I Elective 3	-	-	4	0	0	4	40	60	100
	+Specialization I Elective 4	-	-	4	0	0	4	40	60	100
	+Specialization II Elective 3	-	-	4	0	0	4	40	60	100
	+Specialization II Elective 4	-	-	4	0	0	4	40	60	100
16MBAP491	Major Project and Viva Voce	II/IV	d/f/i	17	0	0	6	80	120	200
-	**Article Re-presentation	-	-	2	0	0	-	-	-	-
Semester Total				**35**	**0**	**0**	**22**	**240**	**360**	**600**
Programme Total				**-**	**-**	**-**	**104**	**1340**	**1560**	**2900**

ELECTIVE LIST - SEMESTER III

Semester	List of Specializations	Course Code	Name of the Elective Course	PEO	PO
	Finance	16MBAPF303A	International Financial Management	I	a/b/g
		16MBAPF303B	Strategic Cost Management	I	a/b/g
		16MBAPF303C	Financial Service Management	I	a/b/g
	Marketing Management	16MBAPM303A	Services Marketing	II	d/f/i
		16MBAPM303B	Sales and Promotional Management	II	d/f/i
		16MBAPM303C	Marketing Research and Consumer behavior	II	d/f/i
	Human Resources Management	16MBAPH303A	Human Resource Development	V	c/e/h
		16MBAPH303B	Managing Interpersonal Effectiveness	V	c/e/h
		16MBAPH303C	Organizational Development	V	c/e/h
	Systems	16MBAPS303A	System Analysis & Design	V	c/e/h
		16MBAPS303B	Emerging Trends in Technology	V	c/e/h
		16MBAPS303C	Software Development	V	c/e/h
		16MBAPE303A	Entrepreneurial Finance	IV	d/f/i

Semester	List of Specializations	Course Code	Name of the Elective Course	PEO	PO
III	Entrepreneurship	16MBAPE303B	Entrepreneurship Development	IV	d/f/i
		16MBAPE303C	Project management	IV	d/f/i
	Banking Management	16MBAPB303A	Fundamentals of Commercial Bank Management	I	a/b/g
		16MBAPB303B	Resource Mobilization – Deposits	I	a/b/g
		16MBAPB303C	Resource Deployment – Small Loans	I	a/b/g
	Retail Management	16MBAPR303A	Retail Environment	II	d/f/i
		16MBAPR303B	Retail Operations, Systems and Inventory	II	d/f/i
		16MBAPR303C	Merchandising Management	II	d/f/i
	International Business	16MBAPI303A	International Marketing Management	IV	d/f/i
		16MBAPI303B	International Logistics and Documentation	IV	d/f/i
		16MBAPI303C	International Business Negotiations	IV	d/f/i
	Production Management	16MBAPP303A	Business Process Reengineering	I	a/b/g
		16MBAPP303B	Advanced Maintenance Management	I	a/b/g
		16MBAPP303C	Lean Management	I	a/b/g
	Insurance Management	16MBAPN303A	General Insurance	I	a/b/g
		16MBAPN303B	Principles and Practice of Insurance	I	a/b/g
		16MBAPN303C	Actuarial Aspects of Product Development	I	a/b/g

ELECTIVE LIST - SEMESTER IV

Semester	List of Specializations	Course Code	Name of the Elective Course	PEO	PO
	Finance	16MBAPF401A	Working Capital Management	I	a/b/g
		16MBAPF401B	Security Analysis & Portfolio Management	I	a/b/g
		16MBAPF401C	Bonds, Derivatives & Commodity Market Management	I	a/b/g
	Marketing Management	16MBAPM401A	Brands and Business	II	d/f/i
		16MBAPM401B	Retail Marketing	II	d/f/i
		16MBAPM401C	Customer Relationship Management	II	d/f/i
	Human Resources Management	16MBAPH401A	Industrial Relations	V	c/e/h
		16MBAPH401B	Training and Development	V	c/e/h
		16MBAPH401C	Compensation Management	V	c/e/h
	Systems	16MBAPS401A	E-Commerce Technology & Management	V	c/e/h
		16MBAPS401B	Software Project Management	V	c/e/h
		16MBAPS401C	Enterprise Resource Planning	V	c/e/h
	Entrepreneurship	16MBAPE401A	Technology Innovation & Sustainable Enterprise for Management	IV	d/f/i
		16MBAPE401B	Business Plan &Ethics	IV	d/f/i
		16MBAPE401C	Managing Diversity	IV	d/f/i
	Banking	16MBAPB401A	Export and Import Financing	I	a/b/g
		16MBAPB401B	Management of Non-Performing Assets	I	a/b/g

Semester	List of Specializations	Course Code	Name of the Elective Course	PEO	PO
IV	**Management**	16MBAPB401C	Risk Management in Banks	I	a/b/g
	Retail Management	16MBAPR401A	International Retailing	II	d/f/i
		16MBAPR401B	Retail Planning	II	d/f/i
		16MBAPR401C	Retail Communication	II	d/f/i
	International Business	16MBAPI401A	Multilateral Trade Agreements and Regulations	IV	d/f/i
		16MBAPI401B	International Economics	IV	d/f/i
		16MBAPI401C	International Logistics Management	IV	d/f/i
	Production Management	16MBAPP401A	Purchasing and Materials Management	I	a/b/g
		16MBAPP401B	Supply Chain and Logistics Management	I	a/b/g
		16MBAPP401C	Total Quality Management	I	a/b/g
	Insurance Management	16MBAPN401A	Insurance Law and Regulation	I	a/b/g
		16MBAPN401B	Reinsurance	I	a/b/g
		16MBAPN401C	Risk Management	I	a/b/g

* The internal evaluation for Management Practice and Communication Practice shall be as follows:

- Attendance = 5 marks
- Activity/Seminar = 45 marks (15 marks for Unit I, 15 Marks for Unit II and 15 Marks for Unit III. Activity/seminar will be conducted at end of each Unit)

**The internal evaluation for Article Re-presentation (Total 15 marks for each course) shall be as follows:

- Subject matter = 05 marks
- Presentation = 04 marks
- Visual aids = 02 marks
- Question & Discussions = 04 marks

+**Electives:** Students can opt for two specializations out of ten specializations and two elective courses out of three elective courses in each specialization.

*The internal evaluation of **Summer Internship& Viva voce** shall be as follows:

- Model Viva-voce = 10 marks
- Project Record = 10 marks
- Viva voce Examination (internal examiner) = 20 marks

*The internal evaluation of **Major Project & Viva voce** shall be as follows:

- Review 1 (PPT Presentation) = 15 marks
- Review 2 (PPT Presentation) = 15 marks
- Model Viva-voce = 20 marks
- Project Record = 10 marks
- Viva voce Examination (internal examiner) = 20 marks

KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established under section 3 of UGC Act, 1956)

Programme Outcomes (POs)

Graduates of the MBA programme will be able to:

a. Understanding the management and domain concepts and apply them to achieve business environmental solutions.
b. Demonstrate the ability to apply multiple theoretical perspectives to address complex managerial issues required for effective problem solving and decision making in contemporary organizational environment.
c. Possess the skills required to work individually and lead effectively in a team-based environment.
d. Recognize the values and ways to identify and resolve ethical issues and apply them in organizational settings
e. Evaluate the implications of changing environmental factors on organizational choices within a global environment
f. Ability to effectively communicate, persuade and strategically engage diverse stakeholders within a business environment.

PROGRAMME SPECIFIC OUTCOMES (PSO)

g. Postgraduates will develop critical thinking and conceptualization of functional knowledge of management
h. Able to accept various responsibilities and exhibit high level of commitment to complete on time.
i. Ability to organize events individually / team and can show creativity and unique ideas in every business solutions

Programme Educational Objectives (PEOs)

I. To develop professional skills for life-long learning in areas of management and related fields.
II. To enable students to acquire proficiency, a sense of professionalism, integrity and team spirit to work in diverse environments.
III. To develop capabilities in students to independently conduct theoretical as well as applied research.
IV. To develop sound knowledge and skill to become an intrapreneur/entrepreneur and to inculcate creativity and innovation among students
V. To adapt to a rapidly changing environment with learned and applied new skills and become socially responsible and value driven citizens committed to sustainable development.

Program Educational Objectives	**Program Outcomes**								
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**
To develop professional skills for life-long learning in areas of management and related fields.	√	√					√		
To enable students to acquire proficiency, a sense of professionalism, integrity and team spirit to work in diverse environments.		√	√	√	√				√
To develop capabilities in students to independently conduct theoretical as well as applied research.			√		√	√		√	

Program Educational Objectives	Program Outcomes								
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**
To develop sound knowledge and skill to become an intrapreneur / entrepreneur and to inculcate creativity and innovation among students	√			√					√
To adapt to a rapidly changing environment with learned and applied new skills and become socially responsible and value driven citizens committed to sustainable development.			√			√		√	

16MBAP101 MANAGEMENT PRINCIPLES & ORGANIZATIONAL BEHAVIOUR 4 0 0 4

Course Objectives:

- Familiar with basic concepts of management in an organizational context and application of these concepts to managerial problems
- Understand the manpower planning and motivation techniques used in organizations.
- To study the system and process of effective controlling in the organization.
- The focus of this course is to make students recognizes human behavior in an organizational context.
- To have critical understanding of organisational behaviour theories.
- It will provide an understanding of the concepts of organizational functioning and human behavior with an emphasis on the application of these concepts to managerial problems.

Course Outcomes (Cos):

1. It helps the students to classify how the managerial tasks of planning, organizing, and controlling can be executed in a variety of circumstances.
2. Determine the most effective action to solve specific situations.
3. Evaluate approaches to addressing issues of diversity.
4. The students will understand to communicate effectively in oral and written forms about organizational behavior theories.
5. To understand the application of OB using appropriate concepts, logic and rhetorical conventions.
6. To analysis functional issues and formulate best solutions

Unit I

Management Overview – Evolution of Management- Functions - Characteristics and importance of management - Management Vs Administration - Role of manager –Planning - Meaning- Steps in planning- objectives - Management by Objectives.

Unit II

Decision making: Meaning, process. Organization – Departmentalization - Manpower planning- Recruitment and selection process, Placement and Orientation- Directing – Motivation Theories.Control – Need, process, steps in control.

Unit III

Organization Behavior: Meaning and definition - Fundamental concepts of OB -Contributing disciplines to the OB- Learning – Theories of Learning - Personality – Determinants of personality- Theories of Personality - psycho-analytical, social learning, job-fit, and trait theories.

Unit IV

Perception – factors influencing perception– Attribution Theory – Frequently Used Shortcuts in Judging Others- Perceptual Process- Organization Errors of perception - Attitudes –Types of attitudes- Functions of Attitudes. Values – Types of Values- Value across Cultures –Groups - Stages of Group Development- Group Norms- Group Cohesiveness.

Unit V

Conflict – Meaning – Functional vs. Dysfunctional Conflict- Levels of Conflict – Conflict Management. Stress – Causes of stress – Effects of Occupational Stress- Coping Strategies for Stress. Organizational change - Forces for change - Resistance to change- Overcoming resistance to change.

Suggested Readings:

Text Books:

1. Koontz &Weirich.(2010). *Essentials of Management*.New Delhi: Tata McGraw Hill.
2. Stephen Robbins. (2012). *Organizational Behaviour*.New Delhi: Prentice Hall of India.

References:

1. Rao, V.S.P., &Hari Krishna, V. (2009).*Management: Text and Case*.New Delhi: Excel Books.
2. Prasad,L.M. (2013). *Principles and Practice of Management*. New Delhi: Sultan Chand & Sons.
3. Robbins, S.P.(2006). *Fundamentals of Management*. New Delhi: Pearson Publications.
4. Gilbert.(2008). *Management Today Principles and Practice*. New Delhi: Tata McGraw Hill.
5. Fred Luthans.(2008). *Organizational Behaviour*(7th Edition).New Delhi: Tata McGraw Hill.

6. Steven. L.Mc Shane & Mary Ann von Glinow.(2001). *Organizational Behaviour*(2nd edition). New Delhi: Tata McGraw Hill.
7. Robbins, S. P., &Judge,T.A. (2007). *Organizational Behaviour*.New Delhi: Prentice Hall of India.
8. Prasad,L.M. (2014). *Organizational Behaviour*(3rd Edition). New Delhi: Sultan Chand and Sons.

16 MBAP102 MANAGERIAL ECONOMICS 4 0 0 4

Course Objectives:

- To illustrate the application of economic theory and methodology as an alternative in managerial decisions.
- To understand the demand behavior and estimate demand
- To gain knowledge on the production functions, economies of scale and cost functions
- To gain a rigorous understanding of competitive markets as well as alternative market structures.
- To understand the forces determining macroeconomic variables such as inflation, unemployment, interest rates, and the exchange rate.
- To obtain familiarity on the macro level business components like money, banking, monetary policy, fiscal policy, trade, business cycles and balance of payments.

Course Outcomes (Cos):

1. Apply the economic way of thinking to individual decisions and business decisions
2. Measure the responsiveness of consumers' demand to changes in the price of a goods or service, and understand how prices get determined in markets,
3. Evaluate the different costs of production and how they affect short and long run decisions and derive the equilibrium conditions for cost minimization and profit maximization
4. Design competition strategies, including cost, pricing, and market environment according to the structure of the markets.
5. Critically evaluate the consequences of basic macroeconomic policy options under differing economic conditions within a business cycle.
6. Demonstrate an understanding of monetary and fiscal policy options as they relate to economic stabilization in the short run and in the long run.

Unit I

Managerial Economics - meaning, nature and scope - Managerial Economics and business decision making – Role and responsibilities of Managerial Economist - Fundamental concepts in Managerial Economics. Objectives of Business Firms - Determinants and types of demand - Elasticity of demand - Demand Forecasting, Applications.

Unit II

Production and Costs Analysis : Production Function –Cobb-Douglas function - Law of Diminishing returns- Law of variable proportions - Isoquants, - Law of Supply and Elasticity of Supply, Economies and Diseconomies of scale – Cost – Concepts – Determinants - cost curves – Revenue – concepts – revenue functions - Break Even Analysis.

Unit III

Product markets - Market Structure - Pricing under different markets- Perfect competition, Monopoly, Duopoly, Monopolistic competition, Oligopoly - Pricing in Public Sector Undertakings.

Unit IV

Factor markets and Factors Prices - Pricing decisions – input pricing - wages, interest, rent and profit - Cost Benefit Analysis.

Unit V

Government and Business - Need for Government intervention in the market – Monetary and Fiscal policy- Prevention and control of monopoly - National Income – Methods - Trade Cycles- Economic Liberalization and Business Trends

Suggested Readings:

Text Book:

1. Varshney., &Maheshwari.(2014).*Managerial Economics.* New Delhi: Sultan Chand and Sons.
2. Mehta,P.L. (2014). *Managerial Economics.* New Delhi: Sultan Chand and sons.
3. George, N. Mankiw. (2011). *Principles of Economics.*New Delhi: Thomson Learning.

References:

1. Joel Dean. (2006). Managerial *Economics*. New Delhi: Prentice Hall of India.
2.Rangarajan. (2007). *Principles of Macro Economics*. New Delhi: Tata McGraw Hill.
3. Mote, Paul.,&Gupta.(2009). *Managerial Economics*. New Delhi: Tata McGraw Hill.
4. Jhingan.,M.L& Stephen, J.K. (2013). *Managerial Economics (2nd edition, reprint).*New Delhi: Vrinda Publications.
5. Jhingan.,M.L. (2013). *Managerial Economics (14th edition, reprint).*New Delhi: Vrinda Publications.
6. Paul A. Samuelson & William D. Nordhaus.(2006). *Economics* (19th edition).New Delhi: Tata McGraw Hill.

16MBAP103 LEGAL ASPECTS OF BUSINESS 4 0 0 4

Course Objectives:

- To make the students understand the basics of legal concept and environment in which the present day business is carried.
- To provide an overview of important laws that have a bearing on the conduct of business in India
- To acquaint students with the functioning of negotiable instruments
- Understand the legal structure of factories act of business organizations and their impact on the employee
- To acquire knowledge of income tax act and GST and its applications in business
- To understand the existing law and practice relating to consumer protection act

Course Outcomes (Cos):

1. Analyze the nature of contract law, Company law and cyber laws and its application in business.
2. Appreciate the overall legal framework within which business activities are carried out.
3. Assess the legal forms of business organization and its modus operandi.
4. Recognize the application of factories act and wages act in business scenario.
5. Understand and apply the concept and laws pertaining to income tax, value added tax, and GST and evaluate its impact on business and social environment.
6. To illustrate the consumer legislations towards consumer protection and Environment protection

Unit 1:

Indian Contract Act – Contract – Offer and Acceptance – Capacity of Contract – Consideration - Free Consent – Performance and Discharge of Contract – Contract of Agency –Negotiable Instruments - Types of Negotiable Instruments.

Unit II:

Companies Act – Nature and Kinds of Companies Act – Memorandum of Association – Articles of Association – Prospectus – Types of Meetings – Winding Up of Company.

Unit III:

Industrial Law – Factories Act – Workmen Compensation Act – ESI Act – Payment of Wages Act – Trade Union Act.

Unit IV:

Income Tax Act - Overview of IT Act – Structure of IT Department –Corporate Tax Planning - Value Added Tax –GST.

Unit V:

Law Related To General Public-Consumer Protection Act -Information Technology Act - Right to Information Act – Environmental (Protection) Act.

Suggested Readings:

Text Books:

1. Kapoor, N.D. (2014). *Elements of Mercantile Law*. New Delhi: Sultan Chand & Sons.
2. Kubendran, V. (2014).*Legal Aspects of Business.* Bangalore: SciTech Publications.

References:

1. Sen., &Mitra.(2010). *Commercial and Industrial Law*. New Delhi: Taxman Publication.
2. Shukla,M.C. (2011). *Mercantile Law*. New Delhi: Sultan Chand & Sons.
3. Gulshan, S.S. (2012). *Business Law*. New Delhi: Excel Books.

16MBAP104 ACCOUNTING FOR MANAGERS 4 1 0 4

Course Objectives:

- To understand the financial accounting standards, conventions and principles in preparation of financial reports
- To understand the tools and techniques used for analyzing the financial statements.
- To recognize the cost concepts and prepare cost sheets.
- Calculate and analyse the cash flow operations with available inputs.
- To know various tools from accounting this would facilitate the decision making
- To develop analytical abilities to face the business situations

Course Outcomes (Cos):

1. Student will be able to understand and apply the accounting process and fundamental accounting principles that underpin the development of financial statements.
2. Ability to read, compute, interpret and analyze financial statements; combine financial analysis with other information to assess the financial performance and determine the position of a company.
3. Evaluate the cost concepts to analyse business management decisions related to pricing and outsourcing
4. Demonstrate capabilities of problem-solving and critical thinking
5. Develop an awareness on ethical, social issues in addition to financial information, in the management decision making process
6. Develop group work and communication skills

Unit I

Introduction to Financial, Cost and Management Accounting- Generally accepted accounting principles, Conventions and Concepts– Journal – Ledger - Trial Balance -Balance sheet and related concepts- Profit and Loss account and related concepts.

Unit II

Final Accounts – Financial accounting Vs Management accounting-Objectives and functions of Management Accounting - Financial Statement Analysis – Objectives –Comparative Statements, Common-Size statement, Trend Percentages.

Unit III

Costing – Basic concepts – Elements of costing – types of costing - Preparation of Cost Sheet- Cost Accounting Systems: Job order costing - Process costing- Activity Based Costing- Target costing.

Unit IV

Analysis of Financial Statements - Ratio Analysis, Meaning, Nature, Uses, Limitations, Classification of Ratios-Liquidity, Solvency and Profitability ratios, Interpretation of Ratios; Funds Flow Statement, Meaning and Concept of Funds, Flow of Funds, Uses and Significance of Funds Flow Statement, Limitations of Funds Flow Statement, Statement of Schedule of Changes in Working Capital, Funds From Operation.

Unit V

Cash Flow Statement, Classification of Cash Flows, Comparison between Funds Flow Statement and Cash Flow Statement, Uses and significance of Cash Flow Statement, Computation of Cash Flow Statement and Cash from Operations.

Note: Problems 60 Marks and Theory 40 Marks.

Suggested Readings:

Text Books:

1. Sharma, R.K., &Gupta, K Shashi. (2014).*Management Accounting*. Ludhiana: Kalyani Publishers.
2. Jain.,&Narang. (2014).*Financial Accounting*. Ludhiana: Kalyani Publishers.

References:

1. Kuppapally, J. Jelsy. (2009).*Accounting for Managers*(1st Edition). New Delhi: Prentice Hall of India.

2. Jan Williams. (2011).*Financial and Managerial Accounting – The basis for business Decisions*(15th edition). New Delhi: Tata McGraw Hill.
3. Stice & Stice. (2010).*Financial Accounting Reporting and Analysis* (8th edition). Cengage Learning.
4. Singhvi Bodhanwala. (2009).*Management Accounting -Text and cases*. New Delhi: Prentice Hall of India.
5. Battacharya, K.Ashish. (2009). *Introduction to Financial Statement Analysis*. Elsevier.

16MBAP105 QUANTITATIVE METHODS FOR MANAGEMENT 4 1 0 4

Course Objectives:

- To understand the classification and analysis of the data with statistical tools and techniques.
- To know the descriptive and inferential statistics, and apply them to examine business and economic data.
- To know the use of tools and techniques of correlation and regression
- To realize the applications of probability and distributions in the analytical decision making.
- To understand the mathematical formulation of transportation problem and assignment problem
- To understand the index number concepts and its applications.

Course Outcomes (Cos):

After successfully completing this course, students will be able to:

1. Understand the basic statistical tools and techniques and its application in business decision making.
2. Categorize and estimate the measures of central tendency
3. Develop an ability to analyse and interpret the collected data to provide meaningful information in making management decisions
4. Demonstrate capabilities of problem-solving, critical thinking, and communication skills related to the discipline of statistics.
5. Classify and evaluate the hypothesis to obtain reliable results.
6. Develop skills to design business model and Analytics projects

Unit I

Role of mathematics and statistics in business decisions - Statistics – meaning – Scope-Functions, limitations, uses and Misuse of statistics. Classification and Tabulation of data,Univariate data analysis: Mean and Standard deviation, Shape of distributions – skewness and kurtosis, Introduction to bivariate data analysis.

Unit II

Correlation: Types of Correlation, Correlation coefficient – degrees of correlation coefficient – methods of finding correlation coefficient -scatter diagram-Karl Pearson's co-efficient of correlation-Spearman's Rank correlation. Regression: regression lines -regression equations -regression co-efficients-methods of forming the Regression equations.

Unit III

Probability: Concepts, definitions-addition and multiplication rules (only statements)- business problems. Probability distributions: binomial distribution-Poisson distribution and normal distribution- business problems.

Unit IV

Transportation problem - Mathematical formulation of Transportation problem-Initial Basic Feasible solution - Optimum solution for non degeneracy and degeneracy models - Unbalanced Transportation problems and Maximization case in Transportation problem. The Assignment problem - Mathematical formulation of Assignment problem – Hungarian method –Unbalanced Assignment problem -Maximization case in Assignment problem.

Unit V

Queuing theory: Introduction – Characteristics of queuing system –Single server finite and infinite capacity models. Game Theory: Two Person-Zero-Sum Game- Saddle Point- Value of Game- Dominating Strategy- Mixed Strategy.

Note: Problems 60 Marks and Theory 40 Marks.

Suggested Readings:

Text Books:

1. RichardLevin.,& David Rubin. (2012). *Statistics for Management*. New Delhi: Prentice Hall.
2. Sharma,J.K. (2013).*Operations Research- Theory and Applications.* New Delhi*:* MacMillan Publishers India Pvt Ltd.

References:

1. Pillai, R.S.N., &Bagavathy. (2002). *Statistics.* New Delhi: S. Chand & Company Ltd.

2. Srivastava, T.N., &Rego, S. (2012).*Statistics for Management*(2nd edition). New Delhi: McGraw Hill Education.
3. Aczel, A.D., &Sounderpandian, J.(2012). *Complete Business Statistics*(7th edition).New Delhi: McGraw Hill Education.
4. Gupta,S.P. (2009). *Statistical Methods*. New Delhi: Sultan Chand & Sons.
5. Anand Sharma. (2004). *Operations Research*. New Delhi: Himalaya Publishing House.
6. Franks, S.BuknickMcleavey., & Richard Mojena. (2002): *Principles of Operations Research for Management*. New Delhi: AITBS Publishers.
7. KanthiSwarup., Gupta, P.K., & Man Mohan. (2010). *Operations Research*. New Delhi: .Sultan Chand & Sons.
8. Kapoor, V.K. (2001). *Operation Research Techniques for Management*. New Delhi: Sultan Chand & Sons,

16 MBAP106 MANAGEMENT PRACTICE I 2 0 0 1

Course Objectives:

- To train graduates to become as managers of varying departments through activity based learning.
- This course provides training on decision making skills
- To determine the role to be played during conflict and empowerment skills.
- To help the students to acquire some of the necessary skills to handle day-to-day managerial responsibilities
- To gain a solid understanding of human behavior in the workplace from an individual, group and organizational perspective
- To obtain frameworks and tools to effectively analyze and approach various organizational situations

Course Outcomes:

1. Gain the knowledge and skills necessary to manage various components of a practice that include organization, administration, communication, and managerial aspects.
2. To focus on decision making aspects and implementation of decisions
3. Students should be able to demonstrate the Interpersonal Skills and Practice-Based Learning
4. Demonstrate the roles of the manager and become an effective planner and decision maker
5. Systematically identify relevant theory and concepts and relate to appropriate methodologies and draw conclusions
6. Evaluate, classify, imagine and plan the successful management practices.

Unit I Interpersonal Skills

Decision Skills: Group decision making (strengths and weaknesses), Developing characteristics of charismatic and transformational leadership. Emotional intelligence and leadership effectiveness - self awareness, self management, self motivation, empathy and social skills

Negotiation skills- preparation and planning, definition of ground rules, clarification and justification, bargaining and problem solving, closure and implementation

Unit II Conflict Management skills

Types of conflict (intrapersonal, Intra group and inter group conflicts), Basic concepts, cues, signals, symbols and secrets of body language, Significance of body language in communication and assertiveness training, Conflict stimulation and conflict resolution techniques for effective management.

Unit III Empowerment Skills

Stimulating innovation and change- coping with “temporariness”, Network culture, Power tactics and power in groups (coalitions), Managerial empowerment and entrepreneurship, Prevention of moral dwarfism especially terrorism, Altruism (pro-social behaviour/helping behaviour), Spirituality - strong sense of purpose- trust and respect- humanistic practices- toleration of fellow human beings expressions.

Suggested Readings:
References:

1. Swaminathan, V.D., &Kaliappan,K.V. (2001). *Psychology for Effective Living*. Chennai: The Madras Psychology Society.
2. Robbins, S.B. (2005). *Organizational Behaviour*. New Delhi: Prentice Hall of India.
3. Hurlock, E.B. (2006). *Personality Development* (28th Reprint). New Delhi: Tata McGraw Hill.

16 MBAP107 COMMUNICATION PRACTICE I 2 0 0 1

Course Objectives:

- To impart students and enrich communication and non-verbal activity such that students will be good on their communication.
- To understand norms of business letters and prepare prompt business letters
- Make students to understand the value of face to face communication
- To learn the importance of postures and gestures
- The students acquire skills on conducting meetings, seminar and conferences.
- To gain practical knowledge on designing and developing clean and lucid writing skills.

Course Outcomes (Cos):

1. The student will able to get practice with Verbal communication and Non- Verbal communication.
2. Demonstrate the understanding of face to face Communication and appropriate ways to communicate to an audience
3. The students shall be familiar with conducting meetings, seminar and conferences.
4. Students attain competence in functional use of communication during both academic and non-academic life situations.
5. To draft effective business correspondence with brevity and clarity.
6. To stimulate their Critical thinking by designing and developing clean and lucid writing skills.

Unit I

Communication - Meaning and significance for management- Types of communication- media – Barriers to communication-Norms for Business letters - Letter for different kinds of situations. Personalized standard letter, enquiries, customer’s complaints, collection letters – sales promotional letters

Unit II

Report writing - formal & informal reports - writing research reports & technical reports- Principles of effective communication - Structuring the resume / report – Letter writing / E-mail communication

Unit III

Communication-Face to face communication – telephonic conversation..SPOKEN ENGLISH – Principles of pronunciation – Fluency and correctness - Confidence and skills in using English – Asking questions – Listening skills

Suggested Readings:

Text Books:

1. Lesikar, Raymond V., John D Pettit., & Mary E Flatly Lesikar's. (2007). *Basic Business Communication* (11th edition). New Delhi: Tata McGraw-Hill.
2. Gerson, Sharan J., & Steven M Gerson. (2013). *Technical Writing: Process and Product* (8th edition). New Delhi: Pearson Education.

References:

1. Leena, Sen. (2007).*Communication Skills* (8th edition).New Delhi: PHI Learning Pvt Ltd.
2. Raymond, V. Lesikar's. (2008). *Basic Business Communication* (7th Edition). New Delhi: Tata McGraw Hill Education Pvt Ltd.
3. Kitty, O. Locker., &Stephen KyoKaczmarek, (2007). *Business communication Building Critical Skills* (3rd edition). New Delhi: Tata McGraw Hill.
4. RajendraPal.,&Korlahali. (2007). *Business Communication*(7th edition). New Delhi: Nisha Publishers.

16 MBAP111 COMPUTER LAB I: MS OFFICE & TALLY 0 0 4 2

Course Objectives:

- To provide insight on importance of technology for communication and decision making.
- To familiarize Students with basic to intermediate skills for using tally in the classroom vis-à-vis Business Applications
- To provide hands-on usage of MS-office to creating new word documents including features like tables, charts and references.
- To enable students to explore MS office
- To provide students hands on experience on tally Utilities
- To gain proficiency in creating solutions for Data Management and Reporting

Course Outcomes (Cos):

1. Develop the student to work efficiently in Ms Word, Ms Excel and Ms Power point.
2. Get familiarize with the shortcuts used in office tools.
3. Recognize effective use of charts, diagrams, and other graphics in business messages and identify potential sources for these visual aids
4. Evaluate and practice various techniques of analysis in excel tools
5. To design presentation using animation, special effects and graphics.
6. To facilitate the understanding of accounting package and its application

Unit I

Components of Computer – Introduction to MS Office- Word – Creating a new documents with templates and wizards- Using Key Board Short cuts – Symbols and Pictures – Text Management.

Unit II

Introduction to Excel – Working with work sheets – Calculation using formulas work sheet formatting – Types of Charts – Formatting and printing – Chart elements

Unit III

Introduction to Power Point – Creating New Presentations - Presentation using Graphics – Slide Transition and Adding Sounds Using action Buttons.

Unit IV

Internet and World Wide Web: Introduction to Internet – Internet access – Internet Addressing – Introduction and use of E-mail working of E-mail – E-mail names and address- Working in Blogs.

Unit V

Accounting Package Tally: Introduction to tally – create a company – creating groups & ledger accounts – Account Voucher creation – Statement of accounts – Inventory reports display

Suggested Readings:

Text book:

1. Rajaraman, V. (2009). *Fundamentals of Computer* (4th Edition). New Delhi: Prentice Hall of India Pvt Ltd.

Reference:

1. Sinha,P.K. (2008). *Fundamentals of Computer* (6th Edition). New Delhi: BPB publication.

16 MBAP201 OPERATIONS MANAGEMENT 4 0 0 4

Course Objectives:

To make the students

- To understand the operations management concepts that yields a competitive advantage through operational excellence.
- Aware of various business combinations, location, layout, total quality management
- Learn about design, planning and control of an organization's processes.
- To know the Maximum utilisation of all kinds of resources needed.
- To understand Master Production Schedule, Material Requirement Planning and Total Quality Management
- To get acquainted with ISO Quality Certifications

Course Outcomes (Cos):

Learners should be able to

1. Classify and understand the core features of the operations and production management function
2. Evaluate and prepare the best plant and factory location and layout.
3. Obtain the knowledge of identifying and applying a quality management tools to improve organizational effectiveness.
4. Compare and combine various business locations, layouts, total quality management.
5. Define and list operations management concepts that yield a competitive advantage through operational excellence.
6. Discover, estimate and classify products & services to customers by improving process & supply chain performance.

Unit I

Operations Management – Meaning – Importance – historical contributions – Functions of OM – Differences between Production and Operations Management – Recent trends in Production and Operations - Types of Production Systems, Product Design and Process selection

Unit II

Facility Location – Facility Layout planning and Designing, Types of layout –Product Layout, Process Layout. Cellular, Lean and Agile manufacturing systems – Computer Integrated Manufacturing Systems -Assembly line balancing.

Unit III

Capacity Planning and Control –– functions - Determinants of Effective Capacity planning – Forecasting Demand for Capacity Planning- Capacity Control– Aggregate planning – Master Production Schedule (MPS) – Material Requirement Planning (MRP) – Bill Of Material (BOM) – Capacity Requirement Planning (CRP) –An Introduction to MRP II and Enterprise Resource Planning (ERP).

Unit IV

Materials Management – functions – material planning and budgeting – Value Analysis - purchase functions and procedure - inventory control – types of inventory – safety stock – order point –inventory control systems – perpetual – periodic – JIT – KANBAN.

Unit V

Total Quality Management Concept - Statistical Quality Control for Acceptance Sampling and Process Control –Quality movement – Quality circles –– ISO Quality Certifications and types – Quality assurance – Six Sigma concept.

Note: Problems 20 Marks and Theory 80 Marks

Suggested Readings:

Text Book:

1. Chary, S.N. (2009). *Production and Operations Management (*3rd edition). New Delhi: TMH Publications.
2. Buffa,E.S. (2009). *Modern Production and Operations Management*(8th edition), Wiley India.

References:

1. Adam, E. E& Ebert. (2009). *Production and Operations Management* (5thedition). New Delhi: PHI publication.

2. Joseph G Monks. (2004).*Operations Management (Theory and Problems)* (2nd edition).New Delhi:McGraw Hill.

3. Pannerselvam. (2012). *Production and Operations Management* (2nd edition).New Delhi: PHI,

4. Krajewski, L.J&Ritzman L.P. *Operations Management: Process and Value Chain*(7th edition).New Delhi: PHI.

5. Krajewski, L.J&Ritzman L.P. (2007). *Operations Management: Strategy and Analysis*(7th edition). Addison Wesley.

6. Chase, Aquilano& Jacobs. (2009). *Production and Operations Management (*13th edition).New Delhi: Tata McGraw Hill.

16 MBAP202 MARKETING MANAGEMENT 4 0 0 4

Course objectives:

To make the students

- To understand the marketing environment and marketing functions
- Learn the importance of consumer buying motives and consumer behavior.
- To get familiarize in marketing mix
- To get an in-depth view on advertising and sales promotional tools
- To make aware of direct marketing and customer relation marketing
- To aware of the competitive strategy for leader, follower & nichers.

Course outcomes (Cos):

Learners should be able to

1. Apply the core concepts of marketing and the role of marketing in business and society.
2. Perform market analysis by formulating and identifying the best marketing mix.
3. Evaluate and support the latest trends in marketing and apply the ethical norms in marketing domain.
4. Effectively communicate ideas, explain procedures and interpret results and solutions in written and oral forms to the team members.
5. Evaluate and relate the techniques involved in promoting and branding products
6. Analyze the importance of consumer buying motives & consumer behavior, Designing competitive strategies for Leaders.

Unit I

Marketing-definition – market-conceptual framework-Marketing Environment: Internal and External – Marketing Functions – E-Marketing, Green Marketing.

Unit II

Buyer behavior - process, Market segmentation – levels - bases, targeting – patterns, positioning and differentiation, Tools of product differentiation.

Unit III

Marketing mix-Product mix- New product development-product line – brand- Product life cycle, Packing, Price mix-methods and strategies

Unit IV

Place Mix-Channel System – Flows-Channel Design-Promotion Mix – Advertising – types – Media, Sales promotion – Tools, Public Relations - Tools -Direct Marketing.

Unit V

Customer relation marketing-Customer database, identifying and analyzing competitors - Designing competitive strategies for Leaders, Challengers, Followers and Niche's:–Attracting and retaining customers.

Suggested Readings:

Text book:

1. Kolter, P., & Keller. (2014). *Marketing Management*. New Delhi: PHI.
2. BagavathiR.S.N.P. (2013). *Marketing Management*. New Delhi: S.Chand & Company Ltd,

References:

1. Saxena R.(2008) .*Marketing Management(* 2nd edition). New Delhi: Tata McGraw Hill.
2. Ramasamy.& Namakumari. (2008). *Marketing Management.* New York: MacMillan India Ltd.
3. Sherlekar, *Marketing Management*(14th edition).Mumbai: Himalaya Publication House.
4. Chandrasekar, K.S. (2010).Marketing Management. Tata McGraw Hill,

16MBAP203 HUMAN RESOURCE MANAGEMENT 4 0 0 4

Course objectives:

To make the students

- To understand the human resource management and human resource information system
- To increase knowledge of HR planning, Selection, Recruitment, job analysis and its interrelations.
- To gain information on feedback systems
- To know about compensation and reward management and its practice in industry.
- To understand the concept of competency mapping and components of quality work life
- To get an in-depth knowledge of knowledge management and global HR practices

Course outcomes (Cos):

Learners should be able to

1. Analyze and assess the job analysis for a profile and understand its linkage with HR planning
2. Identify and evaluate the training needs and prepare a training programme.
3. Examine and outline the compensation and reward system applicable to the industry based and understand its linkage with performance management
4. Apply the appropriate employee relations measures and Recruitment process, Learning organization Auditing HR functions
5. Draft the HR functions and latest developments in the field of HR and effectively communicate ideas, explain procedures and interpret results and solutions in written and oral forms to different audiences.
6. To make any manager to identify various activities related to Human Resources, Job involved in HR, Training, and Compensation

Unit I

Human resource management - Importance, Objectives and Functions of HRMs; HR Planning – factors affecting HR Planning – Human resource information system(HRIS) - Changing environments of HRM - Using HRM to attain competitive advantage - Qualities and role of HR managers - Trends in HRM

Unit II

Job analysis and Design – Process of Job Analysis-Job description, Job specification, Job rotation, Job enrichment- Job enlargement - Recruitment and selection: Sources of recruitment, Recruitment process – Process of selection - Induction and Placement.

Unit III

Orientation – Socialisation – Process of socialization – strategies. Training – Training process - Performance appraisal- process – Traditional and Modern Methods - 360^{o} - 720^{o} feedback – Ethics of performance appraisal.

Unit IV

Job evaluation – Process – Wages and Salary administration- Concepts of different wages – Basic wage plan – Executive compensation – Wage differentials – Monetary and Non-monetary incentives - Competency mapping.

Unit V

Quality of Work life – Concepts – Methods to improve quality of work life – Benefits – Challenges. Knowledge management – Learning organization Auditing HR functions - Future of HRM function, International HRM – Global differences and similarities in HR Practices – Application of IT in various HRM functions

Suggested Readings:

Text Books:

1. Dessler, G. (2011). *Human Resource Management (*11th edition). New Delhi: Prentice Hall of India Pvt, Ltd,
2. Aswathappa, K. (2013). *Human Resource Management* (6th edition). New Delhi: Tata McGraw Hill

References:

1. RaoV.S.P. (2014).*Human Resource Management- Texts and Cases*(2ndedition).New Delhi: Excel Books.
2. Scott., Snell.,George &Bohlander. (2010). *Human Resource Management - A SouthAsian Perpective*,Cengage Learning.
3. Klerman,(2008). *Human Resource Management*, Biztantra.

16MBAP204 FINANCIAL MANAGEMENT 4 1 0 4

Course objectives:

To make the students

- To understand the financial management concept and its importance and its applications in business
- To gain knowledge on the sources of finance and the role and functions of chief financial officer.
- To know the concept of time value of money and the rationale for using the time value of money concept in capital budgeting techniques for evaluations of business proposals.
- To recognize the availability of difference source of capital and computation of cost of capital.
- To recognize the importance of working capital its application in business.
- To comprehend on the importance of capital structure, the factors which influence the dividend policy.

Course outcomes (Cos):

Learners should be able to

1. Evaluate the various sources of capital and its impact on business
2. Demonstrate knowledge and compute value of money to evaluate the business proposal applying capital budgeting techniques
3. Compute the cost of capital to estimate the optimal capital structure.
4. Comprehend the knowledge of assessing the working of organization to assess the liquidity position of the firm.
5. Discover the knowledge on capital structure, and the determination of dividend policy
6. Develop analytical skills which facilitate the financial decision making in business situations

Unit I

Financial Management, Objectives, Functions, Role of Financial Management, Risk-Return Relationship, Sources of Long Term Finance, Capital Market in India.

Unit II

Time Value of Money, Capital Budgeting- Methods of Appraisal- Pay Back Method, Rate of Return, Net Present Value, Internal Rate of Return, Profitability Index.

Unit III

Cost of Capital, Determining component cost of capital, Specific cost of Capital, Overall Cost of Capital, Cost of Equity Capital, Cost of Preference Capital, Cost of Debt, Cost of Retained earnings and Weighted Average Cost of Capital.

Unit IV

Working Capital Management, Current asset and liability decision, Factors affecting working capital requirements, components of working capital, forecasting working capital requirements.

Unit V

Capital Structure, Optimum Capital Structure, EBIT - EPS Analysis -Leverages - Dividend Policy, Factors determining Dividend Policy.

Note: Mark distribution - Problems 40 marks and Theory 60 marks.

Suggested Readings:

Text Book:

1. Pandey.I.M. (2013). *Financial Management*(9th Edition).New Delhi: Vikas Publishing House.
2. Chandra, P.(2012).*Financial Management (*7th Edition). New Delhi: Tata McGraw Hill.

References:

1. Khan& Jain. *Financial Management*. New Delhi: Tata McGraw Hill.
2. Vanhorne, J. C &Wachowicz, J .M Jr . (2001). *Fundamentals of Financial Management*.New Delhi: Pearson Education Limited.
3. Gitman. L. J, *Principles of ManagerialFinance*. New Delhi: Pearson Education limited.
4. Periasamy. P, *Financial Management* .Chennai: Vijay Nichole Imprints.

16MBAP205 BANKING AND INSURANCE MANAGEMENT 4 0 0 4

Course Objectives:

To make the students

- To identify and define the Principles and importance of Credit, documentation, monitoring and control.
- The student will be able to develop and demonstrate and understand basic concepts of banking and insurance and interpret career opportunities available after this course
- To have broad understanding of other functions associated with banking.
- Provide clear understanding of the factors contributing to the growth of Indian Banking industry and its impact on the GDP of Indian economy
- To have distinguished insight into marketing of banking services and banking technology.
- To develop efficient and up-to-date financial and insurance planners.

Course Outcomes (Cos):

1. Get acquainted with the concepts and practical dynamics of the Indian Financial System, Markets, Institution and Financial services
2. Design their own strategies in credit management and Securitizations
3. Evaluate the factors contributing to the growth of Indian Banking industry and its impact on the GDP of Indian economy
4. Classify various banking operations ,specially risk management in lending operations
5. Analyze and develop new insurance products to mitigate the various risks in business operations
6. Demonstrate a critical understanding of insurance market and develop strategies to strengthen the insurance dealings

Unit I

Indian Financial System: Introduction- Role of financial institutions & markets- Functions of financial markets- Instruments of financial markets- Recent developments in Indian Financial System. Indian Banking System: Evaluation of Banking Institutions-Different Banking Institutions in India- their role and functions- Regulatory framework of Banking in India; Functions of Commercial Banks.

Unit II

Loans and Advances: Principles of sound bank lending- Different types of loans- Credit appraisal techniques; Credit management and credit monitoring; Liquidity Management-Asset liability management- Securitizations- Incentives and benefits of Asset securitization; Bank Assurance: Benefits for banks and insurance companies; Mutual funds, their types; Electronic Banking.

Unit III

Risk Management: What are Risk- Perils and Hazards-types of risk-source of risk-method of handling risk; Career opportunity in Insurance Sector - Introduction of Insurance: nature of insurance-Purpose and need of insurance –how insurance works- insurance and economic development.

Unit IV

Insurance Market – Different types of life insurance plans - operations of insurance companies - specialist insurance companies – Provisions of IRDA Act 1999 - the role of regulators –New trends in Insurance Market.

Unit V

Principles of General Insurance: Utmost good faith-features-Breaches of utmost good faith-Insurable interest-meaning-features-how insurable interest is created-when insurance interest should exist-Indemnity-how indemnity is provided-measure of indemnity.

Suggested Readings:

Text Book:

1.Gurusamy, S. (2009). *Banking Theory Law and Practice.*Uttar Pradesh: Tata McGraw Hill.

Reference Books:

1. Gup, B. E&Kolari, J. W.(2005) .*Commercial Banking: The Management of Risks.*New Delhi: Wiley India.
2. Justin Paul, J & Suresh,P. (2010). *Management of Banking and Financial Services.*New Delhi: Pearson Education.
3. Reddy, B.P. N &. Dasaraju, H. (2011).*Dynamics of Commercial Banks in India*, Florida: Associated Publishers.

16 MBAP206 RESEARCH METHODOLOGY FOR MANAGEMENT 4 0 0 4

Course objectives:

To make the students

- To understand the basic framework of research and research process and its important in business decision.
- To learn the research situations from the management perspective
- To develop an understanding of various research designs and sampling techniques and its application.
- To identify appropriate sources of information and methods of data collection for solving a business issue.
- To understand the selection of appropriate tools to analyse the quantitative and qualitative data.
- Disseminate the knowledge of research report and be familiar with the content to be included in the report.

Course outcomes (Cos):

Learners should be able to

1. Assess the best suitable research type and formulate the research objective for the business problem.
2. Identify and design a research process to solve the real time issues in the organizations
3. Formulate the suitable research designs and select appropriate sampling techniques for the research.
4. Practice the appropriate data collection method for solving the business issue and decide the appropriate measurement scale for designing the instrument for data collection.
5. Evaluate the appropriate analytical tools for the data collected and formulate a suitable suggestion for the business problem.
6. Demonstrate capabilities of designing a suitable research report based on the principles of research.

Unit I

Research Methodology: Meaning – objectives - Scope and Significance- Types of research- Characteristics of good research-criteria for good research- objectivity in research - research process–Research in management decisions - Problems encountered by Researchers in India.

Unit II

Research Design: meaning- classification- features – importance- steps in research design-selection of research problem - Sample design- meaning- concepts- steps in sampling- criteria for good sample design – Types of sampling – Probability and Non probability sampling techniques.

Unit III

Data collection : Types of data - Methods of data collection –Collection of primary data – Sources of secondary data - constructing questionnaire - Pilot study - case study - Data processing: coding - editing - and tabulation of data - Measurement - meaning – need- Errors in measurement - scaling Techniques - meaning - Types of scales - scale construction techniques.

Unit IV

Data Analysis: Hypothesis – Meaning – Types – Procedure of testing hypothesis - Test of Significance - Assumptions about parametric and non-parametric tests. Parametric tests - Non-Parametric Tests: One sample run Test-Sign Test, Run test for randomness - Chi-Square Test, ANOVA, - Multivariate analysis - Factor analysis.

Unit V

Interpretation- Meaning – Techniques-Report Writing- Significance, Steps in report writing-Layout of report-mechanics of report writing- Precautions for Writing Report - Types of Reports- Oral Presentation- Executive Summary- Norms for Using Tables, Charts and Diagrams. Appendix: Norms for using index and bibliography- conventions relating to preparation of research reports.

Note: Problems 20 Marks (Unit – IV) and Theory 80 Marks

Suggested Readings:

Text Books:

1. Paneerselvam, R. (2014).*Research Methodology*. New Delhi: Prentice Hall of India Pvt Ltd.
2. Kothari, C.R. (2008). *Research Methodology: Methods and Techniques*. New Delhi: New Age International Pvt Ltd.
3. Deepak Chawala & NeenaSondhi.(2011). *Research Methodology Concepts and Cases* .New Delhi: Vikas Publishing House Pvt Ltd.

References:

1. Donald R. Cooper & Pamela S. Schindler. (2010). *Business Research Methods* (12th edition).Tata McGraw Hill.
2. Bill Taylor. (2007).*Research Methodology: A Guide for Researchers in Management and Social Science.* New Delhi: Prentice Hall of India Pvt Ltd.
3. William Zikmund. (2013). *Business Research Methods*. Mason: South Western Publishers.
4. Uma Sekaran. (2010). *Research Methods for Business*. New Delhi: Wiley India.

16 MBAP207 **MANAGEMENT PRACTICE II** **2 0 0 1**

Course Objectives:

To make the students

- To develop knowledge and demonstrate skills to manage various components of a management practice that includes organization, administration, communication, and managerial aspects.
- To develop and bring improvements in interpersonal Skills and Practice-Based Learning.
- To provide an insight to manage personality development.
- To improve critical thinking and problem solving skills
- To make them build self-confidence and be assertive in workplace
- To understand team building and team spirit in work environment

Course Outcomes (Cos):

Learners should be able to

1. Demonstrate punctuality and manage time in day to day activities
2. Develop new management techniques to carry out routine activities
3. Evaluate and gain leadership qualities and get organized
4. Ability to build good team and have positive spirit in workplace
5. Develop critical thinking and problem solving skills
6. Relate and gain Self-confidence and self-awareness to bring effective communication

Unit I

Time management – identifying time wasters – procrastination – delegation – time management tools – day to day time management techniques

Unit II

Leadership Techniques – Conflict resolution – Assertiveness – Team building – Team spirit – Interpersonal skills – Group interactive skills – Getting organized.

Unit III

Self confidence, positive attitude, communication, team player, critical thinking and problem solving, coping with pressure, flexibility, ability to accept constructive feedback, strong work ethic.

Suggested Readings:

References:

1. Swaminathan. V.D &Kaliappan. K.V.(2001).*Psychology for Effective Living*. Chennai: The Madras Psychology Society.
2. Robbins, S.B.(2005). *Organizational Behaviour*. New Delhi: Prentice Hall of India.
3. Hurlock, E.B. (2006) .*Personality Development*. New Delhi: Tata McGraw Hill.

16 MBAP208 COMMUNICATION PRACTICE II 2 0 0 1

Course Objectives:

To make the students

- Familiar with Verbal communication and Non- Verbal communication. To make the students understand presentation skills and its importance.
- To learn and demonstrate different communication styles and get trained.
- To improve body language and facial expressions to have effective communication.
- To learn to make powerful and effective presentation
- To understand the feedback system prevailing in the organization
- To develop critical thinking and problem solving attitude

Course Outcomes (Cos):

Learners should be able to

1. Organize and participate in public meetings
2. Develop powerful and effective presentations
3. Gain confidence in giving and receiving feedbacks
4. Students attain competence in functional use of communication during both academic and non-academic life situations.
5. To draft effective business correspondence with brevity and clarity.
6. To stimulate their Critical thinking by designing and developing clean and lucid writing skills.

Unit I

Non-verbal communication - personal appearance - posture - body language - visual & audio visual aids for communication -Conducting Meetings: Procedure – preparing Agenda, minutes and Resolution

Unit II

Presentation Skills – Elements of an effective presentation – structure of a presentation-presentation tools – Voice Modulation – Audience analysis - developing and delivering powerful presentations

Unit III

Effective and ineffective communication - Free speech – Giving and receiving feedbacks – Identifying communication styles – accelerated learning – memory techniques – speed reading – mind mapping – relaxation techniques

Suggested Readings:

References:

1. Sen, L.(2007). *Communication Skills*. New Delhi: PHI Learning Pvt Ltd.
2. Lesikar, R. V.(2008). *Basic Business Communication*.New Delhi: Tata McGraw Hill Education Pvt Ltd.
3. Locker, K. O. &Kaczmarek, S. K. (2007). *Business communication Building Critical Skills*. New Delhi: Tata McGraw Hill Education Pvt Ltd.
4. Pal, R &Korlahali.(2007). *Business Communication*. New Delhi: Nisha Publishers.

16 MBAP211 COMPUTER LAB - II: SPSS LAB 0 0 4 2

Course Objectives:

- The course has been introduced in order to make them use statistical package for their research
- Make the students to prepare data sheet and manipulate the data.
- Learn an organization's information systems and technology decision making processes.
- To gain in-depth knowledge on research situations from management perspectives
- To train them to access different statistical tools and interpret the results
- To gain data analytics skills to solve the business/Research problem.

Course Outcomes (Cos):

1. Effectively to apply the statistical package to analyze the research problem under study
2. Evaluate the usage of graphical presentation of data for dissemination of information to audience
3. To analyze the real time data by use of appropriate tools at any given situation in order to come with conclusion
4. Experts in handling data files and carry out basics statistical analysis
5. Get acquainted with advanced statistical tools and bring out appropriate solutions to business problems
6. Develop data analytics skills and meaningful interpretation to the data sets so as to solve the business/Research problem.

Unit I

SPSS – Meaning – scope- Limitation- Data view- Variable view- Data entry procedures

Unit II

Data editing- Missing- Frequencies Distribution – Diagram –Graphs.

U nit III

Descriptive statistics – Mean, Median, Mode, Skewness – kurtosis – Standard Deviation

Unit IV

T- Test for Independent sample and X test – ANOVA

Unit V

Correlation – Rank correlation – Regression – charts

Suggested Readings:

TextBook*:*

1. George, D. *SPSS for Windows step by step*.

16MBAP301 STRATEGIC BUSINESS MANAGEMENT 4 0 0 4

Course Objectives:

- To expose participants to various perspectives and concepts in the field of Strategic Management
- To get the knowledge on setting mission and vision for organization growth
- To help participants develop skills for analyzing business environment to the solution of business problems
- To carry out effective SWOT analysis and learn core competence of business
- To acquaint students with strategy formulation and implementation techniques
- To help students master the analytical tools of strategic management

Course Outcomes (Cos) :

1. Set the mission and vision in personal and organizational level
2. To analyze the environment in strategic planning and ability to take Strategic decisions
3. To be able to apply the basic concepts, principles and practices associated with strategy formulation and implementation.
4. To be able to analyze industry factors, and identify their impact on profitability and strategic positioning
5. To be able to assess the resources and constraints for strategy making in a business organization
6. Communicate effectively strategic evaluation and control techniques

Unit I

Strategic Management – Evolution, Elements in Strategic Management – Understanding Strategy - levels of strategy – strategic decision making – strategic management process – Mission – Vision – goals and objectives – strategic planning process - identifying critical success factors - Strategic management Practice in India. Competitive advantage of Nations and its implication on Indian Business

Unit II

Environment Analysis & Internal Analysis of Firm : Concept of Environment – Environmental sectors - General environment scanning – Industry analysis – Dynamics of internal environment - Assessing internal environment through functional approach and value chain–to identify the strength & weakness - to identify opportunities & threat – SWOT audit – core competence.

Unit III

Strategy Formulation: Generic Strategies – Grand Strategies – Strategies of leading Indian companies – the role of diversification – limits – means and forms. Strategic management for small organizations, non-profit organizations and large multi product and multiple market organizations

Unit IV

Strategy Implementation: Competitive cost dynamics – experience curve – BCG approach – cash flow implication – IA-BS Matrix – A.D. Little Life cycle approach to strategic planning – Business portfolio balancing – Assessment of economic contribution of strategy – strategic funds programming.

Unit V

Strategy Evaluation & Control: Various approach to implementation of strategy – Matching organization structure with strategy – 7S model – Strategic control process – Du Pont's control model and other Quantitative and Qualitative tools – Balanced score Card – M Porter's approach for Globalization – Future of Strategic Management.

Suggested Readings:

Text Book:

1. AzharKazmi,(2010).*Strategic Management and Business Policy*.(3rd Edition). New Delhi:TataMcGraw Hill.

References:

1. Bhattachary, S K &Venkataramin, N. (2006).*Managing Business Enterprise: Strategies, Structure and systems*.New Delhi: Vikas Publishing House.
2. Rao, V.S.P. (2004).*Strategic Management – Text & Case*. New Delhi: Excel Books Publishers.
3. Francis Cherunilam.(2010). *Strategic Management*. New Delhi: Himalaya Publishing House.
4. Fred, R. David.(2009).*Strategic Management: Concepts and Cases*. (13th edition).New Delhi:Prentice Hall India.

5. Gerry Johnson, KevanSchole& Richard Whittington.(2007). *Exploring Corporate Strategy: Text & Cases*.(7th edition).New Delhi: Prentice Hall India.
6. Budhiraja, S.B&Athreya, M.B.(2008).*Cases in Strategic Management*. New Delhi:TataMcGraw Hill.

16MBAP302 **4 0 0 4**

BUSINESS ETHICS, CORPORATE GOVERNANCE& SOCIAL RESPONSIBILITY

Course Objectives:

To make the students

- To develop knowledge and understand about the theoretical perspectives and frameworks of corporate governance, ethical, environmental and social dimensions.
- To learn the theories of stakeholders and adopt the policies to protect their interests
- To assess and understand social responsibility of business and its impact.
- To provide clear understand of environment and ecology and measures to preserve them for future generation
- To understand issues related to business and good governance necessary for long term survival of business.
- To learn new trends in corporate social responsibility

Course Outcomes (Cos):

Learners should be able to

1. Inculcate the ethical practices in personal and organizational life
2. Protect the long term interest of the shareholders and create policies that adopt by laws.
3. Reduce damages, deaths, personal suffering and to reduce mortality and morbidity
4. Maintain sense of social responsibility
5. Analyze ethical issues related to business and good governance necessary for long term survival of business.
6. Evaluate the emerging Areas and Trends in Corporate Social Responsibility

Unit I

Business Ethics - Nature, Characteristics and Needs, Ethical Practices in Management-Indian Values and Ethics - Respect for Elders, Hierarchy and Status, Need for Security, Non - Violence, Cooperation, Simple Living high Thinking, Rights and Duties, Ethics in Work life, Attitudes and Beliefs.

Unit II

Introduction –meaning and overview of corporate governance, corporate board-attributes, duties, responsibilities, liabilities, shareholders – rights, responsibilities of share holders, minority share holders protection. Ethical aspects of corporate governance

Unit III

History of corporate governance-Issues in corporate governance –Corporate Governance concepts and theories-Stewardship theory, Agency theory, Stakeholder theory. Corporate Governance and performance. Role of the regulatory framework -Legislation - Financial reporting

Unit IV

Corporate Social Responsibility-Meaning - Definition and Scope - operationalizing Corporate Social Responsibility for sustainable development - Responsibility of various stakeholders, perspectives and initiatives, Environment and Ecology, Health and well being.

Unit V

Emerging Areas and Trends in Corporate Social Responsibility - Business, Social, Environmental and Regulatory - Globalization and Corporate Governance - Case Study in CSR and Corporate Governance

Suggested Readings:

Text Books

1. Baxi,C.V. (2007). *Corporate Governance*.New Delhi: Excel books.

References

1. Mathur,U.C. (2005). *Corporate Governance & Business Ethics*.New Delhi:Macmillan.
2. Fred Weston, J. (2007). *Takeovers, Restructuring & Corporate Governance*.New Delhi: Pearson Education.
3. Singh, S. (2005). *Corporate Governance*.New Delhi: Excel books.
4. SwamiParthasarathy.(2007). *Corporate Governance*.Biztantra.
5. Christine, A. Mallin.(2008). *Corporate Governance*.(2nd edition). Oxford.
6. Subhash Chandra Das.(2008).*Corporate Governance in India*.New Delhi: PHI.

16MBAPF303A INTERNATIONAL FINANCIAL MANAGEMENT 4 0 0 4

Course Objectives:

- To make one to understand the global concepts used in financial management.
- To know the functions and its application in financial decision making.
- To get insights in the foreign exchange markets
- To gain knowledge on international financial decisions of various international financial institutions
- To get insights into the competencies required to become an effective financial manager
- To practice the students with the intricacies of international business in terms of investment with monetary systems.

Course Outcomes (Cos):

1. Identify the basis global trade and trade transaction mechanism
2. Analyze the foreign exchange rate and factors influencing fluctuations
3. Estimate the flow of Foreign Direct Investment and its impact on Indian economy
4. Ability to evaluate the functioning of international financial institutions
5. Assess the resources of Financing of foreign trade
6. To discover facts on foreign trade.

Unit I

International Trade – Meaning and Benefits –Basis of International Trade – Foreign Trade and Economic Growth – Balance of Trade –Balance of payment – Current Trends in India –Barriers to International Trade- World Trade Organization, Trends in world trade, International trade finance.

Unit II

Foreign Exchange Markets- Market Participants – Types of Transactions - Spot Prices and Forward Prices – Factors influencing Exchange rates – Determination of Foreign Exchange rate and Forecasting – Foreign Exchange Exposure - Measurement and Management.

Unit III

International investment decisions – Political risk - Foreign Direct Investment – Foreign Institutional Investors – International capital budgeting – International portfolio investment.

Unit IV

International financial decisions – Multilateral Development Banks – World Bank – International Finance Corporation – International banking – International financial market instruments- International Taxation and International Working Capital Management.

Unit V

Financing of foreign trade – Documentation - Mode of payment – Methods of trade financing – EXIM Bank, ECGC and its schemes - International taxation.

Suggested Readings:

Text Book:

1. VyuptakeshSharan.(2015).*International Financial Management*.New Delhi: Prentice Hall of India Pvt Ltd.
2. ThummuluriSiddaiah.(2015).*International Financial Management*. New Delhi:Pearson publication.

References:

1. Apte, P.G.(2008).*International Financial Management*.New Delhi: Tata McGraw Hill.
2. Eun.*International Financial Management*. New Delhi:Tata McGraw Hill.
3. Larceny & Bhattacharya.(2010).*International Marketing*.New Delhi:Sultan Chand & Sons.

16 MBAPF303B STRATEGIC COST MANAGEMENT 4 0 0 4

Course Objectives:

- To understand the concept of costing and cost reduction methods.
- To make students to learn to manage total cost and production costing.
- To provide knowledge on the process of various costing methods and management.
- To understand the concept involved costing related to business decisions.
- Provide insight in strategic cost management
- To learn the techniques of cost management that are effective and ethical

Course Outcomes (Cos) :

1. Illustrate the cost sheet and cost reduction methods to improve organizational productivity.
2. Estimate the total cost and production cost to source competitive advantage
3. Evaluate cost control systems and various costing methods and management
4. To analyze the cost function in mathematical methods.
5. Analyze productive results on cost management and reduction
6. Interpret knowledge in Market Based and Cost Based Transfer Prices and Multinational Transfer Pricing.

Unit I

Costing- Purpose- Utility, Objectives-Elements of Cost- Cost Sheet –Methods of Costing – Problems - Cost Reduction and Productivity: Cost Reduction Value Analysis – Productivity- Value added concepts- Learning curves- Quality Circles.

Unit II

Total Cost Management- Managing Process Cost- Managing Production Costs- Managing Delivery Costs- Managing Structural Cost. Target Costing - Cost as a source of competitive advantage - Life Cycle Costing

Unit III

Activity Based Costing - Drawbacks of Conventional Costing- Methodology of ABC - Merits, demerits suitability of ABC - Implementation of ABC. Management Control Systems - Evaluating Management Control Systems - Responsibility Centers- Evaluation of the Performance of Different Responsibility Centers- Problems.

Unit IV

Linear Programming and Regression Analysis- Implications of Linear Programming for Cost Accountants - Guidelines for Regression Analysis- Applications of Regression Analysis in Cost Functions.

Unit V

Strategic Control Systems - Decentralization and Transfer Pricing - Choices about Responsibility Centers-Market Based and Cost Based Transfer Prices- Multinational Transfer Pricing

Suggested Readings:

Text Book:

1. Horngren.(2008).*Cost Accounting*(4th Edition). New Delhi. AITBS Publications.
2. Vijay Govindrajan. (2000).*Strategic Cost Management*(3rd Edition). New Delhi: Wishwa Prakasham.
3. Jokhotiya,G.P. *Strategic Financial Management*. New Delhi: Vikas Publication Ltd.

References:

1 Antony.(2010). *Management Accounting*(3rd Edition).New Delhi: Tata McGraw Hill.

2 J Batty.J.(2007).*Management Accounting*(1st Edition). New Delhi:Vikas Publishing House.

3 Atkinson & Robert Haplan. *Advanced Management Accounting*. New Delhi: Prentice Hall of India.

4 Ajit Prasad.(2009). *Strategic Financial Management*. New Delhi: Vikas Publication Ltd.

16 MBAPF303C FINANCIAL SERVICES MANAGEMENT 4 0 0 4

Course Objectives:

- Understand the various ways of generating funds in to an organization and ways and means of investing surplus.
- To understand the regulation of merchant banking
- To know about mutual funds and the concept of factoring
- To learn the concepts of leasing and effective management of financial resources
- To provide knowledge on hire purchase and investment
- To understand the importance of various credit rating techniques

Course Outcomes (Cos):

Learners should be able to

1. To assess the regulation of merchant banking.
2. To estimate the benefits of mutual funds and the concept of factoring.
3. Classify the different factoring that helps in investment decision making
4. Develop skill to explore new avenues in business operations
5. Developing capabilities of evaluating leasing techniques
6. To manage hire purchase and investment.

Unit I

Nature and scope of Merchant Banking – Regulation of Merchant Banking – overview of Current Indian Merchant Banking Scenario – Procedural aspects of primary issue – Pre-issues Decision Making – Post Issue Management.

Unit II

Mutual Funds – Operation – Performance – SEBI guidance for Mutual Funds Securitization – concept, Securitization as a Funding Mechanism, Securitization of Residential Real Estate – Mortgages & Mortgage Investments.

Unit III

Concept of Factoring – Forms of Factoring Vs Bill Discounting – Factoring Vs Credit Financing – Factoring Vs Forfeiting – Evaluation of a Factor – Legal aspects of Factoring – Factoring Services in India – Bill of Exchange – Definition – Features.

Unit IV

Leasing – History & Development – Concept & Classification – Types – Advantages – Disadvantages- Legislative Framework – Supplier, Lessor, Lessee Relationship – Sub Lease – Default & Remedies – Lease Evaluation in Lessee's and Lessor's point of view.

Unit V

Hire Purchase – Concept & Characteristics – Rate of Interest – Legal aspects – Tax implication frame work for Financial Evaluation – Credit Rating – Concept – Types – Advantages & Disadvantages – Credit Rating Process – Credit Rating Agencies.

Suggested Reading:

Text Books:

1. Khan, M.Y. (2009).*Financial Services*(4th Edition). New Delhi: McGraw Hill.
2. Rameshbabu ,G. (2009).*Indian Financial System.* New Delhi: Himalaya Publishing House.

References:

1. Shanmugam, R.(2010).*Financial Services*.New Delhi: Wiley India Pvt Ltd.
2. Gurusamy, S. (2009).*Merchant Banking and Financial Services*(3rd Edition). New Delhi: Tata McGraw Hill Education Pvt Ltd.
3. Gordon, E.(2000). *Financial Markets & Services*. New Delhi: Himalaya Publications.

16 MBAPM303A **SERVICES MARKETING** **4 0 0 4**

Course Objectives:

- Provide a theoretical and practical basis for assessing services in a simple and understanding level.
- To understand the positioning and differentiation strategies and quality of services
- To make awareness and get insight in Pricing and distribution of service industry
- To get exposure to marketing of hospitality and financial services
- To clarify the marketing of Non-Profit Organizatiions
- To provide insights to the challenges and opportunities in services marketing

Course Outcomes (Cos):

Learners should be able to

1. Infer knowledge on services marketing to serve better in new services avenues
2. Create avenues for relationship marketing
3. Analyze several facets in the area of services marketing essential for the success of a service sector firm.
4. Understanding and determine segmentation of Services marketing
5. Acquire thorough knowledge in different services areas
6. Effectively provide knowledge to develop skills in financial services

Unit I

Services Marketing – meaning – characteristics of services – Service Environment – dimensions – Service Blueprint - Relationship marketing – Service Recovery – Service Expectations – Service Encounters - Service Quality – SERVQUAL – Service Leadership – Service Strategy – process – Service Triangle - Interactive Marketing

Unit II

Marketing Mix decisions: Service Products – Branding services – New service development - Pricing - Promoting and distributing services – segmentation- bases of segmentation-Positioning and differentiation strategies - Quality of service industries – customer support service

Unit III

Marketing of hospitality: Perspectives of Tourism, Hotel and Travel services – Airlines, Railway–Information Technology- Real estate services-courier services

Unit IV

Marketing of Financial services: Concept – features of Banking, Insurance, Lease, Mutual Fund, Factoring, Portfolio and financial intermediary services- Negotiation &parties involved in negotiation

Unit V

Marketing of Non-Profit Organizations: NGOs – Services Offered by Trust/Societies – Educational service – Miscellaneous services – Power and Telecommunication- Hospital services.

Suggested Readings:

Text book:

1. Christopher, Lovelock. Jochenwirtz.(2011)*Services Marketing-People, Technology, Strategy (*7th edition).New Delhi: Pearson Education.

References:

1. Jha, S.M. (2015).*Services Marketing*.New Delhi: Himalaya Publishing House.
2. RammohanRao. K. (2009).*Service Marketing*.New Delhi: Pearson education.
3. Roland & Anthony, (1999).*Service Marketing*. Addison-Wesley.

16 MBAPM303B SALES AND PROMOTIONAL MANAGEMENT 4 0 0 4

Course Objectives:

- To give a broad understanding of Sales Management and its implications.
- Help students understand the Sales & Distribution functions as integral part of marketing functions in a business firm
- To make understand the key terms and concepts in sales force management.
- To learn the role of advertising and media management in business.
- To provide information on Sales Promotion and Public Relations
- To sharpen decision making skills of future sales and distribution managers

Course Outcomes (Cos) :

Learners should be able to

1. Provide an understanding of the concepts, attitudes, techniques and approaches required for effective decision making in the areas of Sales and Distribution.
2. Analyze and pay special emphasizes on the problems and dilemmas in sales force management.
3. Identify distinguished Knowledge on advertisement management that helps to develop business.
4. Develop critical skills for generating, evaluating and selecting sales, advertisement media and distribution strategies.
5. Develop critical skills for generating, evaluating and selecting sales and distribution strategies.
6. Classify the Trade promotional tools and sales person promotional tools

Unit I

Nature and process of personal selling - Sales Management – Importance – Role of Sales Manager – Setting Sales Objectives – Sales Forecasting – Methods of Sales Forecasting-Sales Quotas & Territory – Sales budgeting – Types of Budgets – Budgeting Procedure

Unit II

Sales Force Management – Types of Sales Organizations - Sales Force Recruitment –Sources – Training –designing a training programme – Motivating Sales Force – Sales incentives, contests and compensation – Evaluating Sales Performance.

Unit III

Advertising Management – Meaning – Objectives – Importance – Classification of Advertisement – Economic and Social Effects of Advertisement – Organization of advertising Department– Campaign Planning and Advertising Budget.

Unit IV

Advertising media management – Types – Print, TV, Outdoor and Other forms – Advantages, Limitations, Media Rates, Media Planning and Scheduling. Advertising Copywriting for Print and Broadcast Media

Unit V

Sales Promotion and Public Relations – Sales Promotion - Objectives, Tools, Planning Implementation and Control. Public Relations – Objectives –Tools

Suggested Readings:

Text Books:

1. Richard, R., Edward, Cundiff. W & Norman.(2013).*Sales Management: Decisions, Strategies and Cases*.New Delhi: Prentice hall of India.
2. Chunawalla, S.A. (2007).*Advertising, Sales & Promotion Management*. New Delhi: Himalaya Publishing House.

References:

1. Gupta, S.L. (2009).*Sales and Distribution Management*. New Delhi: Excel Books.
2. Rajeev Batra, John, G. Myers & David A. Aaker. (2013).*Advertising Management.* New Delhi: Prentice Hall India Publishers.
3. Clow Baack.(2007).*Integrated Advertising, Promotion & Marketing Communication.* New Delhi: Prentice Hall India Publishers.

16 MBAPM303C MARKETINGRESEARCH & CONSUMER BEHAVIOR 4 0 0 4

Course Objectives:

- To give the students an understanding of marketing research from both user's (management) and doer's (the researchers) perspective.
- To design and produce, evaluate a research proposal & understand the quality of research studies.
- To acquaint with the factors influencing the consumer behavior and concepts to marketing decisions
- To provide the relevance of consumer behaviour models
- To learn the basic skills to conduct professional marketing research.
- To understand the applications of business research tools in Marketing decision making

Course Outcomes (Cos) :

Learners should be able to

1. To be able to appreciate the different perspectives of marketing research from both user's and doer's perspective.
2. To be able to formulate research proposal and evaluate it.
3. To be able to conduct professional marketing research.
4. Apply business research tools in marketing decision making.
5. To generate new models of consumer behavior
6. Evaluate the effectiveness of marketing programmes on consumption decisions

Unit I

Marketing Research – Scope–Types & uses of marketing research-Marketing Research & decision making – Research Design – The Marketing Research process – Exploratory, descriptive and conclusive Research. Primary and Secondary methods of data collection – Construction of questionnaire

Unit II

Research Categories- Applications of Marketing Research – Product Research – Advertising Research – Market and Sales Analysis Research –Export Marketing Research - Motivation Research - Application of marketing research.

Unit III

Consumer Behaviour- Need to study Consumer Behavior – Applications of consumer behaviour principles to strategic marketing- Models of Consumer Behaviour – Market segmentation and Consumer Behaviour-Factors influencing Consumer Behaviour – Social, Economic, Psychographic, Group influences.

Unit IV

Elements of Consumer Behaviour - Product Perception – Learning, Attitude, Personality - New Product Purchase, Repeat Purchase, Consumer Spatial Behaviour – Consumption Analysis – Product Usage Rates – Expenditure Pattern – Howard-Seth Model of Buyer Behaviour – Organizational Behaviour of buyer.

Unit V

Consumer Decision Processes –Buying Pattern -Problem recognition – Search and Evaluation – Purchasing Processes– Post-purchase behaviour – Consumerism-Impact of consumerism on Marketing Practices – Industrial and Domestic consumer characteristics.

Suggested Readings:

Text book:

1. Paul, E.Green, Donald, S. Tull& Gerald Albaum. (1996).*Research for Marketing Decision*. New Delhi: Prentice Hall India Publishers.

References:

1. Naresh,K., Malhotra. (2007).*Marketing Research.* New Delhi: Prentice Hall India Publishers.
2. Raju, M.S& Dominique Xardel,.(2009).*Consumer Behaviour Concepts*, *Application & Cases.*New Delhi: Vikas publishing house.
3. Arun Kumar & Meenakshi, N. (2006).*Marketing Management*. New Delhi: Vikas publishing house.

16 MBAPH303A HUMAN RESOURCE DEVELOPMENT 4 0 0 4

Course Objectives:

- Helps to recognize the dynamic relationship between strategy, people, technology, and the processes that drive organizations.
- To develop knowledge on analyzing individual and group behavior
- It helps students to understand the key HRD concepts and techniques that can be applied in everyday managerial decision-making.
- To make them understand the techniques of managing conflict and create better environment
- To gain insight in the HRD-OD approach to industrial relations
- To learn about cross cultural dimensions and its impact

Course Outcomes (Cos):

Learners should be able to

1. Recognize the dynamic relationship between strategy, people, technology, and the processes that drive organizations.
2. Acquire skills in analyzing individual behaviour and group behavior
3. Talent in managing conflict in personal and organizational level
4. Learn to evaluate work-life balance
5. Gain knowledge of culture which helps to integrate people
6. Analyze the cultural dimensions that helps to manage people in an individual, organization and society life

Unit I

Introduction to HRD – Meaning – Scope – Importance – Need for HRD – HRD and HRM – Role of HRD professionals – Key Performance Areas – HRD mechanism- Designing effective HRD programs- Framework of HRD process.

Unit II

Individual Behavior: Personality - Perception - Role – Fatigue - Goal Conflict - Frustration – Interpersonal relationship – Group Behavior – Group Dynamics - Group Cohesiveness – Elements for understanding group behavior - Teams – Characteristics.

Unit III

Potential Appraisal – Criteria – Career Planning - Career Development - Succession Planning - Altruism –Determinants - Organization Co-operation –factors – Competition - Benefits- Conflicts-Types/Levels – Consequences – Prevention - Management of conflict.

Unit IV

Quality of work life(QWL) – Scope - Ways to increase QWL – Quality Circle – Process - Organization Effectiveness –Concept – Kaizen – Benchmarking-Just-in Time – Downsizing – Outsourcing-Organizational Change-Change Process-Resistance to Change-Requisites for Successful Change.

Unit V

HRD Cross Cultural Dimensions - HRD Climate –HRD-OD Interface – HRD-OD Approach to Industrial Relations — HRD Experiences in India – Emerging Trends and Perspectives- HRD Scenario in Indian Organization-Problems and prospects- Challenges and Issues in HRD.

Suggested Readings:

Text Book:

1. Rao,V.S.P.*Human Resource Development*. New Delhi: Himalaya Publishing House.
2. Krishnaveni, R. (2009).*Human Resource Development*. Excel Books.
3. LalithaBalakrishna.(2010).*Human Resource Development*. New Delhi: Himalaya Publishing House.

References:

1. UdaiPareek.(2007).*Human Resource Development*.(3rd Edition). London: Oxford and Indian Book House.
2. Kandula, S.R, *Strategic Human Resource Development*. New Delhi: Prentice Hall of India.
3. John, P.Wilson. (2005).*Human Resource Development*.(2nd Edition). Kogan Page Publishers.
4. Tripathi, P.C. *Human Resource Development*. New Delhi: Sultan and Sons.

16 MBAPH303B MANAGING INTERPERSONAL EFFECTIVENESS 4 0 0 4

Course Objectives:

- The course creates self awareness through Transactional analysis for the personal growth of the students.
- Understanding communication and its effectiveness.
- Understand the effect of behaviour has on oneself, other people and on the organisation
- To understand ego states and transaction analysis
- To enhance assertiveness in individual life.
- To overcome barriers through effective counseling.

Course Outcomes (Cos) :

Learners should be able to

1. Improve self awareness and enhance self motivation
2. Develop communication and language which increases confidence in personal and public life
3. Enhance individual assertiveness
4. Focus on benefits of transactional analysis
5. Demonstrate meeting skills as interpersonal skills
6. Formulate the counselling techniques which when applied helps to overcome problems efficiently.

Unit I

Self – Definition - Perception - Self-Schemes - Gaining Self-knowledge - Self-awareness - Self-Effectiveness - Self-Presentation - Motivation and Strategies - Self-monitoring - Impression management-Self esteem.

Unit II

Communication and language – Models- Oral – Qualities and Profile of Good Speakers - Written – Clarity, Responsibility, Simplicity, Style– Barriers - Ways of overcoming –Paralanguage, Eye contact, Facial Expression, Kinesics, Body Language, Deception

.

Unit III

Assertiveness – Nature - Importance & relevance to organizational life – Assertion and Aggression - Assertive writing - Preparing for Assertive Business Writing – Tools, Tips, Pitfalls - Persuasion - When to say Yes/No - Being Assertive with Oneself –cutting , Rewriting, editing - Enhance individual assertiveness.

Unit IV

Transaction Analysis - Ego states – Exclusion – Contamination – Strokes - Life position - Type of transactions - Time Structure – Withdrawal, Rituals, Pastimes, Activities, Games-types, Stamps, Racket and Sweat shirts, Scripts - Advantage and Disadvantage of TA.

Unit V

Counseling -Steps -Elements of counseling – Counseling as a helping strategy - Significant Predicating People's Problem - Journey in a Life Space – Anxiety - Counseling to develop organizations - Check list for counselors - Training for counseling

Suggested Readings:

Textbook:

1. Venkatapathy, R.& Jackson, P.T.Aditya. (2009). *Managing Interpersonal Effectiveness*. New Delhi: Himalaya Publishing House.

References:

1. Thomas Haris.(2007). *I'm Okay You're okay* .New Delhi: Himalaya Publishing House.
2. Fisher Uray. (2009). *Getting to say Yes*. New Delhi: Himalaya Publishing House.
3. Albert & Emmonds, M. (2009).*Complete guide to Assertive Living*. New Delhi: Jaico Publishing house.

16 MBAPH303C ORGANIZATIONAL DEVELOPMENT 4 0 0 4

Course Objectives:

- To understand the purpose, process and applications of human resource planning in the context of different organizational strategies.
- To make the students be aware of the need and ways of changes in organization as a whole.
- To develop the concepts of OD interventions at group and organisational level.
- To know the impact of group dynamics and its impact on organizational productivity
- The course intends to gain a thorough understanding of the organization's ability to assess its current functioning. to achieve goals
- The students gain ability to implement tools of intervention for effectively bringing change.

Course Outcomes (Cos):

Learners should be able to

1. Application of various organizational theories in designing the structure
2. Analyze the role of innovation, decision making process in building organizational culture and ethics.
3. Handle the challenges in bringing Change in Organizational performance
4. Gain ability to implement tools of intervention for effectively bringing change
5. Have practical awareness about the current trends in organizational development in companies.
6. Analyze the prospects of OD in Indian Organisations

Unit I

Introduction to Organizational Development: Concepts - Nature and Scope - Meaning and Definition –Characteristics of OD: Historical perspective of OD: Underlying Assumptions, Beliefs and Values in OD - Foundations of OD – Models and theories.

Unit II

Group Dynamics, Inter group Dynamics and Organization as System - Organizational Climate – The process of OD – Operational components of OD: Diagnostics, Action and process – Maintenance components.

Unit III

Introduction to OD Interventions: Classifications of OD interventions - Team Interventions: Inter-group and third party - peacemaking Interventions: Personnel, Interpersonal and group process interventions - Comprehensive Interventions: Structural Interventions and applicability of OD.

Unit IV

OD strategies at work - Implementation and assessment of OD - Failure and success in O.D efforts - Assessment of OD and Change in Organizational performance: The impact of OD.

Unit V

Key considerations and Issues in OD: Issues in consultant- Client relationship: Power, politics and OD – Research on OD –Ethical issues in OD-The future prospects of OD - Indian experience in OD.

Suggested Readings:

Text Book:

1. Wendell, French. L& Cecil, H. Bell Jr. (2008). *Organization Development*. New Delhi: Prentice Hall Of India.

References

1. Raimann Pattanayak.(2009).*Training for Organisation Development*. Anmol Publishing House.
2. Beckhard and Richard. (2007).*Organisational Development: Strategies*. New Delhi: Prentice Hall India.
3. Wendell, French.L & Cecil, H.Bell Jr.(2008). *Organisation Development Behaviour Science Interventions for organization Improvement*. New Delhi: Prentice Hall of India.
4. Kavita Singh. (2009). *Organization Change and Development*. New Delhi: Excel Books.

16 MBAPS303A SYSTEM ANALYSIS AND DESIGN 4 0 0 4

Course objectives:

- Students understand the business system concepts and role of systems analyst
- Understand the processes of constructing the different types of information systems
- Provides knowledge on system planning and investigation
- To make the students to know the use of systems design techniques, methodologies, and tools
- Make students proficient in systems specializations.
- To make the students understand the system implementation and security aspects of system

Course Outcomes (Cos):

1. Effectively perform the role of system analyst
2. Construct a model to carry out the feasibility study and cost benefit analysis
3. Comprehend knowledge on system design and system security to improve the productivity of system management.
4. Implement code of ethics in system management
5. Provide a solid foundation of systems principles and an understanding of how business function is carried on
6. Gain expertise in system testing and quality assurance

Unit I

Overview: Introduction-Business Systems concepts, The system development life cycle –Life cycle models - Prototyping model, Incremental model, Spiral model, RAD model- Role of systems analyst.

Unit II

System Analysis: System planning and Initial Investigation-Information gathering-Tools of structured analysis-Feasibility study - Cost benefit analysis.

Unit III

System Design: The process and stages of system design-Major development activities-Input and output forms design-File organization and database design-Sequential -Logical and Physical views of data-Normalization.

Unit IV

System Implementation: System testing and quality assurance-The nature of test data-The test plan-Quality Assurance-Role of the data processing auditor-Implementation and software maintenance hardware/software selection.

Unit V

System Security: Introduction - Definition and Threats to system – Security - Control measures. Disaster/recovery planning: The plan - Ethics in system development - Ethical codes and standards of behavior.

Suggested Readings:

Text book:

1. Awad, E. M. (2010). *System analysis and design* (2nd Edition).New Delhi: Galgotia publication.

References:

1. Jr Jain. V.K . (2009) .*System Analysis and Design*(1st edition). New Delhi: Dream Tech Press.
2. Senn. (2009). *Analysis and Design of Information System*. New Delhi: McGraw Hill.
3. AlliBaharami.(2010).*Object Oriented Systems Development* (1st edition). New Delhi: McGraw Hill.

16 MBAPS303B EMERGING TRENDS IN TECHNOLOGY 4 0 0 4

Course Objectives:

- Disseminate knowledge to students on recent trends and developments in technology which covers e-Commerce e-Security, e-Logistics and knowledge management aspects.
- Learn about the physical components needed for information system in Nanotechnology.
- To acquaint with network security systems.
- To provide a clear understanding of e-learning models on e-logistics and supply chain management.
- To give better understanding of knowledge management
- To provide clear view on GIS Standards &Standardization process of GIS development

Course Outcomes (Cos) :

1. Familiarity with e-commerce simples the workload in personal and organizational system.
2. Develop skills on e-security which improves the efficiency in work.
3. Helps to develop network security in relevant areas
4. Design a e-learning models that provides a clear understanding on e-logistics and supply chain management.
5. Illustrate how current technologies and decision-support tools can be utilized to the advantage of business operations
6. Communicate effectively knowledge management techniques

Unit I

E-Business- Models of E-Commerce- Limitations and Advantages of E-commerce – Banking-Transactions: Inter-Banking, Intra Banking, Electronic Payments, (Payment-Gateway Example)-Securities in E-Banking-SSL, Digital Signatures, Service Provided- ATM Smart card, ECS-Electronic Clearing System- Telephone, Electricity Bills - E-commerce opportunities and challenges for Indian Industrialists.

Unit II

E-Security- Firewalls - Electronic Market - E-shop - Introduction to Security - Types of Securities, Security Tools, Network Security. CRM: Sales, Marketing and Service Management, BPO/BCP – Needs – Guidelines-Merits & Demerits, Call Center-Functioning, Ethics, Disaster Recovery Management.

Unit III

Content Management and Disseminations: E-learning-Models WBT, CBT, Virtual Campus, LMS&LCMS, Video conferencing, Chatting, Bulleting, Building Online community, Asynchronous and Synchronous Learning.

Unit IV

E-Logistics- Logistics and Supplier Chain Management, Warehousing management, Transportation/Distribution Management. E-Governance models- G2B, G2C, C2G, G2G-Challenges to E-Governance, Strategies and Tactics for implementation of E-Governance.

Unit V

Knowledge Management-Components- Types –models-Knowledge Management Cycle – tools-approaches.GIS/GPS-Nature of geographic data, Spatial objects & data models, Getting map on computers, GIS Standards &Standardization process of GIS development, Implementation and deployment Phases.

Suggested Readings:

Text Book:

1. Gaynor, G . H. (2009) *Handbook of Technology Management*.New Delhi: Tata Mcgraw Hill.

References

1. Agarwal, A. (2008) *Governance: Case Studies.*, Hyderabad: India Universities Press .
2. Jawadekar. *Management Information System*. New Delhi: McGraw Hill Education Books
3. AmritTiwana. *The Essential Guide to Knowledge Management*. New Delhi:Prentice Hall

16 MBAPS303C SOFTWARE DEVELOPMENT 4 0 0 4

Course Objectives:

- To make students understand the the impact of the implementation of new software, hardware, and networking technologies
- Provides knowledge on process models that can be utilized to the advantage of business operations
- To understand the process of software design and components
- To know about the life cycle process of the software testing and methods
- To know about the concept of quality in software development.
- To exhibit knowledge software configuration and management

Course Outcomes Cos) :

1. Design models to manage the data resources of organizations.
2. Expertise on software design creates career opportunities
3. Hands-on implementation of a data base in corporate environment
4. Gain knowledge in software design
5. Helps to bring new techniques in Software testing
6. Expertise in Software Configuration and Management

Unit I

Fundamentals - A Generic View of Process – Process Models – The Waterfall Model – Incremental Model – Evolutionary Model – Specialized Model – The Unified Process – Agile Process – Agile Models – Software Cost Estimation – Planning – Risk Analysis – Software Project Scheduling.

Unit II

Requirement Analysis -System Engineering Hierarchy – System Modeling – Requirements Engineering: Tasks – Initiating the Process – Eliciting Requirements – Developing Use Cases – Negotiating Requirements – Validating Requirements – Building the Analysis Models

Unit III

Software Design - Design Concepts – Design Models – Pattern Based Design – Architectural Design – Component Level Design – Component – Class Based and Conventional Components Design – User Interface – Analysis and Design.

Unit IV

Software Testing – Strategies: Conventional – Object Oriented – Validation Testing – Criteria – Alpha – Beta Testing – System Testing – Recovery – Security – Stress – Performance – Testing Tactics – Testing Fundamentals – Black Box Testing – While Box Testing – Basis Path – Control Structure.

Unit V

Software Configuration and Management – Features – SCM Process – Software Quality Concepts – Quality Assurance – Software Review – Technical Reviews – Formal Approach To Software Quality Assurance – Reliability – Quality Standards – Software Quality Assurance Plan.

Suggested Readings:

Text Book:

1. Pressman, S. R.(2007).*Software Engineering: A Practitioner's Approach*(6th Edition), Tata McGraw Hill.

References:

1. Fleeger. P. (2009).*Software Engineering*. Prentice Hall of India.
2. Ghezzi, C, Jazayari, M,Mandrioli, D. (2010). *Fundamentals of Software Engineering*. New Delhi: Prentice Hall of India.
3. Sommerville. (2011).*Software Engineering* (7thEdition). Addison Wesley.

16 MBAPE303A ENTREPRENEURIAL FINANCE 4 0 0 4

Course Objectives:

- To make the students understand the ways and means of finance for entrepreneurs.
- To get familiar with various sources of funds available for capital formation.
- To highlight the importance of various decision making areas of financial management
- Students get acquainted with the short term sources and cash management
- Knowledge on venture capital, hire purchase and leasing
- To train the students in project plan preparation.

Course Outcomes (Cos):

1. Estimate planning and capital expenditures related to project.
2. Developing the skills required to be a successful entrepreneur.
3. Evaluate the ways and means of raising funds to the business including forms of financing.
4. Develop competency in venture capital, hire purchase and leasing
5. To maintain ethical standards in individual and business life
6. The student will be able to apprehend different level of facilities available to run the business

Unit I

Capital Expenditures – Concepts - Phases of Capital Budgeting - Levels of Capital budgeting - Estimation of Project Cash flows - Time value of money. Payback Period - NPV - IRR - Cost of acquiring capital - Risk Analysis - Economic Risk - Industry Risk.

Unit II

Sources of Finance- Long Term Sources - Equity Shares, Preference Shares and Debentures - Kinds of Private Placements – IPO – SEBI – FDI - Institutional Finance - Banks - Merchant Banks in India - NBFC's in India - Small and Medium Business in India.

Unit III

Support from Banks and Financial Institutions - Bills Discounting - Factoring - Working Capital - Concepts - Importance – Cash Management.

Unit IV

Project Appraisal – Economic Analysis: Economies of Scale - Employment Generation - Social Cost Benefit Analysis - Contribution to Government Revenue - Political Stability - Priority and Evaluation of International Competitiveness. Project Monitoring – Post Sanction Supervision and Follow up –Warning Signals and Causes – Rehabilitation of a Sick Industrial Unit – Role of the Board for Industrial and Financial Reconstruction (BIFR)

Unit V

Business Ethics - Definition and Importance - Benefits of Business Ethics - Emerging Ethical issues in Business - Ethics as a Dimension of Social Responsibility

Suggested Readings:

Text book:

1. M. Y. Khan. *Indian Financial Systems*. New Delhi: Tata McGraw Hill Publishing.

References:

1. Chandra. P.*Projects - Planning, Analysis, Selection, Implementation and Review* .New Delhi: Tata McGraw.
2. Gordon & Natarajan. *Financial Markets.*BPB Publications.
3. Bhalla. V. K. *Investment Management*. New Delhi: S. Chand & Company Publishers ltd.
4. Finnerty , J . D.*Project, Financing- Asset based Financial Engineering*. New York: John Wiley & Sons Inc.

16 MBAPE303B ENTREPRENEURSHIP DEVELOPMENT 4 0 0 4

Course Objectives:

- Developing the entrepreneurial skill and promoting the qualities, traits, of entrepreneur and is taught in this course.
- To make them understand the value of entrepreneurial promotions and economic development.
- To provide an overview of the competences needed to become an entrepreneur
- To make them know the available international entrepreneurship opportunities
- Provides knowledge on steps for starting a small industry
- Gain understanding on the role of government in promoting entrepreneurship

Course Outcomes (Cos):

1. Students will gain awareness of entrepreneurial skills
2. Knowledge to setup new ventures and make profitable business
3. Capital Budget planning and carry out feasibility study
4. Generating innovative ideas and find ways to apply these ideas to solve issues and problems in different industries and settings.
5. Knowledge to appraise the environment and start new ventures
6. Analyze the role of government in business

Unit I

Entrepreneur - Meaning- Importance-Qualities, Nature, Types, Traits, Culture, Similarities and Economic differences between Entrepreneur and Intrapreneur. Entrepreneurship development- Its importance- Role of Entrepreneurship – Agencies of Entrepreneur.

Unit II

Business plan process - Sources of information - Internet, Government sources and Statistics - Offline research resources - Library - SBDC'S -Trade and Industries Associations - Sources of market research - Evaluating data- Benefits of market study -Coverage of market study - information sources.

Unit III

Creating and Starting the venture - Steps for Starting a Small Industry - Selection of types of organization - International entrepreneurship opportunities.

Unit IV

Managing, Growing and Ending the New Venture - Preparing for the New Venture - Early management decisions - Managing early growth of the New Venture - New Venture Expansion Strategies and Issues - Going public - Ending the venture.

Unit V

Role of Central Government and State Government in promoting Entrepreneurship - Introduction to various incentives, subsidies and grants - Export Oriented Units - Fiscal and Tax Concessions available. Women Entrepreneurs - Reasons for low / no women Entrepreneurs their Role, Problems and Prospects

Suggested Readings:

Text book:

1. Vasanth Desai. *Dynamics of Entrepreneurial Development and Management*.New Delhi: Himalaya Publishing House

References:

1. Srinivasan, N .P. &Gupta, G. P. *Entrepreneurial Development*.New Delhi: Sultanchand&Sons.
2. Saravanavelu.P. *Entrepreneurship Development*.Eskapee Publications.
3.Taneja, S. *Entrepreneur Development*. New Delhi: New Venture Creation.
4. Hisrich, R. D, Peters, M .P. *Entrepreneurship Development*.New Delhi: Tata McGraw Hill.

16 MBAPE303C **PROJECT MANAGEMENT** **4 0 0 4**

Course Objectives

- To make students understand all aspects of Project Management covering project identification formulation, planning, scheduling & control.
- Enable students to acquire concepts, tools & techniques of project management.
- To sensitize the students to complexities of project management.
- To enhance the students of project financing and development banks
- To know the implementation of project and preparation of project report
- To evaluate the project performance and evaluation of costs.

Course Outcomes (Cos):

1. Inculcate in the students the expertise required for formulating project ideas and projecting cash flows as well as evaluation of project proposals.
2. To analyze project feasibility
3. To know the difficulties in project implementation and provide solutions
4. Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.
5. Helps students to develop project models
6. Initiate students to carry out social and government projects

Unit I

Project Management – Concept of a Project – Categories of Project - Project life cycle-Definition of Project Management - The project as a Conversion Process - Project Environment - complexity of projects - Relationship between Project Management and Line Management - Current issues in project management- System approach to project management - Roles and responsibilities of project manager.

Unit II

Project feasibility study- Market Feasibility- Technical Feasibility-Financial Feasibility Economic Feasibility-Critical Success factors- Demand Forecasting Techniques.

Unit III

Project Implementation - Stages - Bottlenecks in Project Implementation -Guidelines for effective implementation - Management techniques for project management - Project monitoring

- Essentials - Roles - Tools and Techniques - Project Management environment - Management reporting - Report designing - Project evaluation - Project review.

Unit IV

Project Direction – Communication in Project – Project Coordination – Project Control – Scope / Progress in Control – Performance Control – Schedule Control – Cost Control.

Unit V

Government projects – Social projects – Import substitution projects – Incentives from State/ Central Government – Advanced management in projects – Strategic management in projects – Future challenges for project management.

Suggested Readings:

Text Book:

1. Prasanna Chandra. *Project Planning, Analysis, Selection, implementation and Review*. New Delhi: TataMcGraw Hill Publishing Company Ltd

References:

1.Harvey Maylor. *Project Management.* New Delhi: Macmillan India Ltd.

2. Narendra Singh. *Project Management and Control.* Bombay: Himalaya publishing house.

3. Choudhury, S. *Project Management.* New Delhi: Tata McGraw Hill publishing

4. Goel, B.B. *Project Management Principles & Techniques* .New Delhi: Deep & Deep publications Pvt Ltd.

5. Harold Kerzner. P*roject Management - A systems Approach to Planning Scheduling and Controlling*. New Delhi: CBs Publishers & Distributors.

16MBAPB303A FUNDAMENTALS OF COMMERCIAL BANK MANAGEMENT 4004

Course objectives:

- To understand the history and growth of banks and process of financial intermediation
- To understand the basic concepts of advances, deposits and Negotiable Instruments Act.
- To make the students understand the nuances of modern banking.
- To know the principles for lending services and other agency services of financial institutions
- To know the procedure for Opening of bank accounts, Types of deposit account: Savings account, Current account
- To provide the knowledge of e-banking and its impact of business operations

Course outcomes (Cos):

1. Analyze the banking services offered and recommendations of committees on banking process.
2. Categorize various Negotiable Instruments**,** Duties of paying and collecting banker
3. Create bank account and evaluate the bank rate for securities
4. Demonstrate knowledge of the liabilities of paying and collecting banks - bills of exchange and promissory notes.
5. To assess various services provided by the banks
6. Gain knowledge in e-banking ,m-banking and Cheque Transaction System

Unit I

Introduction to Banking: Role of banks, Brief History of banking in India, Structure of banking sector in India, Rationale of Banking Sector reforms, Basel Committee recommendations, Banker Customer relationship, RBI Act (Salient Features), Latest recommendations of Basel Committee.

Unit II

Negotiable Instruments – Cheques **-** Meaning, Characteristics, Crossing, Endorsement, Duties of paying banker, Duties of collecting banker, Bouncing of cheques - Liabilities of paying and collecting banks

Unit III

Deposits **-** Opening of bank accounts, Types of deposit accounts: Savings account, Current account, Fixed deposit, RECURRING deposit, Certificate of deposit, KYC Norms - Monthly income plan.

Unit IV

Advances - Principles of Sound Lending, Methods of granting advances, Types of securities, Modes of creating charges, Bank guarantees, Interest rates: Base rate, Fixed vs. Floating rates, Registration of charges with ROC - RBI norms on bank charges

Unit V

Other Services - ATM, EFT, e-banking, m-banking, Cheque Transaction System, Ancillary Services: DD, Safety deposit lockers, Credit cards, Debit cards, Smart cards, NEFT/RTGS, Call center.

Suggested Readings:

Text Book:

1.Gurusamy, S.(2009). *Banking Theory Law and Practice.*Uttar Pradesh: Tata McGraw Hill.

References:

1. Benton E. Gup., & James W. Kolari. (2005). *Commercial Banking: The Management of Risks.* New Delhi: Wiley India.
2. Justin Paul.,&Padmalatha Suresh. (2010). *Management of Banking and Financial Services.* New Delhi: Pearson Education.
3. Narasa Reddy, B.P., &HimachalamDasaraju. (2011). *Dynamics of Commercial Banks in India.* Florida: Associated Publishers.
4. Timothy W. Koch., & Scott Macdonald, S. (2009). *Bank Management.* Bangalore: Thomson South-Western.

16MBAPB303B RESOURCE MOBILIZATION – DEPOSITS 4 0 0 4

Course objectives:

- To know the banker customer relationship and KYC norms
- To understand the basics of low cost, no cost and high cost deposits.
- To study on importance of nomination and the rules governing non-resident accounts.
- To understand the various types of term deposits
- To understand use of decision tools for effective resources mobilization and management
- To study the Nomination facilities, Deceased accounts, Inoperative accounts, Accounts of non-residents

Course outcomes (Cos) :

1. Create bank deposits and aware of banking relationship
2. Infer knowledge of saving deposits and its process
3. Demonstrate the creation of current account and its process
4. The knowledge of Payment of interest and Service charges, Issue of cheque books, closing of accounts
5. Knowledge of opening accounts and building customer relationship
6. Illustrate the different types of deposits and nomination facilities available

Unit I

Opening of deposit accounts - Relationship with customers, Opening of accounts: Individuals, Illiterate persons, Minors, Blind persons, Firms, Associations and Limited Companies, HUF

Unit II

Savings deposits - Introduction, Savings Bank account rules, Passbooks/Statement of accounts, Payment of cheques, Collection of cheques, Payment of interest and Service charges, Issue of cheque books, Closing of accounts.

Unit III

Current Deposits - Introduction, Current account rules, Procedure of return of unpaid cheques, Minimum balance, Service charges, Statement of current accounts, Closing of accounts.

Unit IV

Term deposits - Introduction, Various types of term deposits: Fixed deposit, Monthly income plan, Recurring deposit, Payment of deposit: On due date, Pre-payment, Renewal of deposits, Advances against banks own deposit - Base rate

Unit - V

Other Aspects - Nomination facilities, Deceased accounts, Inoperative accounts, Accounts of non-residents: NRE, NRO and FCNR accounts - DICGCI (Deposit Insurance alone) – NRI.

Suggested Readings:

Text Book:

1. Muraleedharan,D. (2009). *Modern Banking: Theory and Practice*. New Delhi: Prentice Hall of India.

References:

1. Jyotsna Sethi.,& Nishwan Bhatia. (2013). *Elements of Banking and Insurance.* New Delhi: Prentice Hall of India.
2. Peter S. Rose.,& Sylvia C. Hudgins. (2012). *Bank Management & Financial Services.* New Delhi: Tata Mc Graw Hill.
3. Reserve Bank of India. (2000). *Non – Resident Accounts*, Mumbai: Foreign Exchange Dealers Association of India.
4. Reserve Bank of India, (1992). *Non – Residents Accounts*, Mumbai: Foreign Exchange Dealers Association of India.

16MBAPB303C RESOURCE DEPLOYMENT – SMALL LOANS 4 0 0 4

Course objectives:

- Understand the purpose of lending and the elements of income for banks.
- Understand the types of credit facilities and the procedure for granting various types of advances
- Understand the different types of securities and the methods of creating charges.
- To know the Agricultural Lending, Direct and Indirect Finance, and financing of Micro and Small enterprises
- To disseminate the knowledge of various financial bills
- To provide clear understanding of various credit available to customers and calculation of EMI

Course outcomes (Cos):

1. Create bank deposits and aware of banking relationship
2. Infer knowledge of saving deposits and its process
3. Demonstrate the creation of current account and its process
4. The knowledge of Payment of interest and Service charges, Issue of cheque books, closing of accounts
5. Knowledge of opening accounts and building customer relationship
6. Illustrate the different types of deposits and nomination facilities available

Unit I

Introduction to Advances – Lending - Profit maximization: Spread, Burden, Net Interest Income, Net Interest Margin, Net Interest expenses, Non Interest Expenses, Non-Interest income – Cost minimization.

Unit II

Credit facilities and Securities **-** Principles of Sound lending, Methods of granting advances, Types of Securities, Modes of creating charges, Floating charge, Consortium lending, Credit syndication - Pledge of shares

Unit III

Priority Sector advances **-** Rationale of Priority Sector advances, Targets and sub targets under priority sector advances, Agricultural Lending: Direct and Indirect Finance, Micro and Small enterprises, weaker sections – SIDBI

Unit IV

Bills Business **-** Introduction to Bills, Bills Purchased (clean bills), Bills purchased (Demand documentary bills), Bills discounting (Usance Bills) - Foreign bills

Unit V

Retail Lending **-** Home loans, Educational loans, Credit Cards, Consumer loans, other personal loans, Calculation of EMI: Effect of quantum of advance, repayment period and Interest rates on EMI. Impact of fixed and floating rates

Suggested Readings:

Text Book:

1.Narayanan, M.P., & Vikram K. Nanda.(2013). *Finance for Strategic Decision Making: What Non-Financial Managers Need to Know*. New Delhi: Wiley publication.

References:

1. Prasanna Chandra.(2000). *Finance Sense: An Easy Guide for Non- Finance Executive.* New Delhi: Tata McGraw Hill.
2. Stewart C. Myers., Richard A. Brealey., & *Brealey Myers. (2011). Principles of Corporate Finance.* New Delhi: Tata McGraw-Hill.
3. James C. Van Horne.,& John M. Wachowicz, J.R. (2013).*Fundamentals of Financial Management*(13th Edition).New Delhi: PHI.

16MBAPR303A **RETAIL ENVIRONMENT** **4 0 0 4**

Course Objectives:

- To have an exposure in retailing concept and consumer behavior in retail.
- To understand the retail marketing models and theories.
- To evaluate, plan and choose channels of retail distribution strategies.
- To get an insight in Foreign Direct Investment in retail sector
- To know the various retail models being applied in the market
- To know concepts of global retail and factors affecting the success of global retailing strategy.

Course Outcomes (Cos)

1. Apply marketing concepts in retailing and setting trends
2. Demonstrate retailing and its various concepts.
3. Construct business models in retail
4. Create strategies and tools for effective retailing
5. Evaluate marketing tools and techniques to interact with the customers.
6. To analyze the consumers decision making process and threats in global retailing.

Unit I

Retail: Meaning – Functions and special characteristics of a Retailer – Reasons forstudying Retailing Marketing-Retailer Equation – Marketing concepts Applied toRetailing – Retailing as a career – Trends in Retailing.

Unit II

Retail Model and Theories of Retail Development – Life Cycle and phase in growth ofretail markets – Business Models in Retail – Other Retail Models.

Unit III

Strategic Planning in Retailing: Situation Analysis – Objectives – Need for identifying consumer needs – Overall Strategy, Feedback and Control – Consumer decision-making process.

Unit IV

Retail in India: Evolution and Size of Retail in India – Drivers of Retail change in India –Foreign Direct Investment in Retail – Challenges to Retail Developments in India.

Unit V

Global Retail Markets: Strategic Planning Process for Global Retailing – Challenges facing Global Retailers – Challenges and Threats in Global Retailing – Factors affecting the success of Global Retailing Strategy.

Suggested Readings:

Text Book:

1. Swapna Pradhan. (2004). *Retailing Management– Text and Cases* (2nd edition). New Delhi: Tata McGraw Hill.

References:

1. Barry Berman.,& Joel R Evans. (2002). *Retailing Management – A Strategic Approach* (8th Edition). New Delhi: Prentice Hall of India.
2. James R. Ogden., & Denise Ogden. (2005). *Integrated Retail Management.* New Delhi: Biztantra.
3. Gibson G Vedamani. (2004). *Retail Management – Functional Principles and Practice* (2nd Edition). New Delhi: Jaico Publishing House.

16MBAPR303B RETAIL OPERATIONS, SYSTEMS AND INVENTORY 4 0 0 4

Course Objectives:

- To understand the store layout plan and inventory management in retailing
- To have an exposure in retailing concept and consumer behavior in retail.
- To acquire knowledge on store layout and effective retail space management
- To understand the store security, insurance and credit management
- To evaluate, plan and choose channels of retail distribution strategies.
- To get an insight in Space Mix and Effective Retail Space Management

Course Outcomes (Cos):

1. Analyze the factors influencing store location and locate stores.
2. Evaluating a Retail Operation, Store Operating Parameters and its various concepts.
3. Eliminate the difficulties in operating a retail business.
4. Applying the Strategic Resource Model in Retailing
5. To understand the Floor Space Management and Retail Method of Inventory Valuation.
6. Estimate the Return on Inventory Investments and Stock Turnover

Unit I

Choosing a Store Location: Importance of Location to a Retailer – Trading Area Analysis Regional Analysis – Characteristics of the Trading Areas

Unit II

Site selection: Actual Site Analysis and Selection – Choice of a General Location – Characteristics of the Available Site – Retail Store Layout – Circulation Plan – Space Mix and Effective Retail Space Management – Floor Space Management

Unit III

Operations Management: Operating a Retail Business – Operations Blueprint – Store Maintenance, Energy Management and Renovations – Inventory Management – Store Security – Insurance – Credit management – Computerization – Outsourcing – Crisis Management

Unit IV

Evaluating a Retail Operation: Store Operating Parameters – Using the Strategic Resource Model in Retailing – Designing a Performance Programme

Unit V

Retail Inventory: Inventory Planning – Return on Inventory Investments and Stock Turnover – Inventory Management – Physical and Perpetual Inventory Systems – Retail Method of Inventory Valuation

Suggested Readings:

Text Book:

1. James R Ogden., & Denise T Ogden. (2005). *Integrated Retail Management*. New Delhi: Biztantra.

References:

1. Barry Berman.,& Joel R Evans. (2006). *Retail Management – A strategic Approach*. (10th Edition). New Delhi: Prentice Hall of India.
2. Gibson G Vedamani. (2004). *Retail Management – Functional Principles and Practice*(2nd Edition). New Delhi: Jaico Publishing House.
3. Swapna Pradhan. (2004).*Retailing Management: Text and Cases*. New Delhi: Tata McGraw Hill Publishing Company Ltd.

16MBAPR303C MERCHANDISING MANAGEMENT 4 0 0 4

Course Objectives:

- To understand the basic concepts of merchandising, strategies and forecasting.
- To have an exposure on factors affecting merchandising function and functions of Merchandise Manager.
- To understand the Merchandise Buying and Promotional measures.
- To evaluate the sources, Branding Strategies, Category Management and the Components of category management strategies.
- To know the marketing tools used to gain customers in business
- To get an insight Visual Merchandising, Display Planning and Characteristics of effective display trends.

Course Outcomes (Cos) :

1. Demonstrate knowledge in merchandising and its various concepts and how it is done in global level.
2. To evaluate the factors of merchandising and formulate appropriate strategies
3. To formulate merchandise budgets to minimize costs
4. Analyze the ways that merchandising is used in marketing tools and techniques to interact with their customers.
5. To estimate pricing and analyze merchandise performance
6. Innovate visual merchandising to increase the sales volume

Unit I

Merchandising – Meaning – Concept – Factors affecting merchandising function – Merchandise Manager - Functions – Merchandise Hierarchy – Merchandise Mix – Components of Merchandise Management – Merchandise Strategies

Unit II

Merchandise planning - Steps involved – Merchandise control – Open to buy – Assortment Planning – Steps involved – Merchandising Stages - Merchandise Budgets and Forecasting

Unit III

Merchandise Buying – Types of buying – Sources of supply - Identifying and Contracting - Evaluating sources – Branding Strategies – Category Management – Components of category management – Category Management and Business Process.

Unit IV

Merchandise Performance – Retail pricing – Elements – Merchandise allocation – Analyzing merchandise performance – Methods – Integrating Dollar and Unit concept – Gross Margin Return on Investment – Mark Ups and Downs – Shrinkage in Retail Management

Unit V

Visual Merchandising — Display Planning – Characteristics of effective display – Selling power of Display – Methods of Display – Window Display and Interior Display-Space Management – Planning layout.

Suggested Readings:

Text Book:

1. Chetan Bajaj.,& Ranjith. (2005). *Retail Management* (2ndEdition). New York: Oxford University Press.

References:

1. Gillespie. Hecht.,& Lebowitz. (2002). *Retail Business Management* (3rdEdition).New Delhi: McGraw Hill Book Company.
2. Gibson G. Vedamani. (2004). *Retail Management: Functional Principles and Practices* (2ndEdition). New Delhi:Jaico Publishing House.
3. James R. Ogden., & Denise T. Ogden. (2005). *Integrated Retail Management*. New Delhi: Wiley Pvt Ltd.

16MBAPI303A INTERNATIONAL MARKETING MANAGEMENT 4 0 0 4

Course Objectives:

- To have an exposure in international marketing management concept
- To understand the international marketing management and market segmentation.
- To know the process of promoting the product in the international market
- Acquire knowledge on pricing strategies and factors influencing pricing
- To provide better understanding on international distribution systems and strategy related to distribution channel
- To learn about marketing communication and promotion programmes

Course Outcomes (Cos):

1. Ability to analyze the scope of international marketing and International marketing management process
2. Demonstrate the International Market Segmentation and Positioning
3. Ability to determine product policies and pricing strategies and environment factors affecting international prices
4. Focuses on risk involved in multinational product planning and market communications.
5. Ability to understand structure of international distribution systems and Distribution channel strategy
6. Demonstrate capabilities in international marketing communication and promotion programme

Unit I

International Marketing: an overview - Nature, Importance and scope of International Marketing, Domestic marketing vs. International marketing, International marketing management process – International marketing environment, Scanning and monitoring global marketing environment; International Marketing Information System.

Unit II

International market segmentation, Positioning, Analysis of world market, Market analysis, International marketing research, Screening and selection of markets, International market entry: Export, Licensing , Franchise, Joint Venture, Multinational operations, Contract manufacturing

Unit III

International Product Policies – Major product decisions – Product features and quality, Product design, Labeling, Packaging, Branding and product support services; Strategies in multinational product planning, International product life cycle, New product development.

Unit IV

International Pricing Decisions – International Price determination, Price escalation, International pricing process and policies, Delivery terms and currency for export price quotations, International transfer pricing, Methods of determining transfer pricing, Differential Pricing

Unit V

International marketing communication – Communication with foreign buyers, Planning and preparing, International promotion programme, Media structure, Planning media strategy, Corporate advertising.

Suggested Readings:

Text Book:

1. Nargundkar. *International Marketing.* New Delhi: Excel Books.

References:

1) Czinkota. *International Marketing (8th*Edition*). UK:* Thompson publication.
2) Cateora Graham. *International Marketing (10th*Edition*).* New Delhi. Tata McGraw Hill.
3) Siddiqui. *International Marketing.* New York: Wiley Dreamtech publication.
4) Cherunilam, F. (2007). *International Trade and Export Management*. New Delhi: Himalaya publishing house.
5) Varshney ,R.L., &Bhattacharya, B. *International Marketing Management (9th*Edition*).* New Delhi: Sultan Chand & Sons.
6) Jain, S. *International Marketing. UK:* Thomson publication.

16MBAPI303B INTERNATIONAL LOGISTICS AND DOCUMENTATION 4 0 0 4

Course Objectives:

- To have an exposure to International Distribution system and Logistics
- To have an exposure in broad conceptual focus on documentation in exports and imports
- To understand the Logistics and International marketing channel decision.
- To acquire knowledge on the procedures to be followed to Export and Import License
- To get an insight on the international trade terms and legal framework involved in it.
- To understand the concept of export, EXIM strategies, custom clearance and Export incentive schemes.

Course Outcomes (Cos):

1. Demonstrate retailing and its various concepts.
2. Evaluate the value adding perspective of logistics and distribution system.
3. Analyze the linkage of logistics with operations, manufacturing and supply chain.
4. Analyze international terms of trade and trade contracts related to logistics
5. Prepare documents on the exports and imports of goods
6. Understand EDI and custom operations

1. .

Unit I

International Distribution system and Logistics – International marketing channel decision, Importance and scope of channel decisions, Channels between nations, international physical distribution decisions, nature of physical distribution

Unit II

Transportation – Importance of effective transportation system, service choices and their characteristics, cost characteristics and role fixation, In-company management vs. outsourcing, shipping structure – Sea borne trade, International shipping characteristics, Important international sea routes, Liner & tramp operations, Liner freighting, CFC and ICD, Indian shipping – Growth, Policy and Problems, Major Indian ports, International Air Transport, freight rates, India’s exports and imports by air – problems and prospects.

Unit III

Documentation - Naming the enterprise, Forms of ownership, Opening a bank account, Need for documentation, Process of obtaining Export and Import License:- General registrations, registrations with RBI, Registration with Licensing Authorities, Registration with appropriate EPC/Commodity Board’s. Main commercial documents: Statutory documents for exporting country, Statutory documents for importing country and documents for claiming export benefits.

Unit IV

International Trade Terms –Trade contract, Credit risk management and payment terms, LC & parties involved, Types of LC, UCPDC – Major clauses, Consignment sale, Transit risk management – Contract of cargo insurance parties, Insurance policy and certificate, Cargo loss clauses – Procedure and documentation

Unit V

Clearance – Excise duty – Definition, Types of duties, Legal framework – Central Excise Act and rules, Tariffs, Customs Act 1962, Customs Tariffs Act 1975, Foreign Trade Act 1992, Physical Examination of goods, EDI and custom operations.

Suggested Readings:

Text book:

1. Khanna K K. (2007).*Physical Distribution Management: Logistical Approach*. New Delhi: Himalaya publishing house.

References:

1. Johnson J, Wood D. *Contemporary Logistics*.
2. Ismail, R. *Logistic Management.* Excel Books
3. Dornier. *Global Operation & Logistic Management.* John Wiley

16MBAPI303C INTERNATIONAL BUSINESS NEGOTIATIONS 4 0 0 4

Course Objectives:

- To understand the framework of international business negotiations
- To acquaint the students with the model of the negotiation process with different strategies and planning
- To enhance students knowledge in international culture and negotiation
- To have an understanding of the negotiating conventions and expectations between foreign counterparts
- To become aware of the ethics in Negotiations, retail marketing mix and Promotional measures.
- To evaluate, plan and choose channels of retail distribution strategies.

Course Outcomes (Cos):

1. To make the students to define International Business Negotiations and its various concepts.
2. Examine Cultural the aspects of International Business Negotiation and its impact
3. To evaluate the licensing agreements in various business forms
4. Get an insight in ethics in negotiations
5. Analyze the framework and support institutions for negotiations
6. Practice ethics in negotiations and develop business etiquettes

Unit I

International Business Negotiations: Framework and Nature - Background factors - Impact of national culture, organizational culture and personality on buyer-seller interaction – A model of the negotiation process with different strategies and planning – Distributive bargain and integrative negotiations.

Unit II

Cultural aspects of International Business Negotiation - Role of culture - Patterns of cross-culture behavior and communication - Importance of understanding the negotiating conventions and expectations between foreign counterparts - Comparative and inter-cultural studies of negotiating behavior.

Unit III

Inter-firm Negotiation studies: Buyers' Negotiating Strategies in International Sourcing-Negotiating sales, Export transaction and Agency agreements - Negotiating Licensing agreements - Negotiating International Joint Ventures projects - Cooperative negotiation for Mergers and Acquisitions.

Unit IV

Frameworks and support for International Business Negotiations: Multinational, Bilateral trade agreements, Government supported trade delegations, International trade fairs, International trading houses, Industry associations.

Unit V

Ethics in negotiations - Differences from an ethical perspective of the importance of relationship development - Negotiating strategies - Decision making methods - Contracting practices - Illicit behaviors such as bribery - Best practices in negotiations - Business etiquette - Personality and negotiation skills.

Suggested Readings:

Text book:

1. Cellich, C Jain, S.*Global Business Negotiations: A Practical Guide.* South-Western Educational Publishing

References:

1. Gauri P .N. &Usunier, J .C. *International Business Negotiations.*Elsevier ltd.
2.Leigh L. *Negotiation Theory and Research*. UK: Thompson.

16MBAPP303A BUSINESS PROCESS REENGINEERING 4 0 0 4

Course Objectives:

- Emphasize challenges and opportunities for Business Process Reengineering across the process life cycle.
- To understand the importance of business process reengineering and kaizen.
- To gain expertise in ISO standardization and its benefits
- To enable the students to understand the relevance of change management in business process reengineering.
- To familiarize the process of implementation of Business Process Engineering
- To understand the Change Management in Business Process Reengineering

Course Outcomes (Cos):

1. Analyze the Business Process Reengineering and Kaizen and its various concepts.
2. Categorize the benefits of ISO standards
3. Evaluate the Implementation of Business Process Reengineering
4. Get an insight the Pitfalls in organizational environment
5. Demonstrate Application of negotiation in BPR and Implementation of changes
6. Estimate the ways of Change Management in Business Process Reengineering and techniques to interact with their customers.

Unit I

Business Process Reengineering and Kaizen - BPR: Definition, Japanese Business strategy, Kaizen and Management, Characteristic features of Kaizen relevant to BPR - New developments in BPR

Unit II

Business Process Reengineering and other Management concepts - Issues in BPR, BPR and TQM - QFD - ISO standards - ERP - Benefits of ISO standards

Unit III

Implementation of Business Process Reengineering - Business vision and process objectives, Identification of processes to be reengineered - Measurement of processes - Design - Evaluation of process prototype.

Unit IV

Reengineering Structure and Pitfalls - BPR leader - Process owners - Reengineering teams - Pitfalls in organizational environment - Complacency management - Reengineered process - Appraisal system

Unit V

Change Management in Business Process Reengineering - Structure of change, Approaches to radical change, Management of change in BPR, Application of negotiation in BPR. Implementation of changes

Suggested Readings:

Text book:

1. Rastogi, P .N (2007).*Re- engineering and Re-inventing the Enterprise*. New Delhi: Wheeler Publications

References:

1. Dey B .R. (2004). *Business Process Reengineering and change Management.* Biztantra,
2. Jeston, J &Nelis. J. (2008) *Business Process Management: Practical Guidelines to Successful Implementations.* Singapore: Elsevier Ltd.
3. Sumanth, D.J. (2006) .*Total Productivity Management.* USA: CRC Press Ltd.
4. H. H**a**rrington, (2005),*Business Process Improvement: The Breakthrough Strategy for Total Quality, Productivity and Competitiveness.* New Delhi: Tata McGraw Hill.

16MBAPP303B ADVANCED MAINTENANCE MANAGEMENT 4 0 0 4

Course Objectives:

- To understand the advanced maintenance management that provides an insight into maintenance planning, analysis, system, cost and advanced techniques
- To aware the functions of maintenance.
- To gain insight in the concept of Reengineering Maintenance Process
- To familiarize the students with Total Productive Maintenance.
- To enable the students to understand the concept of optimum overhaul.
- To make them understand the Management Information system and Technical audit

Course Outcomes (Cos):

1. Analyze and define maintenance concepts and strategies
2. Determine the design for maintainability and preventive maintenance
3. To evaluate Design out maintenance, Total Productive Maintenance - Reduction of Maintenance Cost
4. To categorize Reengineering Maintenance Process
5. Analyze the Total Productive Maintenance and Reduction of Maintenance Cost
6. Develop knowledge on Maintenance Management Information System & Technical Audit

Unit I

Maintenance Concepts - Objectives and functions of maintenance – Types - Maintenance strategies - Organization for maintenance - Five Zero concept - New Developments in Maintenance

Unit II

Failure Data Analysis - MTBF, MTTF, Useful life, Survival curves, Repair time distribution, Break down time distributions, Poisson, Exponential and Normal distribution. Availability of repairable Systems - Maintainability prediction - Design for maintainability - Preventive Maintenance

Unit III

Maintenance Planning - Overhaul and repair: Meaning and difference, optimal overhaul / Repair / Replace maintenance policy - Re placement Decisions: Optimal Interval - Group Replacement

Unit IV

Maintenance Systems - Fixed time maintenance, Condition based maintenance, Operate to failure, Opportunity maintenance, Design out maintenance, Total Productive Maintenance - Reduction of Maintenance Cost

Unit V

Advanced Techniques - Reliability Centered Maintenance (RCM) – Total Productive Maintenance (TPM) - Philosophy and implementation, Signature analysis - Expert systems – Concept of Terro technology, Reengineering Maintenance Process, Concept of reliability, Reliability improvement, Concept of maintainability and maintainability improvement, Maintenance Management Information System & Technical Audit

Suggested Readings:

Text Book:

1. Mishra R. C &Pathak, K.(2006) *Maintenance Engineering & Management*. New Delhi: Prentice Hall India.

References:

1. Gopalakrishnan, P. Banerji. A.K. (2006) *Maintenance and Spare Parts Management.* New Delhi: Prentice Hall of India.
2. Kelly &Harris,M .J. (2008).*Management of Industrial Maintenance.* Butterworth Company Limited.
3. Jardine, A.K.S. (2006) *Maintenance, Replacement and Reliability.* Pitman Publishing,
4. Singh, U. K & Dewan, J.M.(2007). *Maintenance Management:* New Delhi: Common Wealth Publishers.

16MBAPP303C **LEAN MANAGEMENT** **4 0 0 4**

Course Objectives:

- To gain knowledge on lean manufacturing system
- To enable the student to understand the Designing of 5S and Kanban Signaling
- To have an exposure in the integrated perspective of Lean thinking apart from covering all the basic tools needed.
- To enable the student to acquire the knowledge of Value Steam Mapping
- To get an insight with the implementation of various lean manufacturing techniques. ,
- To aware of Lean line optimization

Course Outcomes (Cos):

1. To analyze the lean manufacturing system in manufacturing industries
2. Define Lean Manufacturing System and its various concepts.
3. Demonstrate lean implementation in service
4. Practice Kanban Strategies and inventory management
5. Analyze the ways of Lean Implementation and Milestones tools and techniques to interact with the workers
6. Evaluate the customer demand and Customer response policy

Unit I

Benefits of Lean Manufacturing System - History and modern applications, MRP and their impact, Lean manufacturing model, Kanban Methodology, Continuing evaluation, Strategic Business Analysis. Internet and e-commerce applications & Reverse Auction

Unit II

Understanding Product, Process and Demand - Value Stream Mapping – Scope - Selecting parent parts - Lean line – Demand - Documenting process flow - Talk time - Process linking and Balancing - Imbalance Approach - Resource , Physical Layout, Designing 5S, Kanban Signaling

Unit III

Kanban Strategies – Process - Single and Multi Card system - Inventory Management, Advantages and Disadvantages - Team Establishment: Commitment, Physical facilitation, Management Structure - Transformation process & perpetual inventory

Unit IV

Lean Implementation and Milestones - Software requirement milestones - Understanding process, Product and Materials- Checking - Factory design - Line startup - Lean implementation in services

Unit V

Lean Line management - Matching customer demand - Customer response policy - Lean line optimization - Resistance to change - Flexibility and rewards.

Suggested Readings:

Text book:

1. Michael L.George. (2002). *Lean SixSigma*. New Delhi:Tata McGraw Hill.

References:

1.P.Hobbs. (2009) .*Lean Manufacturing Implementation*, J.Ross Publishing,

2. Liker. (2004). *The Toyota Way*.New Delhi: Tata McGraw Hill.
3. Garry Conner. (2008). *Lean Manufacturing for the Small Shop*.Society of Manufacturing Engineers.
4. Allan, Robinson and Stewart. (2001).*Lean Manufacturing – A Plant Floor Guide*, Society of Manufacturing Engineers.

16MBAPN303A GENERAL INSURANCE 4004

Course Objectives:

- To have an exposure in Insurance Products concept .
- The students to know about the constitutional provisions in areas and different types of general insurance.
- To understand the concepts, principles, practices and procedures adopted by insurers in underwriting all classes of non-life insurance
- To provide an in-depth knowledge on the international issues in insurance markets
- To improve the critical thinking and problem-solving skills
- To understand the evolution and growth of general insurance sector in India.

Course Outcomes (Cos)

1. Analyze the health insurance and its various products in India
2. Identify the various Investment products & health savings components.
3. Analyze the growth of insurance industry in India
4. Evaluate the International Issues in Insurance Markets
5. Differentiate the various types of insurance like motor, fire Insurance, medical and miscellaneous insurance.
6. Ability to communicate effectively the strategies for insurance packages

Unit I:

Types of Health Insurance Products in India – Hospitalization Indemnity product – Personal Accident products – Critical Illness product – Daily Hospital Cash benefit – Disease management covers – Outpatient covers – Investment products in health insurance & health savings components.

Unit II:

Fire Insurance-Meaning- Scope-Policy Drafting, Endorsements & Premium Computation: Proposal form – Risk Inspection Report Scope & Purpose – Premium – The Schedule – Drafting of Policy – Endorsements – Renewal Notice - The Standard Fire & Special Perils Policy: Preamble – Perils covered viz. Fire, Lightning, Explosion/Implosion, Aircraft Damage, Riot, Strike, and Malicious Damage.

Unit III:

Development of Engineering Insurance and Relevant Legislation: Historical background – Statutes & Regulations that affect conduct of business in India. Construction Phase insurances – Operational Phase insurances.

Unit IV:

Miscellaneous Insurance- Scope- Functions-Money Insurance: Introduction, Coverage, Special features, Exclusions, Conditions, Underwriting considerations, Rating Pattern, Claims Procedure. Bankers Indemnity and Jewellers Block Insurance– Coverage-Rating pattern – Claims procedure.

Unit V:

Motor Insurance- Motor Third Party Pool – Dysfunctional Motor Market – Motor Third Party Pool – Review of Pool – Knock for Knock Agreement – International Issues in Insurance Markets – International Translation of Driver's License – Some Market Practices.

Suggested Readings:

Text Book:

1. *Practice of General Insurance IC 11* (2013). Mumbai: Insurance Institute of India,.

Reference Books:

1.Magee, J. & Bicklhaupt, D. (2001). *General Insurance*

2.ArunAgarwal / Rao, P.R.(2002). *Study on Distribution Functions in General Insurance & Role of Intermediaries.*

3. Frappoli, M. (2005). *General Insurance for Information Technology Professionals*

16MBAPN303B PRINCIPLES AND PRACTICE OF INSURANCE 4004

Course Objectives:

- To have an exposure in insurance mechanism concept
- To understand the Concept of Insurance its Evolution.
- An overview of major life insurance and general insurance products
- To evaluate the concept of insurance and cover of risk.
- To provide basic understanding of various types of reinsurance and methods of reinsurance
- To get an insight in Insurance contract and Importance of group insurance schemes

Course Outcomes (Cos)

1. Demonstrate the principles of insurance and its various concepts.
2. To understand the Concept of Insurance its Evolution.
3. Classify the Constituents of Insurance Market
4. Evaluate the different types of life insurance plans to interact with their customers.
5. Analyze the various types of reinsurance and Methods of reinsurance
6. Analyze the risk management and Risk evaluation in insurance segment

Unit 1:

Concept of Insurance its Evolution: Basics evolution of Insurance – Scope of Insurance - Classes of Insurance – Importance of Insurance – Management of risk by individuals – Management of risk by Insurers – Fixing of Premiums – Reinsurance and its importance.

Unit II:

Insurance Market: Constituents of Insurance Market – Operations of Insurance Companies - Operations of Intermediaries – Specialist Insurance Companies – Role of regulators – Other bodies connected with Insurance - Understanding Insurance Customers – Different customer needs – Importance of Customers.

Unit III:

Insurance Contract: Terms of Insurance contract – Principles which forms the foundation of insurance – Significance of the principle of Insurable Interest – Principle of Indemnity –

Principle of Subrogation – Principle of Contribution – disclosure of all Relevant Information – Principle of Utmost Good faith.

Unit IV:

Different types of life insurance plans – Term Plan – Endowment Plan – Money Back Insurance Plan – Whole-Life Insurance Plan – Unit Linked Insurance Plans (ULIPs) – Joint Life Insurance Plans – Child Insurance Plans – Rider benefits – Industrial life insurance – MWP Policies– Keyman insurance – Health insurance and its types.

Unit V:

Importance of group insurance schemes – Main features of group insurance schemes – Eligibility conditions in group insurance – Different types of group insurance schemes – Group Term Insurance Scheme – Group Gratuity Scheme – Group Superannuation scheme – Types of group superannuation schemes – Group Leave Encashment scheme - Risk Management – Types of reinsurance – Method of reinsurance - Insurer's role in risk management – Risk evaluation.

Suggested Readings:

Text Book:

1. *Principles and Practice of Insurance* Revised Edition: 2013, Insurance Institute of India, Mumbai.

Reference Books:

1. Magee, J. &Bicklhaupt, D, (2001). *General Insurance*
2. ArunAgarwal / Rao, P.R.(2002). *Study on Distribution Functions in General Insurance & Role of Intermediaries.*
3. Frappoli, M. (2005). *General Insurance for Information Technology Professionals*

16MBAPN303C ACTUARIAL ASPECTS OF PRODUCT DEVELOPMENT 4004

Course Objectives:

- To understand the various legal aspects of products
- The object of this course is to equip students with theoretical and practical knowledge of consumer grievance
- To help to evaluate, plan the insurance premium strategies.
- To get familiarize with the 'Group' and 'Group Policy/Scheme' and determination of interest rates
- To get an insight Financial Viability ,Profit Margin and Solvency Margin
- To have exposure on Reinsurance, Types of Reinsurance - Reinsurance Support ,terms and conditions of Treaty

Course Outcomes (Cos)

1. Analyze the types of Insurance Products and its various Legal Aspects of Product concepts.
2. Develop strategies to handle consumer grievances
3. Clear understanding of Price and Premium, Equation of Value – Components of Premium
4. Analyze the group insured schemes
5. Understand the Premium Bases and determine the best Premium bases
6. Evaluate the terms and conditions of reinsurance

Unit I:

Definition of Insurance Product – Scope of Insurance-Physical Form of Product – Utility of Product – Legal Aspects of Product – Insurable Interest – Rights of Nominees, Assignors, Heirs and Successors. Profitability – Design of Product – Health and other conditions – Maturity – Suppression of Information – Consumer Grievances – Regulators, Stakeholders.

Unit II:

Meaning of Price and Premium – Equation of Value – Components of Premium – Problems in Determination of Premium – Renewal Expenses – Long term Business – Life Insurance Business – Assurances – Pure Death Benefit Contracts –Annuities – Riders / Add-ons – Alterations – Profit Contracts –Types of Bonuses – Discount in Premium.

Unit III:

Types of Insurance Products – 'Group' and 'Group Policy/Scheme' – Insured Group Schemes – Experience rating – Profit Sharing –Interest Rate – Determination of Interest Rate.

Unit IV:

Premium Bases – How to determine this Premium bases - Use of Premium bases - Commission rates - Use of Commission Rates – Expense rates

Unit V:

Financial Viability – Profit Margin and Solvency Margin - Reinsurance – Terms and Conditions of Treaty, Inter Alia – Types of Reinsurance - Reinsurance Support.

Suggested Readings:

Text Book:

1. Insurance Institute of India.*(2013).Actuarial Aspects of Product Development.* Mumbai.

References:

1. Hossack ,I.B. (1991).*Introductory Statistics with Applications in General Insurance*
2. Atkinson, D. B. &Dallas, J. W. (2000).*Life Insurance Products and Finance: Charting a Clear Course.*
3. Gauger, M. A. (1982). *Actuarial Models: An Introductory Guide for Actuaries and Other Business Professionals*.

16 MBAP304 MANAGEMENT PRACTICE III 2 1 0 1

Course Objectives:

- To understand the components of Personality Development
- To enhance the personal etiquette among students
- To equip students with the basic knowledge of building relationship with superiors and staff
- To develop students critical and innovative thinking
- To inculcate the knowledge of organizing seminars, conferences and conducting meetings
- To improve managerial skills and goal setting among students

Course Outcomes (Cos):

1. Demonstrate capabilities of lateral thinking and handling criticisms
2. Practice business etiquettes and aware cross-cultural etiquette
3. Demonstrate goal-setting and problem-solving
4. Develop proactive thinking
5. Ability to communicate effectively.
6. To gain professionalism in personal and organizational life

Unit I

Personality Development / Personal Branding for Career Success – SWOT Analysis – Knowing your personality – Emotional Quotient – Lateral thinking – Handling criticisms – Body language

Unit II

Personal etiquette - Good work practices, Dress code, Code of Good conduct, Handling ethical dilemmas – Business etiquettes — Behaviour at work - Awareness of Diversity, Respecting others' space, Greeting in business setting, Meeting people in business setting, developing relationship with superiors and staff - Dining Etiquette - Cross Cultural Etiquette

Unit III

Managerial Skills – Innovative planning – Conducting professional meetings and conferences – Customer retention and satisfaction – Goal setting and problem solving, handling contingent situation

Suggested Reading:

References:

1. Hurlock, E.B. (2006). *Personality Development*, New Delhi: Tata McGraw Hill.

16 MBAP305 COMMUNICATION PRACTICE III 2 0 0 1

Course Objectives:

- To impart students and enrich communication and non-verbal activity such that students will be good on their communication.
- To understand the use of language in day-to-day business life
- To provide the skills in improving social communication
- Make students to understand the value of face to face communication
- To train them in group discussions and interviews
- The students shall be familiar with conducting meetings, seminar and conferences.

Course Outcomes (Cos):

1. The student will able to get practice with Verbal communication and Non- Verbal communication.
2. Demonstrate the understanding of face to face Communication.
3. The students shall be familiar with conducting meetings, seminar and conferences.
4. Students attain competence in functional use of communication during both academic and non-academic life situations.
5. To draft effective business correspondence with brevity and clarity.
6. To stimulate their Critical thinking by designing and developing clean and lucid writing skills.

Unit I

PERSONAL COMMUNICATION:

Day-to-day conversation with family members, neighbors, relatives, friends on various topics, context specific – agreeing/disagreeing, wishing, consoling, advising, persuading, expressing opinions and arguing.

Unit II

SOCIAL COMMUNICATION:

Telephone calls (official), colleagues in the work spot, discussing issues (social, political, cultural), clubs (any social gathering), answering questions, talking about films, books, news items, T.V. programmes, sharing jokes, Current issues.

Unit III

GROUP / MASS COMMUNICATION:

Group discussion (brainstorming), debate, panel discussion, anchoring / master of ceremony, welcome address, proposing vote of thanks, introducing speakers, conducting meetings, making announcements, Just-a-minute (JAM), Block and tackle, shipwreck, spoof, conducting quiz, negotiations, oral reports.

Suggested Readings:

References:

1. Hurlock, E.B. (2006). *Personality Development.* New Delhi: Tata McGraw Hill.
2. Windshuttle, Keith and Elliot E. (1999). *Writing, Researching and Communicating: Communication Skills for the Information Age.* Australia:Tata McGraw-Hill.
3. Goleman, Daniel. (1998). *Working with Emotional Intelligence.* New York: Bantam Books.

16 MBAP321 SUMMER INTERNSHIP & VIVA VOCE 4 0 0 4

Course Objectives:

- Internship is aimed to feed industry - institutional- orientation among the students
- To sensitize students to the nuances of corporate culture and familiarize them with the corporate code of behavior.
- To educate the graduates to acquire skills, knowledge, attitudes, and perceptions along with the experience needed to constitute a professional identity
- To give an insight into the working of the real organizations
- To inculcate the knowledge about business organizations in their totality
- To learn the opportunities available and plan their career

Course Outcomes Cos):

1. Demonstrate theoretical knowledge in solving real time problems.
2. Gain practical exposure of the core area of functioning in industry
3. Learn actual supervised professional experiences
4. Effectively communicate ideas and evaluate its impact on business environment.
5. Understand perspective about business organizations in their totality.
6. Discover career opportunities

During second semester vacation each student shall undertake a Summer Internship for 30 Days. The summer internship may be a general study of all functional areas of a company or may be a functional focus on a specialized functional area of management in a company. The report should be certified by the concerned organization where the student has undertaken the internship. He /She shall also submit a detailed report for Viva-voce Examination.

16MBAPF401A WORKING CAPITAL MANAGEMENT 4 0 0 4

Course objectives:

To make the students

- Being specialized in finance present day managers to be aware of short term movement of capital and problems related to working capital management
- To study about the importance of working capital.
- To learn the factors of cash management.
- To understand credit policy of receivable management.
- To learn the various techniques of inventory management.
- To provide clear view of committee's recommendation on working capital.

Course outcomes (Cos):

Learners should be able to

1. Estimate the requirements and manage the working capital required for the business
2. Analyze the different sources of capital and computation of cost of capital.
3. Develop cash management techniques
4. Evaluate the components of financial leverage, dividend policies and capital structure theories and its application in business.
5. Develop new techniques in managing and controlling inventory in organizations
6. Analyze the Committee recommendations on working capital financing

Unit I

Working Capital Management - an overview - Importance - Components of Working Capital – levels of working capital investment- Factors Influencing the Requirements of Working Capital, Issues and Practices of working capital management in India. Computation of Working Capital requirement (Problems).

Unit II

Cash Management – Facets of cash management – Motives of Holding cash – Factors influencing cash balance – Determining Optimum Cash Balance – Cash Planning – Managing cash collections and disbursement – Investing the Surplus in Marketable Securities. Cash Budget (Problems), Cash Management Practices in India.

Unit III

Receivables Management- Objectives - Credit Policies – Credit Terms - Nature and Goals of Credit Policy – Optimum Credit Policy - Credit Period - Collection Efforts - Credit Evaluation - Credit granting decision - Control of Receivables – Factoring – Definition and Mechanism – Advantages - Problems.

Unit IV

Inventory Management - Nature of Inventories – Objective of Inventory Management - Need to hold Inventories - Techniques for managing inventory - Inventory Control System – Problems

Unit V

Working capital financing**:** Working Capital Control and Banking policy - Committee recommendations on working capital - New system of assessment of working capital finance. Trade credit – Bank Credit – Commercial Papers – Certificate of Deposits– recent trends in working capital financing

Note: Problems 40 Marks and Theory 60 Marks.

Suggested Readings:

Text Books:

1. Bhalla, V.K. (2010). *Working Capital Management* (9th Edition). New Delhi: Anmol Publications Pvt Ltd.
2. Khan.,& Jain. (2009). *Financial Management.* New Delhi: Tata McGraw Hill.
3. Tulsian, P.C. (2009). *Financial Management* (3rd Edition). New Delhi: S.Chand& Co Ltd.

References:

1. Gitman, J.L. (2009). *Principles of Managerial Finance. New Delhi:* Pearson Education Limited.
1. Pandey, I.M. (2010). *Financial Management* (10th Edition). New Delhi: Vikas Publishing House Pvt Ltd.
2. Prasanna Chandra. (2007).*Financial Management* (4th Edition). New Delhi: Tata McGraw Hill.

16 MBAPF401B SECURITY ANALYSIS & PORTFOLIO MANAGEMENT 4 0 0 4

Course objectives:

To make the students

- Understand the securities market and factors influencing risk
- To provide the knowledge of the structure and functioning of capital market
- To expose the concepts of investment Risks and Securities.
- To facilitate them to understand and exploit the tools available for analysis.
- To hassle the need of portfolio management and its application
- To understand the security analysis & portfolio management concept and its importance and its applications in business

Course outcomes (Cos):

Learners should be able to

1. Analyze the role of a financial manager, and their role in taking decisions professionally.
2. To clarify the structure and functioning of capital market.
3. Demonstrate knowledge and compute value of security analysis & portfolio management and apply the concept to Evaluate the business proposal applying capital budgeting techniques
4. Compute the security analysis & portfolio management
5. Demonstrate capabilities of teamwork, problem-solving, critical thinking, and communication skills related to finance decisions
6. Gain insight in risk management techniques

Unit I

Investments – Concepts and features- Objectives – Constraints - Investment vs Speculation - Investment Process, Investment Planning - Investment Avenues – Securities Market – Participants – Securities – Indices - Factors Influencing Risk.

Unit II

Over view of capital market - Structure in Indian capital market- Major players - Role of stock exchanges - Trading and settlement procedures at NSE and BSE. Securities Contract Regulation Act - Securities and Exchange Board of India - Indian debt market- Stock Market Indices.

Unit III

Fundamental Analysis: Economic analysis – Economic Forecasting - Industrial Analysis - Industry life cycle – Analytical tools – SWOT – Porter's Five Force Model – Company Analysis.

Unit IV

Forecasting individual stock performance: Technical analysis – Charting methods – Market indicators, Trends –Trend reversals- Moving average – Oscillators - CAPM –APT theory Valuation of securities- Risk and return – Types - Factors affecting option price.

Unit V

Portfolio theory – Portfolio construction – Markowitz diversification model – Performance evaluation – Portfolio revision- Portfolio evaluation: Sharpe Index, TreynorIndex, Jensen's Model.

Suggested Readings:

Text books:

1. Sasidharan, K. & Alex, K. Mathews. (2013). *Security Analysis and Portfolio Management*. New Delhi: Tata McGraw Hill Education Private Limited.
2. Punithavathy, Pandian. (2013). *Security Analysis and Portfolio Management.* New Delhi: Vikas Publishing House Pvt Ltd.

References:

1. Donald, E. Fischer., & Ronald, J. Jordan. (2010). *Security Analysis & Portfolio Management*. New Delhi: Prentice Hall of India Private Ltd.
2. Prasanna Chandra. (2010). *Managing Investments*. New Delhi: Tata McGraw Hill.
3. Avadhani, V.A. (2008).*Securities Analysis and Portfolio Management.* New Delhi: Himalaya Publishing House,
4. Kevin. (2010). *Security Analysis and Portfolio Management.* New Delhi: Prentice Hall of India Private Ltd.

16 MBAPF401C **4 0 0 4**

BONDS, DERIVATIVES AND COMMODITY MARKET MANAGEMENT

Course objectives:

To make the students

- To clarify the structure and functioning of concepts of Bonds, Derivatives, Futures
- To expose the concepts of futures and options
- To impart the structure and functioning of commodities market.
- To equip young managers with the knowledge of emerging commodities derivatives trading practices in India.
- To explain the regulatory framework of these markets and domestic and international historical developments in commodities market.
- To understand the settlement and risk management in commodity trading

Course outcomes (Cos) :

Learners should be able to

1. Understand the role of a financial manager, and their role in taking decisions professionally
2. Apply derivatives as risk management tools for hedging market risk exposure
3. Demonstrate knowledge and compute value of security analysis & portfolio management
4. Estimate the eligibility of stock for futures and options trading.
5. Compute the commodity trading: commodity derivates – commodity exchanges in India
6. Demonstrate capabilities of teamwork, problem-solving, critical thinking, and communication skills related to finance decisions

Unit I

Bonds attributes – bond returns & prices – risk structure of bonds – forecasting interest rate bonds – the term structure of interest rates. Bond management strategies; - passive – semi active – active – passive and active strategies – new innovations in bonds - Bond portfolio management.

Unit II

Introduction to Derivatives: Definition – types – market index: types of index; introduction to futures and options; forward contract – limitations – features, futures Vs forward contract.

Introduction to options – Distinction between futures and options, pay off for derivative contracts.

Unit III

Futures and options , trading systems – basis of trading – eligibility of stock for futures and options trading – clearing and settlement; clearing entities – members – banks – mechanism – settlement mechanism – regularity framework-case studies in relevant topics.

Unit IV

Introduction to commodity trading: commodity derivates – commodity exchanges in India – types of instruments available for trading – pricing – commodity derivatives, hedging, speculation, arbitrage in commodity derivative markets. Case studies in relevant topics.

Unit V

Clearing, settlement and risk management in commodity trading, Calendar and settlement schedule – position determination – settlement mechanism - settlement price – margining – final statement – exception handling – regularity framework. Case studies in relevant topics.

Suggested Readings:

Text Books:

1. Sunil, K. Parameswaran. (2009). *Future and Options*: New Delhi: Tata McGraw Hill.
2. John,H. (2009). *Options Future and other Derivatives.* New Delhi: Pearson Education.

References:

1. Vijaya, R. Bhaskar &Mahapatra, B. (2007). *Derivatives Simplified* (1st edition). Response Books.
2. Patwari, D.C.& Anshul Bhargava. (2009). *Indian Institute of Banking & Finance-Commodity Derivatives* (1stedition).New Delhi: Macmillan India Ltd.
3. Patwari, D.C.& Anshul Bhargava. (2006). *Options and Futures* (3rdedition). Jaico Publishing House.
4. Yadav, Jain.,&Peyrard. (2008). *Foreign Exchange Markets*. New Delhi: Macmillan India Ltd.

16MBAPM401A **BRANDS AND BUSINESS** **4 0 0 4**

Course Objectives:

- To equip the students with the various dimensions of product management such as Brand Positioning and its Preference.
- To get familiarize with the portfolio management and competitior's analysis
- To develop familiarity and competence with the strategies
- To understand the tactics involved in building, leveraging and defending strong brands in different sectors.
- To equip the students with the various dimensions of product management such as Brand Positioning and its Preference.
- To possess knowledge on building brand equity

Course Outcomes (Cos):

1. Analyze the product concepts and new product development
2. Developing strategies for new product development using various models
3. Construct branding strategy considering social and political aspects of brands
4. Evaluate the failure of branding using new media
5. Create models for brand positioning
6. Evaluate brand equity and brand valuation for successful implementation of branding strategy.

Unit I

Products - Concepts - New Product Development – Strategies - Launching Strategies, Product Life Cycle - Portfolio Management -BCG, GE, Porter's Model, Competitor's Analysis, Customer Analysis, Market potential, Product Demand pattern and Trend Analysis.

Unit II

The Concept of Brands - The Economic Importance of Brands - The Social and Political Aspects of Brands - Difference between Marketing and Branding - Changing Rules of Marketing and Branding in India - Digital Dimension, Consumer Activism, Leveraging Technology

Unit III

Introduction to Brand Positioning: The 4Ps – An Inherently Futuristic Model - 4Ps in the IT Age

- Brand Positioning - Fundamentals of Brand Positioning - First Movers - Mistakes in Brand Positioning – Introspection - Gaining Brand Preference.

Unit IV

The Brand Relevance Model: The First Mover Advantage - Managing a New Category - The Different Levels of Innovation - Understanding Brand Relevance – Categorization - Creating New Categories or Subcategories — Four Tasks - How Categorization Affects Information Processing and Attitudes

Unit V

Packaging – Labeling - Brand Rejuvenation - Brand Success strategies - Brand Resilience - Brand Equity - Brand valuation - Building global brands - Branding failures.

Suggested Readings:

Text Books:

1. Lehmann.,& Winner. (2004). *Product Management.* New Delhi: Tata McGraw Hill.

2. Venugopal., K. (2010). *Product and brand management*. New Delhi: Himalaya Publishing House.

References:

1. Subroto Sengupta. (2005). *Brand Positioning*. New Delhi: Tata McGraw Hill Education Private Limited.
2. David Aaker. (2011). *Brand Relevance – Making Competitors Irrelevant*. Jossey Bass.
3. Hamel, G., & Prahalad, C.K. (1994). *Competing for the Future*. Boston: Harvard Business School Press.
4. Kartikeya Kompella, (2006). *Building Brands: A guide to increasing the financial value of brands.* Viva Books Private Limited.

16MBAPM401B **RETAIL MARKETING** **4 0 0 4**

Course Objectives:

- To have an exposure in retailing concept and consumer behavior in retail.
- To know the theories of retail management and classification of models
- To give a perspective of the Indian retailing scenario
- To understand the retail marketing mix and Promotional measures.
- To evaluate, plan and choose channels of retail distribution strategies.
- To get an insight in IT application and international retailing trends

Course Outcomes (Cos):

1. Adopt strategies to the challenges in retailing and gain competitive advantage
2. Construct models for direct marketing
3. Demonstrate knowledge of the various forms of Retail outlets and current trends in Retail
4. Analyze the retail marketing mix and draw plan for effective combination
5. Adopt information tools and techniques to interact with their customers.
6. Inculcate ethical values, enabling to set value standards and belief to have positive outcomes

Unit I

Retailing – Introduction – Importance – Challenges in retailing — Consumer behavior in retail context –demographic and socio-economic factors – strategic Retail Planning process – opportunities and Competitive advantage

Unit II

The Evolution of retail format –Theories in retail development- environmental, Cyclical and conflict theory – The concept of life cycle in retail - Retail Models – Classification – Store Based – Non store based – Direct Marketing – Franchising – Forms - Mall Management – Mall Designs.

Unit III

Retail Marketing Mix – Product decision – Nature, selection & delivery decision – Types of Pricing - Pricing decision- concepts - leader pricing - odd pricing - Promotion decision – advertising, sales promotion & publicity - channel & channel management

Unit IV

Application in retail - IT applications in retail – Database marketing, data mining and business intelligence – Electronic retailing – Developing decision support systems – Visual Merchandising – types of Visual Merchandising – Store location and Site location.

Unit V

Global retailing trends - Indian and International retailing trends – Indian Retailers in Jewellery - Textiles – Food - Music and Electronics – Ethics in retailing – Social responsibility & Consumerism, E-CRM.

Suggested Readings:

Text Book:

1. Lucas, G.H., Bush, R.P& Gresham, L.G. (2011). *Retailing*. New Delhi: All India Publishers.

References:

1. Berman,B., & Evans, J.R. (2010). *Retail management: A Strategic Approach* (10th Edition). New Delhi: Prentice Hall India Publishers.
2. Gilbert, D. (2009). *Retail Marketing Management* (2nd Edition). New Delhi: Prentice Hall India Publishers.
3. Judy Strauss.,&Adel El-Ansary. (2010). *E−Marketing* (3rd edition). Raymond Frost.
4. Suja Nair. (2009). *Retail Management* (4th Edition). New Delhi: Himalaya Publishing House.

16 MBAPM401C CUSTOMER RELATIONSHIP MANAGEMENT 4 0 0 4

Course objectives:

- To understand the need and importance of maintaining a good relationship with customers
- To expose to the various approaches of Customer Relationship Management
- To have an in-depth knowledge in CRM structures, planning and implementation
- To acquire acquaintance in Concepts and Context of relationship Management
- To gain familiarity by understanding Customers Behaviour and role of relation manager
- To identify Customer perception with the concepts and practical implications of customer relationship management

Course outcomes (Cos) :

1. Formulate tools for effective customer relation towards organization
2. Analyze the customer database and profile and serve to their expectations
3. Build CRM models based on customer psychology behind customer relationship
4. Estimate the Customer behavior in relationship perspectives
5. Recognize Data Ware housing and use the Data mining for CRM
6. Develop the CRM software packages

Unit I

Introduction - Definitions - Concepts and Context of relationship Management – Evolution - Transactional Vs Relationship Approach – CRM as a strategic marketing tool – CRM significance to the stakeholders.

Unit II

Understanding Customers - Customer information Database – Customer Profile Analysis - Customer perception, Expectations analysis – Customer behavior in relationship perspectives; individual and group customer’s - Customer life time value – Selection of Profitable customer segments.

Unit III

CRM structures - Elements of CRM – CRM Process – Strategies for Customer acquisition – Retention and Prevention of defection – Models of CRM – CRM road map for business applications.

Unit IV

CRM planning and implementation - Strategic CRM planning process – Implementation issues – CRM Tools - Analytical CRM – Operational CRM – Call center management – Role of CRM Managers.

Unit V

Trends in CRM – E-CRM Solutions – Data Warehousing – Data mining for CRM – an introduction to CRM software packages

Suggested Readings:

Text Books:

1. Shainesh, G., &Jagdish, N.Sheth, (2005). *Customer Relationships Management: Strategic Prespective* New Delhi: Macmillan Publications.
2. Alok Kumar et al, (2008). *Customer Relationship Management: Concepts and applications*. Biztantra.

References:

1. Mohammed, H.P., & Sagadevan, A. (2012).*Customer Relationship Management- A step by step approach.*New Delhi: Wiley India Pvt. Ltd.
2. Jim Catheart.(2005). *The Eight Competencies of Relationship Selling*. New Delhi: Macmillan India.
3. Assel. (2008). *Consumer Behavior - A Strategic Approach* (6th edition). Biztranza.
4. Kumar. (2007). *Customer Relationship Management - A Database Approach*. New Delhi: Wiley India Pvt. Ltd.
5. Francis Buttle. (2004). *Customer Relationship Management: Concepts & Tools*. Elsevier.
6. Zikmund. (2012). *Customer Relationship Management.* New Delhi: Wiley IndiaPvt. Ltd.

16MBAPH401A **INDUSTRIAL RELATIONS** **4 0 0 4**

Course objectives:

- To learn about industrial relations concepts and objectives.
- To gain familiarity in the industrial relation trends of India
- To know about the industrial conflict and handling the disputes.
- To understand collective bargaining and formation of trade unions
- To focus on industrial safety and psychological problems
- Thorough understanding on labor welfare measures

Course outcomes (Cos):

1. Evaluate the significance of industrial relations
2. Analyze the grievance techniques and adopt suitable grievance method to settle disputes
3. Ability to manage industrial conflicts and disputes
4. Evaluate the role the collective bargaining and manage the settlements
5. Create awareness on occupational hazards with HR and Industrial safety
6. Effective implementation of welfare measures in order to have a peaceful industrial relation

Unit I

Industrial Relations – Concepts and Approaches – causes of poor Industrial Relations-Effects of poor Industrial Relations-Suggestions to improve Industrial Relations- Trends in India. Trade unionism –objectives - functions – structure.

Unit II

Industrial Conflicts – industrial disputes –Types - causes –handling and settling disputes – employee grievances – steps in grievance handling- settlement of grievance in Indian industry- Employee discipline-causes – types-kinds of punishment-procedure for taking disciplinary action, Indian law on punishment.

Unit III

Collective Bargaining:-Concept – function and importance – Principles and forms of collective bargaining – Procedure – conditions for effective collective bargaining – worker's participation in management:- Role and methods of worker's participation – Management participation in Trade Unions.

Unit IV

Industrial Safety – Causes of accidents – Prevention – Safety Provisions – Industrial Health and Hygiene – Importance and Problems – Occupational hazards – Diseases – Psychological problems – counseling.

Unit V

Labour Welfare – Concept – Objectives – Scope – Need – Voluntary Welfare Measures – Statutory welfare measures – Welfare Funds –Education and training schemes –Child labour – Female labour –Contract labour – Construction labour – agricultural labour and differently abled labour

Suggested Readings:

Text Book:

1. Nair, N.G., &Latha Nair. (2007). *Personnel Management and Industrial Relation.*New Delhi: Sultan Chand & Sons.

References:

1. Tripathi, P.C. (2009). *Personnel Management and Industrial Relations***.** New Delhi: Sultan Chand & Sons.
2. Mamoria, C.B., &Sathish Mamoria.(2010). *Dynamics of Industrial Relation.* New Delhi: Himalaya Publishing House.
3. Arun Monappa. (2009).*Industrial Relations.* New Delhi: Tata McGraw Hill.
4. SubbaRao, P.(2008). *Essentials of Human Resource Management and Industrial Relations.* Mumbai: Himalaya Publishing House.

16 MBAPH401B TRAINING & DEVELOPMENT 4 0 0 4

Course objectives:

- To know the role and functions of training and development in organization,
- To understand the theories, principles and their implications for the effectiveness of training programs.
- To elucidate on Implementation of Training – Physical arrangements – Classroom management – Trainer's skills and styles
- To understand Career Planning and Factors affecting Career Choices, Career Stages, Career anchors, Succession planning
- To realize the need of controlling in improving the performance of the organization.
- To enable students to synthesize related information and evaluate options for the most logical and optimal solution such that they would be able to predict and control human behaviour and improve results

Course outcomes (Cos):

1. Ability to train and develop employees to improve organizational efficiency.
2. Assess various key factors in designing training programme
3. Designing the training methods for employees as per the requirement of organization
4. Analyze the efficiency of employees and develop career planning
5. Gain knowledge in management development programmes
6. Evaluate the training programmes and prepare a report

Unit I

Training concepts - Features of Training and Development – Objectives – Benefits of Training and Development – Principles of Training, Scope of Training and Development, Historical development of Training and Development, applying to organizational effectiveness

Unit II

Concepts of Learning, Components of Learning – Principles of Learning – Learning Theories – E –Learning - Training Process – Key factors in designing training programme - Assessing Training needs – Methods of TNA – Training Design – Constraints in Training Design

Unit III

Implementation of Training – Physical arrangements – classroom management – Trainer's skills and styles – Transfer of Training - Evaluation of Training – need – types of instruments – Evaluation design – Models of Training evaluation.

Unit IV

Training Methods – On and Off the Job training Techniques - Lecture Methods, Programmed Learning – Discussion methods, case Methods, Role Play –, Business games, in-basket exercises, Field Training, Audio-Visual Aids, Static and Dynamic media – Computer based training, Training methods adopted by Successful Indian Organizations.

Unit V

Career Planning – need - Factors affecting Career Choices, Career Stages, Career anchors, Succession planning – steps- Career Development- Management Development – Need & Importance – Types of management development programmes - Management characteristics – skill acquisition – Training for Executive level management - Emerging Trends and Future Prospects in Training and Development.

Suggested Readings:

Text book:

1. V.Janaki Raman, V. (2009). *Training and Development.* Biztantra

References:

1. Sahu, R.K. (2008). *Training for Development* (1st edition). New Delhi: Excel Books.
2. Pareek Udai &Rao,T.V. (2009). *Designing and Managing Human Resource System*. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
3. Rao, P.L. (2009). *Training and Development*. New Delhi: Excel Books.
4. Nick Blanchard, P., & James W. Thacker. (2008). *Effective Training.* New Delhi: Prentice Hall of India
5. Raymond A. Noe. (2009). *Employee Training & Development*. New Delhi:Tata McGraw Hill.
6. Tapomoy Deb. (2008).*Training and Development*. New Delhi: ANE Books Pvt Ltd

16 MBAPH401C COMPENSATION MANAGEMENT 4 0 0 4

Course objectives:

- To make the students to be familiar with Wages, Salary, incentives, Compensation and pay scale systems
- To understand the Concept of Equity and Components of Compensation
- To understand the compensation designing and factors deciding compensation designing
- To know the basics of compensation, various incentives and fringe benefits applicable
- To understand the fundamentals of wages, salary, incentives, compensation and pay scale systems and apply lifelong
- To have relevant knowledge of social security laws for employees of the organization

Course outcomes (Cos):

1. Design the compensation plan suitable to their organization
2. Formulate incentives and retirement plans
3. Evaluate the existing fringe benefits and design new programmes for organization
4. Analyze the Internal and External Equity in Compensation Systems
5. Classify the Laws Relating to Workmen's Compensation, Employee's State Insurance, and Provident Fund
6. Evaluate the Compensation plans provided by Public sectors & Private Sectors

Unit I

Compensation: Concept and Nature – Concept of Equity & Compensation-Components of Compensation- Form of Compensation, Compensation Plans- Types of Compensation plans. Wage concepts – components- criteria of wage fixation, Types of Wages - Designing Wage, salary and Compensation Policies- Wage differentials.

Unit II

Compensation Designing –Factors affecting Compensation Designing. Incentives and Retirement plans: Basic Pay, Provisions for Dearness allowance – Calculation of total compensation package, various methods of compensating cost of living, Neutralization factors.

Unit III

Incentives and Fringe Benefits – Incentives – Definition, Types of Incentives: Individual incentives and Organization Wide incentives – Scanlon Plan, Kaiser Plan, Profit sharing, on-financial incentives, Fringe Benefits – Definition, Objectives, Types of Fringe Benefits.

Unit IV

Planning for Improved Competitiveness: Diagnosis and Bench Marking, Obtaining Commitment; Determination of Inter and Intra-industry Compensation Differentials, Internal and External Equity in Compensation Systems. Compensation provided by Public sectors & Private Sectors.

Unit V

Social Security Laws – Laws Relating to Workmen's Compensation, Employee's State Insurance, Provident Fund, Gratuity and Maternity Relief. Wages and Bonus Laws – The Law of Minimum Wages, Payment of Wages, Payment of Bonus.Objectives and scope of Laws.The Impact of fifth pay scale on Central and State Government.

Suggested Readings:

Text Book:

1. Er.SoniShyam Singh. (2009). *Compensation Management.* New Delhi: Excel Books.

References

1. Sunil Bhaksi. (2000). *Compensation Management*. New Delhi: Galgotia Publications.
2. Dwivedi, R.S. (2009). *Managing Human Resource and P.M in Indian Enterprise*. New Delhi: Galgotia Publishing Company.
3. Wayne Cascio. (2007). *Managing Human Resource.* New Delhi: Tata McGraw Hill.

16 MBAPS401A E – COMMERCE TECHNOLOGY AND MANAGEMENT 4 0 0 4

Course Objectives:

- To understand the practices and technology to start an online business
- To analyse the technology requirements for Ecommerce
- To know the different business models available for running a e-business
- To study the different ways of payment and payment services available.
- To acquire knowledge on the E-supply chain management relating to e- business.
- To know about E-business models and Virtual Merchants

Course outcomes (Cos)

1. Ability to manage an e-business
2. Analyse the various market forces influencing the I-way
3. Assess the different technology for managing business online
4. Apprehend different level of applications available to run the business
5. Analyze the different marketing strategies
6. Apply the different E-supply chain management relating to e- business

Unit I

E-Commerce: What is E-Com – Need- Types of E-Com-E-Com framework - E-Com and media convergence - E-Com consumer applications – E-Com organization application. Business models for E-commerce: E-business models based on relationship of transaction parties.

Unit II

Market forces influence the I-way - components of the I-way - public policy issues shaping the I-way enabling technologies of the WWW- Case studies on I – way.

Unit III

E-business models - E-payment systems – Digital payment requirements, digital E-Token systems, properties of electronic cash, and cheque payment systems on the Internet, risk and E-Payment system, designing E-Payment system, digital signature.

Unit IV

E-marketing: Traditional Marketing, identifying Web presence goals, browsing behavior model, on-line marketing, E-Advertising, internet marketing trends, E-Branding, marketing Strategies. E-customer relationship management: Customer relationship management, typical business touch points.

Unit V

E-supply chain management: E-Supply chain -E-strategy: Information and strategy, the virtual value chain, seven dimensions of E-Commerce strategy, value chain and E-Strategy, planning the E-Commerce Project, Strategies for Web site development - Case study: mobile commerce

Suggested Readings:

Text Book:

1. Joseph, P.T.(2002). *E-commerce A Managerial Perspective* (1st Edition). New Delhi: Prentice Hall of India.
2. Ravi kalakota. ,&Andrew B. Whinston. (2000). *Frontiers of E-commerce* (1st edition). Singapore: Pearson Education.

References:

1. Jason R. Rich. (2008). *The Unofficial Guide to Starting an E-commerce Business* (1st edition).New Delhi. IDG Books India Private Limited.
2. LaudonTraver. (2007). *E-Commerce (Business, Technology)*. Singapore: Pearson Education.
3. David Whitley. (2009). *E-Commerce.* New Delhi: Tata McGraw Hill,

16MBAPS401B SOFTWARE PROJECT MANAGEMENT 4 0 0 4

Course Objectives

- To understand project management cycle in software development
- To study resources planning in software development
- To know about acquisition Process of Hardware, Software and Network
- To know the different ways of testing and quality models for software projects
- To apprehend different acquisition process and performance evaluation used
- To understand the risk management associated with implementation of software management

Course outcomes (Cos):

1. Able to identify the software models and software development process
2. Analyze the risk management in project finance
3. Design Resources Planning suitable for organization
4. Ability the undertake testing and develop quality models for software projects
5. Evaluate the acquisition process and its performance
6. Able to identify and managing risk in software

Unit I

Introduction - Software Project Management - An overview of Project planning - Stepwise planning- Overview of COCOMO Model, PERT/CPM, Rayleigh Curve - Project Organization - Risk Management - Project Finance - Procurement Management - Project Scheduling

Unit II

Software Project Management -Resources Planning and Estimation, Different Methods in brief-Function Point Analysis in some details - Use of CASE Tools - Introduction to MS Projects-Design and Development – Schedule - Resource Allocation - Progress Review

Unit III

Testing -Overview of Test Plan - Generation of Test Cases, Test Data - Types of Testing - Quality Concepts - ISO, CMM - Production / Implementation - User Acceptance Tests - Parallel Runs - Maintenance - Types - Adaptive, Corrective, Preventive Version Control and Configuration Management - Documentation Methods.

Unit IV

Acquisition Process - Hardware, Software, Network, Infrastructure -Requirement Planning-Sizing-Selection Methodology including Benchmarking - Documents involved IT HRM – Selection – Retention – Training - Career Path Planning - IT Operations – Scheduling - Performance Evaluation

Unit V

Risk management- Nature of risk - Managing risk - Evaluating risk - A software management process frame works - Life cycle phases - Software Maintenance and Configuration management - Maintenance characteristics - Maintenance task - Maintenance side effects

Suggested Readings:

Text book:

1. Roger. S. Pressman, (2007).Software Project Management (3rd edition). New Delhi: Himalaya publishers

References:

1. Donald. J. Reifer. (2006). *Software Project Management* (6th edition).New Delhi: Wiley India Pvt. Ltd.
2. Kelkar. (2007). *Software Project Management* (2nd edition).New Delhi. Prentice Hall India.

16MBAPS401C ENTERPRISE RESOURCE PLANNING 4 0 0 4

Course objectives

- This course aims to enhance the understanding of the students with respect to the conceptual framework and the technological infrastructure of Enterprise Resource Planning.
- It also aims to expose the students to the implementation issues and future trends associated with ERP.
- To know the future trends in ERP systems to have good relation with customers.
- To understand the concept of Enterprise Resource Planning, its implementation, future trends in ERP and apply the learning's lifelong.
- To evaluate the need of ERP for an organization, select the best vendor and implement the module that is appropriate for the organization need
- To apprehend different Sales and Distribution tools used

Course outcomes (Cos):

1. Determine the right choice of ERP systems curtailing the needs of organization
2. Gain insight in storage management database administrator
3. Evaluate the factors determining the success and failures of ERP
4. Illustrate how current technologies and decision-support tools can be utilized to the advantage of business operations
5. To analyze the future trends in ERP systems to have good relation with customers.
6. To apprehend the application of different Sales and Distribution tools for business.

Unit I

Introduction- purpose of database system – View of data - Data models - Database languages - Transaction Management - Storage Management - Database Administrator - Database Users-System Structure.

Unit II

Entity Relational Model: Basic concept – Key Entity Relationship Diagram, Weak Entity Sets, E-R features, Specialization, Generalization, Relational model - Structure of Relational Databases-Relational Algebra-Views.

Unit III

SQL – Background - Basic structures - Set operations - Aggregate functions - Null values - Nested – Sub queries - Derived relations - Views – Modification of the database - Joined relations - Data definition language - Embedded SQL features – Data warehousing - Concepts – architecture - Data transformation - User interface - Distributed database.

Unit IV

ERP concepts: Introduction to ERP system - Review of DBMS & Transaction processing concepts – Information models – Financial model – Financial Accounting, controlling - Issues in Customizing - ERP system for organization - Introduction to Business Information flows – Work flows.

Unit V

Sales and Distribution – Basic functions – Billing – Electronic Data Interchange – Transportation - Case studies – SAP R/3, People soft – Oracle financials – Development Tools – Administration tools – Reporting and Analysis Tools and Integration Tools – BPR , Implementation - Project Management – Meaning – Business benefits of ES

Suggested Readings:

Text Books:

1. Abraham Silberschatz., Henry F. Korth., &Sudharshan, S. (2007). *Database System Concepts* (3rd edition). New Delhi: Tata McGraw Hill.
2. Michael Hammer, (2008). *Enterprise Resource Planning* (3rd edition). New Delhi: Tata McGraw Hill.

References:

1. Alexis Leon., & Mathews Leon.(2009). *Database Management Systems* (1st edition). New Delhi: Vikas Publishing House.
2. Raghu Rama Krishnan.,& Johannes Gehrke. (2008). *Database Management Systems* (3rd edition). New Delhi: Tata McGraw Hill.

16 MBAPE401A **4 0 0 4**

TECHNOLOGY INNOVATION AND SUSTAINABLE ENTERPRISE FOR MANAGEMENT

Course Objectives

- The course focuses on different matters of importance related to Technology and Innovation Management.
- Provides clear understanding on the Technology Transfer and Joint Ventures
- Enable students to know web marketing and its strategies in marketing research.
- To know about Web Marketing strategies
- To understand E-Mail Marketing and Instant Market Research
- To study Enterprise Resource Planning from an entrepreneurial perspective

Course Outcomes (Cos):

1. Appreciate the role of technology in the modern business economy
2. Analyze the key aspects of Technology Transfer and Joint Ventures and implement in business
3. Assess and develop the necessary critical factors in the Web Marketing
4. Identify and evaluate opportunities for new technologies
5. Compare and contrast the different forms of intellectual property protection in terms of their key differences and similarities.
6. Students will be able to analyze the Enterprise Resource Planning and e-Business Blueprint Planning

Unit I

Innovation: - Need - Objectives of Innovation - Technology Innovation - Its importance - Knowledge Management- Need - Business strategies related to Knowledge Management - Knowledge Management Approaches - Transformation of an enterprise through Knowledge Management - Creating Knowledge Management System in Organization Establishing Knowledge Management through IT - Organizational culture for Knowledge Management - Future of Knowledge Management

Unit II

Technology Transfer and Joint Ventures - Policy, Procedure & Practices - India's Technology base and Capabilities - Preference of Indian Technology - Major Constraints and problems -

Operational constraints - Problems in Indian Business Environment, Problems in Finalization of Agreement - Major Problems in Technology Transfer Collaboration Agreements, R& D, Import Substitution, Scaling, Diagrams - Patterns and Intellectual Property rights.

Unit III

Web Marketing- Meaning - Benefits of Web Marketing-Myths and Facts in Web Marketing - Web Psychology: Understanding the Internet mind - The Internet and the Law: Copyright, Censorship, Privacy, Jurisdiction - Do's and Don'ts on Web.

Unit IV

Web Marketing strategies - Choosing the Strategy - Online Store Fronts - Target Marketing - Attracting Customers - Web Advertising - E-Mail Marketing - Instant Market Research - Securities Issues.

Unit V

Enterprise Resource Planning: Meaning - ERP decision - Enterprise Architecture Planning - ERP Implementation - The Future of ERP Applications – Procurement - e-Business Blueprint Planning.

Suggested Readings:

Text book:

1. Azad, R.R. (2010). *Technology Transfer and Joint Ventures Abroad*. New Delhi: Deep & Deep Publications.

References:

1.Harish Chandra Chaudharaty. (2004). *Knowledge Management for Competitive Advantage*. New Delhi: Excel Books Publications.

2. Thomas J Kuegler. (2008). *Web Advertising and Marketing*(3rd edition). New Delhi: Prentice Hall of India.

3. Ravi Kalakota. (2009). *E-Business Roadmap for Success*. Singapore: Pearson Education.

4. Ravi Kalakota& Andrew B. Whinston.(2000).*Frontiers of Electronic Commerce*.New Delhi: Wiley India Pvt. Ltd.

16MBAPE401B BUSINESS PLAN AND ETHICS 4 0 0 4

Course Objectives:

- To know the fundamental parameters used to generate an idea for business plan
- To understand the business plan sources through trade and industries associations
- To study the industry analysis for applying skills and tools to manage and analyze the gap.
- Helps to understand the marketing plan and sales strategy
- To acquire knowledge on emerging ethical issues in business
- To develop the ethical decision making process

Course Outcomes (Cos):

1. Prepare a business plan considering the basic parameters of capital management and change
2. Critically analyse the sources of information for business plan
3. Identify the gap for applying expertise skills and tools.
4. Evaluate the emerging ethical issues in business.
5. Formulate the ethical decision making process
6. Analyze the Business Ethics in a Global Economy and emerging ethical issues in business

Unit I

Business Plan – Meaning - The why of business plan - Basic parameters - Timing of decision undertaken Project parameters - The common considerations - Factors of successful business - Capital management - Financial control - Anticipating change and adaptability.

Unit II

Business Plan Process - Sources of Information - Internet, Government sources and Statistics - Offline Research Resources - Library - SBDC'S - Trade and Industries Associations - Sources of Market Research - Evaluating data- Benefits of market study - Coverage of market study - Information sources.

Unit III

Business Plan components - The Executive Summary - Company description - Industry Analysis and trends - Target Market - Competition - Strategic position and Risk assessment - Marketing Plan and Sales strategy - Operations - Technology plan - Management and Organization

Unit IV

Business Ethics - Definition and Importance - Benefits of Business Ethics - Emerging Ethical Issues in Business - Ethics as a dimension of Social Responsibility.

Unit V

The Ethical Decision Making Process - Understanding ethical decision making and corporate governance - Individual factors - Organizational factors - Implementing and Auditing Ethics programs - Business Ethics in a Global Economy

Suggested Readings:

Text book:

1. Ferrell, O.C., &John Fraedrich. (2012). *Business Ethics: Ethical Decision Making and Cases.*Cenage Learning.

References:

1.William H. Shaw**.** (2010). *Business Ethics.* Boston: Cenage Learning

2. Entrepreneurship Development Institute of India. *Business plan preparation*

16 MBAPE401C MANAGING DIVERSITY 4 0 0 4

Course Objectives:

- To understand entry of multinationals and innovation of new products
- To study cultural impacts and changes on business
- To study the international trade theories and strategies for managing global entry
- To get familiarize with the Import and Export Acts
- To gain knowledge on the strategic responses to changing environment
- To know the legal acts in India relating to Industry.

Course Outcomes (Cos):

1. Evaluate the modes of entry of multinationals and innovation of new products
2. Demonstrate the Social Responsibility of Business.
3. Critically analyse the cultural changes and its impact on business
4. Formulation of strategies to get profit from global business
5. Estimate the export and import acts for managing global entry.
6. The student will able to evaluate the legal acts in India relating to Industry and the role of cultural diversity in Business Environment.

Unit 1

Business - Concepts and Significance - Entry of Multinationals - New Changes in Business - Innovation of New Products - Technological Changes – Competition in Business - Social Responsibility of Business.

Unit II

Cultural Concept - Cultural Change - Culture and Workplace - Cross Culture - Culture and Competition - Differences in Culture - Cultural Theories - Impact of Culture on Business - Managing Cultural impacts and changes.

Unit III

Nature of Competition - Heckscher Ohlin Theory - The new trade Theory - National Competitive Advantage - Porter's Diamond - Impact of Competition - Managing Competition - Updating of new technology. Era of Globalization - Significance - Strategy and the firm - Profiting from Global Expansion - Pressures for cost reductions and Local responsiveness - Strategic Choice -

Entry mode - Liberalization of Indian economy - Export and Import Acts - Managing global entry.

Unit IV

Strategic Responses to changing environment - Portfolio Related, Process Related and Structure Related - Aligning HR Strategy - Strategic Changes - Planned Changes - Drawbacks- Unplanned Change - Steps in Planned Change - Changes and Amendments in Labors Laws - International Trade Unions and Business Associations

Unit V

Legal acts in India - Industrial Developmental Regulation Act (IDRA) - New Industrial Policy - New Economic Policy - Abolition of MRTP Act and introduction of Competitive Act - Consumer Protection Act - Imposing of MODVAT in India - Political Environment - Political uncertainty - Impact of Politics on Business- GATT - WTO- TRIPS –TRIMS - Consumer movements, Right to information.

Suggested Readings:

Text books:

1. Hill, C. W. (2009). *International Business: Competing in the Global Market Place*. New Delhi: Tata McGraw Hill Publishing Corporation Limited.

2..Francis Cherunilam. (2010). *Business Environ*ment. New Delhi: Himalaya Publishers.

References:

1. Aswathappa. (2008).*Essentials of Business Environment***.** New Delhi: Himalaya Publishers.

2. Agarwal, A. N. (1996). *Indian Economy*. New Delhi: Wishwa Prakashan.

16MBAPB401A EXPORT AND IMPORT FINANCING 4 0 0 4

Course Objectives:

- To understand documentary credits and letters of credit
- To apprehend to export finance and Pre-shipment finance
- To study the different types of post-shipment finance
- To understand the strategic rules governing import credit
- To know the Export and Import policy of India
- To provide knowledge on the various incentives given by the Government of India for exports

Course Outcomes (Cos):

1. Ability to file documentary credits and letters of credit
2. Critically analyse export finance related to Pre-shipment finance and documentation
3. Critically analyse the rules governing the post-shipment finance
4. Examine the strategic rules governing import credit
5. Evaluate the Export and Import policy of India and role of RBI in export finance
6. Evaluate the incentives given by the Government of India for exports

Unit I

Introduction to Documentary Credits **-** Documentary Credits, Letters of Credit, Parties to letters of credit, Types of letters of credit, Documents in Documentary Credit - FOB, CIF, C&F

Unit II

Export Finance – Pre-Shipment Advance **-** Pre-shipment finance, Types of Pre-shipment finance, Disbursements of packing credit advance, Overdue Packing Credit Advances and their follow up, Packing Credit in Foreign Currency (PCFC) - Transshipment

Unit III

Export Finance – Post-Shipment Advance – Post-shipment finance, Rules governing post-shipment finance, Types of post-shipment finance, Crystallization of overdue export bills and their follow up.-Forward cover procedure

Unit IV

Imports - Import letter of credit - Rules governing Import credit - Forward exchange contracts for imports, Payment for import of goods - Technology imports procedure

Unit V

ECGC and EXIM Bank - Export and Import policy of India, Incentives given by the Government of India for exports, Role of RBI in promoting export credit, ECGC – Types of policies, EXIM Bank – Its role and their promotional activities - Foreign Trade shows.

Suggested Readings:

Text Book:

1. Reserve Bank of India. (2000). *Documentary Credit.* Mumbai: Foreign Exchange Dealers Association of India.

References:

1. Reserve Bank of India. (2000). *Exports Finance.* Mumbai: Foreign Exchange Dealers Association of India.
2. Reserve Bank of India, (2000). *Trade and Exchange Control Regulations Relating to Imports,* Mumbai: Foreign Exchange Dealer Association of India.
3. Dun.,& Bradstreet. (2007). *Foreign Exchange Markets.* New Delhi: Tata McGraw Hill.
4. Thummuluri Siddaiah. (2010). *International Financial Management.* New Delhi: Pearson.

16MBAPB401B MANAGEMENT OF NON-PERFORMING ASSETS 4 0 0 4

Course Objectives:

- To make the student to aware of accumulation of NPA, rule regarding rehabilitation of sick units and recovery of dues
- To know the procedure for classification of non-performing assets
- To study the concessions under Income Tax Act for mergers and unwillingness to pay and inability to pay
- To understand the process of recovery of advances and the role of Credit Guarantee Corporation.
- To know about provisioning to various Non- Performing assets and write – off of advances
- To understand Securitization and Reconstruction of Financial Assets and Securities Interest Act

Course Outcomes (Cos):

1. Analyze the impact of sickness on industries and ways & means of preventing sickness
2. Classify the non-performing assets accumulated in their organization
3. Evaluate the concessions under Income Tax Act for mergers and unwillingness to pay and inability to pay
4. Student will discover the process of recovery of advances
5. Understand the importance of Credit Guarantee Corporation
6. Develop the procedure for Accounting Practices.

Unit I

Sickness and its Prevention - Causes and detection of sickness, Follow up of advances, Post- sanction inspection, ABC norms, Sick Industrial companies Act – BIFR - Risk averseness

Unit II

Non-Performing Assets - Introduction to NPAs, Income Recognition, Asset classification: Standard, Sub-standard, Doubtful and loss assets, provisioning to various Non- Performing assets and write – off of advances - Gross NPA and Net NPA

Unit III

Rehabilitation of sick units - Classification of units as viable and non-viable, Guidelines for drawing rehabilitation scheme, revival by Mergers and Amalgamations, Concessions under Income Tax Act for mergers - Unwillingness to pay and inability to pay

Unit IV

Recovery of dues - Corporate Debt Restructuring, Civil suits, Debt Recovery Tribunal, Securitization and Reconstruction of Financial Assets and Securities Interest Act SARFASI, Asset Reconstruction Company, Compromise agreements CIBIL

Unit V

Credit Guarantee Corporation - Objectives of Credit Guarantee Corporation, Small Loans Guarantee Scheme, Small Loans (SSI) Guarantee Scheme, Accounting practices - Crop insurance.

Suggested Readings:

Text Book:

1. Pandey, I. M. & Ramesh Bhat. (2000).*Cases in Financial Management* .New Delhi: Tata McGraw Hill.

References:

1. Ciaran Walsh. (2006). *Key Management Ratios: How to Analyze, Compare and Control the Figures that Drive Company Value.* New Delhi: Macmillan India Ltd.
2. Gopalakrishnan, T.V.(2004). *Management of Non - Performing Advances.* New Delhi: Northern Book Centre.

16MBAPB401C RISK MANAGEMENT IN BANKS 4 0 0 4

Course Objectives:

- To make the student to aware of regulations of RBI to banks
- To know the market risks- interest rate risks for asset and liability management
- To study the credit quality problem and credit scoring models for measurement of credit risk
- To study the basics of reducing off-balance sheet risks and comprehend Commercial letters of credit
- To understand the regulations of RBI to mitigate the risks
- To understand foreign exchange risk and the role to follow capital adequacy norms

Course Outcomes (Cos):

1. Classify the various risks faced by the banks
2. Student can able to analyze the regulations of RBI to banks on various risks.
3. Formulate the procedures for reducing market risks- interest rate risks for asset and liability management
4. Ability to develop the methods for measurement of credit risk,
5. Analyze off-balance sheet risks and commercial letters of credit and provide solutions
6. Estimate the solvency nature of a company and foreign exchange risk.

Unit I

Introduction to Risks - Risk, An introduction to various risks faced by banks, the impact of risks on banks profitability and the regulations of RBI to mitigate these risks. Zero risk assets

Unit II

Market Risks - Interest rate risks, Rate sensitive assets, Rate sensitive liabilities, Re-pricing risks, Liquidity risk, Asset liability management Committee: Role and purpose - Maturity buckets

Unit III

Credit Risk - Credit quality problems, Meaning of willful default and inability by borrower to pay the dues, Measurement of credit risk, Credit scoring models, Loan portfolio and concentration risk - Discriminant analysis

Unit IV

Off-Balance Sheet Risks **-** Commercial letters of credit, Standby letters of credit, Guarantees, Derivative contracts: Basics of reducing off-balance sheet risks - Notes on accounts

Unit V

Other Risks **-** Operational risk, Foreign exchange risk, Country or sovereign risk, Technology risk, Insolvency risk and Capital adequacy norms. Sovereign rating by credit rating agencies

Suggested Readings:

Text book:

1. Jayadev. (2011). *Commercial bank Management.* New Delhi: Tata McGraw-Hill.

References:

1. Ciby Joseph. (2007). *Credit Risk Analysis: A tryst with strategic prudence.* New Delhi: Tata McGraw-Hill.
2. Mark S. Dorfman. (2009). *Introduction to Risk Management and Insurance.* New Delhi: Prentice Hall of India.
3. Dun & Bradstreet. (2007).*Financial Risk Management.* New Delhi: Tata McGraw-Hill.
4. Rene M. Stulz. (2006). *Risk Management and Derivatives.* New Delhi: Thomson South-Western Publications.

16MBAPR401A INTERNATIONAL RETAILING 4 0 0 4

Course Objectives:

- To have an exposure in international retailing segmentation
- To understand the trends in retail marketing and changing nature of boundaries.
- Students have basic understanding of Multi country Competition and Global Competition
- Acquire knowledge for entering and competing in foreign markets.
- To have clear insight of the Stages in development of International Operations
- Students learn about public relation and sales promotional strategies

Course Outcomes (Cos):

1. Analyze the international retailing and markets.
2. Discover the strategies and options for entering and competing in foreign markets.
3. Construct marketing tools and techniques to meet Multi country Competition and Global Competition
4. Access the retail operation through formulation of retail structure.
5. Gain knowledge on international retailing and markets.
6. Mapping Market Research and Sales Promotion Strategies

Unit I

International Trade – Barriers and Facilitators - Regional Economic/Political Integration - Cultural Influences on International Marketing - International Marketing Segmentation – Positioning - The Marketing Plan and Entry Mode Selection

Unit II

International Retailing - Definitions, Interpretations - Trends in the Internationalization of Retailing and Evolution of International Retailing - Motives for International Retailing - The changing nature of boundaries – Assessing the potential of Retail Markets - Methods of International Retailing - Accessing Retail Markets.

Unit III

Competing in Foreign Markets - Why Companies Expand into Foreign Markets - Cross Country Differences in Cultural, Demographic and Market Conditions - Concept of Multi country Competition and Global Competition - Strategy Options for Entering and Competing in Foreign Markets - Quest for competitive Advantage in Foreign Markets

Unit IV:

Retail Structure - Enterprise Density - Market Concentration - Developing markets - Stages in development of International Operations – Export Management Contracts - Franchising – Acquisition and Mergers – Organic Growth - Choice of Market Entry - Domestic Market - Retail Operations - Non Domestic market.

Unit V:

Market Research – Segmentation – Targeting - Positioning – The Market Mix - Image Product range – Format – Price – Location – Distribution – Promotion - Promotional Mix and Advertising – Publicity – Public Relations and Sales Promotion Strategies - Personal Selling and Sales Management.

Suggested Readings:

Text book:

1. Abbas, J. Ali. (2005). *Globalization of Business: Practice and Theory*. Mumbai: Jaico Publishing House.

References:

1. Nicolas Alexander. (2013). *International Retailing*. Blackwell Business Publishers Ltd.
2. Arthur A Thompson., Strickland, A. J, John E. Gamble., &Arun K Jain Crafting. (2010). *Retail Management*. New Delhi: Excel Books.
3. Margaret Bruce., Chistopher Moore., & Grete Birtwistle. (2004). *International Retail Marketing: A Case Study Approach*. Elsiver.
4. Allan M. Findlay., Ronan Paddsion., & John A. Dawson. (1990). *Retailing Environments in Developing Countries*. New York: Routledge.

16MBAPR401B **RETAIL PLANNING** **4 0 0 4**

Course Objectives:

- To understand the role of retailing and strategic business management in service sector
- To study the operations and financial aspects in retail planning
- To comprehend the human resources management in retailing
- To study the legal & compliances for a retail Store
- To know the procedures applicable for a Retail Store
- To emphasize on Mall management and its various forms.

Course outcomes (Cos):

1. Analyze the role of retailing and strategic business management in service sector
2. Know the retailing in banking and other financial services
3. Design the operations and financial aspects in retail planning
4. Comprehend the human resources management in retailing
5. Ability to resolve the legal and compliances for a retail Store
6. Discover strategies for mall management and its various forms.

Unit I

Marketing & Strategic Management: Retailing - Role, Relevance & Trends - Retail Customer - Retail market segmentation & franchising - Retailing in banking and other financial services - mutual funds and Insurance - Services marketing and management

Unit II

Operations & Finance in Retailing: Retail location strategy - Product and Merchandise management – Total Quality Management - Security measures - Footfalls / computerized methods & non computerized methods - Visual / display methods - Management of Obsolete goods

Unit III

Human Resources Management in Retailing: Retail organization - Laws involved in Human Resources - Motivation - Customer psychology - Training needs for employee - Top grading - Obstacles to Top grading - Coaching to fix weakness - Interviews guide

Unit IV

Legal & compliances for a Retail Store: License - Contracts & Recovery - Legal Process - PF/ESI& Exemptions - Food & Restaurants – PPF - IR Law - Shops & establishments - IPR Patents, Copyright & Trademarks - Inclusion of Service Mark - Procedure and Duration of Registration Collective Mark - Procedures applicable for a Retail Store .

Unit V

Mall Management: Types of Various Retail Formats - Concepts in Mall Design - Factors influencing Malls Establishments - Aspects in Finance - Aspects in Security / Accounting - Aspects in HR - Aspects in Quality Management

Suggested Readings:

Text Book:

1. SwapnaPradhan. (2009). *Retailing Management Text & Cases.* New Delhi*:* Tata McGraw Hill.

Reference Books:

1. Levi, E. &Weitz, S. (2009). *Retailing Management*. New Delhi:Tata McGraw Hill.
2. Bert Rosenbloom. (2004).*Marketing Channel*. South Western Publication.
3. William G.Zikumund.,& Michael D.Amico. (2002). *Marketing: Creating and Keeping Customers in an E-commerce World*. South Western Publication.
4. Barry R. Berman.,& Joel R. Evans. (2009). *Retail Management: A Strategic Approach.* New Delhi: Pearson Prentice Hall.
5. Akhileshwar Pathak. (2006). *Legal Aspects of Business. New Delhi:* Tata McGraw Hill Publishing Company Limited.

16MBAPR401C RETAIL COMMUNICATION 4 0 0 4

Course Objectives:

- To understand the basic concepts of personal and impersonal communication in retail
- Knowledge on communication programmes to develop brand images and building customer loyalty
- Students learn about planning, implementing and evaluating communication programs for retailing
- To know the ways of planning and allocating of communication budget
- Acquire knowledge on integrated marketing communications
- To learn the suitable technology for Integrated Marketing Communications

Course Outcomes (Cos):

1. Demonstrate capabilities concepts of personal and impersonal communication in retail
2. Organize communication programmes to develop brand images and building customer loyalty
3. Analyse the planning, implementing and evaluating communication programs for retailing
4. Apply the suitable technology for Integrated Marketing Communications
5. Apply the understanding of Retailing, Retail market segmentation, Retail location, merchandising, Retail operations and Retail Pricing in lifelong practice.
6. Demonstrate capabilities of analysing problems, team work and communication skills.

Unit I

Retail Communication – Methods of communicating with customers – Paid and Unpaid Communication – Personal and Impersonal Communications.

Unit II

Communication programmes to develop Brand Images and Building Customer Loyalty – Extending the brand name.

Unit III

Retail communication planning – Setting objectives – Communication budget – Allocation of the promotional budget – Planning and Implementing and Evaluating communication programs

Unit IV

Retail Communication Mix – Advertising – Sales promotion – Public Relations and Publicity Personal selling – Point of Purchase displays.

Unit V

Integrated Marketing Communications – E tailing – E-commerce – Applications of Technology – EDI, DBMS – Data Warehousing – Data Mining – RFID- Green Marketing- Strategies of Green Marketing.

Suggested Readings:

Text book:

1. Michael Levy., Barton A. Weitz., &Ajay Pandit.(2008). *Retailing Management*. *New Delhi:* Tata McGraw Hill Publishing Company Limited.

References:

1. Swapna Pradhan. (2009). *Retailing Management Text & Cases.* New Delhi*:* Tata McGraw Hill.
2. David Gilbert. (2009). *Retail Marketing Management*. New Delhi*:* Pearson Education.
3. Manish V. Sidhpuria. (2009). *Retail Franchising*. *New Delhi:* Tata McGraw Hill Publishing Company Limited.

16MBAPI401A MULTILATERAL TRADE AGREEMENTS AND REGULATIONS 4004

Course Objectives:

- Attempt to appreciate the conceptual and practical aspects of trade agreements.
- Acquaint the students with environmental, procedural, institutional and decisional aspects of trade.
- To develop capabilities to understand the International Business Laws
- To understand the dispute settlement and issues related to intellectual property regime.
- To understand Implications for International business and progress made by WTO in the last one decade
- Students get familiarize on the formation of regional blocks and its impact on trade.

Course outcomes (Cos):

1. Students can able to link theoretical concepts of trade in business situations
2. Analyze the prevailing international business laws to outsource their business
3. Evaluate the value of trade of their economies and other economies
4. Understand various International Commercial Dispute Settlement
5. Compare and estimate the various trade agreements among nation
6. Ability to manage resources, identify and carry out specific goal oriented tasks

Unit I

Historical background of International Trade, Direction and Composition of International Trade.Terms of Trade, Trade as an engine of growth. Concept of Law - Types of law, Domestic and International and their jurisdiction. Regional Trade Agreements: Concept, Origin, Types - European Union, NAFTA, ASEAN, MERCOSUR – Their structure, Decision making, Funding, Implications on world trade.

Unit II

Law of WTO: Introduction, Objectives, Functions, Structure, Principles, Agreements – implications for International business, Progress made by WTO in the last one decade - Tariff and Non-tariff barriers - Implications for WTO members.

Unit III

International Business Law – International Sale of Goods, Laws governing International Sale of goods – Domestic laws, International Treaties, International Mercantile Customs and Usages – Inco terms, Rules on International Sale of Goods, International Commercial Dispute Settlement – Reconciliation, Arbitration etc.

Unit IV

Intellectual Property: Historical Background, IPR Administration – WIPO, WTO, Indian Patent Office, Patents, Copyrights, Trademarks, Geographical Indications, Industrial Designs, Layout Designs, Trade secrets.

Unit V

Selected Regional Blocks- NAFTA, EU, ASEAN, SAARC, SAPTA, Indo-Lanka Free trade, Indo -Singapore CECA Globalization vs. Regionalization

Suggested Readings:

Text books:

1. Richard E.Caves. Jeffery A. Frankel., & Ronald W.Jones. (2007). *World Trade and Payments* (10th edition). Pearson Education.
2. Cherunilam, Francis, *International Economics*. New Delhi: Tata McGrawHill Publishing Company Ltd.

References:

1. Vinod V. Sople. (2006). *Managing Intellectual Property*. New Delhi: PHI Learning Private Limited
2. Palle Krishna Rao.(2008). *WTO Text and Cases*. New Delhi. Excel Books.

16MBAPI401B **INTERNATIONAL ECONOMICS** **4004**

Course Objectives:

- To make students understand international trade and formation of economic integration
- To enhance knowledge on gains from trade and terms of trade
- To acquire knowledge on the determination of exchange rate, tariffs and quotas
- Students learn about the balance of payments and its consequences.
- To understand the concept and limitations of Foreign Trade Multiplier
- Familiarize the students with the knowledge of export promotion measures and growth of foreign trade

Course Outcomes (Cos):

1. Analyze the significance of Inter-regional and international trade for an economy
2. Gain insight on the regional integration of economies and multilateral arrangements
3. Analyze the impact of exchange rate fluctuation on home currencies
4. Students evaluate the policies pursued by various economic bodies in international trade
5. Analyze the balance of payments and its impact on business
6. Evaluate the benefits and schemes of government and other bodies for promotion of exports

Unit I

Introduction: International Economics- Meaning, Scope & Importance Inter-regional and international trade. Importance of International Trade. Theoretical Aspects of Economic Integration: Free Trade Area, Customs Union and Common Market - Theory of Customs Union - Trade Creation and Diversion effects.

Unit II

Theories of International Trade. Theory of Absolute Cost Advantage, Theory of Comparative Cost Advantage. Intra-Industry Trade. Gains from Trade, Measurement of gains, static and dynamic gains. Terms of trade – Importance & Types, Determinant’s of Terms of trade, Causes of unfavorable terms of trade to less developed countries.

Unit III

Trade policy & Exchange Rate, Free trade policy - Case for and against, Protections – Case for and against, Types of Tariffs and Quotas, Determination of Exchange rate, Fixed & Flexible Exchange Rate- Merits & Demerits.

Unit IV

Balance of Payments, Balance of trade and Balance of payments: Concepts and Components - Equilibrium and Disequilibrium in Balance of Payments; Causes and Consequences, Measures to correct deficit in the Balance of Payments. International Monetary System, Devaluation; Merits, Demerits and Limitations, Foreign Trade Multiplier; Concept and Limitations, IMF, World Bank – Objectives, Functions & Performance.

Unit V

Foreign Trade in India, Recent changes in the composition and direction of foreign trade - Causes and Effects of persistent deficit in the Balance of Payments - Measures adopted by the Government to correct the deficit after 1991 - WTO & India Export Promotion measures, Partial and Full convertibility of Indian Rupees, Export Promotion – Contribution of SEZ Foreign Trade policy 2009, Role of Multinational Corporations in India.

Suggested Readings:

Text books:

1. Kindleberger& Peter H. Linder. (2009). *International Economics***.** New Delhi: Macmillan Publication.
2. Paul Krugman., Maurice Obstfeld & MarcMelitz. (2011). *International Economics***.** New Delhi: Pearson Education.

References:

1. Bo Sodersten & Geoferry Reed.(1999). *International Economics.* New Delhi: Macmillan Publication.
2. Salvatore.D. (2006).*International Economics.* Singapore: John Wiley& Sons.

16MBAPI401C INTERNATIONAL LOGISTICS MANAGEMENT 4004

Course Objectives:

- To have an exposure to International Distribution system and Logistics
- To understand the code of conduct in Logistics and International marketing channel decisions.
- To acquire knowledge on the procedures and role of intermediaries in ocean transportation
- Detailed overview of the important sea routes and shipping ports and cost involved in consignments
- To provide knowledge with the consignment of goods trough air transport
- To get an insight on the inventory control and warehousing facilities

Course Outcomes (Cos):

1. Evaluate the significance of the value adding perspective of logistics and distribution system.
2. Analyze the freight structure and practices of shipping
3. Make Strategic and Operational logistics decisions in the context of different modes of shipping
4. Practice of planning for inventory control and warehousing facilities
5. Gain knowledge to analyze the significance of Logistics in Global scenario.
6. Analyze the liners and freight structures to plan for business outsourcing

Unit I

Marketing Logistics: Concept, Objectives and Scope; System elements - Relevance of logistics in International Marketing- International supply chain management and logistics - Transportation activity – Internal transportation, Inter-state goods movement - Concept of customer service.

Unit II

General Structure of Shipping: Characteristics, liner and tramp operations - Code of conduct for liner conferences - Freight structure and practices - Chartering principles and practices - UN convention on shipping.

Unit III

Developments in Ocean Transportation: Containerization - CFS and inland container depots - Dry ports - Multi-modal transportation and CONCOR - Role of intermediaries including freight booking, shipping agents, C&F agents, Ship owner and shipper consultation arrangements.

Unit IV

Air Transport: Air transportation – Total cost concept, advantages, freight structure and operations - Carrier consignee liabilities.

Unit V

Inventory Control and Warehousing: Inventory management – Concepts and application to international marketing - Significance and types of warehousing facilities - Total cost approach to logistics.

Suggested Readings:

Text book:

1. Lambert, D.M., & James, S.R, (2010). *Strategic Logistic Management*. New Delhi: Tata McGraw Hill.

References:

1.Alan, E. Branch. (2009). *Global Supply Chain Management and International Logistics*. New York: Routledge.

2. Raghuram, G. (1998). *Shipping Management: Cases and Concepts*, New Delhi: Macmillan Publishers India Ltd.

3. Sherlock, Jim. (1994). Principles *of International Physical Distribution.* New Delhi:Wiley India.

16MBAPP401A PURCHASING AND MATERIALS MANAGEMENT 4 0 0 4

Course Objectives:

- To understand the purchase functions and materials management.
- To study the vendor development and maintenance for purchasing of capital goods.
- To familiarize with materials planning and codification.
- To recognize the legal aspects of buying and asses the industry ethical practices in materials
- To familiarize the knowledge of warehousing management.
- To provide knowledge on the Materials Management Information system

Course Outcomes (Cos)

1. Demonstrate the concept vendor development and maintenance for purchasing of capital goods.
2. Able to manage and plan material flows and related information flows as part of the company's logistics process.
3. Examine the vendor’s development and maintenance for purchasing of capital goods.
4. Creating practical engineering solutions for materials planning and codification
5. Classify the functions of Materials Management Information System
6. Develop a model for warehousing management and import-export logistics management.

Unit I

Purchasing Functions - Relationship of purchasing Department with other departments, Procurement, Supply management activities, Purchasing objectives and policies, Operating procedures, Purchasing cycles, Objectives of materials management, Organization of material function.

Unit II

Supply Sources - Importance of source selection, Vendor development & maintenance, Vendor rating, Competitive bidding, selecting the source, Negotiation: Objectives, Process, Techniques, Price negotiation, Purchasing of capital goods, Seasonal commodities, Insurance spares. Contract management

Unit III

Materials Planning - Materials Codification: Evolution of codes, Classification, Methodology, Advantages, Standardization: Definition, Specification, Advantages, Techniques, Pricing Principles: Price analysis, Discounts, Economic consideration in determining the right price

Unit IV

Materials Management - Materials management, Legal aspects of buying, Buyer-Seller relationship and ethics Industry ethical practices in Materials

Unit V

Warehousing Management - Stores management, Incoming material Control, Stores documentation & accounting, Materials Management Information System (MMIS) - New developments in MMIS

Suggested Readings:

Text book:

1. Chatterjee, S. (2004). *Applied Materials Management.* New Delhi: Sage Publications.

References:

1. Tony, J. R., & Stephen N. Chapman. (2009). *Introduction to Materials Management.* New Delhi: Prentice Hall of India.
2. Gopalakrishnan, P., & Sundaresan, M. (2004). *Material Management: An Integrated Approach.* New Delhi: Prentice Hall of India Pvt Ltd.
3. Datta, A.K. (2009). *Materials Management Procedures, Text and Cases.* New Delhi: Prentice Hall of India Pvt. Ltd.
4. Gopalakrishnan, P. (2001). *Purchasing and Materials Management.* New Delhi: Tata McGraw Hill Publishing Company Limited.

16MBAPP401B SUPPLY CHAIN AND LOGISTICS MANAGEMNT 4 0 0 4

Course Objectives

- To understand the concept of supply chain and logistics.
- To get familiarize with the key drivers of supply chain performance.
- To acquire knowledge of supply chain inventory
- To have clear understanding of supply chain network optimization models
- To provide basic concepts of freight management and ocean carrier management
- To enable the students to understand the international logistics and analytical tools necessary to solve supply chain problems.

Course Outcomes (Cos):

1. The students able to demonstrate the connection between company's internal materials management and the network in supply chain.
2. The students able to evaluate the material flow and related information flow as part of the company's logistics process.
3. Illustrate the engineering solutions to solve existing conflicts between good customer satisfaction and working capital.
4. The students will understand the importance of accurate planning and product data management as a part of Logistics Management.
5. Familiarize the key drivers of Logistics outsourcing.
6. Get an in-depth knowledge in Transactional Logistics

Unit I

Supply Chain - Fundamentals, Importance, Decision Phases, Process view, ‟Supplier-Manufacturer-Customer chain", Supply chain performance: Drivers, Structuring supply chain. Overview of supply chain models

Unit II

Overview of Demand forecasting in the supply chain - Aggregate planning, Managing predictable variability - Managing supply chain cycle inventory, Uncertainty, safety inventory, Determination of optimal level of product availability, Coordination in the Supply Chain

Unit III

Distribution Network Design - Role, factors influencing network, options, Value Addition. Models for facility location and capacity planning - Network design: Impact of uncertainty, decisions using decision trees - Distribution center location models - Supply chain network optimization models - New developments in network designs

Unit IV

Logistic System - Evolution, Infrastructure and Networks - Freight Management, Route Planning, Containerization - Modal Characteristics, Inter-modal operators and transport economies - Ocean carrier management, import-export logistics management. Logistics outsourcing, 3PL / 4PL, Importance of Insurance, Reverse logistics

Unit V

Transactional Logistics - Framework and role of supply chain in e- business and b2b practices. Supply Chain IT Framework - International supply chain, GPS, tracking system, Software Packages in Supply Chain

Suggested Readings:

Text book:

1. Sunil Chopra & Peter Meindl. (2010). *Supply Chain Management*, New Delhi: Pearson Education.

References:

1. David Simchi-Levi., Philip Kaminsky., Edith Simchi Levi., & Ravi Shankar. (2007).*Designing and Managing the Supply Chain*. New Delhi: Tata McGraw Hill Ltd.
2. Jeremy F. Shapiro. (2006). *Modeling the Supply Chain*, New Delhi: Cengage India,
3. David N. Burt., Donald W. Dobler& Stephen L. Starling. (2010). *World Class Supply Management: The Key to Supply Chain Management*. New Delhi: Tata McGraw Hill Ltd.
4. Sople, V. Vinod. (2007). *Logistics Management: The Supply Chain Imperative*. New Delhi: Pearson Education.

16MBAPP401C TOTAL QUALITY MANAGEMENT 4 0 0 4

Course Objectives:

- To make the students understand the basic concepts of total quality management and appreciate its importance in today's business environment.
- To understand the quality management practice and TQM tools and its application in improving the organizational performance.
- To provide an insight on the process approach to TQM
- To get exposure on tools and techniques of various quality tools.
- To know the ways of winning quality awards
- To familiarize the students about the Quality Management System.

Course Outcomes (Cos):

1. Demonstrate the knowledge of quality management to improve organizational effectiveness.
2. Student will able to practice various aspects on total quality management
3. Acquire required diagnostic skills on use of various quality tools.
4. Student will get exposure on tools and techniques of quality management
5. Student will familiarize about the Quality Management System.
6. Apply the Quality tools and techniques in improving the performance.

Unit I

Introduction - Introduction and basic concepts, Definition of quality, Dimensions of quality, Evolution of TQM, TQM frame work, Cost of Quality.

Unit II

TQM Implementation - Leadership for TQM, Deming's quality principle, TQM implementation, PDSA cycle, Quality Circles, Quality Council, Supplier Partnership.

Unit III

Process approach to TQM - Process approach, Juran's Trilogy, Taguchi's loss function, Kaizen, Quality by design, 5S, ESI (Early Supplier Involvement), 5M.

Unit IV

Tools and Techniques - 7 Old quality control tools, Total productive maintenance, Failure Mode and Effect Analysis, POKAYOKE, Six Sigma, Toyota and Six Sigma.

Unit V

Quality Management Systems - Management systems for TQM, ISO 9000 & 14000 Quality management systems, Auditing and certification Process, Quality Awards

Suggested Readings:

Text book:

1. Subburaj Ramasamy, (2008). *Total Quality Management.* New Delhi: Tata McGraw Hill Publishing Co. Ltd.

References:

1.Dale H. Besterfield, etal, (2011). *Total Quality Management*. New Delhi: Pearson Education.

2. Evans, J.R. & Lindsay, W.M. (2010). *Quality control and Management*.New Delhi: Cengage Learning.

3.Barrie G. Date., Ton Van Der Wiet and Jos Van Iwaarden. (2012). *Management Quality*. New Delhi: Wiley Publications.

4.Greg Brue, (2002). *Six Sigma for Managers*. New Delhi: Tata McGraw Hill Publication.

16MBAPN401A INSURANCE LAW AND REGULATION 4004

Course Objectives:

To make the students

- To understand the salient aspects of the life insurance contract, the rights and obligations of both parties to the contract
- To make the students to understand the basics and acts related to the insurance law.
- To understand the legal environment within which life insurance practice is carried out.
- To have an exposure in life insurance law, concept and regulations.
- To understand the Superannuation and Gratuity schemes , Key man and Property Insurance
- Understand the Formation of IRDA, Implications of Consumer Protection Act

Course Outcomes

Learners should be able to

1. Analyze the Elements of Contract and its various concepts.
2. Determine the effect of money laundering under the Prevention of Money Laundering Act.
3. Develop the procedures for settlement of claims of insurance
4. Design the System for Redressal of Complaints
5. Develop the knowledge of the Formation of IRDA and its functioning
6. Evaluate the implications of Consumer Protection Act

Unit I:

Law of Contract: Elements of Contract – Capacity of Parties to Contract – Consensus ad idem – Consideration and Legality of Object – Salient features of the Life Insurance Contract like the Principles of Indemnity, Insurable Interest and Utmost Good Faith.

Unit II:

Definition of Law - Statute Law and Common Law - Arbitration and Consumer Forums – Various Laws and Acts like Shops and Establishments Act – Prevention of Money Laundering Act.

Unit III:

Group Life Insurance – Superannuation and Gratuity schemes – Key man and Property Insurance - Life Insurance as Actionable Claim and Mortgage – Policy Loans – Stamp Act Provisions. Assignment, Nomination and MWP Act Provisions – Loss of Policies - Claims Settlement Process – Maturity Claims – Death Claims – Presumption of death for Missing Persons – Evidence of Title and Succession.

Unit IV:

Contract of Agency – Appointment of Agents – IRDA regulations for Licensing of Agents, Brokers and Corporate Agents – Authority of Agent – Rights and Responsibilities of Agents and Principal – Termination of Agency and Renewal / Hereditary Commission.

Unit V:

LIC Act 1956-System for Redressal of Complaints – Implications of Consumer Protection Act– Insurance Initiatives in India – Formation of Malhotra Committee on Reforms in Insurance Sector – Formation of IRDA - Provisions of IRDA Act 1999.

Suggested Readings:

Text Books:

1. Kenneth S. Abraham. (2010). *Insurance Law and Regulation: Cases and Materials.* Thomson Reuters
2. Edward E. Graves, Burke A. Christensen, Dan Mays McGill. (2014). *Mc Gill's Legal Aspects of Life Insurance.*

References:

1. Palande, P.S.,Shah, R.S., &Lunawat, M.L. (2003). *Insurance in India: Changing Policies and Emerging Opportunities.* New Delhi:Response Books.

2.Harold M. Horne., &Donald Bruce Mansfield. (2002). *The Life Insurance Contract*. Life Office Management Association.

3. Dan Mays McGill. (2006).*Fundamentals of Private Pensions*. Oxford University Press

16MBAPN401B **REINSURANCE** **4004**

Course Objectives:

To make the students

- To have an exposure in important role in supporting conduct of insurance business in reinsurance.
- To understand all aspects surrounding Reinsurance and Promotional measures.
- To make understand to plan and choose channels of insurance
- To get an insight in various types of claims and settlements in specific cases
- To understand the newly emerging concepts, trends and practices at Reinsurance
- To get familiarize with the conditions for different classes of termination of reinsurance

Course Outcomes(Cos)

Learners should be able to

1. Analyze the nature of Reinsurance and its various concepts.
2. Evaluate the various factors that influence the reinsurance and measures to control it
3. Identify the significance of Reinsurance to business executives and academics
4. To determine the claims and settlements in special incidents and cases
5. Evaluate the factors which influence retentions and techniques to interact Non-Proportional Reinsurance with their customers.
6. Analyze the special conditions for different classes of termination of reinsurance

Unit I:

Introduction to Reinsurance: Nature of reinsurance – Analysis of factors that influence results – Historical background – Reinsurance in India before & after nationalization and liberalization – GIC Re – Regional co-operation – Functions of reinsurance – Advantages.

Unit II:

Forms of Reinsurance: Facultative reinsurance – Treaty reinsurance – Facultative Obligatory Treaty – Considerations for facultative placements.

Unit III:

Methods of Reinsurance 1- Proportional Reinsurance: Surplus – Quota Share – Proportional Treaty – Bordereaux – Premiums – Ceding Commission – Claims – Quota Share Treaty – Quota Share & surplus combined – Specimen Treaty Slip.

Unit IV:

Methods of Reinsurance 2 – Non-Proportional Reinsurance: Excess of Loss – Working (Per Risk) XL - Catastrophe XL – Stop Loss XL – Aggregate XL – Non-proportional Treaty – Ultimate Net Loss – reinsured Retention – Premium – Burning Cost – Exposure Rating / Pareto Loss Distribution – Reinstatement – Claims – Inception & Termination – Specimen Treaty Slip.

Unit V:

Retentions: Setting Retentions – General Considerations – Factors influencing retentions – Types of retentions – Accumulations within and between branches – Retentions for Property insurance – Engineering insurance – Accident & Liability insurance – Marine Cargo & Hull insurance – Aviation insurance – Life insurance – Special factors for different classes of reinsurance.

Suggested Readings:

Text Books:

1.Eugene Wollan. (2002).*Handbook of Reinsurance Law*. Aspen Law & Business.

2. Reinsurance IC 85. (2013). Insurance *Institute of India* (11th edition). Mumbai.

Reference:

1. Edgar C. Werner. (2009). *Fundamentals of reinsurance*. New Delhi: Tata McGraw Hill Publication.

16MBAPN401C **RISK MANAGEMENT** **4004**

Course Objectives:

To make the students

- To have an exposure in Theoretical Aspects of Risk Management.
- To understand ways to role, functions and responsibilities of risk manager
- To make the students understand, analyze and reduce the risk of damage to physical assets, or injury to employees or customers.
- To understand the scope and objectives of Risk Management and formal system of risk threats.
- To provide knowledge on Risk financing & Transfer mechanisms
- To get an insight in Risk identification purpose and details

Course Outcomes

Learners should be able to

1. Classify the various aspects of Risk Management.
2. Defining role, functions and duties of a Risk manager
3. Develop the techniques for hazard identification & risk assessment
4. Identify the alternate risk management techniques and
5. To analyze risk control ways by Risk financing and & Transfer mechanisms
6. To evaluate and identify and analyze the loss exposures

Unit I:

Theoretical Aspects of Risk Management**:** Risk concepts & possibilities – Risk classification & categorization – Approaches & Philosophy – Cost of risk.

Unit II:

Scope and Objectives of Risk Management: Formal system of risk threats – Contributory factors – Measures for economic control – Basic components of the risk management system – Definitions – Process & administration – Possible contributions & Potential benefits of risk management to a business.

Unit III:

Building up an Effective Risk Management Programme: Deciding the programme objectives – Pre & post loss objectives – Defining role, functions and duties of a Risk manager – Risk management policy – Objectives & Implementation strategies – Risks profiling & risk audits.

Unit IV:

Identifying & analyzing loss exposures: Risk identification purpose & details – Types of risk identification techniques – Hazard identification & risk assessment – Statistical and other methods of assessing risk exposures – Prioritizing and mapping of risks.

Unit V:

Alternate risk management techniques: Risk control – Loss control management – Risk financing & Transfer mechanisms – Risk control – Risk financing & insurance – Risk retention & transfer strategy – Selecting the best technique – Managerial & technical decisions in implementation the selected technique.

Suggested Readings:

Text Books:

1. George E. Rejda. (2011).*Principles of Risk Management and Insurance*. New Delhi: Pearson Education.
2. Scott Harrington & Gregory R. Niehaus.(2004). *Risk Management and Insurance (2ndedition)*.New Delhi: Tata McGraw Hill Publishing Co. Ltd.

References:

1.Michel Crouhy., Dan Galai& Robert Mark (2009). *The Essentials of Risk Management*. New Delhi. TataMc GrawHill.

2. Insurance Institute of India. (2013). *Risk Management IC86*.

16 MBAP491 MAJOR PROJECT & VIVA-VOCE 17 0 0 6

Course Objectives:

- To understand the problems in the functional areas of business enterprises
- To instill a spirit of work behavior among the student participants.
- Internship is aimed to feed industry - institutional- orientation among the students
- To sensitize students to the nuances of corporate culture and familiarize them with the corporate code of behavior.
- Learn actual supervised professional experiences.
- To understand the working environment and functions of departments

Course Outcomes (Cos):

The students will be able

1. Develop the skills, knowledge, attitudes, and perceptions along with the experience needed to constitute a professional identity.
2. Gain actual supervised professional experiences.
3. Get insight in working of the real organizations
4. Analyze the work behavior of the specific functional areas.
5. Match linkages among different functions and departments.
6. Discover career opportunities to students in exploring in their areas of interest.

Every student has to undergo major project in a company for a period of 25 working days during the fourth semester. He / She have to submit a project report containing details of company, company profile, different functional area problems and prospects. The project should be done during the fourth semester. A research project may be based on primary / secondary data.

The report should be well documented and supported by –

- Cover & Title Page
- Certificate, Company Certificate & Declaration
- Acknowledgement
- List of Contents, List of Tables & List of Charts
- Introduction of the Study
- Review of Literature

- Research Methodology
- Data Analysis & Interpretation
- Findings, Suggestions & Conclusion
- Bibliography
- Appendix

பகுதி – I, தமிழ் **பருவம் I**

16LSU101 : **தமிழ் முதல் தாள்** 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I : இக்கால இலக்கியம்: **(10 மணிநேரம்)**

கல்வி : மகாகவி பாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.

இன்றைய நிலை : கவிமணி தேசிக விநாயகம் பிள்ளை – ஒற்றுமையே உயிர்நிலை.

மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் –மலையாளக் காற்று.

சூழலியல் : கவிஞர் வைதீஸ்வரன் - விரல் மீட்டிய மழை.

பெண்ணியம் : கவிஞர் சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை.

அலகு – II : அற இலக்கியம்: **(10 மணிநேரம்)**

கொன்றை வேந்தன்: 1-50 பாடல்கள்

திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்

பழமொழி நானூறு: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: **(10 மணிநேரம்)**

மூவருலா: 1-26 கண்ணிகள்

திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்

கலிங்கத்துப் பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV : கட்டுரை: **(10 மணிநேரம்)**

1. உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்
2. கட்டிடக்கலை - அ. இராசமாணிக்கனார்
3. வாழ்க்கை - இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: **(8 மணிநேரம்)**

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப் பயிற்சிகள்.

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

Semester – I

		L	**T**	**P**	**C**
16ENU101	**ENGLISH- I**	**4**	**0**	**0**	**4**

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcome:

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed.
6. Betterment of language competence.

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT V

Short Story: The Bird – Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. Spring 2013**.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala, V. English for Communication. 2006. Emerald Publishers: Chennai

Semester – I

		L T P C
16MMU101	**CALCULUS**	**4 0 0 4**

Course Objectives

This course enables the students to learn

- The concepts of essentials of concavity, inflection points and its geometrical applications.
- The Higher order derivatives and its applications in business, economics and life sciences.
- The Leibniz rule and its applications in exponential and trigonometric.
- The concepts of volumes by slicing, disks and washers' methods, volumes by cylindrical shells, parametric equations and parameterizing a curve.
- The concepts of vector functions, operations with vector-valued functions, limits and continuity of vector functions.
- Recognize the appropriate tools of calculus to solve applied problems.

Course Outcomes (COs)

On successful completion of this course, the students will be able to

1. Understand the concepts of hyperbolic functions.
2. Explore the concept of reduction formula and calculate limits in indeterminate forms by a repeated use of L'Hospital rule.
3. Use single and multiple integration to calculate the arc length, area and volume.
4. Understand the techniques of sketching conics and properties of conics.
5. Know about the knowledge on application of vector functions.
6. Acquire the knowledge on application of Kepler's second law.

UNIT I

Hyperbolic functions, higher order derivatives, Leibniz rule and its applications to problems of type $e^{ax+b}\sin x$, $e^{ax+b}\cos x$, $(ax+b)^n\sin x$, $(ax+b)^n\cos x$,

UNIT II

Curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves, L'Hospital's rule, applications in business, economics and life sciences. Reduction formulae, derivations and illustrations of reduction formulae of the type $\int \sin nx\, dx$, $\int \cos nx\, dx$, $\int \tan nx\, dx$, $\int \sec nx\, dx$, $\int \log x^n\, dx$, $\int \sin^n x \sin^m x\, dx$.

UNIT III

Volumes by slicing, disks and washers methods, volumes by cylindrical shells, parametric equations, parameterizing a curve, arc length, arc length of parametric curves, area of surface of revolution.

UNIT IV

Techniques of sketching conics, reflection properties of conics, rotation of axes and second degree equations, classification into conics using the discriminant, polar equations of conics.

UNIT V

Triple product, introduction to vector functions, operations with vector-valued functions, limits and continuity of vector functions, differentiation and integration of vector functions, tangent and normal components of acceleration, modeling ballistics and planetary motion, Kepler's second law.

SUGGESTED READINGS

TEXT BOOK

1. Strauss M.J., Bradley G.L.,and Smith K. J., (2007). Calculus, Third Edition ,Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi.

REFERENCES

1. Thomas G.B., and Finney R.L., (2005). Calculus, Ninth Edition, Pearson Education, Delhi.
2. Anton H., Bivens I., and Davis S.,(2002). Calculus, Seventh Edition, John Wiley and Sons (Asia) P. Ltd., Singapore.
3. Courant R., and John F., (2000). Introduction to Calculus and Analysis (Volumes I & II), Springer-Verlag, New York.

		Semester – I
		L T P C
16MMU102	**ALGEBRA**	**6 1 0 6**

Course Objectives

This course enables the students to learn

- The functions, relations, systems of linear equations and linear transformations.
- How to identify, evaluate and simplify algebraic expressions using the correct operations.
- The basic concepts of linear algebra.
- The concepts of principles of mathematical induction.
- The solution and application of linear systems.
- The application of matrix, inverse of matrix and system of linear equations.

Course Outcomes (COs)

On successful completion of this course, the students will be able to

1. Know about the basic concepts of set theory.
2. Describe the categories of functions.
3. Understand the algorithms on operation.
4. Use matrix operations to solve system of linear equations.
5. Learn how to find characteristic equation, eigen value and eigen vector for matrix.
6. Know about the applications of linear systems and linear independence.

UNIT I

Polar representation of complex numbers, nth roots of unity, De Moivre's theorem for rational Indices and its applications.

UNIT II

Equivalence relations, Functions, Composition of functions, Invertible functions, One to one Correspondence and cardinality of a set, Well-ordering property of positive integers.

UNIT III

Division algorithm, Divisibility and Euclidean algorithm, Congruence relation between integers, Principles of Mathematical Induction, Statement of Fundamental Theorem of Arithmetic.

UNIT IV

Systems of linear equations, row reduction and echelon forms, vector equations, the matrix equation Ax=b, solution sets of linear systems, applications of linear systems, linear independence.

UNIT V

Introduction to linear transformations, matrix of a linear transformation, inverse of a matrix, characterizations of invertible matrices. Subspaces of Rn, dimension of subspaces of Rn and rank of a matrix, Eigen values, Eigen Vectors and Characteristic Equation of a matrix.

SUGGESTED READINGS

TEXT BOOKS

1. Titu Andreescu., and Dorin Andrica,(2006). Complex Numbers from A to Z, Birkhauser. Library of Congress Cataloging-in-Publication Data Andreescu, Titu, (**For Unit –I**).

2. Edgar G. Goodaire and Michael M. Parmenter, ,(2005)**.** Discrete Mathematics with Graph Theory, 3rd Edition, Pearson Education (Singapore) P. Ltd., Indian Reprint.(**For Unit –II)**

3.David C. Lay., (2007). Linear Algebra and its Applications, Third Edition, Pearson Education Asia, Indian Reprint. **(For Unit III, IV and V)**

REFERENCE

1. Kenneth Hoffman., Ray Kunze., (2003).Linear Algebra, Second edition, Prentice Hall of India Pvt Ltd, New Delhi.

Semester – I

		L	**T**	**P**	**C**
16MMU103	**REAL ANALYSIS**	**6**	**2**	**0**	**6**

Course Objectives

This course enables the students to learn

- The fundamental properties of the real numbers that underpin the formal development of real analysis
- About the extreme points, Root test, Ratio test.
- The alternating series, and series of functions.
- The concepts of real Sequence, Bounded sequence, Cauchy convergence criterion for sequences.
- The basic theorems on monotone sequences and their convergence.
- About the Power series and radius of convergence.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Understand about the categories of sets.
2. Acquire the knowledge on limits and convergence of sequences.
3. Know the types of test of convergence for series.
4. Familiarize about the basic theorems on monotone sequences.
5. Know about the integrability and differentiability of functions.
6. Understand the Power series and radius of convergence.

UNIT I

Finite and infinite sets, examples of countable and uncountable sets. Real line, bounded sets, suprema and infima, completeness property of R, Archimedean property of R, intervals. Concept of cluster points and statement of Bolzano -Weierstrass theorem.

UNIT II

Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences. Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence (monotone convergence theorem without proof).

UNIT III

Infinite series. Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series, Root test, Ratio test, alternating series, Leibnitz's test(Tests of Convergence without proof). Definition and examples of absolute and conditional convergence.

UNIT IV

Sequences, Bounded sequence, Convergent sequence, Limit of a sequence. Limit Theorems, Monotone Sequences, Monotone Convergence Theorem. Subsequences, Divergence Criteria, Monotone Subsequence Theorem (statement only), Bolzano Weierstrass Theorem for Sequences. Cauchy sequence, Cauchy's Convergence Criterion.

UNIT V

Series of functions, Pointwise and uniform convergence. Mn-test, M-test, Statements of the results about uniform convergence and integrability and differentiability of functions, Power series and radius of convergence.

SUGGESTED READINGS

TEXT BOOK

1. Apostol T. M., (2002). Calculus (Vol. I), John Wiley and Sons (Asia) P. Ltd.

REFERENCE

1. Fischer E., (2012). Intermediate Real Analysis, Springer Verlag.
2. Ross K.A., (2003).Elementary Analysis- The Theory of Calculus Series - Undergraduate Texts in Mathematics, Springer Verlag.
3. Bartle R.G., and Sherbert D. R., 2000. Introduction to Real Analysis, John Wiley and Sons (Asia) Pvt. Ltd.

Semester – I

16MMU111	CALCULUS (PRACTICAL)	L T P C 0 0 3 2

Course Objectives

This course enables the students to learn

- To demonstrate comprehension in relevant area of calculus
- Problem solving through (computer language) programming.
- The basic structure of the programme, declaration and usage of variables.
- The basic MATLAB (matrix laboratory) programme.
- The usage of MATLAB in order to facilitate understanding and visualization of mathematical problems
- The practical preparation knowledge to apply the acquired knowledge and skills.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Familiarize with the programming environment.
2. Acquire the problem solving skills through computer programming.
3. Understand to write diversified solutions using programming language.
4. Plot of graphs of functions (exponential, logarithmic, trigonometric).
5. Sketching parametric curves (Eg. Trochoid, cycloid, epicycloids, hypocycloid).
6. Deal with different input/output methods.

List of Practical (using MATLAB/Mathematica)

(Any 8 programs)

1. Plotting of graphs of function $e^{ax + b}$, log(ax + b), 1/(ax + b), sin(ax + b), cos(ax + b), |ax + b| and to illustrate the effect of a and b on the graph.

2. Plotting the graphs of polynomial of degree 4 and 5, the derivative graph, the second derivative graph and comparing them.

3. Sketching parametric curves (Eg. Trochoid, cycloid, epicycloids, hypocycloid).

4. Obtaining surface of revolution of curves.

5. Tracing of conics in cartesian coordinates/ polar coordinates.

6. Sketching ellipsoid, hyperboloid of one and two sheets, elliptic cone, elliptic, paraboloid, hyperbolic paraboloid using cartesian coordinates.

7. Matrix addition.

8. Matrix multiplication.

9. Inverse of a matrix.

10. Transpose of a matrix.

பகுதி – I, தமிழ்

பருவம் II

16LSU201 : **தமிழ் இரண்டாம் தாள்** 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I : **பக்தி இலக்கியம்** **(10 மணிநேரம்)**

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. **சைவம் -** பெரியபுராணம் - திருமூலநாயனார் புராணம்.
2. **வைணவம் -** பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

அலகு – II : **சங்க இலக்கியம்** **(15 மணிநேரம்)**

சங்க இலக்கியங்கள் அறிமுகம்

அ). எட்டுத்தொகை

நற்றிணை : பிரசம் கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு –

உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : சுடர்தொடீ கேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு : அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி - 48

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள் – 'சிறுதினை மலரொடு' என்பதிலிருந்துதொடங்கி, 'அறிந்தவாறே' என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – ‘தெய்வம் சான்ற’ என்பதிலிருந்து தொடங்கி, ‘நல்குமதி’ என்பது வரையிலான தொடர்கள்: 286-295.

அலகு - III : காப்பியம் **(6 மணிநேரம்)**

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29) – கண்ணகியின் சிறப்பு:

‘நாகநீள் நகரொடு’ என்பதிலிருந்து தொடங்கி,

‘கண்ணகி என்பாண் மன்னோ’ என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234) - சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: ‘அருந்திறலரசர்’ என்பதிலிருந்து தொடங்கி, ‘மன்னவரேறென்’ என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485) - செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: ‘என்னே’ என்பதிலிருந்து தொடங்கி, ‘விசும்பில் தோன்றுமால்’ என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: ‘நீர்வார் கண்ணை’ என்பதிலிருந்து தொடங்கி, ‘புகாரென் பதியே’ என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: ‘வன்னி மரமும்’ என்பதிலிருந்து தொடங்கி, ‘பதிப்பிறந்தேன்’ என்பது வரையிலான தொடர்கள்.

அலகு – IV : சிறுகதை **(10 மணிநேரம்)**

1. ***குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்***
2. ***காட்டில் ஒரு மான் - அம்பை***
3. ***நாற்காலி – கி.ராஜநாராயணன்***
4. ***நகரம் – சுஜாதா***

அலகு- V : மொழிப்பயிற்சி **(7 மணிநேரம்)**

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)

மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

		Semester II
		L T P C
16MMU201	**DIFFERENTIAL EQUATIONS**	**4 0 0 4**

Course Objectives

This course enables the students to learn

- First order exact differential equations, linear homogeneous and non homogeneous equations of higher order with constant coefficients.
- The complete solution of a non-homogeneous differential equation with constant coefficients by the method of undetermined coefficients.
- The transform of a periodic function.
- The applications of the inverse Laplace transform.
- The Euler's equations, method of variation of parameters.
- The predatory-prey model and its analysis, epidemic model of influenza and its analysis.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Understand the concepts of explicit, implicit and singular solutions of a differential equation.
2. Acquire knowledge on linear and bernoulli's equaitons.
3. Know the concepts of population model.
4. Understand the method of solving differential equation using variation of parameters. Identify the applications of differential equations.
5. Know about the concepts of Euler's equation, method of undetermined coefficients and method of variation of parameters.
6. Understand the predatory-prey model and its analysis, epidemic model of influenza and its analysis.

UNIT I

Differential equations and mathematical models. General, particular, explicit, implicit and singular solutions of a differential equation.

UNIT II

Exact differential equations and integrating factors, separable equations and equations reducible to this form, linear equation and Bernoulli equations, special integrating factors and transformations.

UNIT III

Introduction to compartmental model, exponential decay model, lake pollution model (case study of Lake Burley Griffin), drug assimilation into the blood (case of a single cold pill, case of a course of cold pills), exponential growth of population, limited growth of population, limited growth with harvesting.

UNIT IV

General solution of homogeneous equation of second order, principle of super position for homogeneous equation, Wronskian: its properties and applications, Linear homogeneous and non-homogeneous equations of higher order with constant coefficients, Euler's equation, method of undetermined coefficients, method of variation of parameters.

UNIT V

Equilibrium points, Interpretation of the phase plane, predatory-prey model and its analysis, epidemic model of influenza and its analysis, battle model and its analysis.

SUGGESTED READINGS

TEXT BOOK

1. Ross S.L., (2004). Differential Equations, Third Edition, John Wiley and Sons, India.

REFERENCES

1. Martha L Abell., and James P Braselton., (2004). Differential Equations with MATHEMATICA, Third Edition, Elsevier Academic Press.

2. Sneddon I.,(2006). Elements of Partial Differential Equations, McGraw-Hill, International Edition, New Delhi.

Semester – II

		L T P C
16MMU202	**THEORY OF REAL FUNCTIONS**	**6 1 0 6**

Course Objectives

This course enables the students to learn

- The solution of Reciprocal and Binomial Equations and properties of the derived functions.
- About the relations between the roots and coefficients**.**
- The concept of continuous functions and limits of functions.
- The Applications of mean value theorem to inequalities and approximation of polynomials.
- Taylor's series and Maclaurin's series expansions of exponential and trigonometric functions.
- The transformations of equations

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Learn about the Limits of functions and continuous functions.
2. Understand uniform continuity, non-uniform continuity criteria, uniform continuity theorem.
3. Know about the, algebra of differentiable functions.
4. Familiarize about the Mean value theorem and its applications.
5. Know about the Cauchy's mean value theorem.
6. Understand the Taylor's theorem with Cauchy's form of remainder.

UNIT I

Limits of functions, sequential criterion for limits, divergence criteria. Limit theorems, one sided limit. Infinite limits and limits at infinity. Continuous functions, sequential criterion for continuity and discontinuity.

UNIT II

Algebra of continuous functions. Continuous functions on an interval, intermediate value theorem, location of roots theorem, preservation of intervals theorem. Uniform continuity, non-uniform continuity criteria, uniform continuity theorem.

UNIT III

Differentiability of a function at a point and in an interval, Caratheodory's theorem, algebra of differentiable functions. Relative extrema, interior extremum theorem. Rolle's theorem.

UNIT IV

Mean value theorem, intermediate value property of derivatives, Darboux's theorem. Applications of mean value theorem to inequalities and approximation of polynomials, Taylor's theorem to inequalities.

UNIT V

Cauchy's mean value theorem. Taylor's theorem with Lagrange's form of remainder, Taylor's theorem with Cauchy's form of remainder, application of Taylor's theorem to convex functions, relative extrema. Taylor's series and Maclaurin's series expansions of exponential and trigonometric functions, ln(1 + x), 1/ax+b and (1 +x)n.

SUGGESTED READINGS

TEXT BOOK

1. Bartle R., and Sherbert D.R.,(2003). Introduction to Real Analysis, John Wiley and Sons.

REFERENCES

1. Mattuck A., (2013). Introduction to Analysis, Prentice Hall.

2. Ghorpade S. R. and Limaye B.V., (2006). A Course in Calculus and Real Analysis, Springer. New York.
3. Ross K.A., (2004). Elementary Analysis: The Theory of Calculus, Springer. New York.

Semester - II

		L	T	P	C
16MMU203	**GROUP THEORY I**	**6**	**2**	**0**	**6**

Course Objectives

This course enables the students to learn

- Group homomorphism, isomorphism, automorphism and its related properties.
- The concept of internal and external direct product.
- The properties of cyclic groups, permutations and cosets.
- The concepts Abelian groups, divisible and reduced groups and Torsion group.
- The extension of group structure to finite permutation groups.
- The basic concepts of group actions and their applications.

Course Outcomes (COs)

On successful completion of the course, students will be able to:

1. Expertise on fundamental of groups.
2. Know about Subgroups and its properties.
3. Understand the concept of cyclic groups and its properties.
4. Acquire the knowledge on basic concepts of external direct product of a finite number of groups.
5. Apply Cauchy's theorem for finite abelian groups.
6. Understand the concepts of Abelian groups, Torsion group, divisible and reduced groups.

UNIT I

Symmetries of a square, Dihedral groups, definition and examples of groups including permutation groups and quaternion groups (illustration through matrices), elementary properties of groups.

UNIT II

Subgroups and examples of subgroups, centralizer, normalizer, center of a group, product of two subgroups.

UNIT III

Properties of cyclic groups, classification of subgroups of cyclic groups. Cycle notation for permutations, properties of permutations, even and odd permutations, alternating group, properties of cosets, Lagrange's theorem and consequences including Fermat's Little theorem.

UNIT IV

External direct product of a finite number of groups, normal subgroups, factor groups, Cauchy's theorem for finite abelian groups.

UNIT V

Abelian groups, finitely generated abelian group, divisible and reduced groups, Torsion group,

SUGGESTED READINGS

TEXT BOOK

1. Fraleigh.J.B., (2004). A First Course in Abstract Algebra , Seventh edition , Pearson Education Ltd, Singapore.

REFERENCES

1. Artin.M., (2008). Algebra, Prentice-Hall of India, New Delhi.

2. Joseph A. Gallian., (2006). Contemporary Abstract Algebra, Fourth Edition, Narosa Publishing House, New Delhi.

3. Herstein.I.N., (2010). Topics in Algebra, Second Edition, Wiley and sons Pvt Ltd, Singapore.

4. Joseph J. Rotman, (2001). An Introduction to the Theory of Groups, Fourth Edition, Springer Verlag.

Semester II

		L	T	P	C
16MMU211	**DIFFERENTIAL EQUATIONS(PRACTICAL)**	**0**	**0**	**3**	**2**

Course Objectives

This course enables the students to learn

- Problem-solving through programming.
- Hands-on training using lab components.
- Plotting of second order solution of differential equations and recursive sequences.
- Cauchy's root test and Ratio test by plotting the ratio.
- The exponential growth and decay, the population growth of species or the change in investment return over time.
- The usage of program to solve the differential equations.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Demonstrate comprehension in fundamental topics of computing, algorithms, computer organization and software systems.
2. Have applied knowledge of areas of computing to create solutions to challenging problems, including specify, design, implement and validate solutions for new problems.
3. Be aware of current research activity in computing through activities including reading papers, hearing research presentations.
4. Know about successfully planning and completing an individual research project in computing or its application.
5. Understand Cauchy's root test and Ratio test by plotting the ratio.
6. Acquire the knowledge on Growth model and Decay model.

List of Practical (using any software)

(Any 8 programs)

1. Plotting of second order solution family of differential equation.
2. Growth model (exponential case only).
3. Decay model (exponential case only).
4. Lake pollution model (with constant/seasonal flow and pollution concentration).
5. Case of single cold pill and a course of cold pills.
6. Limited growth of population (with and without harvesting).
7. Predatory-prey model (basic volterra model, with density dependence, effect of DDT, two prey one predator).
8. Plotting of recursive sequences.
9. Verify Bolzano-Weierstrass theorem through plotting of sequences and hence identify convergent subsequences from the plot.
10. Study the convergence/divergence of infinite series by plotting their sequences of partial sum.
11. Cauchy's root test by plotting nth roots.
12. Ratio test by plotting the ratio of nth and (n+1)th term.

		Semester – II
		L T P C
16AEC201	**ENVIRONMENTAL STUDIES**	**4 0 0 4**

Course Objectives

This course enables the students to learn

- The awareness about environmental problems among people.
- About various renewable and nonrenewable resources of the region.
- The appropriate judgments and decisions for the protection and improvement of the earth.
- The concept of Environmental Pollution, effects and control measures of urban and industrial wastes.
- About the concepts of Social Issues and the Environment.
- The causes and effects of Environmental pollution.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Create the awareness about environmental problems among people.
2. Motivate the public to participate in environment protection and improvement.
3. Know about the Role of Information Technology in environment and human health.
4. Develop an attitude of concern for the environment and biodiversity at global.
5. Investigate the Environmental Pollution, effects and control measures of urban and industrial wastes.
6. Solve Environment Protection Act, Wildlife Protection Act. Forest Conservation Act.

UNIT I

Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

UNIT II

Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources: Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ill-effects of fireworks.

UNIT III

Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT IV

Environmental Pollution - Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

UNIT V

Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

SUGGESTED READINGS

TEXT BOOKS

1. Tripathy.S.N., and Sunakar Panda., (2004). Fundamentals of Environmental Studies, Second Edition, Vrianda Publications Private Ltd, New Delhi.

2. Arvind Kumar., (2004). A Textbook of Environmental Science, APH Publishing Corporation, New Delhi.

3. Verma P.S., and Agarwal V.K., (2001). Environmental Biology (Principles of Ecology); S.Chand and Company Ltd., New Delhi.

4. Anubha Kaushik, C.P.Kaushik, (2004). Perspectives in Environmental Studies, New Age International Pvt. Ltd. Publications, New Delhi.

REFERENCES

1. Singh, M.P., B.S. Singh and Soma S. Dey, (2004). Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.

2. Daniel B.Botkin and Edward A. Keller., (2014). Environmental Science, John Wiley and Sons, Inc., New York.

3. Uberoi, N.K., (2005). Environmental Studies, Excel Books Publications, New Delhi, India.

		Semester - III
		L T P C
16MMU301	**NUMERICAL METHODS**	**4 0 0 4**

Course Objectives

This course enables the students to learn

- The basic concepts of numerical methods.
- The Numerical integration and differentiation, numerical solution of ordinary differential equations.
- The Engineering problems which are impossible to solve by analytical means.
- Numerical methods to solve linear system of equations**.**
- The numerical solution of initial value problems and boundary value problems**.**
- The appropriate numerical methods to solve algebraic and transcendental equations.

Course Outcomes (COs)

On successful completion of the course, students will be able to:

1. Study the concept of Newton's Method.
2. Realize the system of linear algebraic equtions along with specified methods.
3. Know about the basic concepts of Interpolation.
4. Understand the Gregory forward and backward difference interpolation.
5. Familiar with numerical integration and differentiation, numerical solution of ordinary differential equations.
6. Use the solutions of differential equations by Runge-Kutta methods.

UNIT I

High speed computation: Algorithms, Convergence, Errors: Relative, Absolute, Round off, Truncation. Transcendental and Polynomial equations: Bisection method - Newton's method - False Position method - Secant method - Rate of convergence of these methods.

UNIT II

System of linear algebraic equations: Gaussian Elimination - Gauss Jordan methods - Gauss Jacobi method - Gauss Seidel method and their convergence analysis – LU decomposition - Power method.

UNIT III

Interpolation: Lagrange and Newton's methods. Error bounds - Finite difference operators. Gregory forward and backward difference interpolation – Newton's divided difference – Central difference – Lagrange and inverse Lagrange interpolation formula.

UNIT IV

Numerical Differentiation and Integration: Gregory's Newton's forward and backward differentiation- Trapezoidal rule, Simpson's rule, Simpsons 3/8th rule, Boole's Rule. Midpoint rule, Composite Trapezoidal rule, Composite Simpson's rule.

UNIT V

Ordinary Differential Equations: Taylor's series - Euler's method – modified Euler's method - Runge-Kutta methods of orders two and four.

SUGGESTED READINGS

TEXT BOOK

1. Jain. M.K., Iyengar. S.R.K.,and Jain R.K., (2012). Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, New Delhi .

REFERNCES

1. Bradie B., (2007).A Friendly Introduction to Numerical Analysis, Pearson Education, India,
2. Gerald C.F., and Wheatley P.O., (2006). Applied Numerical Analysis, Sixth Edition, Dorling Kindersley (India) Pvt. Ltd., New Delhi.
3. Uri M. Ascher and Chen Greif., (2013). A First Course in Numerical Methods, Seventh Edition., PHI Learning Private Limited.
4. John H., Mathews and Kurtis D. Fink., (2012). Numerical Methods using Matlab, Fourth Edition., PHI Learning Private Limited.
5. Sastry S.S., (2008). Introductory methods of Numerical Analysis, Fourth edition, Prentice Hall of India, New Delhi.

Semester – III

			L	T	P	C
16MMU302	**RING THEORY AND LINEAR ALGEBRA I**		**6**	**2**	**0**	**6**

Course Objectives
This course enables the students to learn

- Linear transformations, homomorphism, isomorphism and its properties.
- The basic definitions of Rings, subrings, vector spaces, subspaces, algebra of subspaces, isomorphism and its properties.
- The concept of ideals and maximal ideals
- Fundamental characteristics of vector spaces.
- Concepts of linear transformations and their role in modern mathematics.
- The concept of ring homomorphisms, properties of ring homomorphisms.

Course Outcomes (COs)
On successful completion of this course, the student will be able to:

1. Understand the concept of rings, subrings, vector spaces, subspaces, algebra of subspaces, isomorphism and its properties.
2. Understand the concept of ring homomorphisms, properties of ring homomorphisms.
3. Know about the Vector spaces and dimension.
4. Analyze Linear transformations and matrix representation of a linear transformation.
5. Study change of coordinate matrix and its properties.
6. Understand Isomorphism theorems I, II and III, field of quotients.

UNIT I
Definition and examples of rings, properties of rings, subrings, integral domains and fields, characteristic of a ring. Ideal, ideal generated by a subset of a ring, factor rings, operations on ideals, prime and maximal ideals.

UNIT II
Ring homomorphisms, properties of ring homomorphisms, Isomorphism theorems I, II and III, field of quotients.

UNIT III
Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces.

UNIT IV
Linear transformations, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation, algebra of linear transformations.

UNIT V
Isomorphism: Isomorphism theorems, invertibility and isomorphisms, change of coordinate matrix.

SUGGESTED READINGS

TEXT BOOK

1. Fraleigh.J.B., (2004). A First Course in Abstract Algebra , Seventh Edition , Pearson Education Ltd, Singapore.

REFERENCES

1**.**Joseph A. Gallian., (2013). Contemporary Abstract Algebra, Fourth Edition, Narosa Publishing House, New Delhi.

2. Kumaresan S., (2000). Linear Algebra- A Geometric Approach, Prentice Hall of India, New Delhi.

		Semester – III
		L T P C
16MMU303	**MULTIVARIATE CALCULUS**	**6 2 0 6**

Course Objectives

This course enables the students to learn

- The basics concept of functions of several variables.
- Mastery in the skills of limit and continuity functions of two variables.
- Definition and compute partial derivatives, directional derivatives and differentials.
- Find local extreme values of functions of several variables, test for saddle points, examine the conditions for the existence of absolute extreme values.
- Differential, integral and double integral calculus for functions of more than one variable.
- The mathematical tools and methods are used extensively in the physical sciences, engineering and economics.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Understand the functions of several variables.
2. Know about the Extrema of functions of two variables.
3. Use double, triple and its applications.
4. Know about the change of variables in double integrals and triple integrals
5. Synthesize the key concepts of line integrals and its applications.
6. Ability to apply the knowledge of Green's theorem and Stoke's theorem.

UNIT I

Functions of several variables: Limit and continuity of functions of two variables, partial differentiation, total differentiability and differentiability, sufficient condition for differentiability. Chain rule for one and two independent parameters, directional derivatives, the gradient, maximal and normal property of the gradient, tangent planes.

UNIT II

Extrema of functions of two variables: Method of Lagrange multipliers, constrained optimization problems, Definition of vector field, divergence and curl.

UNIT III

Double integration over rectangular region: Double integration over non-rectangular region, double integrals in polar co-ordinates, Triple integrals, Triple integral over a parallelepiped and solid regions. Volume by triple integrals, cylindrical and spherical co-ordinates. Change of variables in double integrals and triple integrals

UNIT IV

Line integrals: Applications of line integrals, Mass and Work. Fundamental theorem for line integrals, conservative vector fields, independence of path.

UNITV

Green’s theorem: Surface integrals, integrals over parametrically defined surfaces. Stoke’s theorem, The Divergence theorem.

SUGGESTED READINGS

TEXT BOOK

1. Strauss M.J., Bradley G.L. and Smith K. J., (2007). Calculus, Third Edition, Dorling Kindersley (India) Pvt.Ltd. (Pearson Education), Delhi.

REFERENCES

1. Thomas G.B., and Finney R.L., (2005). Calculus, Ninth Edition, Pearson Education, Delhi.

2. Marsden E., Tromba A.J. and Weinstein A., (2005). Basic Multivariable Calculus, Springer (SIE), Indian reprint, New Delhi.
3. James Stewart., (2001). Multivariable Calculus, Concepts and Contexts, Second Edition, Brooks Cole, Thomson Learning, USA.

Semester – III

			L	T	P	C
16MMU304A	**LOGIC AND SETS**		**4**	**2**	**0**	**4**

Course Objectives

This course enables the students to learn

- First-order formula of predicate logic is a tautology using a natural-deduction style formal system.
- The formal definitions of predicates, operations on sets and pertaining to relations.
- The concepts of Set operations and the laws of set theory and Venn diagrams.
- Composition of relations, Types of relations, Partitions, Partial ordering relations and n-ary relations.
- The enhancement of logical thinking and its application to computer science.
- The methods of mathematical logic.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Acquire the knowledge about propositions, conjunction, disjunction, logical equivalences and counting principle.
2. Identify between binding variables and negations.
3. Use the language of set theory, interpreting issues in different areas of mathematics.
4. Know the concepts Difference and Symmetric difference of two sets.
5. Mastery in the concepts of relations.
6. Study Composition of relations, Types of relations, Partitions, Partial ordering relations and n-ary relations.

UNIT I

Introduction, propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators.

UNIT II

Propositional equivalence: Logical equivalences.

Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

UNIT III

Sets: Subsets, Set operations and the laws of set theory and Venn diagrams. Examples of finite and infinite sets.

UNIT IV

Finite sets and counting principle. Empty set, properties of empty set. Standard set operations. Classes of sets. Power set of a set. Difference and Symmetric difference of two sets. Set identities, Generalized union and intersections.

UNIT V

Relation: Product set, Composition of relations, Types of relations, Partitions. Equivalence Relations with example of congruence modulo relation, Partial ordering relations, n-ary relations.

SUGGESTED READINGS

TEXT BOOK

1. Grimaldi R.P.,(2004). Discrete Mathematics and Combinatorial Mathematics, Pearson Education, Pvt.Ltd, Singapore.

REFERENCES

1. Halmos P.R.,(2011). Naive Set Theory, Springer Pvt Ltd, New Delhi.
2. Kamke E., (2010).Theory of Sets, Dover Publishers, New York.

Semester – III

		L	T	P	C
16MMU304B	**PROGRAMMING WITH C AND C++**	**4**	**2**	**0**	**4**

Course Objectives

This course enables the students to learn

- The fundamentals of C and C++ programming language.
- The strength of C which provide programmers with the means of writing efficient, maintainable and portable code.
- Know the concept of a large problem into smaller parts, writing each part as a module or function
- Acquire the knowledge about a program in a high-level language being translated by a compiler into machine language program and then executed.
- The Memory Allocation and Using Classes in C++.
- Translate the computer algorithms to computer programs.

Course Outcomes (COs)

On successful completion of the course, students will be able to:

1. Know the basic concept of C and C++.
2. Understand the concept of functions and arrays.
3. Understand the concept structures and unions.
4. Understand pointers and references in C++.
5. Understand the concept of Differentiating between static and dynamic memory allocation.
6. Acquire the knowledge of translate the computer algorithms to computer programs.

UNIT I

Introduction to C and C++:

History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main () function, Compiling and Executing Simple Programs in C++. **Data Types, Variables, Constants, Operators and Basic I/O:** Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putcharetc), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.hetc).**Expressions, Conditional Statements and Iterative Statements:**Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

UNIT II

Functions and Arrays: Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.

Creating and Using One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, ACSUessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays.

UNIT III

Derived Data Types (Structures and Unions): Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members. **Pointers and References in C++:** Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, using references as function arguments and function return values

UNIT IV

Memory Allocation in C++: Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation.**File I/O, Preprocessor Directives:** Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random aCSUess in files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros.

UNIT V

Using Classes in C++: Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors, Constructor Overloading, Function overloading in classes, Class Variables &Functions, Objects as parameters, Specifying the Protected and Private ACS Uess, Copy Constructors, Overview of Template classes and their use. **Overview of Function Overloading and Operator Overloading:** Need of Overloading functions and operators, Overloading functions by number and type of arguments, Looking at an operator as a function call, Overloading Operators (including assignment operators, unary operators) **Inheritance, Polymorphism and Exception Handling:** Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism (Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch and throw, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowing exceptions.

SUGGESTED READINGS

1. Herbtz Schildt, (2003). C++: The Complete Reference, Fourth Edition, McGraw Hill.
2. Bjarne Stroustrup, (2013). The C++ Programming Language, Fourth Edition, Addison-Wesley.
3. Bjarne Stroustroup, (2014). Programming Principles and Practice using C++, Second Edition, Addison- Wesley.
4. E Balaguruswamy,(2008). Object Oriented Programming with C++, Tata McGraw-Hill Education.New Delhi.
5. Paul Deitel, Harvey Deitel, (2011) . C++ How to Program, Eighth Edition, Prentice Hall.
6. John R. Hubbard, (2000).Programming with C++, Schaum's Series, Second Edition. McGraw Hill Professional.
7. Andrew Koeni, Barbara, E. Moo,(2000). ACSUelerated C++, Published by Addison-Wesley .
8. Scott Meyers, (2005). Effective C++, Third Edition, Published by Addison-Wesley.
9. Harry, H. Chaudhary, (2014) . Head First C++ Programming: The Definitive Beginner's Guide, First Create space Inc, O-D Publishing, LLC USA.
10. Walter Savitch, (2007). Problem Solving with C++, Pearson Education.
11. Stanley B. Lippman, JoseeLajoie., Barbara E. Moo.,(2012). C++ Primer, Published by Addison-Wesley, 5th Edition.

WEB SITES

1. http://www.cs.cf.ac.uk/Dave/C/CE.html
2. http://www2.its.strath.ac.uk/courses/c/
3. http://www.iu.hio.no/~mark/CTutorial/CTutorial.html
4. http://www.cplusplus.com/doc/tutorial/
5. www.cplusplus.com/
6. www.cppreference.com/

Semester - III

		L	T	P	C
16MMU311	**NUMERICAL METHODS (PRACTICAL)**	**0**	**0**	**4**	**2**

Course Objectives

This course enables the students to learn

- Exercise user defined functions to solve real time problems.
- Illustrate flowchart and algorithm to the given problem.
- The basic structure of the programme, declaration and usage of variables.
- The basic MATLAB (matrix laboratory) programme.
- The usage of Matlab in order to facilitate understanding and visualization of mathematical problems
- Practical approach to apply the acquired knowledge and skills in professional and specialist courses.

Course outcomes (COs)

On successful completion of this course, the student will be able to

1. Acquire the basic knowledge of MATLAB and explore the structure of the numerical methods.
2. Use different memory allocation methods.
3. Deal with different input/output methods.
4. Use different data structures.
5. Express their ideas in terms of the syntax of the computer package MATLAB.
6. Apply the MATLAB programme in the real world situation involving numerical problems.

List of Practical (using MATLAB/Mathematica)
(Any 10 Programs)

1. Calculate the sum 1/1 + 1/2 + 1/3 + 1/4 + ----------+ 1/ N.
2. To find the absolute value of an integer.
3. Enter 100 integers into an array and sort them in an ascending order.
4. Bisection Method.
5. Newton Raphson Method.
6. Secant Method.
7. Regulai Falsi Method.
8. LU decomposition Method.
9. Gauss-Jacobi Method.
10. Gauss-Seidel Method.
11. Lagrange Interpolation or Newton Interpolation.
12. Simpson's rule.

Semester - IV

16MMU401	**GROUP THEORY II**	**L**	**T**	**P**	**C**
		6	**2**	**0**	**6**

Course Objectives

This course enables the students to learn

- Group homomorphism, isomorphism, automorphism and its related properties.
- Different types of groups such as normal subgroups, factor groups
- Familiar with various direct product of groups.
- Sylow's theorems, Cauchy's theorem and Index theorem.
- The concept of internal and external direct product.
- The applications of group actions and Generalized Cayley's theorem.

Course Outcomes (COs)

On successful completion of the course, students will be able to:

1. Expertise on fundamental theorems of isomorphism.
2. Know about automorphism and its developments.
3. Understand the concept of internal and external direct product.
4. Acquire the knowledge on basic concepts of group actions and their applications.
5. Apply Sylow's theorems to determine the structure of certain groups of small order.
6. Understand the applications of group actions and Generalized Cayley's theorem.

UNIT I

Group homomorphisms, properties of homomorphisms, Cayley's theorem, properties of isomorphisms, First, Second and Third isomorphism theorems.

UNIT II

Automorphism, inner automorphism, automorphism groups, automorphism groups of finite and infinite cyclic groups, applications of factor groups to automorphism groups, Characteristic subgroups, Commutator subgroup and its properties.

UNIT III

Properties of external direct products, the group of units modulo n as an external direct product, internal direct products, Fundamental Theorem of finite abelian groups.

UNIT IV

Group actions, stabilizers and kernels, permutation representation associated with a given group action, Applications of group actions: Generalized Cayley's theorem, Index theorem.

UNIT V

Groups acting on themselves by conjugation, class equation and consequences, conjugacy in Sn, *p*-groups, Sylow's theorems and consequences, Cauchy's theorem, Simplicity of An for $n \geq 5$, non-simplicity tests.

SUGGESTED READINGS

TEXT BOOK

1. Fraleigh.J.B., (2004). A First Course in Abstract Algebra , Seventh edition , Pearson Education Ltd, Singapore.

REFERENCES

1. David S. Dummit and Richard M. Foote, (2004)., Abstract Algebra,. Third Edition., John Wiley and Sons (Asia) Pvt. Ltd., Singapore.
2. Herstein.I.N.,(2010). Topics in Algebra ,Second Edition, Willey and sons Pvt Ltd, Singapore.
3. Joseph A. Gallian., (2001). Contemporary Abstract Algebra, Fourth Edition., Narosa Publishing House, New Delhi.
4. Artin.M., (2008). Algebra, Prentice - Hall of India, New Delhi.

Semester – IV

		L	T	P	C
16MMU402	**METRIC SPACES AND COMPLEX ANALYSIS**	**6**	**2**	**0**	**6**

Course Objectives

This course enables the students to learn

- The theory of functions of a complex variable with examples.
- Metric spaces, Continuous mappings and Convergence of sequences and series.
- Techniques of complex analysis that make practical problems easy (e.g. graphical rotation and scaling as an example of complex multiplication)
- Subsets of a metric space are open, closed, connected, bounded, totally bounded and/or compact.
- Function on a Complex number, and differentiability on complex functions.
- The Cauchy's Theorem, Cauchy's integral formula, Liouville's Theorem and Laurent's expansion.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Understand the various properties of metric spaces
2. Definite continuous mappings - sequential criterion.
3. Understand the basic concepts of Riemann equations, sufficient conditions for differentiability.
4. Explore various properties of Analytic functions.
5. Understand the Contour integrals and its examples.
6. Apply the concept Liouville's theorem and the fundamental theorem of algebra.

UNIT I

Metric spaces: definition and examples - Sequences in metric spaces - Cauchy sequences.
Complete Metric Spaces - Open and closed balls – neighbourhood - open set - interior of a set. Limit point of a set - closed set - diameter of a set - Cantor's theorem – Subspaces - dense sets – separable spaces.

UNIT II

Continuous mappings - sequential criterion and other characterizations of continuity – Uniform Continuity – Homeomorphism - Contraction mappings - Banach Fixed point Theorem - Connectedness - connected subsets of R.

UNIT III

Limits - Limits involving the point at infinity - continuity. Properties of complex numbers – regions in the complex plane - functions of complex variable - mappings. Derivatives, differentiation formulas - Cauchy-Riemann equations, sufficient conditions for differentiability.

UNIT IV

Analytic functions, examples of analytic functions, exponential function, Logarithmic function, trigonometric function, derivatives of functions, definite integrals of functions.
Contours: Contour integrals and its examples - upper bounds for moduli of contour integrals - Cauchy-Goursat theorem, Cauchy integral formula.

UNIT V

Liouville's theorem and the fundamental theorem of algebra. Convergence of sequences and series, Taylor series and its examples - Laurent series and its examples, absolute and uniform convergence of power series.

SUGGESTED READINGS

TEXT BOOK

1. Satish Shirali., and Harikishan L. Vasudeva., (2006). Metric Spaces, Springer Verlag, London.

REFERENCES

1. Kumaresan S., (2011). Topology of Metric Spaces, Second Edition., Narosa Publishing House, New Delhi.
2. Simmons G.F., (2004).Introduction to Topology and Modern Analysis, McGraw-Hill, New Delhi.
3. James Ward Brown., and Ruel V. Churchill., (2009). Complex Variables and Applications, Eighth Edition., McGraw – Hill International Edition, New Delhi.

4. Joseph Bak., and Donald J. Newman., (2010). Complex Analysis, Second Edition., Undergraduate Texts in Mathematics, Springer-Verlag New York.

Semester – IV

16MMU403	RING THEORY AND LINEAR ALGEBRA II	L T P C 6 2 0 6

Course Objectives

This course enables the students to learn

- The behavior of polynomials and operators.
- The Rings and basic properties of rings and ideals.
- The concepts of unique factorization domains, Euclidean domains.
- The transpose of a linear transformation and its matrix in the dual basis.
- The Inner product spaces and norms, Gram-Schmidt orthogonalisation process.
- Least Squares Approximation and Spectral theorem.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Polynomial rings over commutative rings, dual spaces, dual basis, double dual, minimal solutions to systems of linear equations, normal and self-adjoint operators.
2. Understand the Divisibility in integral domains.
3. Study the transpose of a linear transformation and its matrix in the dual basis.
4. Know about the Inner product spaces and norms.
5. Study Least Squares Approximation, minimal solutions to systems of linear equations.
6. Know about the Orthogonal projections and Spectral theorem.

UNIT I

Polynomial rings over commutative rings, division algorithm and consequences, principal ideal domains, factorization of polynomials, reducibility tests, irreducibility tests, Eisenstein criterion, unique factorization in Z[x].

UNIT II

Divisibility in integral domains, irreducibles, primes, unique factorization domains, Euclidean domains.

UNIT III

Dual spaces, dual basis, double dual, transpose of a linear transformation and its matrix in the dual basis, annihilators, Eigen spaces of a linear operator, diagonalizability, invariant subspaces and Cayley-Hamilton theorem, the minimal polynomial for a linear operator.

UNIT IV

Inner product spaces and norms, Gram-Schmidt orthogonalisation process, orthogonal complements, Bessel's inequality, the adjoint of a linear operator.

UNIT V

Least Squares Approximation, minimal solutions to systems of linear equations, Normal and self-adjoint operators, Orthogonal projections and Spectral theorem.

SUGGESTED READINGS

TEXT BOOKS

1. Fraleigh.J.B., (2004). A First Course in Abstract Algebra , Seventh Edition , Pearson Education Ltd, Singapore.

REFERENCES

1. Stephen H. Friedberg., Arnold J. Insel., Lawrence E. Spence, (2004) . Linear Algebra, Fourth Edition., Prentice- Hall of India Pvt. Ltd., New Delhi.

2. S. Lang, (2005). Introduction to Linear Algebra, Second Edition., Springer.

Semester – IV

		L T P C
16MMU404A	**GRAPH THEORY**	**4 2 0 4**

Course Objectives

This course enables the students to learn

- Definitions and Basic properties of graphs.
- The fundamental concepts in graph theory.
- A blended method to prove theorems.
- The concept of Trees, spanning trees and its properties.
- Basic concepts in graph theory and a variety of different problems in Graph Theory.
- Gain the knowledge of various graphs algorithms will also be taught along with its analysis.

Course Outcomes (COs)

On successful completion of the course, students will be able to

1. Understand and Apply the fundamental concepts in graph theory.
2. Understand basic results related with Eulerian and Hamiltonian graphs.
3. Study about Chromatic polynomial, Matching and Covering.
4. Know about the fundamental concepts of trees.
5. Understand the Spanning trees, rank and nullity.
6. Mastery in Dijkstra's algorithm-Floyd- Warshall algorithm

UNIT I

Definition, examples and basic properties of graphs, Directed Graphs, Types of Directed Graphs , pseudo graphs, complete graphs, bi- partite graphs, isomorphism of graphs.

UNIT II

Paths and circuits, Strongly Connected Components , Eulerian circuits, Hamiltonian cycles Random graphs,Planar graphs,Networks.

UNIT III

The adjacency matrix, weighted graph, Incidence matrix, Submatrices, Circuit Matrix,Path Matrix ,Chromatic Number ,Chromatic polynomial, Matching , Covering ,Four Color Problem

UNIT IV

Trees: Trees and its properties, minimally connected graph ,Pendant vertices in a tree ,distance and centers in a tree, rooted and binary tree. Levels in binary tree , height of a tree, Spanning trees , rank and nullity.

UNIT V

Travelling salesman's problem, shortest path, Dijkstra's algorithm, Floyd- Warshall algorithm.

SUGGESTED READINGS

TEXT BOOK

1. Edgar G.Goodaire., and Michael M. Parmenter., (2003) . Discrete Mathematics with Graph Theory, Second Edition, Pearson Education (Singapore) P. Ltd.

REFERENCES

1. Sundaresan V., Ganapathy Subramanian K.S., and Ganesan K., (2002) . Discrete Mathematics, A.R. Publications, Nagapatinam.

2. Jean Gallier, January 4, (2016) , Discrete Mathematics ., Second Edition, Springer.

3. Grimaldi R.P., (2004) . Discrete Mathematics and Combinatorial Mathematics, Pearson Education.

4. Davey B.A., and Priestley H.A., (2002) . Introduction to Lattices and Order, Cambridge University Press, Cambridge.

		Semester – IV
		L T P C
16MMU404B	**OPERATING SYSTEM: LINUX**	**4 2 0 4**

Course Objectives
This course enables the students to learn

- The main components of OS and their working.
- The memory allocation methods, page replacement algorithms, file allocation methods, multi-threading, process synchronization, and CPU scheduling.
- The basic components of a computer operating system, and the interactions among the various components.
- The capabilities and limitations of computer operating systems, process management, processor scheduling, deadlocks, memory management, secondary memory management, file management and I/O systems.
- Introduce the concepts of process and thread and their scheduling policies.
- Design the components of operating system.

Course Outcomes (COs)
On successful completion of this course, the student will be able to

1. Familiar with the memory allocation methods, page replacement algorithms, file allocation methods, multi-threading, process synchronization, and CPU scheduling.
2. Describe the main components of OS and their working.
3. Explain the concepts of process and thread and their scheduling policies.
4. Solve synchronization and deadlock issues.
5. Compare the different techniques for managing memory, I/O, disk and files.
6. Design components of operating system.

UNIT I
Introduction -Mainframe systems Desktop Systems – Multiprocessor systems – distributed systems – real time systems. Process: - Process concepts – Operation on process – cooperation process - Inter process Communication - Mutual Exclusion - Critical sections- primitives – Semaphores – Deadlock: System Model, Deadlock characterization, Deadlock prevention, avoidance, detection, recovery from deadlock.

UNIT II
Storage management: Memory Management - swapping- Contiguous memory allocation – paging, segmentation – segmentation with paging – Virtual memory :Virtual storage organization – Demand Paging, Process Creation – Page replacement – Thrashing.

UNIT III
Processor Scheduling : preemptive scheduling : - Scheduling Criteria – Scheduling Algorithms – FCFS-SJF- Priority – RoundRobin –Multilevel Queue – Multilevel Feedback Queue . Multiprocess schedule: Real time schedule, Algorithm evaluation: Deterministic Modeling, Queue Model, Simulation

UNIT IV

File systems: Introduction – File System Concepts – Access Methods – Directory structure – File Sharing – Allocation Methods – Free space management –Efficiency and performance – Recovery Disk Performance Optimization: Introduction – Disk structure – Disk scheduling – Disk management.

UNIT V

Linux-The Operating System: Linux History, Linux features, Linux distributions, Linux's relationship to Unix, Overview of Linux Architecture, Installation, Start up scripts, system process (an overview), Linux Security, The Ext2 and Ext3 File Systems: General characteristics of the Ext3 File System, File permissions, User Management: Types of users, the powers of Root, Managing users (adding and deleting) : using the command line and GUI Tools.

Resource Management in Linux: File and Directory management, system calls for files process management, Signals, IPC:Pipes, FIFOs, System V IPC, Message Queues, System calls for processes, Memory Management, Library and System calls for Memory.

SUGGESTED READINGS

TEXT BOOK

1. Silberschatz Galvin Gagne. (2012). Operating system concepts, Ninth Edition, Wiley India (pvt), Ltd, New Delhi.

REFERENCES

1. Deitel H.M. (2005). Operating systems, Third Edition, Addision Wesley Publication, New Delhi.

2. Pramod Chandra P. Bhatt. (2007). An Introduction to Operating Systems, Second Edition, Prentice Hall India, New Delhi.

3. Tanenbaum Woodhull. (2005) . Operating Systems., Second Edition, Pearson Education (LPE) , New Delhi.

4. William Stallings. (2010). Operating Systems internals and Design Principles, Sixth Edition, Prentice Hall India, New Delhi.

5. Arnold Robbins., (2008) ., Linux Programming by Examples The Fundamentals, Second Edition., Pearson Education,.

6. Cox K, (2009).Red Hat Linux Administrator's Guide,PHI.

7. Stevens R., (2009). UNIX Network Programming, Third Edition.,PHI.

8. Sumitabha Das, (2009).Unix Concepts and Applications, Fourth Edition., TMH.

9. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, (2009) . Linux in a Nutshell, Sixth Edition,O'Reilly Media.
10. Neil Matthew, Richard Stones, Alan Cox,(2004) Beginning Linux Programming,Third Edition.

WEBSITES

www.cs.columbia.edu/~nieh/teaching/e6118_s00/
www.clarkson.edu/~jnm/cs644
pages.cs.wisc.edu/~remzi/Classes/736/Fall2002/

Semester – V

		L T P C
16MMU501A	**PORTFOLIO OPTIMIZATION**	**6 2 0 6**

Course Objectives

This course enables the students to learn

- The changing domestic and global investment scenario in general and Indian capital market in particular with reference to availability of various financial products and operations of stock exchanges.
- The theory and practice of portfolio management.
- Important theories, techniques, regulations and certain advancements in theory of investment will be covered with an aim of helping the participants make sound investment decisions in the context of portfolio investment.
- The Risk-free assets and one fund theorem, efficient frontier.
- The various strategies followed by investment practitioners.
- The measure and the relationship between risk and return.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Understand the various alternatives available for investment.
2. Learn to measure risk and return.
3. Find the relationship between risk and return.
4. Value the equities and bonds.
5. Gain knowledge of the various strategies followed by investment practitioners.
6. Study Index tracking optimization models.

UNIT I

Financial markets. Investment objectives. Measures of return and risk. Types of risks. Risk free assets. Mutual funds. Portfolio of assets.

UNIT II

Expected risk and return of portfolio. Diversification. Mean-variance portfolio optimization- the Markowitz model and the two-fund theorem.

UNIT III

Risk-free assets and one fund theorem, efficient frontier. Portfolios with short sales.

UNIT IV

Capital market theory.Capital assets pricing model- the capital market line, beta of an asset, beta of a portfolio, securitymarket line.

UNIT V

Index tracking optimization models. Portfolio performance evaluation measures.

SUGGESTED READINGS

TEXT BOOK

1. Reilly . F. K., Keith C. Brown., (2011). Investment Analysis and Portfolio Management, Tenth Edition, South-Western Publishers.

2. Markowitz H.M., (2000). Mean-Variance Analysis in Portfolio Choice and Capital Markets, Blackwell, New York.

3. M.J. Best., (2010). Portfolio Optimization, Chapman and Hall, CRC Press.

4. Luenberger. D.G., (2013). Investment Science, Second Edition., Oxford University Press.

Semester – V

			L	T	P	C
16MMU501B	**NUMBER THEORY**		**6**	**2**	**0**	**6**

Course Objectives

This course enables the students to learn

- Numbers, functions and its properties.
- Beauty and clarity of number theoretic functions.
- The challenging problems in number theory.
- How number theory is related to and used in cryptography.
- The concepts of divisibility, congruence, greatest common divisor, prime, and prime-factorization.
- The Law of Quadratic Reciprocity and other methods to classify numbers as primitive roots, quadratic residues, and quadratic non-residues.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Understand the Linear Diophantine equation,
2. Know about the Fermat's Little theorem.
3. Mastery in the Mobius Inversion formula.
4. Familiar with the concepts of primitive roots
5. Acquire knowledge of the Legendre symbol and its properties.
6. Acquire concepts of Public key encryption, RSA encryption and decryption

UNIT I

Linear Diophantine equation, prime counting function, statement of prime number theorem, Goldbach conjecture, linear congruences, complete set of residues, Chinese Remainder theorem.

UNIT II

Fermat's Little theorem, Wilson's theorem. Number theoretic functions, sum and number of divisors, Totally multiplicative functions , Definition and properties of the Dirichlet product.

UNIT III

The Mobius Inversion formula, the greatest integer function, Euler's phi- function, Euler's theorem reduced set of residues-some properties of Euler's phi-function.

UNIT IV

Order of an integer modulo n, primitive roots for primes, composite numbers having primitive roots, Euler's criterion, the Legendre symbol and its properties.

UNIT V

Quadratic reciprocity-quadratic congruences with composite moduli. Public key encryption, RSA encryption and decryption, the equation $x^2 + y^2 = z^2$, Fermat's Last theorem.

SUGGESTED READINGS

TEXT BOOK

1. David M. Burton, (2007). Elementary Number Theory, Sixth Edition, Tata McGraw- Hill, Delhi.

REFERENCES

1. Neville Robinns, (2007). Beginning Number Theory, 2nd Ed., Narosa Publishing House Pvt. Ltd., Delhi.
2. Neal Koblitz., (2006).A course in Number theory and cryptography,Second Edition, Hindustan Book Agency, New Delhi.

Semester – V

		L T P C
16MMU502A	**INDUSTRIAL MATHEMATICS**	**6 2 0 6**

Course Objectives

This course enables the students to learn

- The basic facts about mathematics.
- Display the knowledge of conventions such annotations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.
- A relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved with mathematical reasoning.
- Translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.
- Application of Fourier and inverse Fourier transforms.
- The concepts of Medical Imaging and Inverse Problems.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Get adequate exposure to global and local concerns so as to explore many aspects of Mathematical Sciences.
2. Apply their skills and knowledge, that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.
3. Know about the X-ray: Introduction, X-ray behavior and Beers Law.
4. Aware of history of mathematics and hence of its past, present and future role as part of our culture.
5. Know the concept of Radon Transform.
6. Use the application of Fourier and inverse Fourier transforms.

UNIT I

Medical Imaging and Inverse Problems: The content is based on Mathematics of X-ray and CT scan based on the knowledge of calculus, elementary differential equations, complex numbers and matrices.

UNIT II

Inverse problems: Introduction , Illustration of Inverse problems through problems taught in Pre-Calculus, Calculus, Matrices and differential equations. Geological anomalies in Earth’s interior from measurements at its surface (Inverse problems for Natural disaster) and Tomography.

UNIT III

X-ray: Introduction, X-ray behavior and Beers Law (The fundament question of image construction) Lines in the place.

UNIT IV

Radon Transform: Definition and Examples, Linearity, Phantom (Shepp - Logan Phantom - Mathematical phantoms). Back Projection: Definition, properties and examples.

UNIT V
CT Scan: Revision of properties of Fourier and inverse Fourier transforms and applications of their properties in image reconstruction. Algorithms of CT scan machine. Algebraic reconstruction techniques abbreviated as ART with application to CT scan.

SUGGESTED READINGS

TEXT BOOK

1. Timothy G. Feeman.,(2010). The Mathematics of Medical Imaging, A Beginners Guide, Springer Under graduate Text in Mathematics and Technology, Springer.

REFERENCE

1. Andreas Kirsch., (2011). An Introduction to the Mathematical Theory of Inverse Problems, 2nd Ed., Springer.

2. Groetsch C.W., (1999). Inverse Problems, Activities for Undergraduates, The Mathematical Association of America.

Semester – V

		L	**T**	**P**	**C**
16MMU502B	**BOOLEAN ALGEBRA AND AUTOMATA THEORY**	**6**	**2**	**0**	**6**

Course Objectives

This course enables the students to learn

- Lattice and algebraic system, Basic properties of algebraic systems
- Finite Automata and regular languages
- The foundations of computability theory
- A strong background in reasoning about finite state automata and formal languages.
- Mathematical arguments using logical connectives and quantifiers.
- The various categories of languages and grammars in the Chomsky hierarchy.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Understand how lattices and Boolean algebra are used as tools and mathematical models in the study of networks.
2. Define various categories of automata.
3. Context free grammars and pushdown automata.
4. Understand Turing machine as a model of computation.
5. Define the various categories of Undecidability.
6. Knowledge about Post Correspondence Problem.

UNIT I

Definition of ordered set with examples and basic properties of ordered sets, maps between ordered sets , duality principle, lattices as ordered sets- lattices as algebraic structures, sublattices, products and homomorphisms, modular and distributive lattices.

Boolean algebras: Boolean polynomials, minimal forms of Boolean polynomials, Quinn- McCluskey method, Karnaugh diagrams, switching circuits and applications of switching circuits.

UNIT II

The central concept of Automata: Alphabets, strings, and languages. Finite Automata and Regular Languages: deterministic and non-deterministic finite automata, regular expressions, regular languages and their relationship with finite automata, pumping lemma and closure properties of regular languages.

UNIT III

Context Free Grammars and Pushdown Automata: Context free grammars (CFG), parse trees, ambiguities in grammars and languages, pushdown automaton (PDA) and the language accepted by PDA, deterministic PDA, Non- deterministic PDA, properties of context free languages, normal forms, pumping lemma, closure properties, decision properties.

UNIT IV

Turing Machines: Turing machine as a model of computation, programming with a Turing machine, variants of Turing machine and their equivalence.

UNIT V

Undecidability: Recursively enumerable and recursive languages, undecidable problems about Turing machines: halting problem, Post Correspondence Problem, and undecidability problems About CFGs.

SUGGESTED READINGS

TEXT BOOKS

4. Davey B A., and Priestley H. A., (2002). Introduction to Lattices and Order, Cambridge University Press, Cambridge.

5. Hopcroft J. E., Motwani R., and Ullman J.D., (2001). Introduction to Automata Theory, Languages, and Computation, Second Edition, Addison-Wesley.

REFERENCES

6. Edgar G. Goodaire and Michael M. Parmenter, (2003). Discrete Mathematics with Graph Theory, Second Edition, Pearson Education P.Ltd., Singapore.

7. Rudolf Lidl and Günter Pilz, (2004). Applied Abstract Algebra, Second Edition , Undergraduate Texts in Mathematics, Springer (SIE).

8. Lewis H.R., Papadimitriou C.H.,and Papadimitriou C.,(2005). Elements of the Theory of Computation, Second Edition ,Prentice-Hall. New Delhi**.**

9. Anderson J.A., (2006). Automata Theory with Modern Applications, Cambridge University Press, Cambridge.

Semester – V

16MMU503 A	THEORY OF EQUATIONS	L T P C 6 2 0 6

Course Objectives

This course enables the students to learn

- The solution of Reciprocal and Binomial Equations and properties of the derived functions.
- About the properties of polynomials**.**
- The concepts of Relations between the roots and coefficients and applications of theorems.
- About algebraic Solution of the Cubic and Biquadratic and Properties of the Derived Functions.
- The algebraic solutions of cubic and biquadratic equations.
- The relation between coefficients of the equation and its roots.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Learn about the properties of polynomials.
2. Find positive, negative and imaginary roots using Descartes rule.
3. Identify the relation between coefficients of the equation and its roots.
4. Familiarize about the transformations of equations.
5. Know about the algebraic solutions of cubic and biquadratic equations.
6. Understand Algebraic Solution of the Cubic and Biquadratic.

UNIT I

General properties of polynomials: Theorem relating to polynomials when the variable receives large values, similar theorem when the variable receives small values.

Continuity of a rational integral function – Form of the quotient and remainder when a polynomial is divided by a Binomial – Tabulation of functions – Graphic representation of a polynomial – Maximum and minimum values of polynomials

UNIT II

General properties of equations: Theorems relating to the real roots of equations - Existence of a root in the general equation. Imaginary roots – Theorem determining the number of roots of an equation.

Descartes' rule of signs for positive roots – Descartes' rule of signs for negative roots – Use of Descartes' rule in proving the existence of imaginary roots – Theorem relating to the substitution of two given numbers for the variable

UNIT III

Relations between the roots and Coefficients-Theorem - Applications of the theorem - Depression of an equation when a relation exists between two of its roots - The cube roots of unity - Symmetric functions of the roots – Examples – Theorems relating to symmetric functions – Examples.

UNIT IV

Transformation of Equations: Transformation of equations - Roots with signs changed - Roots multiplied by a given quantity - Reciprocal roots and reciprocal equations - To increase or diminish the roots by a given quantity - Removal of terms - Binomial coefficients.

Solution of reciprocal and binomial equations: Reciprocal equations - Binomial equations. Propositions embracing their leading general Properties - The special roots of the equation – Solution of binomial equations by circular functions – Examples.

UNIT V
Algebraic Solution Of the Cubic and Biquadratic: On the algebraic solution of equations – The algebraic solution of the cubic equation - Application to numerical equations - Expression of the cubic as the difference of two cubes - Solution of the cubic by symmetric functions of the roots – Examples .

Properties of the Derived Functions: Graphic representation of the derived function - Theorem relating to the maxima and minima of a polynomial - Rolle's Theorem. Corollary - Constitution of the derived functions

SUGGESTED READINGS

TEXT BOOK

1. Burnside W.S., and Panton A.W.,(1954). The Theory of Equations, Eighth Edition ,Dublin University Press.

REFERENCES

1. Leonard Eugene Dickson (2012). First Course in the theory of Equations., , J. Wiley & sons, London: Chapman & Hall,Limited, New York.

2. Turnbull,H.W (2013)., Theory Of Equations, Fourth Edition, Published In Great Britain Bt, Oliver And Boyd Ltd., Edinburgh.

3. James Víctor Uspensky., (2005). Theory of Equations, McGraw-Hill Book Co, New York.

4. MacDuffee C.C., (1962). Theory of Equations, John Wiley & Sons Inc., New York.

Semester- V
L T P C

16MMU503B COMPUTER GRAPHICS 6 2 0 6

Course Objectives

This course enables the students to learn

- The scope of this course is to provide students with distinguished knowledge in the field of two- and three-dimensional computer graphics for Animation.
- Different hardware used for graphical requirement.
- How to display 3D objects in a 2D display devices using projection techniques.
- How to create realistic images using color and shading techniques.
- Computer Animation and Design of Animation Sequences.
- Designing and implementing practical graphic solutions to challenging problems in different application domains.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Transfer to the students the skills required for designing and implementing practical graphic solutions to challenging problems in different application domains and make them a competent product.
2. Understand different hardware used for graphical requirement.
3. Perform visual computations for geometrical drawings.
4. Display 3D objects in a 2D display devices using projection techniques.
5. Create realistic images using color and shading techniques.
6. Developed Computer Animation and Design of Animation Sequences.

UNIT I

A Survey of Computer Graphics - Video Display Devices - Refresh Cathode Ray Tubes -Raster Scan Displays - Random Scan Displays - Color CRT Monitors - Direct –View Storage Tubes - Flat Panel Displays - Three Dimensional Viewing Devices – Raster Scan and Random Scan graphic storages Displays processors and Character generators, color display techniques

UNIT II

Input Devices: Keyboards - Mouse –Track Ball and Space ball – Joysticks - Data Glove – Digitizers - Image Scanners - Touch Panels - Light Pens - Voice Systems. Hard Copy Devices: Printers and Plotters, Interactive input/output devices

Point, lines and Curves : Scan conversion, Line Drawing Algorithms: DDA Algorithm - Bresenhams Line Algorithm. Circle Generating Algorithms: Mid Point Circle Algorithm, Ellipse Generating Algorithm, Conic-section generation, polygon filling anti aliasing.

UNIT III

Two Dimensional Geometric Transformations: Basic Transformations: Translation –Rotation – Scaling - Composite Transformations: Translations – Rotations - Scalings. General Pivot Point Rotation - General Fixed Point Scaling. Two – Dimensional Viewing: The Viewing Pipeline - Window to viewport Transformation - Clipping Operations: Point Clipping - Line Clipping Algorithms- Cohen Sutherland Line Clipping - Polygon Clipping: Sutherland – Hodgeman Polygon Clipping Algorithm - Text Clipping.

UNIT IV
Three – Dimensional Display methods, Three – Dimensional Transformations : Translation –Rotation – Scaling, Three Dimensional viewing : Viewing pipeline - Viewing coordinates - Parallel Projection – . Perspective Projections.

UNIT V
Visible Surface Detection Methods: Classification of Visible Surface Detection Algorithms - Back Face Detection - Depth Buffer Method - Area Sub division Method.
Computer Animation : Design of Animation Sequences-General Computer Animation functions – Raster Animations – Computer animation Languages – Key Frame Systems – Motion Specifications

TEXT BOOK

1. Donald Hearn and M. Pauline Baker, (2010).Computer Graphics - C Version, Second Edition, Pearson Education, New Delhi.

REFERENCES

1. Amarendra N. Sinha,(2008). Computer Graphics, First Edition, Tata McGraw Hill, New Delhi.

2. Foley, Vandam, Feiner and Hughes, (1999). Computer Graphics Principles and Practices, Second Edition, Addison Wesley, Singapore.

3. Zhigang Xiang and Roy A. Plastock, (2002). Theory and Problems of Computer Graphics, Second Edition, Tata McGraw-Hill publishers, New Delhi.

4. William M. NewMan and Robert F. Sproull, (2007). Principles of Interactive Computer Graphics, Second Edition, Tata McGraw-Hill Publishers, New Delhi.

5. Rogers D.F., (2001). Procedural Elements in Computer Graphics, Second Edition, McGraw Hill Book Company, New Delhi.
6. Rogers D.F., Adams A.J., (1990). .Mathematical Elements in Computer Graphics, Second Edition, McGraw Hill Book Company, New Delhi.

WEBSITES
http://www.fileformat.info/mirror/egff/ch02_01.html

http://www.rw-designer.com/how-to

http://en.wikipedia.org/wiki/3D_computer_graphics

Semester – V

		L T P C
16MMU504A	**ANALYTICAL GEOMETRY**	**4 2 0 4**

Course Objectives

This course enables the students to learn

- Geometry and its applications in the real world
- Geometric ideas in the language of the mathematician.
- Parabola, Ellipse and Hyperbola.
- The relation between areas of a triangle and its projection, relation between areas of a polygon.
- The General Equations Tracing of Curves.
- The fundamental theorems of isomorphism.

Course Outcomes (COs)

On successful completion of the course, students will be able to:

1. Acquiring knowledge of straight lines and area of triangle..
2. Know about Reflection properties of parabola.
3. Acquire the knowledge on basic concepts of Hyperbola and their applications.
4. Study the angles between two directed lines, the projection of a segment.
5. Understand the General Equations Tracing of Curves.
6. Know about particular cases of Conic sections.

UNIT I

Coordinates, Lengths of straight lines and areas of triangle, polar coordinates. Locus, equation to a locus. Straight line: Equation of a straight line, angle between two straight line. Length of a perpendicular techniques for sketching parabola, ellipse and hyperbola. Reflection properties of parabola.

UNIT II

Parabola and Ellipse: Classification of quadratic equations representing lines. Parabola : Loci Connected with the parabola ,three normals passing through a given points , parabola referred to two tangent as axes. Ellipse: Auxiliary circle and eccentric angle, equation to a tangent , some properties of Ellipse , poles and polar , conjugate diameters , four normals through any points.

UNIT III

Hyperbola: Asymptotes – equations referred to the asymptotes an axes – one variables examples.
Spheres: The Equation of a sphere - Tangents and tangent plane to a sphere - The radical plane of two spheres Cylindrical surfaces. Illustrations of graphing standard quadric surfaces like cone, ellipsoid.

UNIT IV

The angles between two directed lines, the projection of a segment, relation between a segment and its projection, the projection of a broken line , the angle between two planes , relation between areas of a triangle and its projection , relation between areas of a polygon.

UNIT V

Polar equation to a conic: General Equations Tracing of Curves, particular cases of Conic sections, transformation of equations to center as origin, equations to asymptotes, tracing a parabola , tracing a central conic , eccentricity and foci of general conic.

SUGGESTED READINGS

TEXT BOOK

1. Loney S.L.,(2005). The Elements of Coordinate Geometry, McMillan and Company, London.

REFERENCES

1. Anton H., Bivens I. and Davis S., (2002). Calculus, John Wiley and Sons (Asia) Pvt. Ltd.

2. Thomas G.B., and Finney R.L., (2005). Calculus, Ninth Edition, Pearson Education, Delhi.

3. Fuller, Gordon.,(2000). Analytic Geometry, Addison Wesley Publishing Company Inc. Cambridge.

4. Bill R.J.T., (1994). Elementary Treatise on Coordinate Geometry of Three Dimensions, McMillan India Ltd. New Delhi.

		Semester – V
		L T P C
16MMU504B	**LINEAR PROGRAMMING**	**4 2 0 4**

Course Objectives

This course enables the students to learn

- Fundamental concepts of duality, economic interpretation of dual constraints and game theory.
- The simplex method to solve small linear programming models by hand, given a basic feasible point.
- Formulation of a given simplified description of a suitable real-world problem as a linear programming model.
- Revised Simplex Method, Parametric Linear Programming, Integer Linear Programming: Branch and Bound Method, Cutting Plane Method.
- Mathematical Formulation of LPP, Solution of LPP: Graphical Method with special cases, Simplex Method, Big-M Method, Two Phase method. Special cases in simplex method, Duality theory, Dual Simplex algorithm.
- Solution of Transportation problem and Assignment Problems.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Formulate a LPP and solve it by simplex and graphical method. Also do post optimal analysis of the formulated problem or other application areas.
2. Understand the concepts of Duality, Primal Dual relationship.
3. Solve a Transportation and its types.
4. Analysis Assignment problem and its models.
5. Know the concept of game theory.
6. Study the games with mixed strategies, graphical solution procedure, linear programming solution of games.

UNIT I

Introduction to Linear Programming Problem – Graphical Linear Programming Solution- Theory of Simplex Method-Optimality and unboundedness-the Simplex algorithm –Simplex method in tableau format- Introduction to artificial variables – two –phase method – Big –M method and their comparison.

UNIT II

Duality – Definition of the dual Problems-Formulation of the dual Problem-Primal Dual relationship: Review of simplex matrix Operations –Simplex tableau Layout-Optimal Dual Solution-Simplex Tableau computations. Economic interpretation of the dual: Economic Interpretation of Dual Variables-Economic Interpretation of Dual Constraints.

UNIT III

Transportation Problem: Definition of the Transportation model – Nontraditional Transportation model – The Transportation Algorithm: Determination of the Starting Solution-Northwest –corner method, Least – corner method, Vogel approximation method- Iterative Computations of the Transportation Algorithm.

UNIT IV

The Assignment Model: Introduction to Assignment model- Mathematical Formulation of Assignment model- Hungarian method for solving assignment problem –Simplex Explanation of the Hungarian method.

UNIT V

Game theory: Formulation of two person zero games – Solving two person zero sum games, games with mixed strategies, graphical solution procedure, linear programming solution of games.

SUGGESTED READINGS

TEXT BOOK

1. Handy .A. Taha., (2007). Operations Research, Seventh edition, Prentice Hall of India Pvt Ltd, New Delhi .

REFERENCES

1. Hillier F.S., and Lieberman G.J., (2009). Introduction to Operations Research, Ninth Edition, Tata McGraw Hill, Singapore.

2. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, (2004). Linear Programming and Network Flows, Second Edition, John Wiley and Sons, India.

3. Hadley G.,(2002). Linear Programming, Narosa Publishing House, New Delhi.

Semester – VI

16MMU601A	MATHEMATICAL MODELING	L T P C 6 2 0 6

Course Objectives

This course enables the students to learn

- Mathematical models of real-world systems, analyze them and make predictions about behavior of these systems.
- The principles of mathematical modelling to solve a variety of practical problems in sciences and engineering.
- The behavior of a given physical system based on the analysis of its mathematical model.
- Modeling with a Differential Equations.
- Simulation Modeling – Discrete-Event Simulation, Continuous Simulation, Monte Carlo simulation.
- Analytic methods of model fitting.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Know about the power series solution of a differential equation.
2. Understand the basic concepts of Monte Carlo Simulation Modeling.
3. Study the basic concepts of Queueing theory.
4. Knowledge the applications of differential equations.
5. Study the applications to Traffic Flow
6. Understand the concepts of gravitational potential, conservation laws.

UNIT I

Power series solution of a differential equation about an ordinary point, solution about a regular singular point, Bessel's equation and Legendre's equation, Laplace transform and inverse transform, application to initial value problem up to second order.

UNIT II

Monte Carlo Simulation Modeling: simulating deterministic behavior (area under a curve, volume under a surface), Generating Random Numbers: middle square method, linear congruence.

UNIT III

Queuing Models: harbor system, morning rush hour, Overview of optimization modeling, Linear Programming Model: geometric solution algebraic solution, simplex method, sensitivity analysis.

UNIT IV

Applications of differential equations: the vibrations of a mass on a spring, mixture problem, free damped motion, forced motion, resonance phenomena, electric circuit problem, mechanics of simultaneous differential equations.

UNIT V

Applications to Traffic Flow. Vibrating string, vibrating membrane, conduction of heat in solids, gravitational potential, conservation laws.

SUGGESTED READINGS

TEXT BOOKS

1. Shepley L. Ross, (1984). Differential Equations, Fourth Edition, John Wiley and Sons , New York**.(For Unit-I,II & III)**

2. Sneddon I., (2006). Elements of Partial Differential Equations, McGraw-Hill, International Edition, New York. **.(For Unit-IV & V)**

REFERENCES

1. Tyn Myint-U and Lokenath Debnath, (2006). Linear Partial Differential Equation for Scientists and Engineers, Springer.
2. Frank R. Giordano, Maurice D. Weir and William P. Fox, (2003). A First Course in Mathematical Modeling, Thomson Learning, London and New York.

Semester – VI

		L	T	P	C
16MMU601B	**MECHANICS**	**6**	**2**	**0**	**6**

Course Objectives

This course enables the students to learn

- How to use forces, frictions and their applications in real life.
- To solve dynamics problems such as conservation of energy and linear and angular momentum.
- Applications of differential equations in advanced mathematical problems.
- Motion in different curves under central forces.
- Classification of the Couple moment and Moment of a couple about a line.
- The problem of central forces and mechanical systems.

Course Outcomes (COs)

On successful completion of this course students will be able to

1. Understand the concept of the Moment of a force about a point and an axis.
2. Classify the Laws of Coulomb friction.
3. Solve the problems of Conservative force field and conservation for mechanical energy.
4. Solve the Problems of equilibrium under forces including friction.
5. Analyze the Velocity and acceleration of a particle along a curve.
6. Know about the basic concepts of Simple harmonic motion, Simple Pendulum, Projectile Motion.

UNIT I

Moment of a force about a point and an axis, couple and couple moment, Moment of a couple about a line, resultant of a force system, distributed force system, free body diagram, free body involving interior sections, general equations of equilibrium, two point equivalent loading, problems arising from structures, static indeterminacy.

UNIT II

Laws of Coulomb friction, application to simple and complex surface contact friction problems, transmission of power through belts, screw jack, wedge, first moment of an area and the centroid, other centers, Theorem of Pappus-Guldinus, second moments and the product of area of a plane area, transfer theorems, relation between second moments and products of area, polar moment of area, principal axes.

UNIT III

Conservative force field, conservation for mechanical energy, work energy equation, kinetic energy and work kinetic energy expression based on center of mass, moment of momentum equation for a single particle and a system of particles, translation and rotation of rigid bodies, Chasles' theorem, general relationship between time derivatives of a vector for different references, relationship between velocities of a particle for different references, acceleration of particle for different references.

UNIT IV

Conditions of equilibrium of a particle and of coplanar forces acting on a rigid Body, Laws of friction, Problems of equilibrium under forces including friction, Centre of gravity, Work and potential energy.

UNIT V
Velocity and acceleration of a particle along a curve: radial and transverse components (plane curve), tangential and normal components (space curve), Newton's Laws of motion, Simple harmonic motion, Simple Pendulum, Projectile Motion.

SUGGESTED READINGS

TEXT BOOK

1. Shames I.H., and Krishna Mohan Rao G., (2009). Engineering Mechanics: Statics and Dynamics, 4th Ed., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi.

REFERENCES

1. Hibbeler R.C. and Ashok Gupta.,(2013). Engineering Mechanics: Statics and Dynamics, Eleventh Edition, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi.

2. Roberts A.P., (2003). Statics and Dynamics with Background in Mathematics, Cambridge University Press, Cambridge

SEMESTER –VI

16MMU602A RIEMANN INTEGRATION AND SERIES OF FUNCTIONS

L	T	P	C
6	2	0	6

Course Objectives

This course enables the students to learn

- The Riemann integration, Point wise and uniform convergence of sequence of functions and Series of functions.
- The concept of continuous functions and their bounded variation property.
- Difference between Riemann Integration and Riemann Stieltjes Integration of functions.
- Fundamental theorems of Calculus and Improper integrals.
- The concept of cauchy criterion for uniform convergence and Weierstrass M-Test.
- About pointwise and uniform convergence of sequence of functions.

Course Outcomes (COs)

On successful completion of the course, students will be able to:

1. Understand Riemann sum and definition of Riemann integral.
2. Convergence of Beta and Gamma functions
3. Know about Pointwise and uniform convergence of sequence of functions
4. Theorems on the continuity and derivability of the sum function of a series of functions.
5. Understand Cauchy criterion for uniform convergence and Weierstrass M-Test.
6. Limit superior and Limit inferior and integration of power series.

UNIT I

Riemann integration - inequalities of upper and lower sums - Riemann conditions of integrability - Riemann sum and definition of Riemann integral through Riemann sums - equivalence of two definitions- Riemann integrability of monotone and continuous functions, Properties of the Riemann integral

UNIT II

Definition and integrability of piecewise continuous and monotone functions. - Intermediate Value theorem for Integrals - Fundamental theorems of Calculus - Improper integrals - Convergence of Beta and Gamma functions

UNIT III

Pointwise and uniform convergence of sequence of functions - Theorems on continuity - derivability and integrability of the limit function of a sequence of functions.

UNIT IV

Series of functions - Theorems on the continuity and derivability of the sum function of a series of functions - Cauchy criterion for uniform convergence and Weierstrass M-Test.

UNIT V

Limit superior and Limit inferior - Power series - radius of convergence - Cauchy Hadamard Theorem - Differentiation and integration of power series - Abel's Theorem - Weierstrass Approximation Theorem.

SUGGESTED READINGS

1. Ross K.A., (2004). Elementary Analysis, The Theory of Calculus, Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint,
2. R.G. Bartle D.R. Sherbert, (2002). Introduction to Real Analysis, Third Edition, John Wiley and Sons (Asia) Pvt. Ltd., Singapore,
3. Charles G. Denlinger, (2011). Elements of Real Analysis, Jones & Bartlett (Student Edition),

		Semester -VI
		L T P C
16MMU602B	**PDE AND SYSTEMS OF ODE**	**6 2 0 6**

Course Objectives

This course enables the students to learn

- The various methods of solving Differential equations which is very much used in the field of Engineering.
- The Method of Separation of Variables for solving first order partial differential equations.
- The basic concepts of Reduction of second order Linear Equations to canonical forms
- The Systems of linear differential equations and its applications.
- The concept of second order linear homogeneous, non-homogeneous differential equations with constant coefficients.
- The application of The Euler method-The modified – Euler method -The Runge-Kutta method.

Course Outcomes (COs)

On successful completion of the course, students will be able to

1. Understand the basic concepts partial differential equations.
2. Gain knowledge about forming the differential equations method of separation of Variables, Initial Boundary Value Problems and method of successive approximations.
3. Know about the Reduction of second order Linear Equations to canonical forms.
4. Study the Method of separation of variables and Solving the Vibrating String.
5. Understand the Basic Theory of linear systems in normal form.
6. Use the Numerical methods to solve the real world problems.

UNIT I

Partial Differential Equations – Basic concepts and Definitions -Mathematical Problems.
First Order Equations: Classification - Construction and Geometrical Interpretation- Method of characteristics for obtaining General Solution of Quasi Linear Equations- Canonical Forms of First-order Linear Equations.

UNIT II

Method of Separation of Variables for solving first order partial differential equations.
Derivation of Heat equation -Wave equation and Laplace equation. - Classification of second order - linear equations as hyperbolic, parabolic or elliptic.

UNIT III

Reduction of second order Linear Equations to canonical forms- The Cauchy problem- The Cauchy-Kowaleewskaya theorem -Cauchy problem of an infinite string - Initial Boundary Value Problems - Semi-Infinite String with a fixed end - Semi-Infinite String with a Free end- Equations with non-homogeneous boundary conditions -Non- Homogeneous Wave Equation.

UNIT I V

Method of separation of variables - Solving the Vibrating String - Problems- Solving the Heat Conduction problem - Systems of linear differential equations - Types of linear systems differential operators - an operator method for linear systems with constant coefficients.

UNIT V

Basic Theory of linear systems in normal form : Homogeneous linear systems with constant coefficients -Two Equations in two unknown functions -The method of successive approximations -The Euler method-The modified – Euler method -The Runge-Kutta method.

SUGGESTED READINGS
TEXT BOOK

1. Tyn Myint-U and Lokenath Debnath., (2006). Linear Partial Differential Equations for Scientists and Engineers, 4th edition, Springer, Indian reprint.

REFERENCES

1. Ross S.L., (2004). Differential equations,Third Edition, John Wiley and Sons, India.
2. Martha L Abell., James P Braselton, (2004). Differential equations with MATHEMATICA, Third Edition Elsevier Academic Press.

Semester – VI

16MMU603A	PROBABILITY AND STATISTICS	L T P C
		4 2 0 4

Course Objective:

This course enables the students to learn

- Basic concepts in probability theory and statistical measures.
- Commonly used probability distributions (both discrete and continuous).
- Central Limit theorem and their applications in various disciplines.
- The nature of uncertainty and randomness and set up data collection methods that are free of bias.
- Appropriate methods to draw conclusions based on sample data by constructing and/or evaluating tables, graphs, and numerical measures of characteristics of data.
- The foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Understand the basic concepts of Measures of central tendency.
2. Know about the Probability Concepts and its properties.
3. Know about the Discrete distributions and its types.
4. Study the Continuous distributions and its types.
5. Understand the Basic Theory of Chebyshev's inequality.
6. Chapman-Kolmogorov equations, classification of states.

UNIT I

Meaning and definition of statistics, Measures of central tendency: Arithmetic Mean, Median, Mode. Measures of dispersion – Range, Coefficient of range, Quartile deviation, Coefficient of Quartile deviation, Standard deviation and Coefficient of variation.

UNIT II

Probability Concepts – trial, event, Sample space, mutually exclusive event, exclusive and exhaustive events, dependent and independent events, simple and compound events, Mathematical properties, permutation and combination, probability axioms, addition and multiplication theorem, real random variables (discrete and continuous), cumulative distribution function, probability density functions, mathematical expectation, moments, moment generating function, characteristic function.

UNIT III

Discrete distributions: uniform distribution, binomial distribution, Poisson distribution, and its properties, joint probability density functions, marginal and conditional distributions, expectation of function of two random variables, conditional expectations, independent random variables.

UNIT IV

Continuous distributions: uniform distribution, normal distribution, standard normal distribution, exponential distribution. Joint cumulative distribution function and its properties, joint probability density functions (No derivations) and simple problems. Bivariate distribution, correlation coefficient, joint moment generating function (jmgf) and calculation of covariance (from jmgf), linear regression for two variables.

UNIT V

Chebyshev's inequality, statement and interpretation of (weak) law of large numbers and strong law of large numbers, Central Limit theorem for independent and identically distributed random variables with finite variance, Markov Chains, Chapman-Kolmogorov equations, classification of states.

SUGGESTED READINGS

TEXT BOOK

1. Gupta S.P., (2001). Statistical Methods, Sultan Chand & Sons, New Delhi.

REFERENCES

1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig., (2007). Introduction to Mathematical Statistics, Pearson Education, Asia.

2. Irwin Miller and Marylees Miller, John E. Freund, (2006). Mathematical Statistics with Application, Seventh Edition, Pearson Education, Asia.

3. Sheldon Ross., (2007). Introduction to Probability Model, Ninth Edition, Academic Press, Indian Reprint.

4. Pillai R.S.N., and Bagavathi V., (2002). Statistics, S. Chand & Company Ltd, New Delhi.

5. Srivastava T.N., and Shailaja Rego., (2012). 2e, Statistics for Management, Mc Graw Hill Education, New Delhi.

6. Dr.P.N.Arora, (2002). A foundation course statistics, S.Chand & Company Ltd, New Delhi.

Semester – VI

16MMU603B	DIFFERENTIAL GEOMETRY	L T P C
		4 2 0 4

Course Objective:

This course enables the students to learn

- To get introduced to the concept of a regular parameterized curve in n
- To Understand the concept of curvature of a space curve and signed curvature of a plane curve.
- To be able to understand the fundamental theorem for plane curves.
- To get introduced to the notion of Serret-Frenet frame for space curves and the
- Involutes and evolutes of space curves with the help of examples. To be able to compute the curvature and torsion of space curves.
- The Parallel propagation of vectors, Covariant and intrinsic derivatives

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Understand the theory of space curves with examples.
2. Study the concept of parametric curves on surfaces.
3. Know about the torsion of a geodesic and geodesic curvature.
4. Study the Tensors of different type, Algebra of tensors and contraction.
5. Know about the Parallel propagation of vectors.
6. Understand Laplacian operators in tensor form.

UNIT I

Theory of Space Curves: Space curves - Planer curves, Curvature, torsion and Serret-Frenet formulae - Osculating circles, Osculating circles and spheres - Existence of space curves - Evolutes and involutes of curves.

UNIT II

Theory of Surfaces: Parametric curves on surfaces - Direction coefficients -First and second Fundamental forms - Principal and Gaussian curvatures - Lines of curvature - Euler's theorem - Rodrigue's formula - Conjugate and Asymptotic lines.

UNIT III

Developables: Developable associated with space curves and curveson surfaces – Minimal surfaces. Geodesics: Canonical geodesic equations - Nature of geodesics on a surface of revolution -Clairaut's theorem. -Normal property of geodesics -Torsion of a geodesic - Geodesic curvature - Gauss-Bonnet theorem - Surfaces of constant curvature -Conformal mapping. Geodesic mapping-Tissot's theorem.

UNIT IV

Tensors: Summation convention and indicial notation - Coordinate transformation and Jacobian, Contra-variant and Covariant vectors - Tensors of different type - Algebra of tensors and contraction - Metric tensor and 3-index Christoffel symbols.

UNIT V

Parallel propagation of vectors, Covariant and intrinsic derivatives - Curvature tensor and its properties - Curl, Divergence and Laplacian operators in tensor form - Physical components.

SUGGESTED READINGS

TEXT BOOK

1.Willmore T.J., (2012). An Introduction to Differential Geometry, Dover Publications, New York.

REFERENCES

1. B. O'Neill., (2006). Elementary Differential Geometry, 2nd Ed., Academic Press,New Delhi.
2. Weatherburn C.E., (2003). Differential Geometry of Three Dimensions, Cambridge University Press, Cambridge.
3. Struik D.J., (2012). Lectures on Classical Differential Geometry, 2nd Edition, Dover Publications, New York.
4. Lang S., (2001). Fundamentals of Differential Geometry, Springer, New York.
5. Spain B., (2003).Tensor Calculus: A Concise Course, Dover Publications, New York.

Semester -VI

		L T P C
16MMU691	**PROJECT**	**8 0 0 6**

16MMP101	ALGEBRA	Semester – I L T P C 4 0 0 4

Course Objectives
This course enables the students to learn

- The fundamental concepts of algebraic ring theory and fields.
- The basic central ideas of Polynomial ring.
- How to test if a polynomial is irreducible Finite Field (Galois Fields).
- How to convert the various matrix forms.
- Develop capabilities with an axiomatic treatment of transformation.
- Develop an understanding of the structure of sets with operations on them.

Course Outcomes (COs)
After successful completion of this course the students will be able to

1. Understand the concept and the properties of finite abelian groups.
2. Get pre-doctoral level knowledge in ring theory.
3. Attain good knowledge in field theory.
4. Define and study in details the properties of linear transformations.
5. Analyze the concept of trace and transpose.
6. Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts quadratic forms.

UNIT I
Another counting principle – application of theorems – Cauchy theorem – Sylow's theorem – Direct products – Finite Abelian groups.

UNIT II
Ring Theory- Basic definition- More ideals and quotient rings- Euclidean rings-A Particular Euclidean Rings –Polynomial Rings-Polynomial over the Rational Field.

UNIT III
Fields – Extension Fields-Finite Extension of F – Some basic Definitions and Theorem – Roots of a Polynomial – More about Roots – The elements of Galois theory .

UNIT IV
Linear Transformations-The Algebra Of Linear Transformation – Characteristic Root-Matrices-Canonical Forms –Triangular form-Nilpotent Transformations–Jordan form.

UNIT V
Trace and Transpose – Trace of T-Symmetric Matrix –Determinants–Hermitian Transformation, Unitary Transformation and Normal Transformation – Real quadratic forms.

SUGGESTED READINGS
TEXT BOOK

1. Herstein.I. N.,(2010). Topics in Algebra, Second edition, Wiley and sons Pvt Ltd, Singapore.

REFERENCES

1. Artin. M., (2008). Algebra, Prentice-Hall of India, New Delhi.
2. Fraleigh. J. B., (2004). A First Course in Abstract Algebra , Seventh edition , Pearson Education Ltd, Singapore.
3. Kenneth Hoffman., Ray Kunze., (2003). Linear Algebra, Second edition, Prentice Hall of India Pvt Ltd, New Delhi.
4. Vashista.A.R., (2005). Modern Algebra, Krishna Prakashan Media Pvt Ltd, Meerut.

		Semester – I
16MMP102	**REAL ANALYSIS**	**L T P C**
		4 0 0 4

Course Objectives

This course enables the students to learn

- The basic principles of Riemann – Stieltjes Integral.
- Apply mathematical concepts and principles to infinite series.
- How to identify sets with various properties such as convergence.
- Have the knowledge of Lebesgue integral of functions and their properties.
- Understand the importance of undefined terms, definitions, and axioms.
- Use a variety of proof techniques to prove theorems using axioms, definitions, and previous results.

Course Outcomes (COs)

On successful completion of this course, students will be able to

1. Get specific skill in Riemann Stieltjes integral and Lebesgue integral.
2. Attain knowledge in infinite series.
3. Demonstrate an understanding of the uniform convergence and differentiation.
4. Enrich their knowledge of measure theory and extremum problems.
5. Solve given problems at a high level of abstraction based on Implicit function.
6. Describe the fundamental properties of the real numbers that underpin the formal development of real analysis.

UNIT I

The Riemann – Stieltjes Integral:

Introduction – Basic Definitions – Linear Properties – Integration by parts – Change of variable in a Riemann – Stieltjes Integral – Reduc tion to a Riemann Integral – Step functions as integrators – Reduction of a Riemann – Stieltjes Integral to a finite sum – Monotonically increasing – Additive and linear properties – Riemann condition – Comparison theorems – Integrators of bounded variation – Sufficient condition for Riemann Stieltjes integral.

UNIT II

Infinite series and infinite products:

Introduction – Basic definitions – Ratio test and root test – Dirichlet test and Able's test – Rearrangement of series – Riemann's theorem on conditionally convergent series – Sub series - Double sequences – Double series – Multiplication of series – Cesaro summability.

UNIT III

Sequences of functions:

Basic definitions – Uniform convergence and continuity - Uniform convergence of infinite series of functions – Uniform convergence and Riemann – Stieltjes integration – Non uniformly convergent sequence – Uniform convergence and differentiation – Sufficient condition for uniform convergence of a series.

UNIT IV

The Lebesgue integral:

Introduction- The class of Lebesgue – integrable functions on a general interval- Basic properties of the Lebesgue integral- Lebesgue integration and sets of measure zero- The Levi monotone

convergence theorem- The Lebesgue dominated convergence theorem-
Applications of Lebesgue dominated convergence theorem- Lebesgue integrals on unbounded intervals as limit of integrals on bounded intervals- Improper Riemann integrals- Measurable functions.

UNIT V
Implicit functions and extremum problems:
Introduction – Functions with non zero Jacobian determinant – Inverse function theorem – Implicit function theorem – Extrema of real valued functions of one variable and several variables.

SUGGESTED READINGS

TEXT BOOK

1.Rudin. W., (1976) .Principles of mathematical Analysis, Mcgraw hill, New york .

REFERENCES

1. Tom .M. Apostol., (2002). Mathematical Analysis, Second edition, Narosa Publishing House, New Delhi.

2. Balli. N.P., (1981). Real Analysis, Laxmi Publication Pvt Ltd, New Delhi.

3. Gupta.S.L. and Gupta.N.R.,(2003).Principles of Real Analysis, Second edition, Pearson Education Pvt.Ltd, Singapore.

4. Royden .H.L., (2002). Real Analysis, Third edition, Prentice hall of India,New Delhi.

5. Sterling. K. Berberian., (2004).A First Course in Real Analysis, Springer Pvt Ltd, New Delhi.

		Semester – I
16MMP103	**NUMERICAL ANALYSIS**	**L T P C**
		4 0 0 4

Course Objectives

This course enables the students to learn

- To develop the working techniques on numerical differentiation and integration.
- To solve algebraic and transcendental equations.
- Appropriate numerical methods to solve differential equations.
- To provide suitable and effective methods for obtaining approximate representative numerical results of the problems.
- To solve complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations.
- Provide a basic understanding of the derivation, analysis, and use of these numerical methods, along with a rudimentary understanding of finite precision arithmetic and the conditioning and stability of the various problems and methods.

Course Outcomes (COs)

On successful completion of this course, students will be able to

1. Identify the concept of numerical differentiation and integration.
2. Provide information on methods of iteration.
3. Solve ordinary differential equations by using Euler and modified Euler method.
4. Study in detail the concept of boundary value problems.
5. Attain mastery in the numerical solution of partial differential equations.
6. Apply numerical methods to obtain approximate solutions to mathematical problems.

UNIT I

Solutions of Non Linear Equations: Newton's method-Convergence of Newton's method-Bairstow's method for quadratic factors. Numerical Differentiation and Integration:

Derivatives from difference tables – Higher order derivatives – divided difference. Trapezoidal rule – Romberg integration – Simpson's rules.

UNIT II

Solutions of system of Equations: The Elimination method: Gauss Elimination and Gauss Jordan Methods – LU decomposition method.

Methods of Iteration: Gauss Jacobi and Gauss Seidal iteration-Relaxation method.

UNIT III

Solutions of Ordinary Differential Equations: One step method: Euler and Modified Euler methods –Rungekutta methods. Multistep methods: Adams Moulton method – Milne's method

UNIT IV

Boundary Value Problem and Characteristic value problem: The shooting method: The linear shooting method – The shooting method for non-linear systems.

Characteristic value problems –Eigen values of a matrix by Iteration-The power method.

UNIT V

Numerical Solution of Partial Differential Equations: Classification of Partial Differential Equation of the second order – Elliptic Equations. Parabolic equations: Explicit method – The Crank Nicolson difference method. Hyperbolic equations – solving wave equation by Explicit Formula.

SUGGESTED READINGS

TEXT BOOK

1.Gerald, C. F., and Wheatley. P. O., (2006). Applied Numerical Analysis, sixth edition, Dorling Kindersley (India) Pvt. Ltd. New Delhi.

REFERENCES

1. Jain. M. K., Iyengar. S. R. K. and R. K. Jain., (2009). Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, New Delhi .

2. Burden R. L., and Douglas Faires.J,(2007). Numerical Analysis, Seventh edition, P. W. S. Kent Publishing Company, Boston.

3. Sastry S.S., (2008). Introductory methods of Numerical Analysis, Fourth edition, Prentice Hall of India, New Delhi.

Semester – I

16MMP104 **ORDINARY DIFFERENTIAL EQUATIONS** **L T P C**
4 0 0 4

Course Objectives

This course enables the students to learn

- The formulation and solutions of second order ordinary differential equations and get exposed to physical problems with applications.
- The concept of solve the system of first order equations.
- Linear homogeneous and non homogeneous equations with constant coefficients.
- Understanding the elementary linear oscillations.
- Understand all of the concepts relating to the order and linearity of ordinary differential equations, analytic and computational solution methods for ordinary differential equations, and the real-world applications of ordinary differential equations.
- Apply your understanding of the concepts, formulas, and problem solving procedures to thoroughly investigate relevant physical models.

Course Outcomes (COs)

On successful completion of this course, students will be able to

1. Model a simple physical system to obtain a first and second order differential equation.
2. Understand the basic notions of linearity, superposition, existence and uniqueness of solution to differential equations and use these concepts in solving linear differential equations.
3. Identify homogeneous equations, homogeneous equations with constant coefficients and exact linear differential equations**.**
4. Solve higher order and system of differential equations of Successive approximation.
5. Understand the difficulty of solving problems for elementary linear oscillations.
6. Identify, analyze and subsequently solve physical situations whose behavior can be described by ordinary differential equations.

UNIT I

Second order linear equations with ordinary points – Legendre equation and Legendre polynomial – Second order equations with regular singular points – Bessel equation.

UNIT II

System of first order equations – existence and uniqueness theorems – fundamental matrix.

UNIT III

Non homogeneous linear system – linear systems with constant coefficient – Linear systems with periodic coefficients.

UNIT IV

Successive approximation – Picard's theorem – Non uniqueness of solution – continuation and dependence on initial conditions – existence of solution in the large existence and uniqueness of solution in the system.

UNIT V
Fundamental results – Sturms comparison theorem – elementary linear oscillations – comparison theorem of Hille winter – Oscillations of $x'' + a(t)x = 0$ elementary non linear oscillations.

SUGGESTED READINGS

TEXT BOOK

1.Earl A. Coddington, (2002). An introduction to Ordinary differential Equations, Prentice Hall of India Private limited, New Delhi.

REFERENCES

1. Deo. S. G, Lakshmikantham, V. and Raghavendra, V. (2003). of Ordinary differential Equations, Second edition, Tata Mc Graw Hill Publishing Company limited, New Delhi.

2. Rai. B, Choudhury, D. P. and Freedman, H. I. (2004). A course of Ordinary differential Equations, Narosa Publishing House, New Delhi.

3. George F. Simmons, (1991). Differential Equations with application and historical notes, Second edition ,Tata Mc Graw Hill Publishing Company limited, New Delhi.

Semester – I

16MMP105A ADVANCED DISCRETE MATHEMATICS

L	T	P	C
4	0	0	4

Course Objectives

This course enables the students to learn

- The concept of algebraic structures, lattices and its special categories which plays an important role in the field of computers.
- The fundamental concepts in graph theory, with a sense of some its modern applications.
- Some fundamental mathematical concepts and terminology.
- Learn some different types of discrete structures.
- Introduce students to the techniques, algorithms, and reasoning processes involved in the study of discrete mathematical structures.
- Introduce students to set theory, inductive reasoning, elementary and advanced counting techniques, equivalence relations, recurrence relations, graphs, and trees.

Course Outcomes (COs)

On successful completion of this course, students will be able to

1. Develop new algebraic structures.
2. Think critically and analytically by modeling problems form social and natural sciences with the help of theory of graphs.
3. Apply discrete mathematics in formal representation of various computing constructs
4. Work effectively in groups on a project that requires an understanding of graph theory.
5. Demonstrate different traversal methods for trees and graphs.
6. Recognize the importance of analytical problem-solving approach.

UNIT I

Algebraic Structures: Introduction- Algebraic Systems: Examples and General Properties: Definition and examples - Some Simple Algebraic Systems and General properties - Homomorphism and isomorphism - congruence relation - Semigroups and Monoids: Definitions and Examples - Homomorphism of Semigroups and Monoids.

UNIT II

Lattices: Lattices as Partially Ordered Sets: Definition and Examples - Principle of duality - Some Properties of Lattices - Lattices as Algebraic Systems – Sublattices - Direct product, and Homomorphism.

UNIT III

Some special Lattices - e.g. Complete, Complemented and Distributive Lattices - Boolean Algebra: Definition and Examples - Subalgebra - Direct product and Homomorphism - join irreducible - atoms and antiatoms.

UNIT IV

Graph Theory: Definition of a graph - applications, Incidence and degree - Isolated and pendant vertices - Null graph, Path and Circuits: Isomorphism - Subgraphs, Walks -Paths and circuits - Connected graphs, disconnected graphs – components - Euler graph.

UNIT V

Trees: Trees and its properties - minimally connected graph - Pendant vertices in a tree - distance and centers in a tree - rooted and binary tree. Levels in binary tree - height of a tree - Spanning trees - rank and nullity.

SUGGESTED READINGS

TEXT BOOKS

1. Tremblay J. P. and Manohar, R., (2001). Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Co**.(for unit I,II,III).**

2. Deo N., (2000). Graph Theory with Applications to Engineering and Computer Sciences, Prentice Hall of India. **(for unit IV,V)**

REFERENCES

1. Liu C.L., (2000). Elements of Discrete Mathematics, McGraw-Hill Publishing Company Ltd, New Delhi.

2. Wiitala S., (2003),Discrete Mathematics- A Unified Approach, McGraw-Hill Book Co, New Delhi.

3. Seymour Lepschutz, (2007),Discrete Mathematics, Schaum Series, McGraw-Hill Publishing Company Ltd, New Delhi.

Semester – I

16MMP105B **NEURAL NETWORKS AND FUZZY LOGIC** **L T P C**
4 0 0 4

Course Objectives

This course enables the students to learn

- The introduction and different architectures of neural networks.
- The applications of neural networks.
- To cater the knowledge of Fuzzy Logic Control and use these for controlling real time systems.
- The fundamental concepts of fuzzy logic and artificial neural networks.
- The concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.
- The importance of tolerance of imprecision and uncertainty for design of robust & low cost intelligent machines.

Course Outcomes (COs)

On successful completion of this course, students will be able to

1. Obtain the fundamentals and types of neural networks.
2. Have a broad knowledge in developing the different algorithms for neural networks in Topology.
3. Analyze recurrent neural networks.
4. Acquire a broad knowledge in fuzzy logic principles.
5. Expose the students to the concepts of Classical and fuzzy sets
6. Provide adequate knowledge about the Fuzzy controllers.

UNIT I

Evolution of neural networks; Artificial Neural Network: Basic model, Classification, Feed forward and Recurrent topologies, Activation functions; Learning algorithms: Supervised, Un-supervised and Reinforcement; Fundamentals of connectionist modeling: McCulloach – Pits model, Perceptron, Adaline, Madaline.

UNIT II

Topology of Multi-layer perceptron, Back propagation learning algorithm, limitations of Multi-layer perceptron. Radial Basis Function networks: Topology, learning algorithm, Kohenen's self-organizing network: Topology, learning algorithm; Bidirectional associative memory Topology, learning algorithm, Applications.

UNIT III

Recurrent neural networks: Basic concepts, Dynamics, Architecture and training algorithms, Applications; Hopfield network: Topology, learning algorithm, Applications; Industrial and commercial applications of Neural networks: Semiconductor manufacturing processes, Communication, Process monitoring and optimal control, Robotics, Decision fusion and pattern recognition.

UNIT IV

Classical and fuzzy sets: Introduction, Operations and Properties, Fuzzy Relations: Cardinality, Operations and Properties, Equivalence and tolerance relation, Value assignment: cosine amplitude and max-min method; Fuzzification: Membership value assignment- Inference, rank ordering, angular fuzzy sets. Defuzzification methods, Fuzzy measures, Fuzzy integrals, Fuzziness and fuzzy resolution; possibility theory and Fuzzy arithmetic; composition and inference; Considerations of fuzzy decision-making.

UNIT V

Basic structure and operation of Fuzzy logic control systems; Design methodology and stability analysis of fuzzy control systems; Applications of Fuzzy controllers. Applications of fuzzy theory.

SUGGESTED READINGS

TEXT BOOKS

1. Limin Fu, (2003). Neural Networks in Computer Intelligence, McGraw Hill, Delhi.

2. Fakhreddine O. Karray and Clarence De Silva., (2009). Soft Computing and Intelligent Systems Design, Theory, Tools and Applications, Pearson Education, India.

REFERENCES:

1. Timothy J. Ross, (1995). Fuzzy Logic with Engineering Applications, McGraw Hill, Delhi.

2. Yegnanarayana B., (2006). Artificial Neural Networks, PHI, India

		Semester – I
16MMP105 C	**MAGNETOHYDRODYNAMICS**	**L T P C**
		4 0 0 4

Course Objectives

This course enables the students to learn

- To understand fundamentals of magnetohydrodynamics which describes the dynamics of electrically conducting fluids
- To figure out the applications of magnetohydrodynamics to the various science and engineering fields
- Basics of electromagnetic theory and vector calculus.
- Able to understand the concept of flow and Stability.
- The basic properties of electrically-conducting fluids.
- The role of the Lorentz force and its relevance to plasma confinement, dynamo theory and the dynamics of magnetic waves.

Course Outcomes (COs)

On successful completion of this course the student will be able to:

1. Provide the details of the derivation of ideal and resistive MHD equations.
2. Demonstrate the basic properties of ideal MHD.
3. Describe electromagnetic boundary conditions.
4. Explain MHD waves.
5. Describe the derivation of fluid equations, energy equation.
6. Describe electromagnetic fields in the energy and momentum fluxes.

UNIT I

Review of equation of motions of viscous compressible fluid flow –Introduction of MHD-Electromagnetic field equations-Maxwell’s equations and their Physical significance- Maxwell’s equations in the moving frame of reference-Invariance under Galilean Transformation-Electromagnetic effects and the magnetic Reynolds number-induction equation –Alfven’s Theorem-Physical Significance-Consequence of Alfven’s Theorem-Ferraro’s Law of irritation-The magnetic Energy- the mechanical equations and the mechanical effects-Electromagnetic stresses.

UNIT II

Magneto hydrostatics and steady states-Hydro magnetic equilibrium and forces free magnetic fields-boundary conditions – Boundary conditions in the case of force free magnetic fields-free surface of an isolated fluid mass- Chandrasekhar’s theorem-General solution of force free magnetic field when is constant-some examples of force free fields.

UNIT III

Hydromagnetics of the laboratory- steady laminar motion-Hartmann flow (MHD Poiseuille’s flow)-Domination of viscous forces over magnetic forces and vice versa-physical significance- Important dimensionless of MHD and their physical significance-electromagnetic boundary conditions-tensor electrical conductivity, Hall current and ion slip – simple flow problems with tensor electrical conductivity.

UNIT IV

Magneto hydrodynamic waves- Waves in an infinite fluid of infinite electrical conductivity- Alfven waves in incompressible fluid in viscid fluid of infinite electrical conductivity-Waves of finite amplitude –propagation of velocity and current density with Alfven velocity-MHD waves in incompressible fluid- Alfven wave and two magneto acoustic waves- the limit of zero magnetic Prandtl number significance.

UNIT V

Stability of hydro magnetic systems- theory and applications-methods of investigation-small perturbations and instability-Energy principle-normal mode analysis-simple illustrative examples-the stability of Hartman layer-Squire's theorem-Orr-Summerfield equation-Instability of linear pinch-methods of stabilize- Flute Instability- A general criterion for satiability-Bernstein's method of small oscillations(normal mode analysis) for hydro magnetic stability-jeans criterion for Gravitational stability- Chandrasekhar's generalization for MHD and rotating fluids.

SUGGESTED READINGS

TEXT BOOK

1.Ferraro, V. A. C and Plumpton, C., (1966). An Introduction to Magneto-Fluid Mechanics., Clarendon press, oxford.

REFERENCES

1. Crammer M.R., and Shi-l pai.,(1973). Magneto-Fluid Mechanics for engineers and applied physicists, Scripta publishing company, Washington D.C.

2. Roberts P. H., (1967). An Introduction to Magneto hydrodynamics., Longmans, Green and Co Ltd., London.

3. Sutton G.W., and Sherman A., (1965). Engineering Magneto hydrodynamics., McGraw HillBook Co., New Delhi.

4. Chandrasekhar S., (1961). Hydro dynamic and Hydro dynamic stability, Oxford university press. Cambridge, UK.

16MMP106 **FUZZY LOGIC** **Semester – I**
L T P C
4 0 0 4

Course Objectives
This course enables the students to learn

- The introduction and different architectures of fuzzy sets.
- The applications of fuzzy networks.
- To cater the knowledge of fuzzy Logic Control and use these for controlling real time systems.
- Solve problems that are appropriately solved by neural networks, fuzzy logic, and genetic algorithms.
- The concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.
- The importance of tolerance of imprecision and uncertainty for design of robust & low cost intelligent machines.

Course Outcomes (COs)
On successful completion of this course, students will be able to

1. Obtain the fundamentals and types of fuzzy networks.
2. Have a broad knowledge in developing the different algorithms for fuzzy Logic.
3. Analyze constructing Fuzzy sets and operations.
4. Acquire a broad knowledge in Fuzzy relation equation.
5. The basic mathematical elements of the theory of Fuzzy systems and neural networks.
6. Explain the concepts of neural networks, fuzzy logic, and genetic algorithms.

UNIT I
Classical logic: An overview-Multivalued logics-Fuzzy Propositions-Fuzzy quantifiers-linguistic hedges-Inference from conditional fuzzy propositions-Inference from conditional and qualified propositions-Inference from qualified propositions.

UNIT II
Uncertainty based in formations-Information and uncertainty-Non specificity of crisp sets- Non specificity of Fuzzy sets-Fuzziness of fuzzy sets- Uncertainty in evidence theory-Summary of Uncertainty measures-Principles of Uncertainty.

UNIT III
Constructing Fuzzy sets and operations - General discussion-Method of construction: An overview-Direct method with one expert- Direct method with multiple experts- Indirect method with one expert- Indirect method with multiple experts-Constructions from sample data.

UNIT IV
Fuzzy expert systems: An overview-Fuzzy implications-selection of Fuzzy implications-Multi conditional approximate reasoning-The role of Fuzzy relation equation-Interval-valued approximate reasoning.

UNIT V
Fuzzy systems-General discussion-Fuzzy controllers: An overview and examples-Fuzzy systems and

neural networks- Fuzzy neural networks- Fuzzy Automata-Fuzzy dynamic systems.

SUGGESTED READINGS

TEXTBOOKS

1. George J. Klir, Tina. A Folger, (2008). Fuzzy sets, uncertainty and information, Prentice Hall of India Pvt. Ltd, New Delhi, (For Unit I, II, III)

2. George J. Klir and Bo Yuan., (1995). Fuzzy sets and fuzzy logic theory and applications, Prentice- Hall of India private limited, New Delhi. (For Unit IV, V)

REFERENCES

1. Timothy J. Ross, (2000). Fuzzy logic with Engineering Applications, McGraw Hill, Inc. New Delhi.

2. H.J. Zimmermann, (2006). Fuzzy set theory and its applications, Second Edition, Springer New Delhi,

Semester – I

16MMP111 **NUMERICAL ANALYSIS- PRACTICAL I** **L T P C**
0 0 4 2

Course Objectives

This course enables the students to learn

- In-depth understanding of functional, logic, and programming paradigms.
- How to implement several programs in languages other than the one emphasized in the core curriculum.
- This course provides an introduction to the basic concepts and techniques of numerical solution of algebraic equation.
- This course is to provide students with an introduction to the field of numerical analysis.
- Develop and apply the appropriate numerical techniques for your problem, interpret the results, and assess accuracy.
- This module are to make the students familiarize with the ways of solving complicated mathematical problems numerically.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Know the concepts for problem solving.
2. Acquire new knowledge in computing, including the ability to learn about new ideas and advances, techniques, tools, and languages, and to use them effectively; and to be motivated to engage in life-long learning
3. Comprehend important issues related to the development of computer-based systems in a professional context using a well-defined process.
4. Be familiar with programming with numerical packages.
5. Be aware of the use of numerical methods in modern scientific computing.
6. To develop the mathematical skills of the students in the Euler method.

List of Practical:

1. Solution of non-linear equation-Bairstow’s method for quadratic factors.
2. Solution of simultaneous equations-Gauss Elimination.
3. Solution of simultaneous equations-Gauss Jordan.
4. Solution of simultaneous equations-Gauss Jacobi.
5. Solution of simultaneous equations-Gauss Seidal.
6. Solution of simultaneous equations-Triangularization.
7. Numerical integration-Trapezoidal rule.
8. Numerical integration-Simpson’s rules.
9. Solution for ordinary differential equation-Euler method.
10. Solution for ordinary differential equation- Runge Kutta Second order.

11. Solution for parabolic equation - Explicit method.
12. Solution for parabolic equation - The Crank Nicolson method.

16MMP201 **COMPLEX ANALYSIS** **Semester-II**
L T P C
4 0 0 4

Course Objectives
This course enables the students to learn

- To learn the concepts of Oriented circles and level curves.
- Fundamental concepts of complex integration.
- To know the concepts of harmonic function.
- To develop the skill of contour integration to evaluate complicated real integrals via residue calculus.
- The development of the complex variable in boundary behaviour.
- Contour integral using parametrization, fundamental theorem of calculus and Cauchy's integral formula.

Course Outcomes (COs)
On successful completion of this course, students will be able to

1. Explain the role of the Conformal mapping.
2. Evaluate complex contour integrals and some of their consequences.
3. Determine the Taylor series or the Laurent series of an analytic function in a given region
4. Describe the convergence properties of a power series.
5. Know the basic properties of singularities of analytic functions.
6. Demonstrate familiarity with a range of examples of these concepts of conformal mapping.

UNIT I
Conformal mapping-Linear transformations- cross ratio- symmetry- Oriented circles-families of circles-level curves.

UNIT II
Complex integration-rectifiable Arcs- Cauchy's theorem for Rectangle and disc-Cauchy's integral formula-higher derivatives.

UNIT III
Harmonic functions-mean value property-Poisson's formula-Schwarz theorem, Reflection principle-Weierstrass theorem- Taylor series and Laurent series.

UNIT IV
Partial Fractions- Infinite products – Canonical products-The gamma function – Stirling's Formula – Entire functions – Jensen's formula.

UNIT V
Riemann Mapping Theorem – Boundary behaviour – Use of Reflection Principle – Analytical arcs – Conformal mapping of polygons- The Schwartz - Christoffel formula.

SUGGESTED READINGS

TEXT BOOK

1. Lars V .Ahlfors., (1979). Complex Analysis, Third edition, Mc-Graw Hill Book Company, New Delhi.

REFERENCES

1. Ponnusamy, S., (2005). Foundation of Complex Analysis, Second edition, Narosa publishing house, New Delhi.

2. Choudhary, B.,(2003). The Elements of Complex Analysis ,New Age International Pvt. Ltd , New Delhi.

3. Vasishtha, A. R.,(2005). Complex Analysis, Krishna Prakashan Media Pvt. Ltd., Meerut.

4. Walter Rudin., (2012) .Real and Complex Analysis,3rd edition, Mc Graw Hill Book Company, New york.

16MMP202	TOPOLOGY	Semester – II L T P C 4 0 0 4

Course Objectives

This course enables the students to learn

- Topological properties of sets.
- The properties of compact spaces and connected spaces.
- To explore the foundations of linear subspace.
- The concepts of metric spaces and topological spaces.
- Metric spaces and metrizability of topological spaces; separation axioms.
- Interior, closure and boundary: applications to geographic information systems

Course Outcomes (COs)

On successful completion of this course, students will be able to

1. Know the concept of topological spaces.
2. Acquire knowledge about various types of topological spaces and their properties.
3. Formulate and analyze topological problems in connected space.
4. Know the result of Compactness problems and theorems.
5. Admire the deep mathematical results like Urysohn's lemma.
6. Create examples and counter examples in the fundamental concepts of separation space.

UNIT I

Topological spaces, Basis for a topologies, the order topology, the product topology X x Y, the subspace topology.

UNIT II

Closed set and limit points, continuous functions, the product topologies, the metric topologies.

UNIT III

Connected spaces, connected subspaces of the real line, components and local connectedness.

UNIT IV

Compact spaces, compact subspaces of the Real line, limit point compactness, local compactness.

UNIT V

The countability axioms, the separation axioms, normal spaces, The Urysohn lemma, The Urysohn metrization theorem, the Tietze Extension theorem.

SUGGESTED READINGS

TEXT BOOK

1. James R.Munkres., (2008). Topology, Second edition, Pearson Prentice Hall, New Delhi.

REFERENCES

1. Simmons, G. F., (2004). Introduction to Topology and Modern Analysis, Tata Mc Graw Hill, New Delhi.
2. Deshpande, J. V., (1990). Introduction to topology, Tata Mc Graw Hill, New Delhi.
3. James Dugundji., (2002). Topology, Universal Book Stall, New Delhi.
4. Joshi, K. D.(2004). Introduction to General Topology, New Age International Pvt Ltd, New Delhi.

		Semester – II
16MMP203	**OPTIMIZATION TECHNIQUES**	**L T P C**
		4 0 0 4

Course Objectives

This course enables the students to learn

- The basic concepts of integer linear programming.
- How to solve quadratic programming problems, dynamic programming problems and non-linear programming problems.
- Classical optimization techniques and numerical methods of optimization.
- Know the basics of different evolutionary algorithms.
- Explain Integer programming techniques and apply different optimization techniques to solve various models.
- Enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems.

Course Outcomes (COs)

After successful completion of this course the students will be able to

1. Understand the concept of linear programming and integer programming.
2. Develop optimal decision policy skill.
3. Familiarize with real life applications of inventory models.
4. Skill in decision analysis.
5. Mastery in Beale's method and simplex method.
6. Use classical optimization techniques and numerical methods of optimization.

UNIT I

Integer Linear Programming: Types of Integer Linear Programming Problems - Concept of Cutting Plane - Gomory's All Integer Cutting Plane Method - Gomory's mixed Integer Cutting Plane method

Branch and Bound Method. - Zero-One Integer Programming – Real life application in Integer Linear Programming.

UNIT II

Dynamic Programming: Characteristics of Dynamic Programming Problem - Developing Optimal Decision Policy - Dynamic Programming under Certainty - DP approach to solve LPP.

UNIT III

Probabilistic Inventory Model: Real life application -Continuous review models- Probabilistic Economic order quantity (EOQ) Model. Single-period models – No setup model – setup model. Multi period model.

UNIT IV

Decision Analysis: Real life application - Decision making under certainty- Analytic hierarchy process. Decisions under Risk- Decision Trees-based expected value criterion, variations of the expected value criterion. Decisions under Uncertainty Real life application in Decision Analysis

UNIT V

Non-linear Programming Methods: Examples of NLPP - General NLPP - Graphical solution - Quadratic Programming - Wolfe's modified Simplex Methods - Beale's Method.

SUGGESTED READINGS

TEXT BOOK

1. Handy, A. Taha.(2007). Operations Research, Seventh edition, Prentice Hall of India Pvt Ltd, New Delhi.

REFERENCES

1**.**Kanti swarup., Gupta, P. K. and Manmohan., (2006). Operations Research, Twelfth edition, Sultan Chand & Sons Educational Publishers, New Delhi.

2.Panneerselvam, R., (2007). Operations Research, Second edition, Prentice Hall of India Private Ltd, New Delhi.

3.Sharma, J. K., (2008). Operations Research Theory and Practice, Third edition, Macmillan India Ltd.

4**.**Singiresu, S. Rao., (2006). Engineering Optimization Theory and Practice, Third edition New Age International Pvt Ltd, New Delhi.

5.Sivarethina Mohan. R., (2005). Operations Research, First edition, Tata Mc Graw Hill Publishing Company Ltd, New Delhi.

16MMP204	**PARTIAL DIFFERENTIAL EQUATIONS**	**Semester – II** **L T P C** **4 0 0 4**

Course Objectives

This course enables the students to learn

- The basic concepts of solution of PDE and its applications.
- About initial and boundary value problems for PDEs of first and second order which includes Laplace Equation, Diffusion Equation and Wave Equation.
- Introduce students to how to solve linear Partial Differential with different methods.
- Technique of separation of variables to solve PDEs and analyze the behavior of solutions in terms of eigen function expansions.
- Solutions of PDEs are determined by conditions at the boundary of the spatial domain and initial conditions at time zero.
- Basic questions concerning the existence and uniqueness of solutions, and continuous dependence of initial and boundary data.

Course Outcomes (COs)

After successful completion of this course the students will be able to

1. Classify linear and Non linear first order differential equations with constant coefficients.
2. Describe the method of separable variables and integral transforms.
3. Solve the elementary Laplace equation with symmetry.
4. Acquire the knowledge of wave equation and vibrating membranes.
5. Enrich their knowledge about diffusion equations with sources.
6. Finding the solutions of differential equation with initial and boundary conditions.

UNIT I

First Order Partial Differential Equations:

Non linear partial differential equation of first order –Compatible systems of first order equations – Special type of first order equations- Partial differential equations of second order – The origin of second order equations – Linear partial differential equations with constant coefficient equations with variable coefficients.

UNIT II

Method of separation of variables –The method of integral transforms.

UNIT III

Laplace Equation:

Elementary solutions of Laplace equations- Families of Equi-potential surfaces - Boundary Value problems-separation of variables-problems with axial symmetry.

UNIT IV

Wave Equation:

Elementary solutions of one dimensional wave equation-Vibrating membranes - Applications of calculus of variations- Green’s functions for the wave equation.

UNIT V

Diffusion Equation:

The resolution of Boundary value problems for the Diffusion equation- Elementary solutions of diffusion equation - Separation of variables- use of Green's functions- Diffusion with Sources.

SUGGESTED READINGS

TEXT BOOK

1. Ian. N. Sneedon, (2006). Elementary Partial differential equations, Tata Mcgraw Hill Ltd.

REFERENCES

1. Sharma, J. N, Kehar singh, (2001), Partial Differential Equations for Engineering and Scientists, Narosa Publishing House, New Delhi.
2. Geraold. B. Folland, (2001), Introduction to Partial Differential Equations, Prentice Hall of India Private limited, New Delhi.
3. Sankara Rao. K, (2005), Introduction to Partial Differential Equations, Prentice Hall of India Private limited, New Delhi.
4. Veerarajan, T, (2004), Partial Differential Equations and Integral Transforms, Tata McGraw-Hill Publishing Company limited, New Delhi.
5. John, F, (1991). Partial Differential equations, Third edition, Narosa publication co, New Delhi.

		Semester – II
16MMP205A	**GRAPH THEORY AND ITS APPLICATIONS**	**L T P C**
		4 0 0 4

Course Objectives

This course enables the students to learn

- The fundamental concepts in Graph Theory and some of its modern applications.
- The use of these methods in subsequent courses in the design and analysis of algorithms, computability theory, software engineering, and computer systems.
- Apply graph-theoretic terminology and notation.
- Analyze new networks using the main concepts of graph theory.
- Central theorems about trees, matching, connectivity, colouring and planar graphs.
- Describe and apply some basic algorithms for graphs.

Course Outcomes (COs)

On successful completion of this course, students will be able to

1. Understanding the basic concepts of Euler graphs and Trees.
2. Determine whether graphs are Planer and/or non planer
3. Overview of properties of trees and a minimal spanning tree for a given weighted graph.
4. Identify induced subgraphs, cliques, matchings, covers in graphs.
5. Understand the concept of Directed Graphs.
6. Know the concept of domination in graphs.

UNIT I

Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits – Connectedness – Components – Euler Graphs – Hamiltonian Paths and Circuits – Trees – Properties of trees – Distance and Centers in Tree – Rooted and Binary Trees - Spanning trees – Fundamental Circuits.

UNIT II

Spanning Trees in a Weighted Graph – Cut Sets – Properties of Cut Set – All Cut Sets – Fundamental Circuits and Cut Sets – Connectivity and separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational versus Geometric Graphs – Planer Graphs – Different Representation of a Planer Graph.

UNIT III

Incidence matrix – Sub matrices – Circuit Matrix – Path Matrix – Adjacency Matrix – Chromatic Number – Chromatic partitioning – Chromatic polynomial - Matching - Covering – Four Color Problem.

UNIT IV

Directed Graphs – Types of Directed Graphs - Types of enumeration, counting labeled trees, counting unlabelled trees, Polya's counting theorem, graph enumeration with Polya's theorem.

UNIT V

Domination in graphs: Introduction – Terminology and concepts – Applications – Dominating set and domination number – Independent set and independence number – History of domination in graphs.

SUGGESTED READINGS

TEXT BOOKS

1. Deo N, (2004). Graph Theory with Applications to Engineering and Computer Science, Prentice Hall Inc ,Upper Saddle River, NJ, USA. **(for Unit I to IV).**

2. Teresa W. Haynes, Stephen T. Hedetniemi and Peter J.Slater, (1998), Fundamentals of Domination in Graphs, Marcel Dekker, New York **(for Unit V)**

REFERENCES

1. Jonathan L Gross, Jay Yellen, (2014). Handbook of Graph Theory, CRC Press LLC. Taylor &Francis Group,Boca Rotan.

2. Diestel. R Springer-Verlag, (2012). Graph Theory. Springer-Verleg,New York.

3. Jensen.TR and Toft.B., (1995). Graph Coloring Problems. Wiley-Interscience , , New York.

4. Fred Buckley and Frank Harary, (1990). Distance in Graphs, Addison - Wesley Publications. Redwood City, California.

5. C. R. Flouds , (2009). Graph Theory Applications, Narosa Publishing House. New Delhi,India.

6. Arumugam. S, Ramachandran. S ,(2003). Invitation to graph theory, Scitech publications, Chennai.

7. Harary F, (1972).Graph Theory, Addison- Wesley publications, Massachusetts Menlo Park, California, London

		Semester – II
16MMP205 B	**THEORY OF ELASTICITY**	**L T P C**
		4 0 0 4

Course Objectives

This course enables the students to learn

- The theoretical fundamentals of theory of elasticity.
- The ability to use the principles of theory of elasticity in engineering problems.
- To solve advanced solid mechanics problems using classical methods and to characterize materials with elastics constitutive relations.
- To make students understand the principle of strain energy function.
- Be proficient with basic concepts in continuum mechanics of solids, including of strain, internal force, stress and equilibrium in solids.
- Be able to characterize materials with elastic constitutive relations.

Course Outcomes (COs)

On successful completion of this course the student will be able to

1. Know the concept of Tensor Analysis.
2. Analyze solid mechanics problems using classical methods and energy methods.
3. Apply various failure criteria for general stress states at points.
4. Get advanced knowledge about stresses, strains.
5. Understand the theory of elasticity including strain/displacement and Hooke's law relationships.
6. Apply the concept of strain energy function.

UNIT I

Tensor Analysis:

Co-ordinate transformations-contravarient and covariant vectors and tensors-symmetric and anti-symmetric tensors- metric tensor – conjugate tensor-associated tensors –Christoffel's symbols and transformations laws – covariant derivative – permutation symbols and tensors – relative and absolute tensors.

UNIT II

Analysis of strain:

Deformation –Affine transformation – infinitesimal affine deformations – A geometrical interpretation of components of strain – strain quadric of Cauchy – Principal strains and invariants general infinitesimal deformation – examples of strain – saint-Venant's equations of compatibility – finite –deformations.

UNIT III

Analysis of Stress:

Body and surface forces – stress tensor – equations of equilibrium in Cartesian co-ordinates – transformation of co-ordinates –stress quadric of Cauchy principal stresses – invariants of stress tension – maximum normal and shear stresses- Mohr's diagram – examples of stress.

UNIT IV

Equation of elasticity

Generalized Hooke's law- homogeneous isotropic medium – elastic module for isotropic media –

simple tension – pure shear – hydrostatic pressure – equilibrium equations for an isotropic elastic solid – Beltrami- Michell compatibility equations.

UNIT V
Dynamical equations of isotropic elastic solid – strain energy function – uniqueness of solution – statement of saint – Senant's principle.

SUGGESTED READINGS

TEXT BOOKS

1. Dipak Chatterjee,(2003). Vector Analysis, Prentice Hall Of India, New Delhi.(for unit-I,II,III)

2. S.P. Timoshenko, J.N. Goodier , Theory of Elasticity. McGraw Hill book coompany, New York (for unit-IV,V)

References

1. P. D. S. Verma, Theory of Elasticity. S.Chand (G/L) & Company Ltd,India.

2. Murray Rspiegel,(2010). Vector Analysis, Schaum's Series, Mcgraw-Hill Companies, New York

3. Sokolnikoff, I. S., Mathematical Theory Of Elasticity. Second Edition, Tata Mcgraw.Hill Publishing Company Ltd. New Delhi.

Semester – II

16MMP205 C FUNDAMENTALS OF ACTUARIAL MATHEMATICS

L	T	P	C
4	0	0	4

Course Objectives

This course enables the students to learn

- The fundamental theories of actuarial science as they apply in life insurance, general insurance and superannuation.
- How to assess the suitability of actuarial, financial and economic models in solving actuarial problems
- Interpretation and critically evaluating the articles in the actuarial research literature.
- About the concept of educational annuity plan.
- Understand the Premium Conversion tables for calculation of Policy values.
- The concept of Premiums for Annuity Plans.

Course Outcomes (COs)

On successful completion of this course the student will be able to

1. Explain the basic concepts of accounts and calculations of interest rates in banking / financial institution system.
2. Define Annuity and Summarize / calculate different values Annuities.
3. Leant about how to read Mortality Table and from that how to calculate the Probability of Survival and Death.
4. Describe about Premiums of Life Insurance and Endowment Assurance (Pure, Double and Marriage) and Educational Annuity plan.
5. Find the Annuity values for various Annuities.
6. Calculation of Net Premiums for Assurance Plans.

UNIT I

Accumulated Value – Present Value – Formula for present value- Annuities Certain- present Values-Amounts - Deferred Annuities –Perpetuities - Present Value of an Immediate Annuity Certain – Accumulated Value of Annuity – Relation between Sn and a_n – Present Value of Deferred Annuity Certain – Accumulated Value of a term of n years – Perpetuity – Present Value of an Immediate Perpetuity of 1p.a. – Present Value of a Perpetuity due of 1 p.a. – Deferred Perpetuity with Deferment Period of m years – Mortality Table – The Probabilities of Survival and Death.

UNIT II

Life Insurance Premiums – General considerations - Assurance Benefits – Pure Endowment Assurance – Endowment Assurance – Temporary Assurance or Term Assurance - Whole Life Assurance – Pure Endowment Assurance – Endowment Assurance – Double Endowment Assurance – Increasing Temporary Assurance – Increasing Whole Life Assurance – Commutation Functions Dx, Cx, Mx and Rx – Expressions for Present Values of Assurance Benefits in terms of Commutation Functions – Fixed Term (Marriage) Endowment – Educational Annuity Plan.

UNIT III

Life Annuities and Temporary Annuities – Commutation Functions Nx – To Find the Present Value of an Annuity Due of Re.1 p.a. for Life – Temporary Immediate Life Annuity – Expression for ax : n – Deferred Temporary Life Annuity – Variable Life Annuity – Increasing Life Annuity – Commutation Function Sx – Increasing Temporary Life Annuity – Tables of Life Annuity and Temporary Life Annuity – Variations in the Present Values of Annuities – Life Annuities Payable at Frequent Intervals.

UNIT IV

Net Premiums for Assurance Plans – Natural Premiums – Level Annual Premium – Symbols for Level Annual Premium under Various Assurance Plans – Mathematical Expressions for level Annual Premium under Level Annual Premium under Various Plans for Sum Assure of Re. 1 – Net Premiums – Consequences of charging level Premium – Consequences of withdrawals – Net Premiums for Annuity Plans – Immediate Annuities – Deferred Annuities.

UNIT V

Premium Conversion tables – Single Premium Conversion tables – Annual Premium Conversion Tables – Policy Values – Two kinds of Policy values – Policy value in symbols – Calculation of Policy Value for Unit Sum Assure – Numerical Example : Retrospective Method and Comparison with Prospective Value – Derivative of Theoretical Expressions for Policy Value, tVx by the Retrospective Method and Prospective Method – Other Expressions for Policy Value – Surrender Values – Paid up Policies – Alteration of Policy Contracts.

SUGGESTED READINGS:

TEXT BOOK

1.Mathematical Basis of Life Insurance - Insurance Institute of India

Semester – II
L T P C
16MMP206 **MECHANICS** **4 0 0 4**

Course Objectives
This course enables the students to learn
- How to use Newton's laws of motion to solve advanced problems involving the dynamic motion of classical mechanical systems.
- Applications of differential equations in advanced mathematical problems.
- To solve dynamics problems such as conservation of energy and linear and angular momentum.
- Parameters defining the motion of mechanical systems and their degrees of freedom.
- The components of a force in rectangular or nonrectangular coordinates. ÿ Determine the resultant of a system of forces.
- Complete and correct free-body diagrams and write the appropriate equilibrium equations from the free-body diagram.

Course Outcomes (COs)
On successful completion of this course students will be able to
1. Understand the concept of the D'Alembert's principle.
2. Derive the Lagrange's equation for holomonic and non holomonic constraints.
3. Classify Scleronomic and Rheonomic systems.
4. Solve the problems of Hamilton equations of motion.
5. Study of the canonical transformations.
6. Know the concept of Hamilton Jacobi Theory.

UNIT I
Survey of Elementary principles: Constraints - Generalized coordinates, Holonomic and non-holonomic systems, Scleronomic and Rheonomic systems. D'Alembert's principle and Lagrange's equations – Velocity – dependent potentials and the dissipation function – some applications of the Lagrange formulation.

UNIT II
Variation principles and Lagrange's equations: Hamilton's principle – Some techniques of calculus of variations – Derivation of Lagrange's Equations from Hamilton's principle – Extension of Hamilton's principle to non-holonomic systems – Conservation theorems and symmetry properties.

UNIT III
Hamilton Equations of motion: Legendre Transformations and the Hamilton Equations of motion-canonical equations of Hamilton – Cyclic coordinates and conservation theorems – Routh's procedure - Derivation of Hamilton's equations from a variational principle – The principle of least action.

UNIT IV
Canonical transformations: The equations of canonical transformation – Examples of Canonical transformations – Poission Brackets and other Canonical invariants – integral invariants of Poincare, Lagrange brackets.

UNIT V
Hamilton Jacobi Theory: Hamilton Jacobi equations for Hamilton's principle function – Harmonic oscillator problem - Hamilton Jacobi equation for Hamilton's characteristic function – Separation

of variables in the Hamilton-Jacobi equation.

SUGGESTED READINGS

TEXT BOOK

1. Goldstein, H. (2001),Classical Mechanics Second Edition, Narosa Publishing House, New Delhi.

REFERENCES

1. Gantmacher, F., (2013). Lectures in Analytic Mechanics, MIR Publishers, Moscow.

2. Gelfand, I. M., and Fomin, S. V., (2003),Calculus of Variations, Prentice Hall, New Delhi.

3. Loney, S. L., (1979). An elementary treatise on Statics, Kalyani Publishers, New Delhi.

Semester – II

		L	T	P	C
16MMP211	**OPTIMIZATION TECHNIQUES-PRACTICAL-II**	**0**	**0**	**4**	**2**

This course enables the students to learn

Course Objectives

- To provide the students an exposure to develop well-structured optimization techniques knowledge arising process in various level of science.
- The course aims at building capabilities in the students for analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.
- This module aims to introduce students to use Probabilistic Model and techniques.
- The course aims at providing fundamental knowledge and exposure of the concepts, theories and practices in the field of management.
- Study the basic components of an optimization problem.
- Formulation of design problems as mathematical programming problems.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Use the object oriented concepts for implementation of Optimization Techniques.
2. Implement the data structure concepts for Optimization Techniques problems.
3. Acquire skills to solve various multivariable optimization problems
4. Solve of different optimization problems.
5. Identify and develop operational research models from the verbal description of the real system. Understand the mathematical tools that are needed to solve optimization problems.
6. Use mathematical software to solve the proposed models.

List of Practical:

1. Solution for a system of equations- Simplex method.
2. Decision Making with minimax criteria.
3. Decision Making under risk.
4. Travelling salesman problem to find the shortest path.
5. Write a C program to calculate the minimum cost using North West Corner Rule.
6. To calculate the EOQ for purchasing model without shortage using C program.
7. To calculate the EOQ for manufacturing model without shortage using C program.
8. To calculate the EOQ for manufacturing model with shortage using C program.
9. To calculate the EOQ for purchasing model with shortage using C program.
10. Probabilistic Model-EOQ.

Semester – III

16MMP301 **FUNCTIONAL ANALYSIS**

	L	T	P	C
	4	**0**	**0**	**4**

Course Objectives

This course enables the students to learn

- The concept of Banach spaces and related theorems
- The specific techniques for bounded operators over normed and Hilbert spaces.
- The demonstrate significant applications of the theory of functional analysis.
- The ideas and some of the fundamental theorems of functional analysis.
- Understand how to use the main properties of compact operators.
- Apply the spectral analysis of compact self-adjoint operators to the resolution of integral equations.

Course Outcomes (COs)

After successful completion of this course the students will be able to

1. Develop Banach spaces from vector spaces.
2. Describe the open mapping theorem.
3. Discuss Hilbert spaces and its properties.
4. Study in detail about the adjoint of an operator.
5. Handle complex problems concerning topics within the area of Functional Analysis.
6. Understand and apply fundamental theorems from the theory of normed and Banach spaces.

UNIT I

Banach Spaces- Normed linear space – Definitions and Examples-Theorems. Continuous Linear Transformations – Some theorems- Problems. The Hahn- Banach Theorem –Lemma and Theorems. The Natural imbedding of N in N**-Definitions and Theorems.

UNIT II

The Open Mapping Theorem- Theorem and Examples –Problems. The closed graph theorem. The conjugate of an operation- The uniform boundedness theorem- Problems.

UNIT III

Hilbert Spaces- The Definition and Some Simple Properties – Examples and Problems. Orthogonal Complements - Some theorems .Ortho-normal sets – Definitions and Examples- Bessel's inequality- The conjugate space H*.

UNIT IV

The Adjoint of an operator – Definitions and Some Properties-Problems. Self- adjoint operators – Some Theorems and Problems. Normal and Unitary operators –theorems and problems. Projections - Theorems and Problems.

UNIT V

Banach algebras: The definition and some examples of Banach algebra – Regular and singular elements – Topological divisors of zero – The spectrum – The formula for the spectral radius.

SUGGESTED READINGS

TEXT BOOK

1. Balmohan V. and Limaye.**,(**2004). Functional Analysis, New Age International Pvt. Ltd, Chennai.

REFERENCES

1. Simmons. G. F., (2004). Introduction to Topology & Modern Analysis, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
2. Chandrasekhara Rao, K., (2006). Functional Analysis, Narosa Publishing House, Chennai.
3. Choudhary, .B and Sundarsan Nanda. (2003). Functional Analysis with Applications, New Age International Pvt. Ltd, Chennai.
4. Ponnusamy, S., (2002). Foundations of functional analysis, Narosa Publishing House, Chennai.

		Semester – III
16MMP302	**FLUID DYNAMICS**	**L T P C**
		4 0 0 4

Course Objectives

This course enables the students to learn

- The concepts of fluid, its properties and behavior under various conditions of internal and external flows.
- The fundamentals of Fluid Dynamics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics etc.
- To imbibe basic laws and equations used for analysis of static and dynamic fluids
- About the Two-Dimensional Motion of the fluid.
- Identify the fundamental kinematics of a fluid element.
- State the conservation principles of mass, linear momentum, and energy for fluid flow.

Course Outcomes (COs)

On successful completion of this course, students will be able to

1. Classify and exploit fluids based on the physical properties of a fluid.
2. Compute correctly the kinematical properties of a fluid element.
3. Apply the concept of Bernoulli's theorem in steady motion.
4. Understand both flow physics and mathematical properties of governing Navier-Stokes equations and define proper boundary conditions for solution.
5. Provide the student with the basic mathematical background and tools to model fluid motion.
6. Develop a physical understanding of the important aspects that govern incompressible flow that can be observed in a variety of situations in everyday life.

UNIT I

Introductory Notions – Velocity – Stream Lines and Path Lines – Stream Tubes and Filaments – Fluid Body – Density – Pressure. Differentiation following the Fluid – Equation of continuity – Boundary conditions – Kinematical and physical – Rate of change of linear momentum – Equation of motion of an in viscid fluid.

UNIT II

Euler's momentum Theorem – Conservative forces – Bernoulli's theorem in steady motion – energy equation for in viscid fluid – circulation – Kelvin's theorem – vortex motion – Helmholtz equation.

UNIT III

Two Dimensional Motion – Two Dimensional Functions – Complex Potential – basic singularities – source – sink – Vortex – doublet – Circle theorem. Flow past a circular cylinder with circulation – Blasius Theorem – Lift force. (Magnus effect)

UNIT IV

Viscous flows – Navier-Stokes equations – Vorticity and circulation in a viscous fluid – Steady flow through an arbitrary cylinder under pressure – Staedy Couettc flow between cylinders in relative motion – Steady flow between parallel planes.

UNIT V

Laminar Boundary Layer in incompressible flow: Boundary Layer concept – Boundary Layer equations – Displacement thickness, Momentum thickness – Kinetic energy thickness – integral equation of boundary layer – flow parallel to semi infinite flat plate – Blasius equation and its solution in series.

SUGGESTED READINGS

TEXT BOOKS

1. Milne Thomson .L.M., (1968). Theoretical Hydrodynamics , Fifth edition, Dover Publications INC, NewYork**.(for unit I,II)**
2. Curle.N., and H.J.Davies, (1971),Modern Fluid Dynamics Volume-I , D Van Nostrand Company Ltd., London. **(for unit III,IV,V)**

REFERENCES

1. Yuan, S.W, (1976). Foundations of Fluid Mechanics, Prentice- Hall, India.

2. Shanthi swarup, (2003), Fluid dynamics, Krishna Prakasan media Pvt Ltd, Meerut.

Semester – III

16MMP303 **MATHEMATICAL MODELING** **L T P C**
4 0 0 4

Course Objectives

This course enables the students to learn

- Enrich the fundamental of mathematical modeling skills.
- The construction and analysis of mathematical models inspired by real life problems
- Several modeling techniques and the means to analyze the resulting systems.
- To analyze a model and to apply an appropriate method to calculate a solution in order to predict the behavior of the system.
- Assess and articulate what type of modeling techniques are appropriate for a given physical system.
- Make predictions of the behavior of a given physical system based on the analysis of its mathematical model.

Course Outcomes (COs)

On successful completion of this course the student will be able to

1. Solve problems involving dynamic models, and probabilistic models.
2. Understand the use of modern technology in solving real-world to Epidemic models.
3. Problems through ordinary differential equations, probability theory, graphs.
4. Formulate a mathematical model given a clear statement of the underlying scientific principles.
5. Solve basic linear difference equations and solve application problems.
6. Know the concept of mathematical modeling through Graphs.

UNIT I

Mathematical Modeling through Ordinary Differential Equations of First order: Linear Growth and Decay Models – Non-Linear Growth and Decay Models – Compartment Models – Dynamics problems – Geometrical problems.

UNIT II

Mathematical Modeling through Systems of Ordinary Differential Equations of First Order: Population Dynamics – Epidemics – Compartment Models – Economics – Medicine, Arms Race, Battles and International Trade – Dynamics.

UNIT III

Mathematical Modeling through Ordinary Differential Equations of Second Order: Planetary Motions – Circular Motion and Motion of Satellites – Mathematical Modelling through Linear Differential Equations of Second Order – Miscellaneous Mathematical Models.

UNIT IV

Mathematical Modeling through Difference Equations : Simple Models – Basic Theory of Linear Difference Equations with Constant Coefficients – Economics and Finance – Population Dynamics and Genetics – Probability Theory.

UNIT V

Mathematical Modeling through Graphs: Solutions that can be Modeled through Graphs – Mathematical Modeling in Terms of Directed Graphs, Signed Graphs, Weighted Digraphs and Un oriented Graphs.

SUGGESTED READINGS

TEXT BOOK

1. J.N. Kapur, (2015). Mathematical Modeling, Wiley Eastern Limited, New Delhi.

REFERENCES

1. Kapur, J. N., (1985). Mathematical Models in Biology and Medicine, Affiliated East –West Press Pvt Limited, New Delhi.
2. Brain Albright, (2010). Mathematical Modeling with Excel, Jones and Bartlett Publishers, New Delhi.
3. Frank. R. Giordano, Maurice. D.Weir, WilliamP. Fox, (2003). A first course in Mathematical Modelling, Vikash Publishing House, UK.

16MMP304 **MATHEMATICAL STATISTICS** **Semester – III**
L T P C
4 0 0 4

Course Objectives

This course enables the students to learn

- To understand the basic concepts in probability generating functions, sample moments and their functions, sampling, significance tests and statistical measures
- Probability distributions, significance of testing hypothesis and its interpretation,
- Estimation, ANOVA and their applications in various disciplines.
- Understand the concept of estimation.
- The knowledge of fixed-sample and large-sample statistical properties of point and interval estimators.
- Understanding of how to design experiments and surveys for efficiency.

Course Outcomes (COs)

After successfully completed this module the students will be able to

1. Explain the concepts of probability, including conditional probability.
2. Explain the concepts of random variable, probability distribution, distribution function, expected value, variance and higher moments, and calculate expected values and probabilities associated with the distributions of random variables.
3. Summarize the main features of a data set and test statistical hypotheses.
4. Define basic discrete and continuous distributions, be able to apply them and simulate them in simple cases.
5. Explain the concepts of analysis of variance and use them to investigate factorial dependence.
6. Describe the main methods of estimation and the main properties of estimators, and apply them.

UNIT I

Probability: Random Events – Preliminary remarks – random events and operations performed on them – the system of axioms of the theory of probability – conditional probability – Bayes theorem – Independent Events – functions of random variables –Introduction to hypothesis testing, type of errors, standard errors, confidence interval, confidence limits. Significance level.

UNIT II

Sample moments and their functions: Notion of a sample and a statistic - Distribution functions of X, S^2 and (X , S^2) -Chi-square distribution -Student t-distribution -Fisher's Z-distribution -Snedecor's F -distribution - Distribution of sample mean from non-normal populations.

UNIT III

Significance test: Concept of a statistical test -Parametric tests for small samples and large samples Chi-square test -Kolmogorov Theorem-Smirnov Theorem-Tests of Kolmogorov and Smirnov type The Wald-Wolfovitz and Wilcoxon-Mann-Whitney tests -Independence Tests by contingency tables.

UNIT IV

Estimation: Preliminary notion -Consistency estimation -Unbiased estimates -Sufficiency - Efficiency - Asymptotically most efficient estimates -methods of finding estimates -confidence Interval.

UNIT V

Analysis of Variance: One way classification and two-way classification. Hypotheses Testing: Poser functions -OC function-Most Powerful test -Uniformly most powerful test -unbiased test.

SUGGESTED READINGS

TEXT BOOK

1.Marek Fisz, (1980). Probability Theory and Mathematical Statistics, John Wiley and Sons, New York.

REFERENCES

1. Meyer, (2006). Introduction to Probability and Statistical applications, Oxford and IBH Publishing Co.Pvt Ltd. New Delhi.
2. Sheldon M. Ross, (2009). Introduction to probability and statistics for engineers and scientists, Third edition, Academic press.
3. Heinz Bauer,(1996),Probality Theory, Narosa Publishing House, London.
4. Parimal Mukhopadhyay, (2012). Theory of Probability, New central book agency, Calcutta.

Semester – III

16MMP305A FORMAL LANGUAGES AND AUTOMATA THEORY **L T P C 4 0 0 4**

Course Objectives

This course enables the students to learn

- The basic concepts in automata theory and theory of computation.
- To identify different formal language classes and their relationships.
- This course focuses on the basic theory of Computer Science and formal methods of computation like automata theory, formal languages, grammars.
- Design automata, regular expressions and context free grammars for accepting or generating a certain language.
- Design grammars and recognizers for different formal languages
- Determine the decidability and intractability of computational problems.

Course Outcomes (COs)

On successful completion of this course the students will be able to:

1. Understand the definition of Automata.
2. Know about the different concepts in automata theory and formal languages such as formal proofs, non-deterministic automata, regular expressions, regular languages context-free grammars, context-free languages.
3. Discuss the acceptability of a string by finite automation.
4. Applications of Pumping Lemma.
5. Design automata, regular expressions and context-free grammars accepting or generating certain languages.
6. Acquire concepts relating to the theory of computation and computational models including decidability and intractability.

UNIT I

Definition of an Automation - Description of Finite Automaton – Transition systems - Property of transition functions - Acceptability of a string by a finite Automaton - Non deterministic finite automaton - The equivalence of DFA and NDFA.

UNIT II

Formal Languages - Basic Definitions and examples - Chomsky classification of Languages - Languages and their relation - Recursive and Recursively Enumerable sets- Operations on Languages.

UNIT III

Regular expressions - Finite Automata and Regular expressions.

UNIT IV

Pumping Lemma for Regular sets - Applications of Pumping Lemma - Closure Property of Regular sets - Regular sets and Regular grammars.

UNIT V

Context free Languages and Derivation trees - Ambiguity in Context free grammars - Simplification of Context free grammars (examples only).

SUGGESTED READINGS

TEXTBOOK

1. Mishra, K. L. P and Chandrasekaran, N.,(2008). Theory of Computer Science, Automata Languages and Computation, Prentice Hall of India, New Delhi.

REFERENCES

1. John E. Hopcroft and J.D. Ullman, (2006). Introduction to Automata theory, Languages and Computation, Third Edition, Prentice Hall.of India,New Delhi.

2. Aho A.V., and Ullman J.D., (2002). Principles of compiler design, Narosa Publishing Company, London.

3. Rakesh Duke, Adesh Pandey and RiTu Gupta, (2007). Discrete Structures and Automata theory. Narosa Publishing Company, New Delhi.

		Semester–III
16MMP305B	**COMBINATORICS**	**L T P C**
		4 0 0 4

Course Objectives
This course enables the students to learn

- Improve mathematical proof writing skills.
- Cater mathematical verbal communication skills.
- Afford problem-solving skills.
- Combinatorial proofs of identities and inequalities.
- Model and analyze computational processes using analytic and combinatorial methods.
- Structures to represent mathematical and applied questions, and they will become comfortable with the combinatorial tools commonly used to analyze such structures.

Course Outcomes (COs)
On successful completion of this course, students will be able to

1. Cognition in various combinatorial methods.
2. Solve recurrence relations through computational skills.
3. Apply the inclusion/exclusion principle.
4. Develop fundamental knowledge of combinatorics and Euler function.
5. Analyze combinatorial objects satisfying certain properties and answer questions related to Necklace problem.
6. Know the concept of Burnside's lemma.

UNIT I
Basic Combinatorial Numbers – Stirling numbers of the second kind – Recurrence formula for Pnm.

UNIT II
Generating functions – Recurrence relations- Bell's formula.

UNIT III
Multinomial – Multinomial theorem- Inclusion and Exclusion principle.

UNIT IV
Euler function –Permutations with forbidden positions –the Menage Problem.

UNIT V
Problem of Fibonacci –Necklace problem – Burnside's lemma.

SUGGESTED READINGS
TEXTBOOK
1. Krishnamurthy, V. (2002), Combinatorics: Theory and Applications, East West Press Pvt. Ltd.
REFERENCES
1. Balakrishnan V.K., (1995). Theory and problems of Combinatorics, Schaums outline series, McGraw Hill Professional.

2. Alan tucker, (2002). Applied Combinatorics, 4e, John wiley & Sons, New York.

Semester – III

16MMP305C **FUZZY TOPOLOGY** **L T P C**
4 0 0 4

Course Objectives:

This course enables the students to learn

- The basic concepts of fuzzy topological spaces
- Separation axioms in Fuzzy Topological spaces
- To study about Fuzzy relations
- To study α - connectedness and α - compactness.
- Understand the concept of fuzzy nonlinear simulation.
- The development of Fuzzy Arithmetic.

Course Outcomes (COs)

On successful completion of this course the student will be able to:

1. Able to learn fuzzy set theory.
2. Understand the concept of Operations on Fuzzy Sets
3. Mastery in fuzzy relations and fuzzy graphs
4. Attain in-depth knowledge in fuzzy relations.
5. Understand the knowledge of Fuzzy Logic.
6. Gain knowledge about the fundamental concepts of α - shading families.

UNIT I

Introduction: From classical Sets (crisp sets) to fuzzy sets, Basic definitions, basic operations on fuzzy sets, fuzzy sets induced by mappings, Types of fuzzy sets.

Fuzzy Sets Versus Crisp Sets: The α - cuts, strong α - cuts, properties of cuts,representation of fuzzy sets, decomposition theorems, Zadeh's extension principle.

UNIT II

Operations on Fuzzy Sets: Types of operations, fuzzy complements, fuzzy intersections, t – norms, fuzzy unions, t – conorms, combinations of operations, aggregation operations.

Fuzzy Arithmetic: Fuzzy numbers, Linguistic variables, arithmetic operations onintervals and fuzzy numbers, fuzzy equations.

UNIT III

Fuzzy Relations: Crisp and fuzzy relations, Projections and cylindric extensions, binary fuzzy relations, membership matrices and sagittal diagram, inverse and composition

of fuzzy relations, binary fuzzy relation on a single set, fuzzy equivalence relation, fuzzy ordering relation, fuzzy morphisms, sup and inf compositions.

UNIT IV

Fuzzy Logic: An overview of classical logic. Multivalued logics, fuzzy propositions, fuzzy quantifiers, Linguistic hedges, inferences from conditional fuzzy propositions,qualified fuzzy propositions and quantified fuzzy propositions.Fuzzy rule based systems and fuzzy nonlinear simulation.

UNIT V

Fuzzy Topology: Change's and Lowen's definition of fuzzy topology. Continuity,open and closed maps. α - shading families, α - connectedness and α - compactness.

Applications: Applications of fuzzy sets and fuzzy logic to various disciplines including Computer Science.

SUGGESTED READINGS

TEXT BOOKS

1. Klir G. J., and Yuan B., (1997). Fuzzy Sets and Fuzzy Logic; Theory and Applications, Prentice Hall P T R Upper saddle River,New Jersey. **(For Unit I, II, III & IV)**

2. Ming L.Y., and Kung L. M.,(1997). Fuzzy Topology, World Scientific Publishing company,Washington. **(For Unit V)**

REFERENCES

1. Kaufmann A., (1977). Introduction to the theory of Fuzzy Subsets, Vol. – I, Academic Press, California

2. Ross, T. J.,(2010). Fuzzy Logic with Engineering Applications, Tata McGraw Hill, Delhi.

3.Kartalopoulos, S. V.,(2000). Understanding Neural Networks and Fuzzy Logic, Prentice Hall P T R Upper saddle River,New Jersey.

4. Zimmermann, H. J.,(2001). Fuzzy Set Theory and its Applications, Allied Publishers,New Delhi.

5. Palaniappan N., (2002). Fuzzy Topology, Narosa publishing house, New Delhi.

Semester – III

16MMP306 **INTEGRAL EQUATIONS AND TRANSFORMS** **L T P C**

4 0 0 4

Course Objectives

This course enables the students to learn

- Range of mathematics tools with emphasis on engineering applications.
- To think quantitatively and analyse problems critically.
- How to apply integral equations to the ordinary differential equation.
- Converting the IVPs and BVPs to the corresponding integral equations and Fredholm and Volterra integro-differential equations.
- Equip with the methods of finding Laplace transform and Fourier Transforms of different functions.
- Fundamental concepts of Fourier series, Fourier transforms and Laplace transforms and their applications to differential equations.

Course Outcomes (COs)

On successful completion of this course the students will be able to,

1. Calculate the Laplace equation in half plane of standard functions both from the definition and by using tables.
2. Equation with seperable kernel and Fredholm alternative approximation Method.
3. Select and combine the necessary Laplace transform techniques to solve second-order ordinary differential equations.
4. Calculate both real and complex forms of the Fourier series.
5. Calculate the Fourier transform of elementary functions from the definition.
6. Calculate the variational problem in parametric form.

UNIT I

Fourier transforms: Fourier Transforms – Definition of Inversion theorem –Fourier cosine transforms - Fourier sine transforms – Fourier transforms of derivatives -Fourier transforms of some simple functions - Fourier transforms of rational function.

UNIT II

The convolution integral – convolution theorem – Parseval‟s relation for Fourier transforms – solution of PDE by Fourier transform – Laplace's Equation in Half plane – Laplace's Equation in an infinite strip - The Linear diffusion equation on a semi-infinite line - The two-dimensional diffusion equation.

UNIT III

Integral equations: Types of Integral equations–Equation with separable kernel- Fredholm Alternative Approximate method – Volterra integral equations–Classical Fredholm theory – Fredholm's First, Second, Third theorems.

UNIT- IV

Application of Integral equation to ordinary differential equation – initial value problems – Boundary value problems – singular integral equations – Abel Integral equation .

UNIT V

Calculus of variations: Variation and its properties – Euler's equation – Functionals of the integral forms - Functional dependent on higher order derivatives – functionals dependent on the functions of several independent variables – variational problems in parametric form.

SUGGESTED READINGS:

TEXT BOOKS

1. Sneedon. I. N, (1974). The Use of Integral Transforms, Tata Mc Graw Hill, New Delhi. **(For Unit –I & II)**
2. Kanwal, R. P, (2013). Linear integral Equations Theory and Technique, Academic press, New York. **(For Unit –III & IV**)
3. Elsgots, L., (2003). Differential Equations and Calculus of Variation, Mir Publication Moscow. **(For Unit –V)**

REFERENCES

1. Gelfand, I. M and Francis, S.V. (2000). Calculus of Variation, Prentice Hall, India.
2. Tricomi.F.G, (1985). Integral Equations, Dover, New York.
3. Larry C. Andrews and Bhimson K. Shivamoggi, (1999). The Integral transforms for Engineers , Spie Press, Washington.

		Semester – III
16MMP311	**MATHEMATICAL STATISTICS-PRACTICAL III**	**L T P C**
		4 0 0 4

Course Objectives

This course enables the students to learn

- It is well recognized nowadays the importance of Statistics as an indispensable tool for obtaining and spreading information.
- Importance has been enhanced by the use of computational resources and particularly the software SPSS, that showed, during the last decades, to be an effective tool for treating and analyzing statistical data.
- Ability to use SPSS procedures in handling data files and performing statistical analysis, and to interpret the outputs provided by the program.
- Acquiring sensitivity and critical thinking towards arguments and conclusions based on statistical studies.
- Understanding the fundamental principles underlying descriptive and inferential statistical reasoning.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Describe and classify data using statistical terminology.
2. Use SPSS to conduct basic descriptive analyses and graphical presentations.
3. Define the null hypothesis and the alternative hypothesis and Interpret P values and confidence intervals.
4. Understand different measures of effect (e.g. mean difference).
5. Know when to use basic statistical hypothesis tests (t-tests, chi-squared tests, correlation) and how to carry out these tests using SPSS.
6. Appreciate how to present and interpret these results in scientific reports.

List of Practical:

1. Introduction to SPSS Package
2. Working with windows in SPSS
3. Defining variables in variable view window in SPSS
4. Drawing of graphs and diagrams in SPSS Package
5. Standard deviation for individual and discrete series using SPSS Package.
6. Standard deviation continuous series using SPSS Package.
7. Coefficient of variation for individual and discrete series using SPSS Package.
8. Calculation of Mean and variance for binomial distribution using SPSS Package.

9. Calculation of Mean and variance for Poisson distribution using SPSS Package.
10. Karl Pearson's Correlation using SPSS Package.
11. Rank Correlation Coefficient using SPSS Package.
12. Testing Hypothesis using t - test in SPSS Package.
13. Testing Hypothesis using Z - test in SPSS Package.
14. Testing Hypothesis using chi-square - test in SPSS Package.
15. Interpretation of results in the SPSS output viewer.

Semester –IV

16MMP401 **MEASURE THEORY** **L T P C**
4 0 0 4

Course Objectives
This course enables the students to learn

- Perspective on the broader impact of measure theory in ergodic theory.
- To apply the general principles of measure theory and integration.
- About the concept of Measurable spaces.
- To understand the basic concepts Riemann integral and Lebesgue integral.
- Basic knowledge of measure theory needed to understand probability theory, statistics and functional analysis.
- Develop the ideas of Lebesgue integration and its properties.

Course Outcomes (COs)
After successful completion of this course the students will be able to:

1. Get a clear view of the fundamentals of measure theory.
2. Acquaint with the proofs of the fundamental theorems underlying the theory of Lebesgue integration.
3. Identify the broader impact of measure theory in ergodic theory and ability to pursue further studies in this area.
4. Mastery in the measure spaces and its properties.
5. Apply the theorems of monotone and dominated convergence and Fatou's lemma.
6. Apply Lebesgue decomposition and the Radon-Nikodym theorem.

UNIT I
Lebesgue Measure: Introduction – Outer measure – Measurable sets and Lebesgue Measure – A non measurable set – Measurable set – Measurable functions – Litttlewood's three principles.

UNIT II
The Lebesgue Integral: The Riemann integral – The Lebesgue integral of a bounded function over a set finite measure – The integral of a non negative function – The general Lebesgue integral – Convergence in measure.

UNIT III
Differentiation of monotone function, Functions of bounded variation-differentiation of an integral-Absolute continuity.

UNIT IV
Measure spaces-Measurable functions-Integration-General convergence Theorems.

UNIT V
Signed measures-The Radon-Nikodym theorem-the L^P spaces.

SUGGESTED READINGS:

TEXT BOOK
1.Royden, H. L, (2004). Real Analysis, Third Edition, Prentice – Hall of India Pvt.Ltd, New Delhi.

REFERENCES

1. Keshwa Prasad Gupta, (2005). Measure Theory, Krishna Prakashan Ltd, Meerut.
2. Donald L. Cohn, (2013). Measure Theory, United States.
3. Paul R. Halmos, (2008). Measure Theory, Princeton University Press Dover Publications, New York .
4. Rudin W, (2006). Real and Complex Analysis, 3 rd Edition, Mcgraw – Hill, New Delhi.

		Semester – IV
16MMP402	**STOCHASTIC PROCESS**	**L T P C**
		4 0 0 4

Course Objectives

This course enables the students to learn

- The mathematical theory of random variables and random processes
- How queueing theory are used as tools and mathematical models in the study of networks.
- The theoretical concepts and techniques for solving problems that arises in practice
- Markov processes in discrete and continuous time.
- The essential mathematical tools for handling random processes.
- The familiarize the students with the stochastic simulation techniques.

Course Outcomes (COs)

On successful completion of the course, students will be able to:

1. Capable to expose the students to different types mathematical models with a view of random processes.
2. Understanding in the concept of birth and death process.
3. Solve the Kolmogrov equations problems.
4. Compute probabilities of transition between states and return to the initial state after long time intervals in Markov chains.
5. Identify classes of states in Markov chains and characterize the classes.
6. Stochastic Processes in Queuing Systems.

UNIT -I

Definition of Stochastic Processes – Markov chains: definition, order of a Markov Chain – Higher transition probabilities – classification of states and chains.

UNIT -II

Markov Process with discrete state space: Poisson process – and related distributions – properties of Poisson process, Generalizations of Poisson Processes – Birth and death
Processes – continuous time Markov Chains.

UNIT -III

Markov processes with continuous state space: Introduction, Brownian motion – Weiner Process and differential equations for Weiner process, Kolmogrov equations – first passage time distribution for Weiner process – Ornstein – Uhlenbech process.

UNIT -IV

Branching Processes: Introduction – properties of generating functions of Branching process– Distribution of the total number of progeny, Continuous- Time Markov Branching Process, Age dependent branching process: Bellman-Harris process.

UNIT -V

Stochastic Processes in Queuing Systems: Concepts – Queuing model M/M1 – transient behavior of M/M/1 model – Birth and death process in Queuing theory: M/M/1 – Model related distributions – M/M/1 - M/M/S/S – loss system - M/M/S/M – Non birth and death Queuing process: Bulk queues – M(x)/M/1.

SUGGESTED READINGS
TEXT BOOK

1.Medhi, J., (2006). Stochastic Processes, 2nd Edition, New age international Private limited, New Delhi.

REFERENCES

1. Basu, K., (2003). Introduction to Stochastic Process, Narosa Publishing House, New Delhi.

2.Goswami and Rao, B. V., (2006). A Course in Applied Stochastic Processes, Hindustan Book Agency, New Delhi.

3.Grimmett, G. and Stirzaker D., (2001). Probability and Random Processes, 3rd Ed., Oxford University Press, New York.

4.Papoulis.A and Unnikrishna Pillai, (2002). Probability, Random variables and Stochastic Processes, Fourth Edition, McGraw-Hill, New Delhi.

Semester – IV

16MMP491 **PROJECT** **L T P C**
0 0 0 8

DEPARTMENT OF MICROBIOLOGY
FACULTY OF ARTS, SCIENCE AND HUMANITIES (FASH)
KARPAGAM ACADEMY OF HIGHER EDUCATION
UG PROGRAM (CBCS) – Microbiology (2016–2017 Batch)

Course code	Name of the course	Objective & outcomes		Hrs / week	Marks			Exam (h)	Credit
		PEOs	POs		CIA	ESE	Total		
16LSU101	Language – I	VII	e	04	40	60	100	3	4
16ENU101	English	VII	e	04	40	60	100	3	4
16MBU101	Introduction to Microbiology and Microbial Diversity	II	a	04	40	60	100	3	4
16MBU102	Bacteriology	I	g	04	40	60	100	3	4
16MBU103	Biochemistry	VI	g	04	40	60	100	3	4
16MBU111	Basic Microbiology- Practical	VI	b	03	40	60	100	3	2
16MBU112	Bacteriology - Practical	VI	b	03	40	60	100	3	2
16MBU113	Basic Biochemistry- Practical	VI	b	04	40	60	100	3	2
	Semester total			**30**	**320**	**480**	**800**	**–**	**26**
16LSU201	Language –II	VII	e	04	40	60	100	3	4
16MBU201	Virology	I	g	04	40	60	100	3	4
16MBU202	Microbial Physiology and Metabolism	II	g	04	40	60	100	3	4
16MBU203	Microbial genetics	IV	g	04	40	60	100	3	4
16MBU211	Virology - Practical	VI	b	03	40	60	100	6	2
16MBU212	Microbial Physiology and Metabolism - Practical	VI	b	03	40	60	100	6	2
16MBU213	Microbial Genetics - Practical	VI	b	04	40	60	100	6	2
16AEC201	Environmental Studies	IV	f	04	40	60	100	3	4
	Semester total			**30**	**320**	**480**	**800**	**–**	**26**
16MBU301	Environmental Microbiology	IV	h	04	40	60	100	3	4
16MBU302	Food and Dairy Microbiology	IV	h	04	40	60	100	3	4
16MBU303	Industrial Microbiology	IV	g	04	40	60	100	3	4
16MBU304A	Microbial Quality Control in Food and Pharmaceutical Industries	IV	h	03	40	60	100	3	3
16MBU304B	Microbial Diagnosis in Health Clinic								
16MBU311	Environmental Microbiology - Practical	IV	h	04	40	60	100	9	2
16MBU312	Food and Dairy Microbiology- Practical	VI	b	04	40	60	100	9	2
16MBU313	Industrial Microbiology - Practical	IV	g	04	40	60	100	9	2
16MBU314A	Microbial Quality Control in Food and Pharmaceutical Industries - Practical	III	b,h	03	40	60	100	3	1
16MBU314B	Microbial Diagnosis in Health Clinic - Practical								
	Semester total			**30**	**320**	**480**	**800**	**–**	**22**

16MBU401	Immunology	I	h	04	40	60	100	3	4
16MBU402	Medical Microbiology	IV	j	04	40	60	100	3	4
16MBU403	Recombinant DNA Technology	IV	h,g,i	04	40	60	100	3	4
16MBU404A	Biofertilizers and Biopesticides			03	40	60	100	3	3
16MBU404B	Personal Health Care	IV	j						
16MBU411	Immunology - Practical	I	h	04	40	60	100	6	2
16MBU412	Medical Microbiology - Practical	IV	j	04	40	60	100	9	2
16MBU413	Recombinant DNA Technology – Practical	IV	h,g,i	04	40	60	100	9	2
16MBU414A	Biofertilizers and Biopesticides - Practical			03	40	60	100	6	1
16MBU414B	Personal Health Care - Practical	IV	j						
	Semester total			**30**	**320**	**480**	**800**	**-**	**22**
16MBU501A	Management of Human Microbial Diseases	IV	B	04	40	60	100	3	4
16MBU501B	Microbiological Analysis of air and water	I	B						
16MBU502A	Biomathematics and Biostatistics	VII	D	04	40	60	100	3	4
16MBU502B	Bioinformatics	VII	C						
16MBU503A	Instrumentation and Biotechniques	VI	B	04	40	60	100	3	4
16MBU503B	Plant Pathology	II	B						
16MBU504A	Microbial Biotechnology	V	G	03	40	60	100	3	3
16MBU504B	Inheritance Biology	II	A						
16MBU511A	Management of Human Microbial Diseases - Practical	IV	B	04	40	60	100	9	2
16MBU511B	Microbiological Analysis of air and water - Practical	I	B						
16MBU512A	Biomathematics and Biostatistics - Practical	VII	D	04	40	60	100	3	2
16MBU512B	Bioinformatics - Practical	VII	C						
16MBU513A	Instrumentation and Biotechniques - Practical	VI	B	04	40	60	100	3	2
16MBU513B	Plant Pathology - Practical	II	B						
16MBU514A	Microbial Biotechnology - Practical	V	G	03	40	60	100	6	1

16MBU514B	Inheritance Biology - Practical	II	A						
	Semester total			**30**	**320**	**480**	**800**	**–**	**22**
16MBU601A	Mushroom Cultivation	III	G	04	40	60	100	3	4
16MBU601B	Food Fermentation Techniques	IV	H						
16MBU602A	Biosafety and Intellectual Property Rights	V	I	04	40	60	100	3	4
16MBU602B	Microbes in Sustainable Agriculture and Development	IV	G						
16MBU603A	Cell Biology	VI	B	03	40	60	100	3	3
16MBU603B	Molecular Biology	VI	B						
16MBU611A	Mushroom Cultivation - Practical	III	G	04	40	60	100	6	2
16MBU611B	Food Fermentation Techniques - Practical	IV	H						
16MBU612A	Biosafety and Intellectual Property Rights - Practical	V	I	04	40	60	100	6	2
16MBU612B	Microbes in Sustainable Agriculture and Development -Practical	IV	G						
16MBU613A	Cell Biology - Practical	VI	B	03	40	60	100	3	1
16MBU613B	Molecular Biology - Practical	VI	B						
16MBU691	Project	IV	D	08	40	60	100	3	6
	ECA / NCC / NSS / Sports / General interest etc							Good	
	Semester total			**30**	**280**	**420**	**700**	**–**	**22**
	COURSE TOTAL			**180**	**1880**	**2820**	**4700**	**–**	**140**

Elective Courses

Skill Enhancement Elective Courses			
Elective	**Semester**	**Course code**	**Name of the course**
SEC – 1	III	16MBU304A	Microbial Quality Control in Food and Pharmaceutical Industries
		16MBU314A	Microbial Quality Control in Food and Pharmaceutical Industries - Practical
	III	16MBU304B	Microbial Diagnosis in Health Clinic
		16MBU314B	Microbial Diagnosis in Health Clinic - Practical
SEC – 2	IV	16MBU404A	Biofertilizers and Biopesticides
		16MBU414A	Biofertilizers and Biopesticides-Practical
	IV	16MBU404B	Personal Health Care
		16MBU414B	Personal Health Care –Practical
SEC – 3	V	16MBU501A	Management of Human Microbial Diseases
		16MBU511A	Management of Human Microbial Diseases – Practical
	V	16MBU501B	Microbiological Analysis of air and water
		16MBU511B	Microbiological Analysis of air and water – Practical
SEC – 4	VI	16MBU601A	Mushroom Cultivation
		16MBU611A	Mushroom Cultivation –Practical
	VI	16MBU601B	Food Fermentation Techniques
		16MBU611B	Food Fermentation Techniques -Practical

Discipline Specific Elective Courses

Electives	Semester	Course code	Name of the course
DSE – 1	V	16MBU502A	Biomathematics and Biostatistics
		16MBU512A	Biomathematics and Biostatistics - Practical
	V	16MBU502B	Bioinformatics
		16MBU512B	Bioinformatics – Practical
DSE – 2	V	16MBU503A	Instrumentation and Biotechniques
		16MBU513A	Instrumentation and Biotechniques - Practical
	V	16MBU503B	Plant Pathology
		16MBU513B	Plant Pathology – Practical
DSE – 3	V	16MBU504A	Microbial Biotechnology
		16MBU514A	Microbial Biotechnology - Practical
	V	16MBU504B	Inheritance Biology
		16MBU514B	Inheritance Biology – Practical
DSE – 4	VI	16MBU602A	Biosafety and Intellectual Property Rights
		16MBU612A	Biosafety and Intellectual Property Rights - Practical
	VI	16MBU602B	Microbes in Sustainable Agriculture and Development

		16MBU612B	Microbes in Sustainable Agriculture and Development - Practical
DSE – 5	VI	16MBU603A	Cell Biology
		16MBU613A	Cell Biology – Practical
	VI	16MBU603B	Molecular Biology
		16MBU613B	Molecular Biology- Practical
DSE – 6	VI	16MBU691	Project

Undergraduate Programme – B.Sc Microbiology Programme Outcomes

Programme Outcomes of UG Microbiology: Students of all undergraduate microbiology degree Programmes at the time of graduation will be able to

a. Scientific Knowledge: Microbiology majors able to make observations, develop hypotheses, and design and execute experiments using advanced methods. Able to discuss science and scientific methodology. They will have a good knowledge of Intellectual Property Rights.

b. Laboratory Skills: Microbiology students will master the following laboratory skills: aseptic culture techniques, microscopy, use of appropriate methods to identify microorganisms and to use high laboratory equipments. They are able to practice safe microbiology, using appropriate protective and emergency procedures.

c. Data analysis skills: Systematically collect, record, and analyze data, identify sources of error, interpret the results, and reach logical conclusions.

d. Problem-Solving Skills: Microbiology students will be able to analyze and interpret results from a variety of microbiological methods, and apply these methods to analogous situations. Use mathematical and graphing skills and reasoning to solve problems in microbiology.

e. Communication Skills: Microbiology majors will demonstrate competence in written and oral communication.

f. Cooperation/Social Responsibility: Microbiology majors able to understand and appreciate the value of cooperating and working effectively with peers and be able to demonstrate a commitment to the process of developing such skills.

g. Able to understand the importance of microorganisms in various industries such as pharmaceuticals, food, biofertilizers and biopesticidesetc, Students will have a major knowledge on concepts of immunology, biotechnology, molecular biology, biochemistry, genetics. Able to explain the beneficial and harmful role of microorganisms in environment.

Programme Specific Outcomes (PSOs)

h. Students will have a major knowledge on concepts of immunology, biotechnology, molecular biology, biochemistry, genetics. Able to explain the beneficial and harmful role of microorganisms in environment. Able to understand the importance of microorganisms in various industries such as pharmaceuticals, food, biofertilizers and biopesticides etc,

i Describe how microorganisms are used as *model systems* to study basic biology, genetics, metabolism and ecology.

j. Identify ways microorganisms play an *integral role* in disease, and microbial and immunological methodologies are used in disease treatment and prevention.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Programme Educational Objectives of UG Microbiology: The major objectives of the undergraduate course is

PEO-I: To impart knowledge on basic concepts of microbiology. To understand the beneficial and harmful role of microorganisms in the environment.

PEO-II: To understand the fundamentals of physiological reactions including metabolic pathways and biochemical reactions in microorganisms.

PEO-III: To develop human resource and entrepreneurs in Microbiology with the ability to independently start their own ventures or small biotech units in the field of biotechnology.

PEO-IV: Understand modern microbiology - practices and approaches with an emphasis in technology application in pharmaceutical, medical, industrial, environmental and agricultural areas.

PEO-V: Become familiar with public policy, bio-safety, and intellectual property rights issues related to microbiology applications nationally and globally

PEO-VI: Gain experience with standard bioinstrumentations and molecular tools and approaches utilized: manipulate genes, gene products and organisms.

PEO-VII: To demonstrate the written and oral communication skill. To develop the problem solving and data interpretation skills.

POs	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**
PEO I	X							X		X
PEO II	X							X	X	
PEO III				X			X	X		
PEO IV				X			X		X	
PEO V	X					X				X
PEO VI		X	X	X						
PEO VII	X		X	X	X					

Semester – I

16LSU101 **தமிழ்முதல்தாள்** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40**External: **60** Total: **100**
End Semester Exam: 3 Hours

[illegible] **பொதுநோக்கம்**

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துத[illegible].
- [illegible] மேம்படுத்துத[illegible].
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

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- [illegible], [illegible], [illegible], ‘[illegible]’ [illegible].
- [illegible], [illegible], [illegible].
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- [illegible].
- [illegible]

தாள்கள் வரிசையும் தேர்வுச் செயல்திட்டமும் பகுதி-I தமிழ்

அலகு – I :இக்காலஇலக்கியம்: **(10 மணிநேரம்)**

கல்வி: மகாகவிபாரதியார் – சுயசரிதை – ஆங்கிலக்கல்வி.

இன்றையநிலை: கவிமணிதேசிகவிநாயகம்பிள்ளை–ஒற்றுமையேஉயிர்நிலை.

மனிதநேயம்:கவிஞர்சிற்பிபாலசுப்பிரமணியன் –மலையாளக்காற்று.

சூழலியல்:கவிஞர்வைதீஸ்வரன் - விரல்மீட்டியமழை.

பெண்ணியம்:கவிஞர்சுகந்திசுப்பிரமணியம் – புதையுண்டவாழ்க்கை.

அலகு – II :அறஇலக்கியம்: **(10 மணிநேரம்)**

கொன்றைவேந்தன்: 1-50 பாடல்கள்

திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்

பழமொழிநானூறு: 5 பாடல்கள்

அலகு - III :சிற்றிலக்கியம்: **(10 மணிநேரம்)**

மூவருலா: 1-26 கண்ணிகள்

திருச்செந்தூர்முருகன்பிள்ளைத்தமிழ்: 2 பாடல்கள்

கலிங்கத்துப்பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV :கட்டுரை: **(10 மணிநேரம்)**

1. **உயர்தனிச்செம்மொழி-பரிதிமாற்கலைஞர்**
2. **கட்டிடக்கலை**- அ. இராசமாணிக்கனார்
3. **வாழ்க்கை** - இளவழகனார்
4. ஆளுமைத்திறன்அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V :மொழிப்பயிற்சி: **(8 மணிநேரம்)**

1. படைப்பிலக்கியப்பயிற்சிகள் (கதை,கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப்பயிற்சிகள்

பாடநூல்:கற்பகச்சோலை – தமிழ்ஏடு.கற்பகம்பல்கலைக்கழகத்தமிழ்த்துறைவெளியீடு.

Semester – I

16ENU101 **ENGLISH** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar.

Course Outcome:

- Develop the four types of skills
- Reading and comprehending literary works
- Genres of literature to provide moral education
- Develop communication skills in business environment
- Interpersonal skills will be developed.
- Betterment of language competence

UNIT–I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT – II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman – Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT– III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT – IV

Poetry: No Sentence – Anjum Hassan
One-Act Play: While the Auto Waits- O' Henry
Vocabulary: Words Often Confused, Anagrams
Grammar: Preposition, Voice- Active and Passive

UNIT–V

Short Story: The Bird **–** Amar Jalil
One-Act Play: The Cellphone Epidemic – Claudia I. Haas
Vocabulary: Portmanteau Words, One Word Substitution
Grammar: Question, Pronunciation

PRESCRIBED TEXT

- Rao, G. Chandralekha et al. *Spring* 2013**.** Emerald Publishers: Chennai.

SUGGESTED READINGS

- Shyamala, V. *English for Communication*. 2006. Emerald Publishers: Chennai

Semester – I

16MBU101 INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- It gives brief description on the microbial metabolism and its energetic
- It deals with the various aerobic and an aerobic process through which the organisms obtain and utilize the energy for their growth and to produce industrially important products that helps the students to become better entrepreneurs
- Explains photosynthesis and photosynthetic bacteria
- To study the structure, function, energy metabolism, growth and regulatory mechanisms of microorganisms.
- The students will learn about the metabolic diversity exhibited by microorganisms
- The students will learn about regulatory networks that support their survival and growth of the microorganism.

COURSE OUTCOME (CO'S)

- The students will be able to understand and predict the various metabolic reactions in microbial cell.
- This will make them predict the intermediate products which can be employed in industrial production processes.
- Students will understand the growth, nutrition and environmental factors
- Students able to assess the prokaryotes by observing the biochemical reaction
- This course will support them to interpret the fermentation using microbes
- Able to summarize the nutrients uptake system in the prokaryotes

Unit I – History and Development of Microbiology

Development of microbiology as a discipline, spontaneous generation Vs biogenesis. Contribution of Anton von Leewenhoek, Golden era of Microbiology Louis Pasteur, Robert Koch, Joseph Lister, Alexander Flemming. Role of microorganism in fermentation, Germ theory of disease, Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Ellie Metchnikoff, Edward Jenner. Microscopy Application in industries, Application in medicine, Application in agriculture, Application in biotechnology, Application in biology.

Unit II – Diversity of Microbial world

Bergey's Manual, Binomial Nomenclature and Universal Phylogenetic tree. Classification system: Phenetic and Phylogenetic, Whittaker's Five Kingdom and Carl Woese's three kingdom classification system and their utility. Difference between prokaryotic and eukaryotic microorganism.Major diversity of microbial life. Bacteriology

Unit III– Algae

General characteristics of algae including algal cell ultra-structure.Chlamydomonas, Volvox, Diatoms, red algae and brown algae.Application of Algae in agriculture, industry, environment and food.

Unit IV – Fungi and Actinomycetes

General characteristics of fungi including habitat, distribution, nutritional requirements, fungal cell ultra-structure. Economic importance of fungi with examples in agriculture, environment, industry, medicines, food, biodeterioration and mycotoxins. Alexopoulos classification.

Unit V – Protozoa and virus

General characteristics with special references with *Entameoba histolytica*, *Trichomonas*, *Giardia* and *Plasmodium*. Classification of viruses.

SUGGESTED READINGS

1. Tortora, G.J., Funke, B.R., and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.
2. Madigan, M.T., Martinko J.M., Dunlap, P.V., and Clark, D.P. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition.
3. Cappucino, J., and Sherman, N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited.
4. Wiley, J.M., Sherwood, L.M., and Woolverton, C.J. (2013) Prescott's Microbiology. 9th edition. McGraw Hill International.
5. Atlas, R.M. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.
6. Pelczar, M.J., Chan, E.C.S., and Krieg, N.R. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
7. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L., and Painter, P.R. (2005). General Microbiology. 5th edition. McMillan.8
8. Duby, R.C. (2014)Textbookof Microbiology. 5th edition. S. Chand Publishing.

Semester – I

16MBU102 **BACTERIOLOGY** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40v**External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To provide a strong base in the fundamentals of bacteria that improves their chances in employability.
- To learn techniques and methods used in the cultivation and isolation of bacteria.
- To learn various physical and chemical means of sterilization
- To prepare the specimen and identify the morphology of the bacteria
- To know about the culture media
- To obtain with the knowledge about the habitat and characteristics of various physiological groups of bacteria and archaea in detail.

COURSE OUTCOME (CO'S)

After completion of this course candidate able to:

- Understand the basic microbial structure and function and this course provide an understanding of the concepts of bacteriology which is one of the basic requirements for their employability
- Understand the structural similarities and differences among various physiological groups of bacteria and archaea
- Demonstrate theory and practical skills in staining procedures
- Understand various Culture media and their applications
- Understand various physical and chemical means of sterilization
- Know General bacteriology and microbial techniques for isolation of pure culture of bacteria

Unit I – Cell organization

Cell shape and arrangement, glycocalyx, capsule, flagella, fimbriae and pili. Cell-wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaebacterial cell wall, Gram and acid-fast staining mechanisms, sphaeroplasts, protoplasts, and L-forms. Effect of antibiotics and enzymes on the cell wall. Cell Membrane: Structure, function and chemical composition of bacterial and Archaeal cell membranes. Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids. Endospore: Structure, formation, stages of sporulation.

Unit II – Bacteriological techniques

Observation of living microorganisms- Wet mount, motility. Stains and staining reactions - Simple and differential staining - Gram, Spore, Capsule, Acid fast and Hemocytometer. Pure culture isolation: Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, and methods to study non-culturable bacteria.

Unit III – Growth, nutrition and reproduction in bacteria

Culture media: components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media. Physical methods of microbial control: heat – below 100˚C, at 100˚C, above 100˚C, Autoclave, Tyndallization; filtration, desiccation, osmotic pressure, radiation. Chemical methods of microbial control: Antiseptics, disinfectants – types and mode of action. Asexual methods of reproduction, logarithmic representation of bacterial populations, phases of growth, calculation of generation time and specific growth rate

Unit IV – Bacterial Systematics

Aim and principles of classification, systematics and taxonomy, concept of species, taxa, strain; conventional, molecular and recent approaches to polyphasic bacterial taxonomy, evolutionary chronometers, rRNA oligonucleotide sequencing, signature sequences, and protein sequences. Differences between eubacteria and Archaebacteria.

Unit V – Important archaeal and eubacterial groups

Archaebacteria: General characteristics, phylogenetic overview, genera belonging to Nanoarchaeota (*Nanoarchaeum*), Crenarchaeota (*Sulfolobus*, *Thermoproteus*) and Euryarchaeota(*Methanobacterium*, *Methanocaldococcus*).Thermophiles (*Thermococcus*, *Pyrococcus*, *Thermoplasma*) and Halophiles (*Halobacterium*, *Halococcus*)]. Eubacteria: Morphology, metabolism, ecological significance and economic importance of following groups: Gram Negative:General characteristics with suitable examples of Alpha, Beta, Gamma, Delta, Epsilon, Zeta and Non-proteobacteria.Gram Positive:Low G+C (Firmicutes): General characteristics with suitable examples. High G+C (Actinobacteria): General characteristics with suitable examples. Cyanobacteria: An Introduction.

SUGGESTED READINGS

1. Pelczar, J.r M.J., Chan,ECS., and Krieg, N.R. (2004). Microbiology. 5th edition. Tata McGraw Hill.
2. Willey, J.M., Sherwood, L.M., and Woolverton, C.J. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
3. Madigan, M.T., and Martinko, J.M. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.
4. Tortora, G.J., Funke, B.R., and Case, C.L. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.
5. Black, J.G. (2008). Microbiology: Principles and Explorations. 7th edition. Prentice Hall
6. Stanier, R.Y., Ingraham,J.L., Wheelis, M.L., and Painter, P.R. (2005). General Microbiology. 5th edition. McMillan.
7. Atlas, R.M. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.
8. Cappucino, J., and Sherman. N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited
9. Srivastava, S., and Srivastava, P.S. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht.

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Semester – I

16MBU103 **BIOCHEMISTRY** **(4H – 4C)**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To provide the knowledge on basics of biochemistry and its applications and to highlight the technical skill.
- To describe the classification and functions of lipids.
- To summarize the structure and classification of enzymes
- To state the Structure and types of DNA
- To analyse the functions and properties of phosphoglycerides
- To understand about storage and structural polysaccharides.

COURSE OUTCOME (CO'S)

- Understand the structures of enzymes, proteins, carbohydrates and fats
- Understand the functions of biomolecules
- Analyze the process of metabolism
- Understand of nucleic acids and their importance to combine and analyses information.
- Structure and classification of enzymes, specificity of enzymes
- Summarize the protein structure and enzyme activity, unit and specificity

Unit I–Basics of Biochemistry

Atoms and molecules, cell structure, cell organelles, developing membrane structure, transport of molecules, Beer and Lambert's Law, Calorimeter,Anabolism and catabolism and standard for energy change.

Unit II – Carbohydrates

Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses.

Stereo isomerism of monosaccharides, epimers, Mutarotation and anomers of glucose. Furanose and pyranose forms of glucose and fructose, Haworth projection formulae for glucose; chair and boat forms of glucose, Sugar derivatives, glucosamine, galactosamine, muramic acid, N- acetyl neuraminic acid, Disaccharides; concept of reducing and non-reducing sugars, occurrence and Haworth projections of maltose, lactose, and sucrose, Polysaccharides, storage polysaccharides, starch and glycogen. Structural Polysaccharides, cellulose, peptidoglycan and chitin

Unit III – Lipids

Definition and major classes of storage and structural lipids.Storage lipids.Fatty acids structure and functions.Essential fatty acids. Triacyl glycerols structure, functions and properties. Saponification.Structural lipids. Phosphoglycerides: Building blocks, General structure, functions and properties. Structure of phosphatidylethanolamine and phosphatidylcholine, Sphingolipids: building blocks, structure of sphingosine, ceramide. Special mention of sphingomyelins, cerebrosides and gangliosides Lipid functions: cell signals, cofactors, prostaglandins, Introduction of lipid micelles, monolayers, bilayers

Unit IV – Proteins

Functions of proteins, Primary structures of proteins: Amino acids, the building blocks of proteins. General formula of amino acid and concept of zwitterion. Titration curve of amino acid and its Significance, Classification, biochemical structure and notation of standard protein amino acids Ninhydrin reaction.Natural modifications of amino acids in proteins hydrolysine, cystine and hydroxyproline, Non protein amino acids: Gramicidin, beta-alanine, D-alanine and D-glutamic acid Oligopeptides: Structure and functions of naturally occurring glutathione and insulin and synthetic aspartame, Secondary structure of proteins: Peptide unit and its salient features. The alpha helix, the beta pleated sheet and their occurrence in proteins, Tertiary and quaternary structures of proteins. Forces holding the polypeptide together. Human haemoglobin structure, Quaternary structures of proteins

Unit V – Enzymes and Vitamins

Structure of enzyme: Apoenzyme and cofactors, prosthetic group-TPP, coenzymeNAD,metal cofactors, Classification of enzymes, Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis. Significance of hyperbolic, double reciprocal plots of enzyme activity, Km, and allosteric mechanism Definitions of terms – enzyme unit, specific activity and turnover number, Multienzyme complex : pyruvate dehydrogenase; isozyme: lactate dehydrogenase, Effect of pH and temperature on enzyme activity. Enzyme inhibition: competitive- sulfa drugs; non-competitive-heavy metal salts. Vitamins - Classification and characteristics with suitable examples, sources and importance.

SUGGESTED READINGS

1. Campbell, M.K. (2012) Biochemistry, 7thedition. Published by Cengage Learning.
2. Campbell, P.N., and Smith, A.D., (2011) Biochemistry Illustrated, 4thedition. Published by Churchill Livingstone.
3. Tymoczko, J.L., Berg, J.M., and Stryer, L. (2012) Biochemistry: A short course, 2ndedition. W.H.Freeman.
4. Berg, J.M., Tymoczko, J.L., and Stryer, L. (2011) Biochemistry, W.H.Freeman and Company.
5. Nelson, D.L and Cox, M.M. (2008) Lehninger Principles of Biochemistry, 5th edition. W.H. Freeman and Company.
6. Willey, M.J., Sherwood, L.M., & Woolverton, C. J. (2013) Prescott, Harley and Klein's Microbiology.9th edition. McGrawHill.

16MBU111	BASIC MICROBIOLOGY -PRACTICAL	Semester – I (3H – 2C)

Instruction Hours / week: L: 0 T: 0 P: 3 | **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To develop skills related to
- Isolation and culture techniques of bacteria
- The external feature of bacteria and colony characteristics. Various staining techniques
- Sterilization of heat sensitive materials
- Counting of microorganism in the environment
- Isolation of parasites from edible fruits.
- Good laboratory practice and Biosafety measures.

COURSE OUTCOME (CO'S)

- This practical paper will build the student to describe and distinguish the bacterial colonies.
- They also will create knowledge on preparing permanent temporary mounts for fungi, protozoan's and algae.
- Students will able to understand the parasites and its nature.
- They can able to handle the pathogens safely.
- Students able to describe the *Spirogyra, Chlamydomonas* and *Volvox*
- Students able to handle the instruments in the microbiology laboratory

EXPERIMENTS

1. Microbiology Good Laboratory Practices and Biosafety.
2. To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, microscope, pH meter) used in the microbiology laboratory.
3. Preparation of culture media for bacterial cultivation.
4. Sterilization of heat sensitive material by membrane filtration and assessment for sterility.
5. Demonstration of the presence of micro flora in the environment by exposing nutrient agar plates to air.
6. Temporary mounts Lacto phenol cotton blue mount – *Rhizopus, Penicillium, Aspergillus*.
7. Study of *Spirogyra* and *Chlamydomonas, Volvox* using temporary mounts.
8. Study of the following protozoans using permanent mounts/photographs: *Amoeba,Entamoeba,Paramecium* and *Plasmodium*

SUGGESTED READINGS

1. Tortora, G.J., Funke, B.R, and Case, C.L. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.
2. Madigan, M.T., Martinko, J,M., Dunlap, P.V., and Clark,D.P. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International edition.
3. Cappucino, J., and Sherman,N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited.

4. Wiley, J.M., Sherwood, L.M., and Woolverton, C.J. (2013) Prescott's Microbiology. 9th edition. McGraw Hill International.
5. Atlas, R.M. (1997). Principles of Microbiology. 2ndedition. WM.T.Brown Publishers.
6. Pelczar, M.J., Chan,ECS., and Krieg, N.R. (1993). Microbiology. 5thedition. McGraw Hill Book Company.
7. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L., and Painter, P.R., (2005). General Microbiology.5thedition.McMillan.

Semester – I

16MBU112 **BACTERIOLOGY -PRACTICAL** **(3H – 2C)**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To provide a strong base in the fundamentals of bacteria.
- To learn techniques and methods used in the cultivation and isolation of bacteria.
- To develop skills related to preservation of bacterial cultures.
- To learn about bacterial specialized structure using staining methods
- To learn the bacterial special structure capsule and spore
- To measure the bacterial size

COURSE OUTCOME (CO'S)

Theory and practical skills in staining procedures

- Various Culture media and their applications
- Various microbial culture techniques to obtain isolation of pure cultures of bacteria
- Bacterial endospore and capsule
- Able to analyze the Bacterial size
- Able explain the bacterial motility and flagella
- To know the staining procedure

EXPERIMENTS

1. Preparation of different media: synthetic media BG-11, Complex media - Nutrient agar, McConkey agar, EMB agar.
2. Micrometry.
3. Motility by hanging drop method.
4. Simple staining
5. Negative staining
6. Gram's staining
7. Acid fast staining – demonstration permanent slide only.
8. Capsule staining
9. Endospore staining.
10. Isolation of pure cultures of bacteria by streaking method - Quadrant, Continuous and T-streaking.
11. Preservation of bacterial cultures by various techniques - Agar slants and deeps - Mineral Oil,Glycerol stocks
12. Estimation of Colony Forming Unit (CFU) count by spread plate method/pour plate method.

SUGGESTED READINGS

1. Pelczar Jr, M.J., Chan,ECS., and Krieg, N.R. (2004). Microbiology. 5th edition. Tata McGraw Hill.
2. Willey, J.M., Sherwood, L.M., and Woolverton, C.J. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
3. Madigan, M.T., and Martinko, J.M. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.

4. Tortora, G.J., Funke, B.R., and Case, C.L. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.
5. Black, J.G. (2008). Microbiology: Principles and Explorations. 7th edition. Prentice Hall
6. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L., and Painter, P.R. (2005). General Microbiology. 5th edition. McMillan.
7. Atlas, R.M. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.
8. Cappucino, J., and Sherman, N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited
9. Srivastava, S., and Srivastava, P.S. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht.

Semester – I

16MBU113 BASIC BIOCHEMISTRY- PRACTICAL (3H – 2C)

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVE

- To familiarize the students with the basic cellular processes at molecular level
- To make students familiar with practical techniques used for studying biochemical structure and analysis of biochemical methods.
- To expertise in Qualitative/Quantitative tests of carbohydrates, reducing sugars, Protein and lipids
- To study the protein secondary and tertiary structures
- To study the effect of temperature, pH and heavy metals on enzyme activity.
- To gain the knowledge on vitamin estimation

COURSE OUTCOME

- The practical knowledge and the skills associated about various techniques used in Biochemistry.
- The skill in qualitative and quantity analysis of carbohydrates, protein and lipid
- An understanding in protein secondary and tertiary structures
- An insight in enzyme activity and its physical factors influence the activity
- Knowledge on vitamin estimation
- Cognitive skill and students able to solve the numerical problems

EXPERIMENTS

1. Properties of water, concept of pH and buffers, preparation of buffers and numerical problems to explain the concepts.
2. Numerical problems on calculations of standard free energy change and equilibrium constant.
3. Standard free energy change of coupled reactions.
4. Qualitative/Quantitative tests for carbohydrates, reducing sugars, and non-reducing sugars.
5. Qualitative/Quantitative tests for lipids and proteins.
6. Study of protein secondary and tertiary structures with the help of models.
7. Study of enzyme kinetics – calculation of Vmax, Km, Kcat values.
8. Study effect of temperature, pH and heavy metals on enzyme activity.
9. Estimation of any one vitamin.

SUGGESTED READING

1. Campbell., M.K. (2012) Biochemistry, 7th edition. Published by Cengage Learning.
2. Campbell, P.N., and Smith, A.D. (2011) Biochemistry Illustrated, 4th edition. Published by Churchill Livingstone.
3. Tymoczko, J.L., Berg, J.M., and Stryer, L. (2012) Biochemistry: A short course, 2nd edition. W.H.Freeman
4. Berg, J.M., Tymoczko, J.L., and Stryer, L. (2011) Biochemistry, W.H.Freeman and Company.
5. Nelson, D.L., and Cox, MM.. (2008) Lehninger Principles of Biochemistry, 5th Edition. W.H. Freeman and Company.
6. Willey, M.J. herwood, L.M.& Woolverton, C.J. (2013) Prescott, Harley and Klein's Microbiology 9th Edition. McGrawHill
7. Voet, D,.and Voet, J.G. (2004) Biochemistry 3rd edition, John Wiley and Sons.

Semester – II
(4H – 4C)

16LSU201 **தமிழ்இரண்டாம்தாள்**

[illegible] **பொதுநோக்கம்**

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துத[illegible].
- [illegible] மேம்படுத்துத[illegible].
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

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அலகு – I :பக்திஇலக்கியம் **(10 மணிநேரம்)**

வைணவஇலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. சைவம் -பெரியபுராணம் - திருமூலநாயனார்புராணம்.

2.வைணவம் - பெரியாழ்வார்திருமொழி: 10 பாடல்கள்.

அலகு – II :சங்கஇலக்கியம் : (15 மணிநேரம்)

சங்கஇலக்கியங்கள்அறிமுகம்

அ).எட்டுத்தொகை

நற்றிணை: பிரசம்கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக்கலை – குறிஞ்சி- 69

ஐங்குறுநூறு :நெய்தல்-தொண்டிப்பத்து: திரைஇமிழ்இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்ததுமன்ற– 27

பரிபாடல்: பரிபாடல்திரட்டு-மதுரைநகர்ச்சிறப்பு – உலகம்ஒருநிறையாத்தான்-6, மாயோன்கொப்பூழ்-7, செய்யாட்குஇழைத்த-9, கார்த்திகைகாதில்-10, ஈவாரைக்கொண்டாடி-11.

கலித்தொகை:சுடர்தொடீகேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு:அன்னாய்வாழிவேண்டன்னை - குறிஞ்சி - 48

புறநானூறு :யாதும்ஊரேயாவருங்கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின்சிறப்பு

முருகன்இருப்பிடங்கள் – ‘சிறுதினைமலரொடு’ என்பதிலிருந்துதொடங்கி, ‘அறிந்தவாறே’ என்பதுவரையிலானதொடர்கள்: 218-249.

முருகன்அருள்புரிதல் – ‘தெய்வம்சான்ற’ என்பதிலிருந்துதொடங்கி, ‘நல்குமதி’ என்பதுவரையிலானதொடர்கள்: 286-295.

அலகு - III :காப்பியம் (6 மணிநேரம்)

சிலப்பதிகாரம்:

மங்கலவாழ்த்துப்பாடல்: (21-29) – கண்ணகியின்சிறப்பு:

‘நாகநீள்நகரொடு’ என்பதிலிருந்துதொடங்கி,
‘கண்ணகிஎன்பாண்மன்னோ’ என்பதுவரையிலானதொடர்கள்.

நடுகற்காதை: (207-234)-

சேரன்செங்குட்டுவன்கண்ணகிக்குக்கோயில்எடுத்தல்:

‘அருந்திறலரசர்’ என்பதிலிருந்துதொடங்கி, ‘மன்னவரேறென்’ என்பதுவரையிலானதொடர்கள்.

வாழ்த்துக்காதை: (482-485)-

செங்குட்டுவனுக்குக்கண்ணகிகாட்சியளித்தல்: ‘என்னே’ என்பதிலிருந்துதொடங்கி, ‘விசும்பில்தோன்றுமால்’ என்பதுவரையிலானதொடர்கள்.

வழக்குரைகாதை:பத்தினிப்பெண்டிர்எழுவர்கதை: ‘நீர்வார்கண்ணை’ என்பதிலிருந்துதொடங்கி, ‘புகாரென்பதியே’ என்பதுவரையிலானதொடர்கள்.

வஞ்சினமாலை: ‘வன்னிமரமும்’ என்பதிலிருந்துதொடங்கி, ‘பதிப்பிறந்தேன்’ என்பதுவரையிலானதொடர்கள்.

அலகு – IV :சிறுகதை **(10 மணிநேரம்)**

1. **குளத்தங்கரைஅரசமரம் – வ.வே.சு.ஐயர்**
2. **காட்டில்ஒருமான் - அம்பை**
3. **நாற்காலி – கி.ராஜநாராயணன்**
4. **நகரம் – சுஜாதா**

அலகு- V :மொழிப்பயிற்சி **(7 மணிநேரம்)**

படைப்பிலக்கியப்பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)

மொழிபெயர்ப்பு

பாடநூல்:கற்பகச்சோலை – தமிழ்ஏடு.கற்பகம்பல்கலைக்கழகத்தமிழ்த்துறைவெளியீடு.

Semester – II

16MBU201 **VIROLOGY** **(4H – 4C)**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- Describe the structure and replication strategies of the individual viruses discussed, including the processes of entry into cells, control of gene transcription.
- Define the process of virus latency and describe in molecular terms control of the process and activation of viral genomes during reactivation.
- Describe the growth behavior differences between normal cells and cells transformed by oncogenic DNA and RNA viruses.
- To study general aspects of viral morphology and classification.
- Cultivation of viruses and various methods of propagation.
- To discuss the application of various immunological and molecular diagnostic tools.

COURSE OUTCOME (CO'S)

- Upon paper completion, students will have skill-based knowledge on structure of plants, animal, bacteria and viruses.
- This paper also enables the student on isolation, propagation of various viruses.
- It will help the students to understand the plant and animal viruses.
- Students can distinguish the viruses According to their characteristic features.
- It will explain the research activities involved in virology studies.
- Skill based viral analysis can be performed in medical research.

Unit I – Nature and Properties of Viruses

Introduction: Discovery of viruses, nature and definition of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions. Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses. Isolation, purification and cultivation of viruses. Viral assay, Viral taxonomy: Classification and nomenclature of different groups of viruses

Unit II – Bacteriophages

Diversity, classification, one step multiplication curve, lytic and lysogenic phages (lambda phage) concept of early and late proteins, regulation of transcription in lambda phage

Unit III – Viral Transmission, salient features of viral nucleic acids & replication

Modes of viral transmission: Persistent, non-persistent, vertical and horizontal. Salient features of viral Nucleic acid: Unusual bases (TMV,T4 phage), overlapping genes (φX174, Hepatitis B virus), alternate splicing (HIV), terminal redundancy (T4 phage), terminal cohesive ends (lambda phage), partial double stranded genomes (Hepatitis B), long terminal repeats (retrovirus), segmented (Influenza virus), and non-segmented genomes (picornavirus), capping and tailing (TMV).

Unit IV – Viruses and Cancer, Prevention & control of viral diseases

Viral multiplication and replication strategies: Interaction of viruses with cellular receptors and entry of viruses. Replication strategies of viruses as per Baltimore classification (phi X 174, Retroviridae, Vaccinia, Picorna), Assembly, maturation and release of virions

Unit V – Applications of Virology

Introduction to oncogenic viruses. Types of oncogenic DNA and RNA viruses: Concepts of oncogenes and proto-oncogenes. Antiviral compounds and their mode of action. Interferon and their mode of action.General principles of viral vaccination. Immunization schedule. Use of viral vectors in cloning and expression, gene therapy and phage display

SUGGESTED READINGS

1. Dimmock, N.J., Easton., A.L., Leppard, K.N. (2007). Introduction to Modern Virology. 6thedition, Blackwell Publishing Ltd.
2. Carte,r J., and Saunders, V. (2007). Virology: Principles and Applications. John Wiley and Sons.
3. Flint, S.J., Enquist, L.W., Krug, R.M., Racaniello, V.R., Skalka, A.M. (2004). Principles of Virology, Molecular biology, Pathogenesis and Control. 2ndedition. ASM press Washington DC.
4. Levy, J.A., Conrat, H.F., Owens, R.A. (2000). Virology. 3rdedition. Prentice Hall publication, New Jersey.
5. Wagner, E.K., Hewlett, M.J. (2004). Basic Virology. 2ndedition. Blackwell Publishing.
6. Mathews. (2004). Plant Virology. Hull R. Academic Press, New York.
7. Nayud, M.V. (2008). Plant Viruses. Tata McGraw Hill, India.
8. Bos, L. (1999) Plant viruses-A text book of plant virology by. Backhuys Publishers.
9. Versteeg J. (1985). A Color Atlas of Virology. Wolfe Medical Publication.

Semester – II

16MBU202 MICROBIAL PHYSIOLOGY AND METABOLISM (4H – 4C)

Instruction Hours / week:L: 4 T: 0 P: 0 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- It gives brief description on the microbial metabolism and its energetic
- It deals with the various aerobic and an aerobic process through which the organisms obtain and utilize the energy for their growth and to produce industrially important products that helps the students to become better entrepreneurs
- Explains photosynthesis and photosynthetic bacteria
- To study the structure, function, energy metabolism, growth and regulatory mechanisms of microorganisms.
- The students will learn about the metabolic diversity exhibited by microorganisms
- The students will learn about regulatory networks that support their survival and growth of the microorganism.

COURSE OUTCOME (CO'S)

- The students will be able to understand and predict the various metabolic reactions in microbial cell.
- This will make them predict the intermediate products which can be employed in industrial production processes.
- Students will understand the growth, nutrition and environmental factors
- Students able to assess the prokaryotes by observing the biochemical reaction
- This course will support them to interpret the fermentation using microbes
- Able to summarize the nutrients uptake system in the prokaryotes

Unit I – Microbial Growth & Effect of Environment on Microbial Growth

Definitions of growth, measurement of microbial growth, Batch culture, Continuous culture, generation time and specific growth rate, synchronous growth, diauxic growth curve. Microbial growth in response to environment -Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles), solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe),barophilic..

Unit II– Nutrient uptake and Transport

Microbial growth in response to nutrition and energy – Autotroph/Phototroph, heterotrophy, Chemolithoautotroph, Chemolithoheterotroph, Chemoheterotroph, Chemolithotroph, photolithoautotroph, Photoorganoheterotroph. Passive and facilitated diffusion.Primary and secondary active transport, concept of uniport, symport and antiport.Group translocation. Iron uptake

Unit III – Chemoheterotrophic Metabolism-Aerobic Respiration

Concept of aerobic respiration, anaerobic respiration and fermentation Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway TCA cycle, Electron transport chain: components of respiratory chain, comparison of mitochondrial and bacterial ETC, electron transport phosphorylation, uncouplers and inhibitors.

Unit IV – Chemoheterotrophic Metabolism-Anaerobic respiration&fermentation

Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate/nitrite and nitrate/ammonia respiration; fermentative nitrate reduction). Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways

Unit V– Chemolithotrophic, Phototrophic and nitrogen Metabolism

Introduction to aerobic and anaerobic chemolithotrophy with an example each.Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction). Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic *vs.* oxygenic photosynthesis with reference to photosynthesis in green bacteria, purple bacteria and cyanobacteria. Nitrogen Metabolism: An overview. Introduction to biological nitrogen fixation Ammonia assimilation. Assimilatory nitrate reduction, dissimilatory nitrate reduction, denitrification

SUGGESTED READINGS

1. Madigan, M.T., and Martinko, J.M. (2014). Brock Biology of Microorganisms. 14thedition. PrenticeHall International Inc.
2. Moat, A.G., and Foster, J.W. (2002). Microbial Physiology. 4thedition. John Wiley & Sons.
3. Reddy, S.R., and Reddy, M. (2005). Microbial Physiology. Scientific Publishers India.
4. Gottschalk, G. (1986). Bacterial Metabolism. 2ndedition. Springer Verlag.
5. Stanier, R.Y., Ingrahm, J.I., Wheelis, M.L., and Painter, P.R. (1987). General Microbiology. 5thedition, McMillan Press.
6. Willey, J.M., Sherwood, L.M., and Woolverton, C.J. (2013). Prescott's Microbiology. 9thedition.McGraw Hill Higher Education.

		Semester – II
16MBU203	**MICROBIAL GENETICS**	**(4H – 4C)**

Instruction Hours / week:L: 4 T: 0 P: 0 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To focus on the basic principles of genetics incorporating the concepts of classical, molecular and population genetics.
- Compilation is required for recent advances in genetic principles for strong foundation in Biotechnology that improve their chances of employability in biotechnological industries
- To explain the mutagen and process of mutation
- To explain about DNA as a genetic material
- To paraphrase the genetic material structure and model
- To explain the concept of recombination, linkage mapping and elucidate the gene transfer mechanisms in prokaryotes and eukaryotes

COURSE OUTCOME (CO'S)

- This course provided candidates with basic knowledge and understanding of Molecular Biology with special reference to microbial genome.
- Students undertaking this course will be able to describe the nature of molecular world and its application in modern Microbiological sectors.
- Students able to understand the properties, structure and function of genes in microorganism at the molecular level
- Describe the importance of genetic code and operon concept
- Discuss the molecular mechanisms underlying mutations and repair mechanisms
- Able to summarize the concept of recombination, linkage mapping and elucidate the gene transfer mechanisms in prokaryotes and eukaryotes

Unit I – History of Genetics

Concept of Genetics, Mendel's model of genetics, proof of structure material, DNA structure, models of DNA, DNA replication, transcription, translation, RNA structure, types of RNA,

Unit II – Plasmids

Types of plasmids – F plasmid, R Plasmids, colicinogenic plasmids, Ti plasmids, linear plasmids, yeast- 2 µ plasmid, Plasmid replication and partitioning, Host range, plasmid-incompatibility, plasmid amplification, Regulation of copy number, curing of plasmids, Application of plasmids.

Unit III – Mechanisms of Genetic Exchange

Genetic code, Lac operon, Trp operon,Transformation - Discovery, mechanism of natural competence. Conjugation - Discovery, mechanism, Hfr and F' strains, Interrupted mating technique and time of entry mapping. Transduction - Generalized transduction, specialized transduction, LFT & HFT lysates, Mapping by recombination and co- transduction of markers Features of T4 genetics, Genetic basis of lytic *versus* lysogenic switch of phage lambda

Unit IV – Phage Genetics

Genome organization: *E. coli, Saccharomyces, Tetrahymena.* Mutations and mutagenesis: Definition and types of Mutations; Physical and chemical mutagens; Molecular basis of mutations; Functional mutants (loss and gain of function mutants); Uses of mutations. Reversion and suppression: True revertants; Intra- and inter-genic suppression; Ames test; Mutator genes.

Unit V – Transposable elements

Prokaryotic transposable elements – Insertion Sequences, composite and non-composite transposons, Replicative and Non replicative transposition, Mu transposon.Eukaryotic transposable elements - Yeast (Ty retrotransposon), Drosophila (P elements), Maize (Ac/Ds). Uses of transposons and transposition

SUGGESTED READINGS

1. Klug, W.S., Cummings, M.R., Spencer, C., Palladino, M. (2011). Concepts of Genetics, 10th edition, Benjamin Cummings.
2. Krebs, J., Goldstein, E., Kilpatrick, S. (2013). Lewin's Essential Genes, 3rd edition, Jones and Bartlett Learning.
3. Pierce, B.A. (2011) Genetics: A Conceptual Approach, 4th edition, Macmillan Higher Education Learning.
4. Watson, J,D., Baker, T.A., Bell, S.P., et al. (2008) Molecular Biology of the Gene, 6th edition, Benjamin Cummings.
5. Gardner, E.J., Simmons, M.J., Snustad, D,P. (2008). Principles of Genetics. 8th edition, Wiley-India.
6. Russell, P.J. (2009). *i*Genetics- A Molecular Approach. 3rdedition, Benjamin Cummings.
7. Sambrook, J., and Russell, D.W. (2001). Molecular Cloning: A Laboratory Manual. 4th edition, Cold Spring Harbour Laboratory press.
8. Maloy, S.R, Cronan, J.E., and Friefelder, D.(2004) Microbial Genetics 2nd edition, Jones andBarlettPublishers.

Semester – II

16MBU211 **VIROLOGY–PRACTICAL** **(3H – 2C)**

Instruction Hours / week:L: 0 T: 0 P: 3 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 6 Hours

COURSE OBJECTIVES

- Describe the structure and replication strategies of the individual viruses discussed, including the processes of entry into cells, control of gene transcription.
- Define the process of virus latency and describe in molecular terms control of the process and activation of viral genomes during reactivation.
- Describe the growth behavior differences between normal cells and cells transformed by oncogenic DNA and RNA viruses.
- To study general aspects of viral morphology and classification.
- Cultivation of viruses and various methods of propagation.
- To discuss the application of various immunological and molecular diagnostic tools.

COURSE OUTCOME (CO'S)

- Upon paper completion, students will have skill-based knowledge on structure of plants, animal, bacteria and viruses.
- This paper also enables the student on isolation, propagation of various viruses.
- It will help the students to understand the plant and animal viruses.
- Students can distinguish the viruses According to their characteristic features.
- It will explain the research activities involved in virology studies.
- Skill based viral analysis can be performed in medical research.

EXPERIMENTS

1. Study of the structure of important animal viruses (rhabdo, influenza, paramyxo hepatitis B and retroviruses) using electron micrographs – Demonstration.
2. Study of the structure of important plant viruses (caulimo, Gemini, tobacco ring spot, cucumber mosaic and alpha-alpha mosaic viruses) using electron micrographs – Demonstration.
3. Study of the structure of important bacterial viruses (φX174, T4, λ) using electron micrograph – Demonstration.
4. Isolation and enumeration of bacteriophages (PFU) from water/sewage sample using double agar layer technique
5. Studying isolation and propagation of animal viruses by chick embryo technique
6. Study of cytopathic effects of viruses using photographs
7. Perform local lesion technique for assaying plant viruses.

SUGGESTED READING

1. Dimmock, N.J., Easton, A.L., Leppard, K.N. (2007). Introduction to Modern Virology. 6th edition, Blackwell Publishing Ltd.

2. Carter, J., and Saunders, V. (2007). Virology: Principles and Applications. John Wiley and Sons.
3. Flint, S.J., Enquist, L.W., Krug, R.M., Racaniello, V.R., Skalka, A.M. (2004). Principles of Virology, Molecular biology, Pathogenesis and Control. 2nd edition. ASM pres.s Washington DC.
4. Levy, J.A., Conrat, H.F., Owens, R.A. (2000). Virology. 3rd edition. Prentice Hall publication, New Jersey.
5. Wagner, E.K., Hewlett, M.J. (2004). Basic Virology. 2nd edition. Blackwell Publishing.
6. Mathews. (2004). Plant Virology. Hull R. Academic Press, New York.
7. Nayudu, M.V. (2008). Plant Viruses. Tata McGraw Hill, India.
8. Bos, L. (1999) Plant viruses-A text book of plant virology by. Backhuys Publishers.
9. Versteeg, J. (1985). A Color Atlas of Virology. Wolfe Medical Publication.

Semester – II

16MBU212 MICROBIAL PHYSIOLOGY AND METABOLISM – PRACTICAL **(3H – 2C)**

Instruction Hours / week:L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 6 Hours

COURSE OBJECTIVES

- To enhance the student's knowledge on various aspects of microbial physiology like growth, extremophiles studies and chemical characterization of microbes.
- To improve their skills in handing microorganisms
- To analyze the growth condition of the bacteria.
- To facilitate the students to deal with the bacterial strain
- To demonstrate the fermentation technique
- To demonstrate the generation time and thermal death time of bacteria

COURSE OUTCOME

- The students will be able to analyze the bacteria growth and growth condition
- Able to identify the various factors for optimal growth of *E.coli*.
- Understand the basic microbial structure and functions of various physiological groups of prokaryotes.
- Able to utilize the various Culture media in the proper physical condition for fermentation
- Able to explain the microbial metabolism – Autotrophy and heterotrophy modes of nutrition
- Students able to understand the physical and chemical growth requirements of bacteria and thermal death time of bacteria.

EXPERIMENTS

1. Study and plot the growth curve of *E. coli* by turbidometric and standard plate count methods.
2. Calculations of generation time and specific growth rate of bacteria from the graph plotted with the given data
3. Effect of temperature on growth of *E. coli*
4. Effect of pH on growth of *E. coli*
5. Effect of carbon and nitrogen sources on growth of *E.coli*
6. Effect of salt on growth of *E. coli*
7. Demonstration of alcoholic fermentation
8. Demonstration of the thermal death time and decimal reduction time of *E. coli.*

SUGGESTED READINGS

1. Madigan, M.T., and Martinko, J.M. (2014). Brock Biology of Microorganisms. 14th edition. Prentice Hall International Inc.
2. Moat, A.G., and Foster,J.W. (2002). Microbial Physiology. 4th edition. John Wiley & Sons
3. Reddy, S.R., and Reddy, S.M. (2005). Microbial Physiology. Scientific Publishers India
4. Gottschalk, G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag

5. Stanier, R.Y, Ingrahm, J.I., Wheelis, M.L., and Painter, P.R. (1987). General Microbiology. 5th edition, McMillan Press.
6. Willey, J.M., Sherwood, L.M., and Woolverton, C.J. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.

Semester – II

16MBU213 MICROBIAL GENETICS - PRACTICAL (3H – 2C)

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 6 Hours

COURSE OBJECTIVES

- To focus on the basic principles of genetics incorporating the concepts of classical, molecular and population genetics.
- Compilation is required for recent advances in genetic principles for strong foundation in Biotechnology that improve their chances of employability in biotechnological industries
- To study the effect of chemical and physical mutagens on prokaryotic cell
- To isolate the extra chromosomal from bacteria
- To Interpret the DNA quantity and purity
- To identify the mutant strains using appropriate techniques

COURSE OUTCOME (CO'S)

- Students undertaking this practical shall be able to describe the key concept in the basic Microbial Genetics
- Effectively understand the implication of mutation and its characteristics.
- Further, the experiments would allow students to recall and relate the information gained from Microbial Genetics theory paper and skills associated with it
- Students able demonstrate the gene transfer techniques
- Students can estimate the genetic materials
- Able to distinguish the plasmid and Genomic DNA

EXPERIMENTS

1. Preparation of Master and Replica Plates.
2. Study the effect of chemical (HNO2) and physical (UV) mutagens on bacterial cells.
3. Study survival curve of bacteria after exposure to ultraviolet (UV) light.
4. Isolation of Plasmid DNA from *E.coli.*
5. Study different conformations of plasmid DNA through Agarose gel electrophoresis.
6. Demonstration of Bacterial Conjugation.
7. Demonstration of bacterial transformation and transduction.
8. Demonstration of AMES test.

SUGGESTED READINGS

1. Klug, W.S., Cummings, M.R., Spencer, C., Palladino, M. (2011). Concepts of Genetics, 10th edition, Benjamin Cummings
2. Krebs, J., Goldstein, E., Kilpatrick, S. (2013). Lewin's Essential Genes, 3rd edition, Jones and Bartlett Learning.
3. Pierce, B.A. (2011) Genetics: A Conceptual Approach, 4thedition, Macmillan Higher Education Learning.
4. Watson, J.D., Baker, T.A., Bell, S.P., et al. (2008) Molecular Biology of the Gene, 6thedition, Benjamin Cummings.
5. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. 8thedition, Wiley-India.

6. Russell, P.J. (2009). *I* Genetics- A Molecular Approach. 3rd edition, Benjamin Cummings.
7. Sambrook, J., and Russell, D.W. (2001). Molecular Cloning: A Laboratory Manual. 4th edition, Cold Spring Harbour Laboratory press.

		Semester – II
16AEC201	**ENVIRONMENTAL STUDIES**	**(4H – 4C)**

Instruction Hours / week:L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.
- To create awareness among the students to know about various renewable and nonrenewable resources of the region, enables environmentally literate citizens (by knowing the environmental acts, rights, rules, legislation, etc.)
- To make appropriate judgments and decisions for the protection and skills associated with improvement of the earth.

COURSE OUTCOME

- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Unit I–Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

Unit II – Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources : Use and over-utilization, exploitation. Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.Ill-effects of fireworks.

Unit III – Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels.India as a mega-diversity nation.Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV– Environmental Pollution - Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution , Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit V – Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.Wasteland reclamation.Consumerism and waste products.Environment Protection Act.Air (Prevention and Control of Pollution) Act.

Water (Prevention and Control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health.Human rights.Value education.HIV/AIDS.Women and Child Welfare.Role of Information Technology in environment and human health.

SUGGESTED READINGS

1. Tripathy.S.N. and Sunakar Panda. 2004. Fundamentals of Environmental Studies; 2nd Edition, Vrianda Publications Private Ltd., New Delhi.
2. Arvind Kumar, 2004. A Textbook of Environmental Science; APH Publishing Corporation, New Delhi.
3. P.S.Verma, V.K.Agarwal. 2001. Environmental Biology (Principles of Ecology); S.Chand and Company Ltd., New Delhi.
4. Anubha Kaushik, C.P.Kaushik, 2004. Perspectives in Environmental Studies, New Age International Pvt. Ltd. Publications, New Delhi.
5. Singh, M.P., B.S. Singh and Soma S. Dey, 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.
6. Daniel B.Botkin and Edward A. Keller. 1995. Environmental Science, John Wiley and Sons, Inc., New York.
7. Uberoi, N.K., 2005. Environmental Studies, Excel Books Publications, New Delhi, India.

Semester – III

16MBU301 ENVIRONMENTAL MICROBIOLOGY (4H – 4C)

Instruction Hours / week:L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To educate students about Environmental monitoring and environmental aspects of microbes.
- To impart a skilled knowledge on Microbes and environment and ecological importance.
- The main goal is to know and understand the role of microbes in biogeochemical processes in different ecosystems.
- The students will learn the basic microbiological principles, the methods in microbial ecology and their theoretical and practical use.
- The knowledge can give the base for understanding processes and changes in the environment.
- The students can get some skills to recognise the ecological problems and critical evaluation of the human impacts on pollution, climate changes and as well as environmental protection.

COURSE OUTCOME

- It provides a comprehensive overview of biogeochemical processes relevant to environmental scientists and engineers mediated by microorganisms.
- It will impart the student to develop their entrepreneurial knowledge on ecological behavior of microorganism.
- It will distinguish biogeochemical cycles
- This course will determine microbial role in nutrient cycling
- This course can able to determine water quality,
- It will explain the degradation of natural organic compounds and selected pollutants in the environment.

UnitI – Microorganism and their Habitats

Structure and function of ecosystems.Terrestrial Environment: Soil profile and soil microflora. Aquatic Environment: Microflora of fresh water and marine habitats. Atmosphere: Aeromicroflora and dispersal of microbes. Animal Environment: Microbes in/on human body (Microbiomics) & animal (ruminants) body. Extreme Habitats: Extremophiles: Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels. Microbial succession in decomposition of plant organic matter.

Unit II – Microbial Interactions

Microbe interactions: Mutualism, synergism, commensalism, competition, amensalism, parasitism, predation. Microbe-Plant interaction: Symbiotic and non-symbiotic interactions. Microbe-animal interaction: Microbes in ruminants, nematophagus fungi and symbiotic luminescent bacteria

Unit III – Biogeochemical Cycling

Carbon cycle: Microbial degradation of cellulose, hemicelluloses, lignin and chitin. Nitrogen cycle: Nitrogen fixation, ammonification, nitrification, denitrification and nitrate reduction. Phosphorus cycle: Phosphate immobilization and solubilisation. Sulphur cycle:Microbes involved in sulphur cycle. Other elemental cycles: Iron and manganese

Unit IV – Waste Management

Solid Waste management:Sources and types of solid waste, Methods of solid waste disposal (composting and sanitary landfill). Liquid waste management: Composition and strength of sewage (BOD and COD), Primary, secondary (oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiary sewage treatment.

Unit V – Microbial Bioremediation and Water Potability

Principles and biodegradation of common pesticides, organic (hydrocarbons, oil spills) and inorganic (metals) matter, biosurfactants. Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) MPN test (b) Membrane filter technique.GMO and their impact.

SUGGESTED READINGS

1. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press
2. Okafor, N (2011). Environmental Microbiology of Aquatic & Waste systems. 1st edition, Springer, New York
3. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA
4. Subba Rao NS. (1999). Soil Microbiology. 4th edition. Oxford & IBH Publishing Co. New Delhi.
5. Barton LL & Northup DE (2011). Microbial Ecology. 1st edition, Wiley Blackwell, USA Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.
6. Coyne MS. (2001). Soil Microbiology: An Exploratory Approach. Delmar Thomson Learning.
7. Lynch JM & Hobbie JE. (1988). Microorganisms in Action: Concepts & Application in Microbial Ecology. Blackwell Scientific Publication, U.K.
8. Martin A. (1977). An Introduction to Soil Microbiology. 2nd edition. John Wiley & Sons Inc. New York & London.
9. Stolp H. (1988). Microbial Ecology: Organisms Habitats Activities. Cambridge University Press, Cambridge, England.
10. Madigan MT, Martinko JM and Parker J. (2014). Brock Biology of Microorganisms. 14th edition. Pearson/ Benjamin Cummings.

Semester – III

16MBU302 FOOD AND DAIRY MICROBIOLOGY(4H – 4C)

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To encode the employability importance of the role of microorganisms in food industries both in beneficial and harmful ways.
- This course aims to provide instruction in the general principles of food microbiology.
- Hands on practical complimented with an industry-based project, give a real-world perspective to microbiological challenges faced by the food industry.
- The course covers the microbiology of food preservation and food commodities; principles and methods for the microbiological examination of foods and microbiological quality control.
- To develop an understanding of the major principles of and current issues in the several topical areas that collectively constitute Food Microbiology
- It will helps the students to understand the dairy Technology.

COURSE OUTCOME

- Provides job-oriented information about the role of microorganisms in many food, and beverage industries both in production and spoilage processes.
- Develop job based output on industrial based technologies on Food microbiology.
- It will explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival.
- Discuss the microbiology of different types of food commodities.
- Explain why microbiological quality control programmes are necessary in food production.
- It helps to start business.

Unit I – Foods as a substrate for microorganisms
Natural flora and source of contamination of foods in general. Intrinsic and extrinsic factors that affect growth and survival of microbes in foods. Microbial spoilage of various foods – Spoilage of vegetables, fruits, meat, eggs, milk and butter, bread, canned Foods

Unit II – Principles and methods of food preservation and sterilization
Principles of food preservation. Physical methods of food preservation: temperature (low, high, canning, and drying), irradiation, hydrostatic pressure, high voltage pulse, microwave processing and aseptic packaging. Chemical methods

of food preservation: salt, sugar, organic acids, SO_2, nitrite and nitrates, antibiotics and bacteriocins, sterilization of dry heat, moist heat, chemical, physical and radiation.

Unit III – Fermented foods

Fermented dairy products: yogurt, acidophilus milk, kumiss, kefir, dahi and cheese. Other fermented foods: dosa, sauerkraut, soy sauce and tampeh. Probiotics: Health benefits, types of microorganisms used, probiotic foods available in market.

Unit IV– Food borne diseases

Causative agents, foods involved, symptoms and preventive measures of the following diseases

Food intoxications:*Staphylococcus aureus*, *Clostridium botulinum* and mycotoxins. Food infections:*Bacillus cereus*, *Vibrio parahaemolyticus*, *Escherichia coli*, Salmonellosis, Shigellosis, *Yersinia enterocolitica*, *Listeria monocytogenes* and *Campylobacter jejuni*, fungal diseases, toxins

Unit V– Detection of food borne pathogens, food sanitation and control Cultural and rapid detection methods of food borne pathogens in foods and introduction to predictive microbiology. HACCP, FSSAI Indices of food sanitary quality and sanitizers.

SUGGESTED READINGS

1. Jay JM, Loessner MJ and Golden DA. (2005). Modern Food Microbiology. 7th edition, CBS Publishers and Distributors, Delhi, India.
2. Frazier WC and Westhoff DC. (1992). Food Microbiology. 3rd edition. Tata McGraw-Hill Publishing Company Ltd, New Delhi, India.
3. Adams MR and Moss MO. (1995). Food Microbiology. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.
4. Gould GW. (1995). New Methods of Food Preservation. Blackie Academic and Professional, London.
5. Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.
6. Davidson PM and Brannen AL. (1993). Antimicrobials in Foods. Marcel Dekker, New York.
7. Dillion VM and Board RG. (1996). Natural Antimicrobial Systems and Food Preservation. CAB International, Wallingford, Oxon.
8. Lund BM, Baird Parker AC, and Gould GW. (2000). The Microbiological Safety and Quality of Foods. Vol. 1-2, ASPEN Publication, Gaithersberg, MD.

Semester – III

16MBU303 INDUSTRIAL MICROBIOLOGY (4H – 4C)

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To encompasses the employability use of microorganisms in the manufacture of food or industrial products.
- The aim of the course is to give the students broad theoretical and practical skills in industrial microbiology.
- This course covers the principles of various processes associated with the production and recovery of different bio-products derived from microorganisms.
- The students will be able to discuss the role of microorganisms in industry, as well as to carry out experiments to produce microbial metabolites.
- It will make the students to explore their practical skills in entrepreneurial activities.
- It will deliver the large-scale production of microbial products techniques in advanced level.

COURSE OUTCOME

- Provides knowledge in the large scale production of industrial product, providing the trends to cater the needs of industry.
- This will help the students to enhance their employment knowledge on microbiology based commercial products.
- The aim of the course is to give the students broad theoretical and practical skills in industrial microbiology.
- This course covers the principles of various processes associated with the production and recovery of different bio-products derived from microorganisms.
- The students will be able to discuss the role of microorganisms in industry, as well as to carry out experiments to produce microbial metabolites.
- Students will differentiate the types of fermentation processes

Unit I – Introduction to industrial microbiology

Brief history and developments in industrial microbiology. Sources of industrially important microbes and methods for their isolation, primary and secondary strain improvement.

Unit II – Isolation of industrially important microbes and fermentation media

Preservation and maintenance of industrial strains. Crude and synthetic media - molasses, corn- steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates.

Unit III – Types of fermentation processes, bio-reactors and measurement of fermentation parameters
Types of fermentation processes – Solid-state and liquid-state (stationary and submerged) fermentations; batch, fed-batch and continuous fermentations. Components of a typical bio-reactor, Types of bioreactors – Laboratory, pilot- scale and production fermenters, constantly stirred tank and air-lift fermenters. Measurement and control of fermentation parameters - pH, temperature, dissolved oxygen, foaming and aeration.

Unit IV – Down-stream processing and Enzyme immobilization
Separation of cells – filtration and centrifugation.Cell disruption – physical, chemical and enzymatic methods.Product separation – solvent extraction and precipitation.Lyophilization and spray drying. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase).

Unit V –Microbial production of industrial products (micro-organisms involved, media, fermentation conditions, downstream processing and uses)
Citric acid, Ethanol, Penicillin, Glutamic acid, Vitamin B_{12}, Enzymes (amylase, protease, lipase) Wine, Beer.

SUGGESTED READINGS

1. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.
2. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.
3. Okafor N. (2007). Modern Industrial Microbiology and Biotechnology. 1st edition. Bios Scientific Publishers Limited. USA
4. Glaze A.N. and Nikaido H. (1995). Microbial Biotechnology: Fundamentals of Applied Microbiology. 1st edition. W.H. Freeman and Company
5. Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.
6. Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited.
7. Waites M.J., Morgan N.L., Rockey J.S. and Higton G. (2001). Industrial Microbiology: An Introduction. 1st edition. Wiley – Blackwell.

Semester – III

16MBU304A **(3H – 3C)**

MICROBIALQUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES

Instruction Hours / week:L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To make the students better to understand the aspects of skilled manufacturing practices, kinds of pathogenic microorganisms in food and quality control in food and pharmaceutical industries.
- Develop industry-oriented skills on developing drugs and food.
- To make the students to understand the food quality systems and advancement universally.
- It will explain the students about all kinds of bio safety levels in laboratories.
- To train the students to be competent working professionals in the food industry and pharmaceutical industry.
- To help the students to explain the production of quality food by imparting better nutritional, sanitation & hygiene concepts.

COURSE OUTCOME

- Imparts skilled knowledge on good manufacturing practices and food spoilage of different types of foods.
- Develop skills on Food and drug based microbiological analysis.
- To encourage students to the entrepreneurs and develop the capacity for setting up small scale enterprises with respect to food and pharmaceuticals within the country.
- To organize functions for creating awareness about the importance of safe processed nutritious food.
- To provide diagnostic analysis of food and pharmaceutical products.
- The students will be able to discuss the role of microorganisms in industry, as well as to carry out experiments to produce microbial metabolites.

Unit I – Microbiological Laboratory and Safe Practices

Good laboratory practices – Good microbiological practices. Biosafety cabinets – Working of biosafety cabinets, using protective clothing, specification for BSL-1, BSL-2, BSL-3.Discarding biohazardous waste – Methodology of Disinfection, Autoclaving & Incineration.

Unit II – Determining Microbes in Food / Pharmaceutical Samples

Sampling procedures for food, water, and air. Culture and microscopic methods – Standard plate count, membrane filtration,most probable numbers, direct microscopic counts, Biochemical and immunological methods: Limulus lysate test for endotoxin, gel, lot agglutination precipitation, sterility testing for pharmaceutical products. Molecular methods – Nucleic acid probes, PCR based detection, biosensors.

Unit III – Enrichment culture technique

Enrichment culture technique, Detection of specific microorganisms – on XLD agar, Salmonella Shigella Agar, Mannitol salt agar, EMB agar, MacConkey Agar, Saboraud Agar.

Unit IV – Pathogenic Microorganisms of Importance in Food & Water

Ascertaining microbial quality of milk by MBRT, Rapid detection methods of microbiological quality of milk at milk collection centres (COB, 10 min Resazurin assay).

Unit V – HACCP for Food Safety and Microbial Standards

Hazard analysis of critical control point (HACCP) - Principles, flow diagrams, limitations.Microbial Standards for Different Foods and Water – BIS specifications for common foods and drinking water.

SUGGESTED READINGS

1. Harrigan WF (1998) Laboratory Methods in Food Microbiology, 3rd edition, Academic Press
2. Garg N, Garg KL and Mukerji KG (2010). Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
3. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer.
4. Baird RM, Hodges NA and Denyer SP (2005). Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.

Semester – III

16MBU304B MICROBIAL DIAGNOSIS IN HEALTH CLINIC (3H – 3C)

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To provide an employment understanding of the natural history of infectious diseases in order to deal with the etiology, laboratory diagnosis, treatment and control of infections in the community.
- This course is aimed to Identify the species of pathogenic bacteria and fungi
- Determine the modes of transmission of infectious diseases and pathogenesis
- Know of the theoretical foundations for the differentiation of the major pathogenic groups
- To Determine the antimicrobials to be used in the sensitivity testing of different types of pathogens.
- Analyze and solve case studies involving bacterial and fungal agents

COURSE OUTCOME

- Provides employment knowledge to identify the common infectious agents with the help of laboratory procedures and use antimicrobial sensitivity tests to select suitable antimicrobial agents.
- It describes the basic mechanisms of pathogenesis of infectious diseases.
- It explains the basic principles of diagnosis, antimicrobial treatment, prevention and control of infectious diseases in the hospital and community.
- It helps the students to understand the host immune system and explain the host response to infection
- Understand and interpret basic laboratory tests for the diagnosis of infectious diseases.
- Apply the principles of molecular and immunological techniques for the diagnosis of infectious diseases.

Unit I– Importance of Diagnosis of Diseases

Bacterial, Viral, Fungal and Protozoan Diseases of various human body systems, Disease associated clinical samples for diagnosis.

Unit II – Collection of Clinical Samples

How to collect clinical samples (oral cavity, throat, skin, Blood, CSF, urine and faeces) and precautions required. Method of transport of clinical samples to laboratory and storage.

Unit III – Direct Microscopic Examination and Culture

Examination of sample by staining – Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa-stained thin blood film for malaria.Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, MacConkey agar, distinct colony properties of various bacterial pathogens.

Unit IV – Serological and Molecular Methods

Serological Methods - Agglutination, ELISA, immune fluorescence, Nucleic acid based methods – PCR, Nucleic acid probes, Typhoid, and HIV

Unit V – Testing for Antibiotic Sensitivity in Bacteria

Importance, Determination of resistance/sensitivity of bacteria using disc diffusion method (Kirby Bauer Method) Determination of minimal inhibitory concentration (MIC) of an antibiotic by broth dilution method.

SUGGESTED READINGS

1. Ananthanarayan R and Paniker CKJ (2009). Textbook of Microbiology, 8th edition, Universities Press Private Ltd.
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013). Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
3. Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology. 2nd edition, Elsevier India Pvt Ltd.
4. Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby
5. Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and Mccartney Practical Medical Microbiology, 14th edition, Elsevier.

Semester – III

16MBU311 ENVIRONMENTAL MICROBIOLOGY –PRACTICAL (3H – 2C)

Instruction Hours / week:L: 0 T: 0 P: 4Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 9 Hours

COURSE OBJECTIVES

- To educate students about skill oriented Environmental monitoring and environmental aspects of microbes.
- To impart a knowledge on Microbes and environment and ecological importance.
- To study the diversity of microorganism and microbial communities inhabiting a multitude of habitats and occupying a wide range of ecological habitats.
- Learn the occurrence, abundance and distribution of microorganism in the environment and their role in the environment and also learn different methods for their detection and characterization
- Competently explain various aspects of environmental microbiology and microbial ecology and to become familiar with current research in environmental microbiology.
- Understand various biogeochemical cycles – Carbon, Nitrogen, Phosphorus cycles etc. and microbes involved

COURSE OUTCOME

- Provides a comprehensive skilled overview of biogeochemical processes relevant to environmental scientists and engineers mediated by microorganisms.
- Understand various plant microbes interactions especially rhizosphere and their applications especially the biofertilizers and their production techniques
- Understand the basic principles of environment microbiology and be able to apply these principles to understanding and solving environmental problems – waste water treatment and bioremediation
- Know the Microorganisms responsible for water pollution especially Water-borne pathogenic microorganisms and their transmission
- Comprehend the various methods to determine the Sanitary quality of water and sewage treatment methods employed in waste water treatment
- Provide learning opportunities to critically evaluate research methodology and findings.

EXPERIMENTS

1. Analysisofsoil-pH,moisturecontent,waterholdingcapacity,percolation,capillaryaction.
2. Isolationofmicrobes(bacteria&fungi)fromsoil(28ºC&45ºC).
3. Isolationofmicrobes(bacteria&fungi)fromrhizosphereandrhizoplane.
4. Assessmentofmicrobiologicalqualityofwater.
5. DeterminationofBODofwastewatersample.
6. Studythepresenceofmicrobialactivitybydetecting(qualitatively)enzymes(dehydrogenase, amylaseand urease)insoil.
7. Isolationof*Rhizobium*fromrootnodules.

SUGGESTEDREADINGS

1. MaierRM,PepperILandGerbaCP.(2009).EnvironmentalMicrobiology.2nd edition,Academic Press.
2. Okafor,N(2011).EnvironmentalMicrobiologyofAquatic&Wastesystems.1st edition,Springer, NewYork.
3. AtlasRMandBarthaR.(2000).MicrobialEcology:Fundamentals&Applications. 4thedition. Benjamin/Cummings SciencePublishing,USA
4. SubbaRaoNS.(1999).SoilMicrobiology.4th edition.Oxford&IBHPublishingCo. NewDelhi.
5. BartonLL&NorthupDE(2011).MicrobialEcology.1st edition,WileyBlackwell,USA Campbell RE.(1983).MicrobialEcology.BlackwellScientificPublication,Oxford,England.
6. CoyneMS.(2001).SoilMicrobiology:AnExploratoryApproach.DelmarThomsonLearning.
7. LynchJM&HobbieJE.(1988).MicroorganismsinAction:Concepts&ApplicationinMicrobial Ecology.BlackwellScientificPublication,U.K.
8. MartinA.(1977).AnIntroductiontoSoilMicrobiology.2ndedition.JohnWiley&SonsInc.New York&London.
9. StolpH.(1988).MicrobialEcology:OrganismsHabitatsActivities.CambridgeUniversityPress, Cambridge,England.
10. MadiganMT,MartinkoJMandParkerJ.(2014).BrockBiologyofMicroorganisms.14thedition. Pearson/BenjaminCummings.
11. WilleyJM,SherwoodLM,andWoolvertonCJ.(2013).Prescott'sMicrobiology.9thedition. McGrawHillHigherEducation.
12. SinghA,Kuhad,RC&WardOP(2009).AdvancesinAppliedBioremediation.Volume17, Springer-Verlag,BerlinHedeilberg.

Semester – III

16MBU312 FOOD AND DAIRY MICROBIOLOGY– PRACTICAL (3H – 2C)

Instruction Hours / week: L: 0 T: 0 P: 4Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 9 Hours

COURSE OBJECTIVES

- To encode the importance of the role of microorganisms in food industries both in beneficial and harmful ways.
- To obtain a good entrepreneurial understanding of food and dairy products and become qualified as microbiologist in food and dairy industries.
- Understand the significance and activities of microorganisms in food and role of intrinsic and extrinsic factors on growth and survival of microorganisms in foods
- To know the spoilage mechanisms in foods and thus identify methods to control deterioration and spoilage
- Recognize and describe the characteristics of important pathogens and spoilage microorganisms in foods.
- To Learn various methods for their isolation, detection and identification of microorganisms in food and employ in industries.

COURSE OUTCOME

- Provides necessary entrepreneurial information on the food, dairy Microbiology in safety and quality perspective.
- It will help to study the importance in the prevention of contamination that might be caused by the microorganisms.
- To Learn various methods for their isolation, detection and identification of microorganisms in food and employ in industries
- Identify ways to control microorganisms in foods and thus know the principles involving various methods of food preservation
- Students can able to understand of the basis of food safety regulations and Discuss the rationale for the use of standard methods and procedures for the microbiological analysis of food
- Acquire, discover, and apply the theories and principles of food microbiology in practical, real-world situations and problems.

EXPERIMENTS

1. MBRT of milk samples

2. Standard plate count of milk sample.
3. Alkaline phosphatase test to check the efficiency of pasteurization of milk.
4. Isolation of food borne bacteria from food products.
5. Isolation of spoilage microorganisms from spoiled vegetables/fruits.
6. Isolation of spoilage microorganisms from bread.
7. Preparation of yogurt.

SUGGESTED READINGS

1. Jay JM, Loessner MJ and Golden DA. (2005). Modern Food Microbiology. 7th edition, CBS Publishers and Distributors, Delhi, India.
2. Frazier WC and Westhoff DC. (1992). Food Microbiology. 3rd edition. Tata McGraw-Hill Publishing Company Ltd, New Delhi, India.
3. Adams MR and Moss MO. (1995). Food Microbiology. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.
4. Gould GW. (1995). New Methods of Food Preservation. Blackie Academic and Professional, London.
5. Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.
6. Davidson PM and Brannen AL. (1993). Antimicrobials in Foods. Marcel Dekker, New York.
7. Dillion VM and Board RG. (1996). Natural Antimicrobial Systems and Food Preservation. CAB International, Wallingford, Oxon.
8. Lund BM, Baird Parker AC, and Gould GW. (2000). The Microbiological Safety and Quality of Foods. Vol. 1-2, ASPEN Publication, Gaithersberg, MD.
9. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.

Semester – III

16MBU313 INDUSTRIAL MICROBIOLOGY– PRACTICAL (3H – 2C)

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 9 Hours

COURSE OBJECTIVES

- To encompasses the use of microorganisms in the manufacture of food or industrial products on the basis of employment.
- Get equipped with a theoretical and practical understanding of industrial microbiology
- Appreciate how microbiology is applied in manufacture of industrial products
- Know how to source for microorganisms of industrial importance from the environment
- Know about design of bioreactors, factors affecting growth and production, heat transfer, oxygen transfer
- Understand the rationale in medium formulation & design for microbial fermentation, sterilization of medium and air.

COURSE OUTCOME

- Provides knowledge in the large-scale production of industrial product, and teaches the modern employment trends to cater the needs of industry.
- Students will differentiate the types of fermentation processes
- Understand the biochemistry of various fermentations
- Identify techniques applicable for Improvement of microorganisms based on known biochemical pathways and regulatory mechanisms
- Comprehend the techniques and the underlying principles in downstream processing
- Students can able to explore the practical skills in research activities.

EXPERIMENTS

1. Study of different parts of fermenter
2. Microbial fermentation – Production and estimation (qualitative and quantitative) of
    a) Enzymes : Amylase and Protease
    b) Amino acid : Glutamic acid
    c) Organic acid : Citric acid
    d) Alcohol : Ethanol
3. A visit to any educational institute/industry to see an industrial fermenter, and other downstream processing operations.

SUGGESTED READINGS

1. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.
2. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.
3. Okafor N. (2007). Modern Industrial Microbiology and Biotechnology. 1st edition. Bios Scientific Publishers Limited. USA.
4. Glaze A.N. and Nikaido H. (1995). Microbial Biotechnology: Fundamentals of Applied Microbiology. 1st edition. W.H. Freeman and Company.
5. Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.
6. Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited.
7. Waites M.J., Morgan N.L., Rockey J.S. and Higton G. (2001). Industrial Microbiology: An Introduction. 1st edition. Wiley – Blackwell.

Semester – III

16MBU314A **(3H – 1C)**

MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES– PRACTICAL

Instruction Hours / week:L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVE

- To make the students better to understand the aspects of skilled manufacturing practices, kinds of pathogenic microorganisms in food and quality control in food and pharmaceutical industries.
- Quality systems such as investigations, document management systems, Standard Operating Procedures (SOP), change management system, recall management and inspection management
- Food safety systems including hazard analysis critical control points and preventative control plans
- Principles of enumeration and identification of micro-organisms, using both traditional and rapid methods as well as the pharmacopoeial methods for the detection of specified organisms.
- To gain theoretical and practical knowledge on food and pharma industries.
- To encourage students to the entrepreneurs and develop the capacity for setting up small scale enterprises with respect to food within the country.

COURSE OUTCOME

- This paper imparts skilled knowledge on good manufacturing practices and food spoilage of different types of foods.
- Students can develop their entrepreneurial skills in food and pharma sectors.
- Good Manufacturing Practices (GMP) and associated guidelines for drugs, natural health products, cannabis and food
- Good documentation Practices (GDP) and Data Integrity (DI)
- Validation for equipment, methods, cleaning and process
- Quality systems such as investigations, document management systems, Standard Operating Procedures (SOP), change management system, recall management and inspection management.

EXPERIMENTS

1. Good manufacturing practices.
2. Most probable number test.

3. Isolation of pathogens from food samples.
4. Methylene blue reduction test.
5. Enumeration of microbial population from pharmaceutical samples.

SUGGESTED READINGS

1. Harrigan WF (1998) Laboratory Methods in Food Microbiology, 3rd edition, Academic Press.
2. Garg N, Garg KL and Mukerji KG (2010). Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
3. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer.
4. Baird RM, Hodges NA and Denyer SP (2005). Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.

Semester – III

16MBU314B (3H – 1C)

MICROBIAL DIAGNOSIS IN HEALTH CLINICS- PRACTICAL

Instruction Hours / week:L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To provide employment-oriented understanding of the natural history of infectious diseases in order to deal with the etiology, laboratory diagnosis, treatment and control of infections in the community.
- This course provides learning opportunities in the basic principles of medical microbiology and infectious disease.
- It covers mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- It also provides opportunities to develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

COURSE OUTCOME

- Acquire knowledge to identify the common infectious agents with the help of laboratory procedures and use antimicrobial sensitivity tests to select suitable antimicrobial agents on the basis of employment.
- Helps to understand the use of lab animals in medical field.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.
- Demonstrate theory and practical skills in microscopy and their handling techniques and staining procedures.
- It will help the students to understand the general bacteriology and microbial techniques for isolation of pure cultures of Microorganisms.

EXPERIMENTS

1. Collection and processing of clinical specimen – Sputum.

2. Collection and processing of clinical specimen – Urine.
3. Collection and processing of clinical specimen – Blood.
4. Collection and processing of clinical specimen – Stool.
5. Antibiotic sensitivity testing by Kirby-Bauer method
6. Determination of minimal inhibitory concentration.

SUGGESTED READINGS

1. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013). Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
2. Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and Mccartney Practical Medical Microbiology, 14th edition, Elsevier.
3. Greenwood D, Slack R, Barer M, and Irving W. (2012). Medical Microbiology, 18th Edition. Churchill Livingstone.
4. Ryan KJ and Ray CG. (2014). Sherris Medical Microbiology, 6th Edition. McGraw-Hill Professional.

Semester – IV

16MBU401 **IMMUNOLOGY** **(4H – 4C)**

Instruction Hours / week: L: 4 T: 0 P: 0Marks: Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To strengthen the knowledge of students in immunodiagnostics.
- To learn the latest trends in immunology.
- Rapid diagnosis and Immune reaction.
- To provide overview of immune system, antigen antibody structure and interactions.
- To develop understanding of innate and adaptive immunity along with major cells and molecules involved.
- To integrate immunology with health and enrich the knowledge for autoimmune disorders, hypersensitivity reaction

COURSE OUTCOME

- Introducing the employment aspect of immunology and to study various types of immune systems their classification structure and mechanism of immune activation.
- Upon completion students will gain knowledge of immune system, cells involved along with complement system and autoimmunity
- Develop understanding about immune system, antigen antibody interactions.
- Gain theoretical knowledge of various diseased conditions generated due to interplay of immune system components.
- Students can able to perform basic immunological assays.
- It will distinguish fundamental knowledge on immunology and its advancement.

Unit I – Introduction, Immune Cells and Organs

Concept of Innate and Adaptive immunity; Contributions of following scientists to the development of field of immunology – Edward Jenner, Karl Landsteiner, Robert Koch, Paul Ehrlich, Elie Metchnikoff, Peter Medawar, MacFarlane Burnet, Neils K Jerne, Rodney Porter and Susumu Tonegawa. Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, dendritic cell; and Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT, MALT, CALT.

Unit II – Antigens and Antibodies

Antigens – Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Haptens; Epitopes (T & B cell epitopes); T-dependent and T-independent antigens; Adjuvants. Antibodies – Structure, Types, Functions and Properties of antibodies; Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic); VDJ rearrangements; Monoclonal and Chimeric antibodies.

Unit III – Major Histocompatibility Complex, Complement System

MHC – Organization of MHC locus; Structure and Functions of MHC I & II molecules; Antigen processing and presentation (Cytosolic and Endocytic pathways). Complement system – Components of the Complement system; Activation pathways (Classical, Alternative and Lectin pathways); Biological consequences of complement Activation

Unit IV – Generation of Immune Response, Immunological Disorders and Tumor Immunity

Primary and Secondary Immune Response; Generation of Humoral Immune Response (Plasma and Memory cells); Generation of Cell Mediated Immune Response (Self MHC restriction, T cell activation, Co-stimulatory signals); Killing Mechanisms by CTL and NK cells, Introduction to tolerance. Types of Autoimmunity and Hypersensitivity with examples; Immunodeficiencies – Animal models (Nude and SCID mice), DiGeorge syndrome, Chediak-Higashi syndrome, Leukocyte adhesion deficiency, CGD; Transplation immunology, Graft versus host reaction Types of tumors, tumor Antigens, causes and therapy for cancers.

Unit V – Immunological Techniques

Principlesof precipitation, agglutination, complement fixation, Immunodiffusion, Immunoelectrophoresis, ELISA, ELISPOT, Western blotting, Immunofluoresence, Flow cytometry, Immunoelectron microscopy.

SUGGESTED READINGS

1. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6^{th} edition. W.H. Freeman and Company, New York.
2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11^{th} edition Wiley- Blackwell Scientific Publication, Oxford.
3. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7^{th} edition Garland Science Publishers, New York.
4. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6^{th} edition, Saunders Publication, Philadelphia.
5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2^{nd} edition ChurchillLivingstone Publishers, Edinberg.

Semester – IV

16MBU402 MEDICAL MICROBIOLOGY (4H – 4C)

Instruction Hours / week:L: 4 T: 0 P: 0 **Marks:** Internal: **40 External**: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To strengthen the knowledge of students in immunodiagnostics.
- To learn the latest trends in immunology.
- Rapid diagnosis and Immune reaction.
- To provide overview of immune system, antigen antibody structure and interactions.
- To develop understanding of innate and adaptive immunity along with major cells and molecules involved.
- To integrate immunology with health and enrich the knowledge for autoimmune disorders, hypersensitivity reaction

COURSE OUTCOME

- Introducing the employment aspect of immunology and to study various types of immune systems their classification structure and mechanism of immune activation.
- Upon completion students will gain knowledge of immune system, cells involved along with complement system and autoimmunity
- Develop understanding about immune system, antigen antibody interactions.
- Gain theoretical knowledge of various diseased conditions generated due to interplay of immune system components.
- Students can able to perform basic immunological assays.
- It will distinguish fundamental knowledge on immunology and its advancement.

Unit I – Normal micro flora of the human body and host pathogen interaction

Normal microflora of the human body: Importance of normal microflora, normal microflora of skin, throat, gastrointestinal tract, urogenital tract. Host pathogen interaction: Definitions – Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity, Carriers and their types, Opportunistic infections, Nosocomial infections. Transmission of infection, Pathophysiologic effects of LPS. Collection, transport and culturing of clinical samples – Sputum, Stool and Urine.

Unit II – Bacterial diseases

List of diseases of various organ systems and their causative agents.The following diseases in detail with symptoms, mode of transmission, prophylaxis and control.Respiratory

Diseases:*Streptococcus pyogenes, Haemophilus influenzae, Mycobacterium tuberculosis*. Gastrointestinal Diseases: *Escherichia coli, Salmonella typhi, Vibrio cholerae, Helicobacter pylori.* Others: *Staphylococcus aureus, Bacillus anthracis, Clostridium tetani, Treponema pallidum, Clostridium difficle.*

Unit III – Viral diseases

The detailed study of following diseases – Causative agents, Mode of transmissions, Pathogenicity, Symptoms and prophylaxis of Polio, Herpes, Hepatitis, Rabies, Dengue, AIDS, Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis

Unit IV – Fungal and Protozoan diseases

Brief description of each of the following types of mycoses and one representative disease to be studied with respect to transmission, symptoms and prevention. Cutaneous mycoses: Tinea pedis (Athlete's foot). Systemic mycoses: Histoplasmosis. Opportunistic mycoses: Candidiasis. The detailed study of following diseases – Causative agents, Mode of transmissions, Pathogenicity, Symptoms and prophylaxis of Amoebiasis, Giardiasis, Elephanttiasis, Taeniasis, Malaria, Kala-azar.

Unit V – Antimicrobial agents: General characteristics and mode of action

Antibacterial agents: Five modes of action with one example each: Inhibitor of nucleic acid synthesis; Inhibitor of cell wall synthesis; Inhibitor of cell membrane function; Inhibitor of protein synthesis; Antibiotic resistance - MDR, XDR, MRSA, NDM-1 – resistance mechanisms. Antifungal agents: Mechanism of action of Amphotericin B, Griseofulvin. Antiviral agents:Mechanism of action of Amantadine, Acyclovir, Azidothymidine.

SUGGESTED READINGS

1. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013). Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
2. Greenwood D, Slack R, Barer M, and Irving W. (2012). Medical Microbiology, 18th Edition. Churchill Livingstone.
3. Ryan KJ and Ray CG. (2014). Sherris Medical Microbiology, 6th Edition. McGraw-Hill Professional.
4. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
5. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition.
6. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007). Mims' Medical Microbiology. 4th edition. Elsevier.

7. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.

Semester – IV

16MBU403 RECOMBINANT DNA TECHNOLOGY (4H – 4C)

Instruction Hours / week:L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To learn the basic tools in recombinant technology
- To understand the various concepts of cloning vectors and cloning strategies
- To emphasize the knowledge in biotechnology and techniques.
- To familiarize the students to versatile tools and techniques employed in genetic engineering and recombinant DNA technology.
- A sound knowledge on procedural repertoire allows students to innovatively apply these in basic and applied fields of biological research.
- This course offers theoretical bases to properties and applications of versatile DNA modifying enzymes, cloning strategies, vector types, host genotype specificities for selection and screening of recombinants and/or recombinant transformants.

COURSE OUTCOME

- Imparts the entrepreneurial concepts of rDNA technology and their applications and Acquire knowledge on the applications of genetic engineering.
- Understand the difference between old biotechnology and modern biotechnology.
- Provide examples of current applications of biotechnology and advances in the different areas like medical, microbial, environmental, bioremediation, agricultural, plant, animal, and forensic sciences.
- Explain the general principles of generating transgenic plants, animals and microbes.
- Technical know-how on versatile techniques in recombinant DNA technology.
- An understanding on application of genetic engineering techniques in basic and applied experimental biology.

Unit I – Introduction to Genetic Engineering

Milestones in genetic engineering and Biotechnology cloning Tools; Restriction modification systems: Types I, II and III. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering. DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases

Unit II – Molecular Cloning- Tools and Strategies

Cloning Vectors: Definition and Properties Plasmid vectors: pBR and pUC series Bacteriophage lambda and M13 based vectors Cosmids, BACs, YACs. Use of linkers and adaptors. Expression vectors: *E.coli* lac and T7 promoter-based vectors, yeast YIp, YEp and YCp vectors, Baculovirus based vectors, mammalian SV40-based expression vectors

Unit III– Methods in Molecular Cloning

Transformation of DNA: Chemical method, Electroporation. Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral- mediated delivery, *Agrobacterium* - mediated delivery DNA, RNA and Protein analysis: Agarose gel electrophoresis, Southern - and Northern - blotting techniques, dot blot, DNA microarray analysis, SDS-PAGE and Western blotting.

UnitIV – DNA Amplification and DNA sequencing

PCR: Basics of PCR, RT-PCR, Real-Time PCR. Sanger's method of DNA Sequencing: traditional and automated sequencing. Primer walking and shotgun sequencing

UnitV – Construction and Screening of Genomic and cDNA libraries. Applications of Recombinant DNA Technology

Genomic and cDNA libraries: Preparation and uses, Screening of libraries: Colony hybridization and colony PCR, Chromosome walking and chromosome jumping. Products of recombinant DNA technology: Products of human therapeutic interest - insulin, hGH, antisense molecules. Bt transgenic - cotton, brinjal, Gene therapy, recombinant vaccines, protein engineering and site directed mutagenesis.

SUGGESTED READINGS

1. Brown TA. (2010). Gene Cloning and DNA Analysis. 6thedition. Blackwell Publishing, Oxford, U.K.
2. Clark DP and Pazdernik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA.
3. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7thedition. Blackwell Publishing, Oxford, U.K.
4. Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rdedition. Cold Spring Harbor Laboratory Press.
5. Wiley JM, Sherwood LM and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education.
6. Brown TA. (2007). Genomes-3. Garland Science Publishers
7. Primrose SB and Twyman RM. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.

Semester – IV

16MBU404A **BIOFERTILIZERS AND BIOPESTICIDES** **(3H – 3C)**

Instruction Hours / week:L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To demonstrate the techno-economic viability of the biofertilizers / biopesticides to farmers through field demonstration at farmer's field & by know-how training.
- To study about the biofertilizers in increasing soil fertility and usage of Biopesticides for plant disease.
- To prepare literature and promulgate in local language through booklets / documents etc. about; the benefits of biofertilizers for farming in villages through trained beneficiaries/ cultivators as multiplier impact.
- To demonstrate the effectiveness of biofertilizer cultural practices in the farmers fieldsfor enhanced crop productivity through bioreclamation of waste/ marginal land
- To raise the rural/tribal economy & living standard of the lowly of the lowest backward farming community especially SC & ST and marginal farmers.
- To create self employment opportunities to weaker underprivileged SC & ST and marginal farmers.

COURSE OUTCOME

- This course has been designed to provide the student knowledge about ecofriendly product which play a crucial role in determining its future use and applications in environmental management.
- Provides detailed entrepreneurial idea about biofertilizer production and plant disease.
- To produce and impart training of ecofriendly agricultural inputs so as to nullify the ill effects of chemical fertilizers.
- To demonstrate the know-how technology pertinent to microbiological and physico-chemical analyses of soil samples and their assessment.
- To demonstrate the low-cost media preparation and cultural practices in biofertilizer / biopesticide production.
- Students can able to develop fundamental aspects of to seed/seed material/seedlings/soil/waste matter/crop residues in order to increase the population

Unit I– Biofertilizers

General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers. Symbiotic N2 fixers:*Rhizobium* – Isolation, characteristics, types, inoculum production and field application, legume/pulses plants. *Frankia* – Isolation and characteristics, Alder, Casurina plants, non-leguminous crop symbiosis. Cyanobacteria, *Azolla* – Isolation, characterization, mass multiplication, their role in rice cultivation, crop response and field application.

Unit II – Non-Symbiotic Nitrogen Fixers

Free living *Azospirillum*, *Azotobacter* – isolation, characteristics, mass production and field application.

Unit III – Phosphate Solubilizers
Phosphate solubilizing microbes – Isolation, characterization, mass production, field application.

Unit IV – Mycorrhizal Biofertilizers
Importance of mycorrizal inoculum, types of mycorrhizae and associated plants, Mass production of VAM, field applications of Ectomycorrhizae and VAM.

Unit V– Biopesticides
General account of microbes used as bio-insecticides and their advantages over synthetic pesticides, *Bacillus thuringiensis*, production, Field applications, Viruses – cultivation and field applications.

SUGGESTED READINGS

1. Kannaiyan, S. (2003). Bioetchnology of Biofertilizers, CHIPS, Texas.
2. Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth Press, Inc. New York.
3. Reddy, S.M. *et. al.* (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.
4. Subba Rao N.S (1995) Soil microorganisms and plant growth Oxford and IBH publishing co. Pvt. Ltd. NewDelhi.
5. Saleem F and Shakoori AR (2012) Development of Bioinsecticide, Lap Lambert Academic Publishing GmbH KG.
6. Aggarwal SK (2005) Advanced Environmental Biotechnology, APH publication.

Semester – IV

16MBU404B **PERSONAL HEALTH CARE** **(3H – 3C)**

Instruction Hours / week:L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To strengthen the knowledge of personal health care to students through a detailed study on vaccine and its schedule throughout the life time for all age group.
- Increase the focus on health promotion and prevention, screening and early intervention; and
- Improve quality, safety, performance and accountability.
- To provide health care services aimed at preventing health problems.
- To work with health care professionals
- To counsel and educate the patients and their families

COURSE OUTCOME

- Introducing the skilled basics about the health care and to study various types of vaccines to control the life time infectious disease.
- Demonstrate understanding of the role of health in the practice of health promotion
- Discuss the concepts of health, health education, health promotion and some related terms
- To develop Personal Health Knowledge to achieve societal benefits on health care system.
- Upon completion students will gain knowledge personal health care system.
- Gain theoretical knowledge of various diseased conditions generated due to interplay of immune system components.

Unit I

Vaccination: History –Types of vaccines –conventional and modern vaccines, Route of administrations – mechanisms of inducing immunity.

UnitII

Vaccination schedule for adults - Hepatitis B vaccines, MMR – Tetanus - Varicella vaccines.Vaccines for travelers.

UnitIII

Vaccines for 50 - year-old adult - types and routes.Vaccines for 65 – year - old adult - types and routes.Vaccines for healthcare workers.

UnitIV

Child health management - General health - Types of infection in child - Growth and development – Nutrition and fitness - Positive parenting.

UnitV

Vaccination schedule in children – New born - Child below 5yrs - Child below 10years Vaccines at adolescent age. Vaccine risks and safety.

SUGGESTED READINGS

1. Gary S. Marshall, M.D. 2015. The Vaccine Handbook: A Practical Guide for Clinicians. 5th Edition. Professional Communications Publishers.
2. International Travel and Health. WHO Guide. 2012.
3. Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine-Preventable Diseases. 2012. 12th edition.
4. Vaccine Administration, Recommendations and Guidelines. CDC. 2012.
5. Chaudhri, A.K., (Editor) 1998. Tripathy, G.C. and D. Sharma - Common sense rules for wellbeing. Naval Printing Press, New Delhi.
6. Dunne, J., (Editor) 1997. Webb, M., R. Scott and P. Beale - First aid manual. 7th Edition. Dorling Kindersley Ltd., London.
7. Nadkarni, S.S., 1995. Anatomy and Physiology. Syndicate Pvt. Ltd, Chennai.
8. Prasada Rao, J.V.R., 1999. Manual for Control of Hospital Associated Infections National AIDS Control Organization. Ministry of Health and Family Welfare, Government of India. New Delhi.
9. Reed, G. (Editor), 1998. Prescott and Dunn's Industrial Microbiology. 4th Edition, CBS Publishers and Distributors, New Delhi.

Semester – IV

16MBU411 IMMUNOLOGY– PRACTICAL (3H – 2C)

Instruction Hours / week:L: 0 T: 0 P: 4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 6 Hours

COURSE OBJECTIVES

- To strengthen the knowledge of students in immunodiagnostics on skill basis.
- To learn the latest trends in immunology.
- Rapid diagnosis and Immune reaction.
- To provide overview of immune system, antigen antibody structure and interactions.
- To develop understanding of innate and adaptive immunity along with major cells and molecules involved.
- To integrate immunology with health and enrich the knowledge for autoimmune disorders, hypersensitivity reaction.

COURSE OUTCOME

- Introducing the science of immunology and to study various types of immune systems their classification structure and mechanism of immune activation.
- Upon completion students will gain knowledge of immune system, cells involved along with complement system and autoimmunity
- Develop understanding about immune system, antigen antibody interactions.
- Gain theoretical knowledge of various diseased conditions generated due to interplay of immune system components.
- After course completion, students can apply the knowledge in further studies and higher education.
- Knows the concepts of advanced immunological assays.

EXPERIMENTS

1. Identification of human blood groups.
2. Perform Total Leukocyte Count of the given blood sample.
3. Perform Differential Leukocyte Count of the given blood sample.
4. Separate serum and plasma from the blood sample (demonstration).
5. Perform immunodiffusion by Ouchterlony method.
6. Perform DOT ELISA.
7. Perform immunoelectrophoresis.

SUGGESTED READINGS

1. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition, W.H. Freeman and Company, New York.
2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11th edition, Wiley- Blackwell Scientific Publication, Oxford.

3. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition, Garland Science Publishers, New York.
4. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition, Saunders Publication, Philadelphia.
5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.
6. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.

Semester – IV

16MBU412 MEDICAL MICROBIOLOGY - PRACTICAL (3H – 2C)

Instruction Hours / week:L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 9 Hours

COURSE OBJECTIVES

- To introduce the knowledge of the medically important microganisms, microbial morphology with the main focuses being the characterization, isolation and identification of different microorganism.
- The aim of Medical Microbiology course is to introduce basic principles and application relevance of clinical disease for students who are in preparation for physicians.
- The content of rigorous course includes many etiological agents responsible for global infectious diseases.
- It covers all biology of bacteria, viruses and other pathogens related with infectious diseases in humans.
- The course will provide the conceptual basis for understanding pathogenic microorganisms and particularly address the fundamental mechanisms of their pathogenicity.
- It will develops the basic skills on handling clinical pathogens.

COURSE OUTCOME

- It provides the entrepreneurial ability to characterize, isolate and identify different microbes.
- It includes a detailed study of characterization, etiology, pathogenicity, clinical systems, and laboratory diagnosis of disease-causing Microorganisms.
- It will also provide opportunities for a student to develop diagnostic skills in microbiology, including the practical application and interpretation of laboratory tests for the diagnosis of infectious diseases.
- Comprehend the various methods for identification of unknown microorganisms.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Demonstrate practical skills in fundamental microbiological techniques.

EXPERIMENTS

1. Identify bacteria (any three of *E. coli*, *Salmonella*, *Pseudomonas*, *Staphylococcus*, *Bacillus*) using laboratory strains on the basis of cultural, morphological and biochemical characteristics: IMViC, TSI, nitrate reduction, urease production and catalase tests.
2. Study of composition and use of important differential media for identification of bacteria: EMB Agar, MacConkey agar, Mannitol salt agar, Deoxycholate citrate agar, TCBS, Salmonella Shigella/BSA Agar.
3. Study of bacterial flora of skin by swab method.
4. Antibacterial sensitivity assay by Kirby-Bauer method.
5. Determination of minimal inhibitory concentration (MIC) of an antibiotic.

6. Study symptoms of the diseases with the help of photographs: Polio, anthrax, herpes, chicken pox, HPV warts, AIDS (candidiasis), dermatomycoses (ring worms).
7. Study of various stages of malarial parasite in RBCs using permanent mounts.

SUGGESTED READINGS

1. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013). Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
2. Greenwood D, Slack R, Barer M, and Irving W. (2012). Medical Microbiology, 18th Edition. Churchill Livingstone.
3. Ryan KJ and Ray CG. (2014). Sherris Medical Microbiology, 6th Edition. McGraw-Hill Professional.
4. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
5. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition.
6. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007). Mims' Medical Microbiology. 4th edition. Elsevier
7. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.

Semester – IV

16MBU413 RECOMBINANT DNA TECHNOLOGY – PRACTICAL (3H – 2C)

Instruction Hours / week:L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 9 Hours

COURSE OBJECTIVES

- To learn the entrepreneurial basic tools in recombinant technology
- To understand the various concepts of cloning vectors and cloning strategies
- To emphasize the knowledge in biotechnology and techniques.
- Provide idea about DNA, protein purification from samples and quantification.
- To learn the techniques pertaining to amplification of biological molecules.
- To impart knowledge on basic microbial isolation and identification approaches

COURSE OUTCOME

- Imparts the concepts of rDNA technology and their applications and Acquire knowledge on the applications of genetic engineering.
- Students will develop understanding about isolation and enumeration of microorganisms from various samples.
- Microbial identification and characterization using a number of approaches will be well understood.
- Acquainted with molecular modification approaches that encompass extraction, purification, quantification and augmentation.
- To give basic understanding of microbial genetic manipulations
- To understand working of different laboratory equipments used in microbiological laboratories

EXPERIMENTS

1. Preparation of competent cells for transformation.
2. Demonstration of Bacterial Transformation and calculation of transformation efficiency.
3. Digestion of DNA using restriction enzymes and analysis by agarose gel electrophoresis
4. Ligation of DNA fragments.
5. Cloning of DNA insert and Blue white screening of recombinants.
6. Interpretation of sequencing gel electropherograms.
7. Designing of primers for DNA amplification.
8. Amplification of DNA by PCR.
9. Demonstration of Southern blotting.

Suggestedreading

1. Brown TA. (2010). Gene Cloning and DNA Analysis. 6thedition. Blackwell Publishing, Oxford, U.K.
2. Clark DP and Pazdernik NJ. (2009). Biotechnology: Applying the Genetic Revolution. ElsevierAcademic Press, USA.

3. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.
4. Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. ColdSpring Harbor Laboratory Press
5. Wiley JM, Sherwood LM and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education
6. Brown TA. (2007). Genomes-3. Garland Science Publishers
7. Primrose SB and Twyman RM. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.

Semester – IV

16MBU414A BIOFERTILIZERS AND BIOPESTICIDES- PRACTICAL (3H – 1C)

Instruction Hours / week:L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To study about the biofertilizers in increasing soil fertility and usage of Biopesticides for plant disease on the entrepreneurial basis.
- Appreciate the diversity of microorganism and microbial communities inhabiting a multitude of habitats and occupying a wide range of ecological habitats.
- Learn the occurrence, abundance and distribution of microorganism in the environment and their role in the environment and also learn different methods for their detection and characterization
- Competently explain various aspects of environmental microbiology and microbial ecology and to become familiar with current research in environmental microbiology.
- Understand various biogeochemical cycles – Carbon, Nitrogen, Phosphorus cycles etc. and microbes involved
- Understand various plant microbes interactions especially rhizosphere, phyllosphere and mycorrhizae and their applications especially the biofertilizers and their production techniques

COURSE OUTCOME

- Provide the student knowledge about eco friendly product which play a crucial role in determining its future use and applications in environmental management.
- Provides detailed idea about biofertilizer production and plant disease.
- Understand the basic principles of environment microbiology and be able to apply these principles to understanding and solving environmental problems
- waste water treatment and bioremediation
- Know the Microorganisms responsible for water pollution especially Water-borne pathogenic microorganisms and their transmission
- Comprehend the various methods to determine the Sanitary quality of water and sewage treatment methods employed in waste water treatment

EXPERIMENTS

1. Isolation and identification of *Rhizobium* spp. from root nodules – mass production and application.
2. Isolation and identification of *Azotobacter* spp. – mass production and application.
3. Isolation and identification of *Azospirillum* spp. – mass production and application.
4. Isolation and identification of phosphate solubilizing bacteria – mass production and application.
5. Isolation and identification of mycorrhizae.
6. Isolation and maintenance of *Azolla*.
7. Isolation and identification of *Anabena* and *Nostoc* – its mass cultivation.
8. Isolation, identification and maintenance of *Bacillus thuringiensis*.
9. Isolation and identification of *Trichoderma viridae* – its mass cultivation.
10. Isolation and identification of *Beauveria bassiana* – its mass cultivation.

SUGGESTED READINGS

1. Kannaiyan, S. (2003). Biotechnology of Biofertilizers, CHIPS, Texas.
2. Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth Press, Inc. New York.
3. Reddy, S.M. *et. al.* (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.
4. Subba Rao N.S (1995) Soil microorganisms and plant growth Oxford and IBH publishing co. Pvt. Ltd. NewDelhi.
5. Saleem F and Shakoori AR (2012) Development of Bioinsecticide, Lap Lambert Academic Publishing GmbH KG.

Semester – IV

16MBU414B PERSONAL HEALTH CARE – PRACTICAL (3H – 1C)

Instruction Hours / week:L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To strengthen the skilled knowledge of personal health care to students through a detailed study on vaccine and its schedule throughout the life time for all age group.
- Demonstrate understanding of the role of health in the practice of health promotion
- Discuss the concepts of health, health education, health promotion and some related terms
- Identify social determinants of health
- List the levels of disease prevention
- To distinguish microbial concept on normal micro flora and pathogens.

COURSE OUTCOME

- Introducing the skilled basics about the health care and to study various types of vaccines to control the life time infectious disease.
- Personal Health and disease, influence of family and community
- Culture, beliefs, attitudes, and stigmatized illnesses
- To make the understanding on Leading causes of death, risk factors, and prevention
- To distinguish three levels of health promotion/disease prevention
- To build a consumer-focused integrated primary health care system.

EXPERIMENTS

1. Effect of hand-wash on microbial load.
2. Isolation of Various kinds of skin microflora.
3. Effectiveness of antimicrobial clothes
4. Normal flora and pathogen of mouth.
5. Evaluation of disinfectants and antiseptics.

SUGGESTED READINGS

1. Chaudhri, A.K., (Editor) 1998. Tripathy, G.C. and D. Sharma - Common sense rules for wellbeing. Naval Printing Press, New Delhi.
2. Dunne, J., (Editor) 1997. Webb, M., R. Scott and P. Beale - First aid manual. 7th Edition. Dorling Kindersley Ltd., London.
3. Nadkarni, S.S., 1995. Anatomy and Physiology. Syndicate Pvt. Ltd, Chennai.

4. Prasada Rao, J.V.R., 1999. Manual for Control of Hospital Associated Infections National AIDS Control Organisation. Ministry of Health and Family Welfare, Government of India. New Delhi.
5. Reed, G. (Editor), 1998. Prescott and Dunn's Industrial Microbiology. 4th Edition, CBS Publishers and Distributors, New Delhi.

16MBU501A MANAGEMENT OF HUMAN MICROBIAL DISEA SES (4H – 4C) Semester – V

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To provide a strong base in the fundamentals of pathogens.
- To learn techniques and methods used in the cultivation and isolation of pathogens.
- To obtain with the knowledge about the habitat and characteristics of pathogens in detail.
- Develop understanding about immune system, antigen antibody interactions.
- Gain theoretical knowledge of various diseased conditions generated due to interplay of immune system components.
- Theoretical knowledge on techniques employed for culturing and detection of plant and animal viruses.

COURSE OUTCOME

- Develop employability skills for identification, classification, and characterization of various pathogens.
- To describe and practice the basic principles of chemotherapy and disinfection through laboratory exercises accompanied by case studies.
- Upon completion, students gained the knowledge of most common medically important organism and the infections they cause.
- Different approaches, techniques and tools used to identify pathogens and control them.
- Diagnostic approaches for microbial pathogens
- Developing efficient vaccines and new drugs

Unit I – Human Diseases

Infectious and non-infectious diseases, microbial and non-microbial diseases, Deficiency diseases, occupational diseases, Incubation period, mortality rate, nosocomial infections

Unit II – Microbial diseases

Respiratory microbial diseases, gastrointestinal microbial diseases, Nervous system diseases, skin diseases, eye diseases, urinary tract diseases, Sexually transmitted diseases: Types, route of infection, clinical systems and general prevention methods, study of recent outbreaks of human diseases (SARS/ Swine flu/Ebola) – causes, spread and control, Mosquito borne disease – Types and prevention.

Unit III – Therapeutics of microbial diseases

Treatment using antibiotics: beta lactam antibiotics (penicillin, cephalosporins), quinolones, polypeptides and aminoglycosides**.** Judicious use of antibiotics, importance of completing antibiotic regimen, Concept of DOTS, emergence of antibiotic resistance, current issues of MDR/XDR microbial strains. Treatment using antiviral agents: Amantadine, Acyclovir, Azidothymidine. Concept of HAART.

Unit IV – Prevention of microbial Diseases

General preventive measures, Importance of personal hygiene, environmental sanitation and methods to prevent the spread of infectious agents transmitted by direct contact, food, water and insect vectors.

Unit V – Vaccines and immune prophylaxis
Importance, types, vaccines available against microbial diseases, vaccination schedule (compulsory and preventive) in the Indian context.

SUGGESTED READINGS

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier.
4. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.
5. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition.

Semester – V

16MBU501B MICROBIOLOGICAL ANALYSIS OF AIR AND WATER (4H – 4C)

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVE

- To impart knowledge microflora of air and water, sample collection, analysis and control of diseases.
- This paper is designed with the objective to impart hand-on experience and laboratory skills to students in area of bioprocess.
- Learning the basic principles of environment microbiology and be able to apply these principles to understanding and solving problems in current environmental, air and water issues.
- The students will develop set of skills to recognize the ecological problems and critical evaluation of the human impacts on pollution, climate changes and as well as environmental protection.
- To reduce volume of sludge, to stabilize organic solids, and to recover resources. Typical Methods of Treatment: Thickening, chemical addition, centrifugation, filtration, digestion, incineration.
- Quality systems such as investigations, document management systems, Standard Operating Procedures (SOP), change management system, recall management and inspection management

COURSE OUTCOME

- Provides employability skills involved in the air and water analysis
- Characterization of microorganisms from water and air samples
- Students will get the basic knowledge how to prepare and perform sampling and microbial analyses to determine the abundance, growth rate and microbial community composition together with the basic environmental parameters.
- Validation for equipment, methods, cleaning and process
- Students can develop their entrepreneurial skills in analysis of air and water sample.
- Learning the basic principles of microbiological analysis of environmental sector.

Unit I – Aero microbiology

Bioaerosols, Air borne microorganisms (bacteria, viruses, fungi) and their impact on human health and environment, significance in food and pharma industries and operation theatres, allergens

Unit II – Air Sample Collection and Analysis

Bioaerosol sampling, air samplers, methods of analysis, CFU, culture media for bacteria and fungi, Identification characteristics

Unit III – Control Measures

Fate of bioaerosols, inactivation mechanisms – UV light, HEPA filters, desiccation, Incineration. Precipitation, chemical disinfection, filtration, high temperature, UV light

Unit IV – Water Microbiology

Water borne pathogens and water borne diseases

Unit V – Microbiological Analysis of Water

Sample Collection, Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive/MPN tests confirmed and completed tests for faecal coliforms (b) Membrane filter technique and (c) Presence/absence tests

SUGGESTED READINGS

1. Da Silva N, Taniwaki MH, Junqueira VC, Silveira N, Nascimento MS, Gomes RAR (2012) Microbiological Examination Methods of Food and Water. A Laboratory Manual, CRC Press.
2. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA.
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press.
4. Hurst CJ, Crawford RL, Garland JL, Lipson DA (2007). Manual of Environmental Microbiology, 3rd edition, ASM press.

Semester – V

16MBU502A BIOMATHEMATICS AND BIOSTATISTICS (4H – 4C)

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

SCOPE

- This course has been intended to provide the learner insights into helpful areas of Statistics which plays an essential role in present, future use and applications of Biology.
- This course provides an introduction to a variety of statistical methods of use in describing and analyzing biological data.
- It includes a laboratory component in which biological data are analyzed using statistical software. No prior knowledge of the software will be assumed.
- Statisticians help to design data collection plans, analyze data appropriately and interpret and draw conclusions from those analyses.
- To develop students' skills in algebraic manipulation, the calculus of linear and non-linear differential equations, mathematical modelling, matrix algebra and statistical methods.
- To introduce students to the application of mathematical modeling in the analysis of biological systems including populations of molecules, cells and organisms.
- To show how mathematics, statistics and computing can be used in an integrated way to analyse biological systems.

OBJECTIVE

- Students get an idea about collection, interpretation and presentation of statistical data.
- Statistics, a branch of applied Mathematics, is regarded as mathematics applied to observational data.
- Conceivably everything dealing with the collection, processing, analysis and interpretation of numerical data belongs to the domain of statistics.
- To introduce students to the use of R for the analysis of biological processes and data, including simple computer programming.
- have an enhanced knowledge and understanding of mathematical modeling and statistical methods in the analysis of biological systems;
- be able to analyse data from experiments and draw sound conclusions about the underlying processes using their understanding of mathematics and statistics be better able to assess biological inferences that rest on mathematical and statistical arguments.

Unit I

Sets. Functions and their graphs : polynomial, sine, cosine, exponential and logarithmic functions. Motivation and illustration for these functions through projectile motion, simple pendulum, biological rhythms, cell division, muscular fibres etc. Simple observations about these functions like increasing, decreasing and, periodicity. Sequences to be introduced through the examples arising in Science beginning with finite sequences, followed by concepts of recursion and difference equations. For instance, the Fibonacci sequence arising from branching habit of trees and breeding habit of rabbits.

Unit II

Intuitive idea of algebraic relationships and convergence. Infinite Geometric Series. Series formulas for ex, log (1+x), sin x, cos x. Step function. Intuitive idea of discontinuity, continuity and limits. Differentiation. Conception to be motivated through simple concrete examples as given above from Biological and Physical Sciences. Use of methods of differentiation like Chain rule, Product rule and Quotient rule. Second order derivatives of above functions. Integration as reverse process of differentiation.Integrals of the functions introduced above. Differential Equations of first order, Linear Differential Equations. Points in plane and space and coordinate form. Examples of matrices arising in Biological Sciences and Biological networks. Sum and Produce of matrices upto order3.

Unit III

Measures of central tendency, Measures of dispersion; skewness, kurtosis; Elementary Probability and basic laws; Discrete and Continuous Random variable, Mathematical Expectation; Curve Fitting; Correlation and Regression. Emphasis on examples from Biological Sciences.

Unit IV

Mean and Variance of Discrete and Continuous Distributions namely Binomial, Poisson, Geometric, Weibull, Logistic and Normal distribution. Fitting of Distributions; Statistical methods: Scope of statistics: utility and misuse. Principles of statistical analysis of biological data.

Unit V

Sampling parameters. Difference between sample and Population, Sampling Errors, Censoring, difference between parametric and non-parametric statistics. Sampling Distributions, Standard Error, Testing of Hypothesis, Level of Significance and Degree ofFreedom; Large Sample Test based on Normal Distribution, Small sample test based on t-test, Z- test and F test; Confidence Interval; Distribution-free test - Chi-square test; Basic Introduction to Multivariate statistics, etc.

SUGGESTED READINGS

1. H. S. Bear: Understanding Calculus, John Wiley and Sons (Second Edition); (2003).
2. E. Batschelet : Introduction to Mathematics for Life Scientists,Springer Verlag, InternationalStudent Edition, Narosa Publishing House, New Delhi; (1975)
3. Edmondson and D. Druce : Advanced Biology Statistics, Oxford University Press; (1996).
4. W. Danial:Biostatistics: A foundation for Analysis in Health Sciences, John Wiley and Sons Inc; (2004).

16MBU502B	**BIOINFORMATICS**	**Semester – V** **(4H – 4C)**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To detail the importance of computer in field of life sciences.
- To obtain good understanding about the interpretation of biological data base.
- To uptake knowledge in latest tools and technology.
- Aimed to provide an overview of various bioinformatics tools, databases available and sequence analysis
- Provide knowledge on database concept, management, retrieval along with utilization in gene and protein analysis.
- To get introduced to the basic concepts of Bioinformatics and its significance in Biological data analysis.

COURSE OUTCOME

- Provides computational skill on search engines and various software tools involved in bioinformatics
- It will impart computational based techniques which includes genomics and proteomics in Bioinformatics.
- Retrieve information from available databases and use them for microbial identifications and drug designing
- Gain ability to modify gene and protein structures in simulated systems.
- Introduction to the basics of sequence alignment and analysis.
- Describe about the different types of Biological databases.

Unit I– Introduction to Computer Fundamentals
RDBMS - Definition of relational database. Mode of data transfer (FTP, SFTP, SCP), advantage of encrypted data transfer.

Unit II– Introduction to Bioinformatics and Biological Databases
Biological databases– nucleic acid, genome, protein sequence and structure, geneexpression databases, Database of metabolic pathways, Mode of data storage - File formats - FASTA, Genbank and Uniprot, Data submission & retrieval from NCBI, EMBL, DDBJ, Uniprot, PDB.

Unit III– Sequence Alignments, Phylogeny and Phylogenetic trees
Local and Global Sequence alignment, pairwise and multiple sequence alignment. Scoring an alignment, scoring matrices, PAM & BLOSUM series of matrices. Types of phylogenetic trees, Different approaches of phylogenetic tree construction - UPGMA,Neighbour joining, Maximum Parsomony, Maximum likelihood.

Unit IV– Genome organization and analysis
Diversity of Genomes: Viral, prokaryotic & eukaryotic genomesGenome, transcriptome, proteome, 2-D gel electrophoresis, Maldi Tof spectroscopy. Major features of completed genomes: *E.coli, S.cerevisiae, Arabidopsis*, Human.

Unit V – Protein Structure Predictions

Hierarchy of protein structure - primary, secondary and tertiary structures, modeling. Structural Classes, Motifs, Folds and Domains. Protein structure prediction in presenceand absence of structure template Energy minimizations and evaluation by Ramachandran plot Protein structure and rational drug design.

SUGGESTED READINGS

1.Saxena Sanjay (2003) A First Course in Computers, Vikas Publishing.
2.Pradeep and Sinha Preeti (2007) Foundations of Computing, 4^{th} ed., BPB Publications.
3.Lesk M.A.(2008) Introduction to Bioinformatics . Oxford Publication, 3^{rd} International Student Edition.
4. Rastogi S.C., Mendiratta N. and Rastogi P. (2007) Bioinformatics: methods and applications, genomics, proteomics and drug discovery, 2^{nd} ed. Prentice Hall India Publication.
5.Primrose and Twyman (2003) Principles of Genome Analysis & Genomics. Blackwell.

Semester – V

16MBU503A INSTRUCTION AND BIOTECHNIQUES **(4H – 4C)**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

To develop skills related to

- Understand the principles of various instruments used in the life sciences
- Ability to operate the instruments
- Data analysis and interpretations
- Introduce the basic concept of qualitative and quantitative analysis of a given sample
- Study various spectroscopic techniques and its instrumentation.
- Study the concept of separation science and its applications.
- To learn the fundamentals of research methodology, working principles and applications of instruments used in biology.

COURSE OUTCOME

- offers the students with an opportunity to develop skill on the bioinstrumentation and concepts of principles and applications.
- Define and explain various fundamentals of spectroscopy, qualitative and quantitative analysis
- and characterize functionalities of biomolecules by using spectroscopic techniques.
- Explain the various separation techniques and its instrumentation.
- Describe the principle and working of various radiation detectors.
- Evaluate the various types & applications of chromatography and electrophoresis.
- Appreciate the working principles and applications of Microscopy.

Unit I– Microscopy

Brightfield and darkfield microscopy, Fluorescence Microscopy, Phase contrast Microscopy, Confocal Microscopy, Electron Microscopy (Scanning and Transmission Electron Microscopy).

Unit II – Chromatography

Principles and applications of paper chromatography (including Descending and 2-D), Thin layer chromatography. Column Chromatography - packing types (IEC, AC, SEC), fraction collection. GLC and HPLC.

Unit III – Electrophoresis

Principle and applications of native polyacrylamide gel electrophoresis, SDS- polyacrylamide gel electrophoresis, 2D gel electrophoresis, Isoelectric focusing, Zymogram preparation and Agarose gel electrophoresis.

Unit IV – Spectrophotometry

Principle, Instrumentation and application of spectrophotometer, colorimeter and turdibometer.

Unit V – Centrifugation

Principles of centrifugations – RCF and sedimentation coefficient. Types of centrifuges – rotors - fixed angle and swinging bucket rotors. Types of Centrifugation – differential, density gradient and ultracentrifugation. Analytical centrifugation.

SUGGESTED READINGS

1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7th Ed., Cambridge University Press.
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
3. Willey MJ, Sherwood LM & Woolverton CJ. (2013). Prescott, Harley and Klein's Microbiology. 9th Ed., McGraw Hill.
4. Karp G. (2010) Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons. Inc.
5. De Robertis EDP and De Robertis EMF. (2006). Cell and Molecular Biology. 8th edition. Lipincott Williams and Wilkins, Philadelphia.
6. Cooper G.M. and Hausman R.E. (2009). The Cell: A Molecular Approach. 5th Edition. ASM Press & Sunderland, Washington D.C., Sinauer Associates, MA.
7. Nigam A and Ayyagari A. 2007. Lab Manual in Biochemistry, Immunology and Biotechnology. Tata McGraw Hill.

Semester – V

16MBU503B PLANT PATHOLOGY (4H – 4C)

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

- This paper aims at introducing students to the basic and applied aspects of plant biotechnology.
- Introduce students to the basic principles and concepts of plant pathology.
- Introduce and illustrate the major groups of organisms that cause plant diseases.
- Enhance student's understanding of scientific research, especially as it applies to the science of plant pathology and the study of microorganisms.
- Provide a framework that students can use in their profession to best approach plant disease management.
- Prepare students for additional classes in Plant Pathology and related disciplines.

COURSE OUTCOME

- This will enable for learning the techniques to save endangered species which will be useful for mankind
- Describe the concepts of what constitutes disease in plants.
- Identify major principles of plant pathology.
- Recognize the etiological agents of disease.
- Employ methods to diagnose and manage a wide range of plant diseases.
- Describe aspects of integrated pest management.

Unit I – Introduction and History of plant pathology
Concept of plant disease- definitions of disease, disease cycle and pathogenicity, symptoms associated with microbial plant diseases, types of plant pathogens, economic losses and social impact of plant diseases. Significant landmarks in the field of plant pathology- Contributions of Anton DeBary, Millardet, Burrill, E. Smith, Adolph Mayer, Ivanowski, Diener, Stakman, H.H. Flor, Van Der Plank, molecular Koch's postulates. Contributions of eminent Indian plant pathologists.

Unit II – Stages in development of a disease
Infection, invasion, colonization, dissemination of pathogens and perennation. Concepts of monocyclic, polycyclic and polyetic diseases, disease triangle & disease pyramid, forecasting of plant diseases and its relevance in Indian context.

Unit III – Specific plant diseases
Study of some important plant diseases giving emphasis on its etiological agent, symptoms, epidemiology and control.

a. Important diseases caused by phytopathogenic bacteria: Angular leaf spot of cotton, bacterial leaf blight of rice, crown galls, bacterial cankers of citrus.
b. Important diseases caused by fungi: White rust of crucifers - *Albugo candida,* Downy mildew of onion – *Peronospora,* Powdery mildew of wheat - *Erysiphe graminis.*
c. Important diseases caused by viruses: Papaya ring spot, tomato yellow leaf curl, banana bunchy top, rice tungro.

Unit IV– Host Pathogen Interaction

a. Microbial Pathogenicity

Virulence factors of pathogens: enzymes, toxins (host specific and non specific) growth regulators, virulence factors in viruses (replicase, coat protein, silencing suppressors) in disease development. Effects of pathogens on host physiological processes (photosynthesis, respiration, cell membrane permeability, translocation of water and nutrients, plant growth and reproduction).

b. Genetics of Plant Diseases

Concept of resistance (R) gene and avirulence (avr) gene; gene for gene hypothesis, types of plant resistance: true resistance– horizontal & vertical, apparent resistance.

c. Defense Mechanisms in Plants

Concepts of constitutive defense mechanisms in plants, inducible structural defenses (histological- cork layer, abscission layer, tyloses, gums), inducible biochemical defenses [hypersensitive response (HR), systemic acquired resistance (SAR), phytoalexins, pathogenesis related (PR) proteins, plantibodies, phenolics, quinones, oxidative bursts].

Unit V– Control of Plant Diseases

Principles and practices involved in the management of plant diseases by different methods, *viz.* regulatory - quarantine, crop certification, avoidance of pathogen, use of pathogen free propagative material cultural - host eradication, crop rotation, sanitation, polyethylene traps and mulcheschemical - protectants and systemic fungicides, antibiotics, resistance of pathogens to chemicals. biological - suppressive soils, antagonistic microbes-bacteria and fungi, trap plantsgenetic engineering of disease resistant plants- with plant derived genes and pathogen derived genes.

SUGGESTED READINGS

1. Agrios GN. (2006). Plant Pathology. 5th edition. Academic press, San Diego.
2. Lucas JA. (1998). Plant Pathology and Plant Pathogens. 3rd edition. Blackwell Science, Oxford.

Semester – V

16MBU504A MICROBIAL BIOTECHNOLOGY (3H – 3C)

Instruction Hours / week: L: 3 T: 0 P: 0 Marks: Internal: **40** External:**60**Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVE

- To make students understand the aspects of industrial, soil, environmental, agricultural microbiology.
- Gain knowledge about the Industrially important microorganisms &uritional requirements.
- Know about the Commercialization methods of Microbial products.
- To understand the industrially important microorganisms' commercial value and importance of patent and IPR.
- Describe about different sewage treatment methods employed in waste water treatment.
- know the microorganisms responsible for water pollution.

COURSE OUTCOME

- This paper imparts knowledge on applications of microorganisms in various fields and helps to gain employability in pharmaceutical industries
- Describe about different sewage treatment methods employed in waste water treatment.
- Learn about the global environmental problems.
- To provide a fundamental knowledge about the various scopes in environmental and industrial studies.
- Learn about the applications of microbes in biotransformations, therapeutic and industrial biotechnology
- Describe aspects of genetically engineered microbes for industrial application.

Unit I – Microbial Biotechnology and its Applications

Microbial biotechnology: Scope and its applications in human therapeutics, agriculture (Biofertilizers, PGPR, Mycorrhizae), environmental, and food technology. Use of prokaryotic and eukaryotic microorganisms in biotechnological applications. Genetically engineered microbes for industrial application: Bacteria and yeast

Unit II – Therapeutic and Industrial Biotechnology

Recombinant microbial production processes in pharmaceutical industries - Streptokinase, recombinant vaccines (Hepatitis B vaccine). Microbial polysaccharides and polyesters, Microbial production of bio-pesticides, bioplastics, Microbial biosensors

Unit III – Applications of Microbes in Biotransformations

Microbial based transformation of steroids and sterols. Bio-catalytic processes and their industrial applications: Production of high fructose syrup and production of cocoa butter substitute

Unit IV – Microbial Products and their Recovery and RNAi

Microbial product purification: filtration, ion exchange & affinity chromatography techniques Immobilization methods and their application: Whole cell immobilization. RNAi and its applications in silencing genes, drug resistance, therapeutics and host pathogen interactions.

Unit V – Microbes for Bio-energy and Environment, Intellectual Property Rights

Bio-ethanol and bio-diesel production: commercial production from lignocellulosic waste and algal biomass, Biogas production: Methane and hydrogen production using microbial culture. Microorganisms in bioremediation: Degradation of xenobiotics, mineral recovery, removal of heavy metals from aqueous effluents. Patents, patenting fundamental requirements- patent multicellular organisms, IPR, Copyrights, Trademarks

SUGGESTED READINGS

1. Ratledge, C and Kristiansen, B. (2001). Basic Biotechnology, 2nd edition, Cambridge University Press.
2. Demain, A. L and Davies, J. E. (1999). Manual of Industrial Microbiology and Biotechnology, 2nd edition, ASM Press.
3. Swartz, J. R. (2001). Advances in Escherichia coli production of therapeutic proteins. Current Opinion in Biotechnology, 12, 195–201.
4. Prescott, Harley and Klein's Microbiology by Willey JM, Sherwood LM, Woolverton CJ (2014), 9th edition, Mc Graw Hill Publishers.
5. Gupta PK (2009) Elements of Biotechnology 2nd edition, Rastogi Publications.
6. Glazer AN and Nikaido H (2007) Microbial Biotechnology, 2nd edition, Cambridge University Press
7. Glick BR, Pasternak JJ, and Patten CL (2010) Molecular Biotechnology 4th edition, ASM Press.
8. Stanbury PF, Whitaker A, Hall SJ (1995) Principles of Fermentation Technology 2nd edition, Elsevier Science.
9. Crueger W, Crueger A (1990) Biotechnology: A text Book of Industrial Microbiology 2nd edition. Sinauer associates, Inc.

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Semester – V

16MBU504B **INHERITANCE BIOLOGY** **(3H – 3C)**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVE

- To make students understand the principles of Genetics and inheritance biology.
- understand that genes are the units of inheritance for individual characteristics and also may contribute to susceptibility to certain diseases
- understand the number of chromosomes that make up the human genome and where they are located within the cell
- understand the role of the X and Y chromosomes in determining sex and how they are inherited.
- understand how gametes are produced by the process of meiosis and how the full complement of 46 chromosomes is restored at fertilisation
- To identify and describe the process and purposes of the cell cycle, meiosis, and mitosis, as well as predict the outcomes of these processes.

COURSE OUTCOME

- This paper imparts knowledge on the different aspects of genetics and pedigree analysis.
- Understand the central dogma of molecular biology and the genome of prokaryotic and eukaryotic microorganisms.
- To gain knowledge about the microbial genetics and central dogma of molecular biology
- Students will understand the cellular components underlying mitotic cell division.
- Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation.
- To describe applications and techniques of modern genetic technology, as well as select the correct techniques to solve practical genetic problems.

Unit I – Introduction to Genetics
Historical developments: Model organisms in genetic analyses and experimentation: *Escherichia coli, Saccharomyces cerevisiae, Neurospora crassa, Caenorhabditis elegans Drosophila melanogaster, Arabidopsis thaliana.*

Unit II – Mendelian Principles
Mendel's Laws: Dominance, segregation, independent assortment, deviation from Mendelian inheritance, Rediscovery of Mendel's principles, Chromosome theory of inheritance: Allele, multiple alleles, pseudoallele, complementation tests, Extensions of Mendelian genetics: Allelic interactions, concept of dominance, recessiveness, Incomplete dominance and co-dominance, Multiple alleles, Epistasis, penetrance and expressivity.

Unit III – Linkage and Crossing over & Recombination

Linkage and recombination of genes, Cytological basis of crossing over, Crossing over at four-strand stage, Molecular mechanism of crossing over, mapping Homologous and non-homologous recombination, including transposition, site-specific recombination.

Unit IV – Extra-Chromosomal Inheritance & Human genetics

Rules of extra nuclear inheritance, Organelle heredity - Chloroplast mutations in *Chlamydomonas*, mitochondrial, mutations in *Saccharomyces*, Maternal effects – Shell coiling in *Limnaea peregra* Infectious heredity - Kappa particles in *Paramecium*.Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders.Polygenic inheritance, heritability and its measurements, QTL mapping.

Unit V – Characteristics of Chromosomes

Structural organization of chromosomes - centromeres, telomeres and repetitive DNA, Packaging DNA molecules into chromosomes, Concept of euchromatin and heterochromatin, Normal and abnormal karyotypes of human chromosomes, Chromosome banding, Giant chromosomes: Polytene and lampbrush chromosomes, Variations in chromosome structure: Deletion, duplication, inversion and translocation, Variation in chromosomal number and structural abnormalities -

Klinefelter syndrome, Turner syndrome, Down syndrome

SUGGESTED READINGS

1. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8th Ed. Wiley-India.

2. Snustad DP, Simmons MJ (2011). Principles of Genetics. 6th Ed. John Wiley and Sons Inc.

3. Weaver RF, Hedrick PW (1997). Genetics. 3rd Ed. McGraw-Hill Education.

4. Klug WS, Cummings MR, Spencer CA, Palladino M (2012). Concepts of Genetics. 10th Ed. Benjamin Cummings.

5. Griffith AJF, Wessler SR, Lewontin RC, Carroll SB. (2007). Introduction to Genetic Analysis. 9th Ed. W.H.Freeman and Co., New York.

6. Hartl DL, Jones EW (2009). Genetics: Analysis of Genes and Genomes. 7th Ed, Jones and Bartlett Publishers.

7. Russell PJ. (2009). *i* Genetics - A Molecular Approach. 3rd Ed, Benjamin Cummings.

Semester – V

16MBU511A MANAGEMENT OF HUMAN MICROBIAL DISEASES- PRACTICAL (4H – 2C)

Instruction Hours / week: L: 0 T: 0 P: 4Marks: Internal: **40**External: **60** Total: **100**

End Semester Exam: 9 Hours

COURSE OBJECTIVES

- To provide a strong base in the fundamentals of pathogens.
- To learn techniques and methods used in the cultivation and isolation of pathogens.
- To obtain with the knowledge about the habitat and characteristics of pathogens.
- Program aims to develop students' understanding of medical microbiology with hand on experience in the isolation of the bacteria from different sources.
- It gives the knowledge about the pathogenicity, understanding the biofilm formation in bacteria, role of biofilm in pathogenicity and their antibiotics resistance pattern of pathogenic bacteria which is useful for public awareness.
- The objective of this course is to instill awareness on basics of immune system where students will learn the components of immunity and various immune responses that work together to protect the host.

COURSE OUTCOME

- Involves the identification, classification, and characterization of pathogenic species.
- This paper imparts employability in hospital laboratories.
- Properly use aseptic techniques, including sterilization. Know General bacteriology and microbial techniques for isolation of pure cultures of bacteria.
- Basics in microbiology course is designed as an interdisciplinary course to acquaint the students of different streams with a very basic knowledge and understanding of
- microbes, pathogens and their control Learning methods for antimicrobial susceptibility testing
- In this course the students will observe and perform experiments related to clinical microbiology and virology which will enhance their laboratory skills, and scientific knowledge.

EXPERIMENTS

1. Diagnosis of respiratory tract disease.
2. Diagnosis of urinary tract disease.
3. Diagnosis of gastrointestinal tract disease.
4. Identification of dermatophytes

SUGGESTED READINGS

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier.

4. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.
5. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition.

Semester – V

16MBU511B **(3H – 1C)**

MICROBIOLOGICAL ANALYSIS OF AIR AND WATER –PRACTICAL

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 9 Hours

COURSE OBJECTIVES

- Impart knowledge microflora of air and water, sample collection, analysis and control of diseases.
- Explain the significance of air Microflora and airborne diseases
- Gain knowledge about water pollution and waste water treatments.
- Learning the basic principles of environment microbiology and be able to apply these principles to understanding and solving problems in current environmental, air and water issues.
- Validation for equipment, methods, cleaning and process
- Students can develop their entrepreneurial skills in analysis of air and water sample.

COURSE OUTCOME

- This paper teaches different laboratory skills of analyzing air and water.
- Hand on training of the general equipment used in microbiology laboratory
- Develop capability to perform different gene transfer methods in microbes
- Characterization of microorganisms from water and air samples
- Enumeration of bacteria and fungi from air by membrane filtration technique
- Gain knowledge about water pollution and waste water treatments.

EXPERIMENTS

1. Enumeration of indoor and outdoor microflora of air (bacteria and fungi) by settle plate method.
2. Enumeration of bacteria and fungi from air by membrane filtration technique.
3. Microbicidal effect of UV light.
4. Evaluation of disinfectants – Phenol coefficient method.
5. MPN test.
6. Enumeration of bacteria and fungi from water by membrane filtration technique.

SUGGESTED READINGS

1. Da Silva N, Taniwaki MH, Junqueira VC, Silveira N, Nascimento MS, Gomes RAR (2012) Microbiological Examination Methods of Food and Water. A Laboratory Manual, CRC Press.
2. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA.
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press.
4. Hurst CJ, Crawford RL, Garland JL, Lipson DA (2007). Manual of Environmental Microbiology, 3rd edition, ASM press.

Semester – V

16MBU512A BIOMATHEMATICS AND BIOSTASTICS - PRACTICAL (4H – 2C)

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

SCOPE

- This course has been intended to provide the learner insights into helpful areas of Statistics which plays an essential role in present, future use and applications of Biology.
- Statisticians help to design data collection plans, analyze data appropriately and interpret and draw conclusions from those analyses.
- Statistics helps in the proper and efficient planning of a statistical inquiry in any field of study.
- Statistics helps in providing a better understanding and exact description of a phenomenon of nature.
- To develop students' skills in algebraic manipulation, the calculus of linear and non-linear differential equations, mathematical modelling, matrix algebra and statistical methods.
- To introduce students to the application of mathematical modeling in the analysis of biological systems including populations of molecules, cells and organisms.

OBJECTIVES

- Students get an idea about collection, interpretation and presentation of statistical data.
- Statistics help in providing data as well as tools to analyze the data.
- Some powerful techniques are index numbers, time series analysis, and also forecasting.
- Statistical knowledge helps you use the proper methods to collect the data, employ the correct analyses, and effectively present the results.
- To show how mathematics, statistics and computing can be used in an integrated way to analyse biological systems.
- Conceivably everything dealing with the collection, processing, analysis and interpretation of numerical data belongs to the domain of statistics.

Statistics helps in collecting appropriate quantitative data.

EXPERIMENTS

1. Word Problems based on Differential Equations
2. Mean, Median, Mode from grouped and ungrouped Data set
3. Standard Deviation and Coefficient of Variation
4. Skewness and Kurtosis
5. Curve fitting
6. Correlation
7. Regression
8. Finding area under the curve using normal probability
9. Testing of Hypothesis- Normal Distribution, t-test and Chi-Square-test
10. Confidence Interval

SUGGESTED READINGS

1. H. S. Bear: Understanding Calculus, John Wiley and Sons (Second Edition); (2003).

2. E. Batschelet : Introduction to Mathematics for Life Scientists,Springer Verlag, International Student Edition, Narosa Publishing House, New Delhi; (1975)
3. Edmondson and D. Druce : Advanced Biology Statistics, Oxford University Press; (1996).
4. W. Danial: Biostatistics: A foundation for Analysis in Health Sciences, John Wiley and Sons Inc; (2004).

Semester – V

16MBU512B BIOINFORMATICS - PRACTICAL (4H – 2C)

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Internal: **40** External:**60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- Students get an idea about collection, interpretation and presentation of bioinformatics data.
- Develop competence to integrate biological information with computational softwares
- Impart basic understanding of bioinformatics approaches for bacterial/viral/fungal identifications and drug design
- Bioinformatics is the application of computer technology to get the information that's stored in certain types of biological data.
- Bioinformatics provides central, globally accessible databases that enable scientists to submit, search and analyse information.
- A sound knowledge on procedural repertoire allows students to innovatively apply these in basic
- and applied fields of biological research.

COURSE OUTCOME

- This course has been intended to provide the learner insights into helpful areas of Bioinformatics which plays an essential role in application-oriented biology.
- Provides computational skill on search engines and various software tools involved in bioinformatics
- Learning methods for designing primers and in-silico PCR
- Develop competence to retrieve information from biological databases and integrate this biological information with computational softwares.
- Design an experiment with step-by-step instructions to address a research problem
- Technical know-how on versatile techniques in bioinformatics techniques

EXPERIMENTS

1. Introduction to different operating systems - UNIX, LINUX and Windows
2. Introduction to bioinformatics databases (any three): NCBI/PDB/DDBJ, Uniprot, PDB
3. Sequence retrieval using BLAST
4. Sequence alignment & phylogenetic analysis using clustalW & phylip
5. Picking out a given gene from genomes using Genscan or other softwares (promoter region identification, repeat in genome, ORF prediction). Gene finding tools (Glimmer, GENSCAN), Primer designing, Genscan/Genetool
6. Protein structure prediction: primary structure analysis, secondary structure prediction using psi- pred, homology modeling using Swissmodel. Molecular visualization using jmol, Protein structure model evaluation (PROCHECK)
7. Prediction of different features of a functional gene.

SUGGESTED READINGDS

1. Saxena Sanjay (2003) A First Course in Computers, Vikas Publishing House

2. Pradeep and Sinha Preeti (2007) Foundations of Computing, 4th ed., BPB Publications
3. Lesk M.A.(2008) Introduction to Bioinformatics . Oxford Publication, 3rd International Student Edition.
4. Rastogi S.C., Mendiratta N. and Rastogi P. (2007) Bioinformatics: methods and applications, genomics, proteomics and drug discovery, 2nd ed. Prentice Hall India Publication
5. Primrose and Twyman (2003) Principles of Genome Analysis & Genomics. Blackwell.

Semester – V

16MBU513A INSTRUMENTATION AND BIOTECHNIQUES –PRACTICAL (4H – 2C)

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

To develop skills related to

- Understand the principles of various instruments used in the life sciences.
- Ability to operate the instruments.
- Data analysis and interpretations.
- Appreciate the working principles and applications of Microscopy.
- Understand the mechanics of thesis writing
- To understand working of different laboratory equipment used in microbiological laboratories

COURSE OUTCOME

- Offers the students with an opportunity to gain practical skills on the bioinstrumentation and concepts of principles and applications.
- Evaluate the various types & applications of chromatography and electrophoresis.
- Evaluate the various types & phase contrast microscopy and Electron microscopy
- Explain the various separation techniques and its instrumentation.
- Hand on training of the general equipment used in microbiology laboratory
- Comprehend the major spectrophotometric and titrimetric approaches of quantification in biological and environmental samples.

EXPERIMENTS

1. Study of fluorescent micrographs to visualize bacterial cells – Demonstration
2. Ray diagrams of phase contrast microscopy and Electron microscopy – Demonstration
3. Separation of mixtures by paper / thin layer chromatography.
4. Demonstration of column packing in any form of column chromatography.
5. Separation of protein mixtures by any form of chromatography.
6. Separation of protein mixtures by Polyacrylamide Gel Electrophoresis (PAGE).
7. Determination of λ max for an unknown sample and calculation of extinction coefficient.
8. Separation of components of a given mixture using a laboratory scale centrifuge.
9. Understanding density gradient centrifugation with the help of pictures.

SUGGESTED READINGS

1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7th edition, Cambridge University Press.
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5thedition, W.H. Freeman and Company.

3. Willey MJ, Sherwood LM & Woolverton CJ. (2013). Prescott, Harley and Klein's Microbiology. 9thedition, McGraw Hill.
4. Karp G. (2010) Cell and Molecular Biology: Concepts and Experiments. 6th edition. JohnWiley & Sons. Inc.
5. De Robertis EDP and De Robertis EMF. (2006). Cell and Molecular Biology. 8th edition. Lipincott Williams and Wilkins, Philadelphia.
6. Cooper G.M. and Hausman R.E. (2009). The Cell: A Molecular Approach. 5thedition. ASM Press & Sunderland, Washington D.C., Sinauer Associates, MA.
7. Nigam A and Ayyagari A. (2007). Lab Manual in Biochemistry, Immunology and Biotechnology. Tata McGraw Hill.

Semester – V

16MBU513B PLANT PATHOLOGY – PRACTICAL (4H – 2C)

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: **40**External:**60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVE

- This paper aims at introducing students to the basic and applied aspects of plant biotechnology.
- Introduce students to the basic principles and concepts of plant pathology.
- Introduce and illustrate the major groups of organisms that cause plant diseases
- Provide a framework that students can use in their profession to best approach plant disease management.
- To study the importance of plant diseases and cutting sections of infected plant material
- To acquaint with different strategies for management of plant diseases

COURSE OUTCOME

- This will enable for learning the techniques to save endangered species which will be useful for mankind.
- Identify major principles of plant pathology.
- Demonstration of fungal, bacterial and viral plant pathogens.
- Recognize the etiological agents of disease.
- Employ methods to diagnose and manage a wide range of plant diseases.
- To teach the students about the different groups of insects that vector plant pathogens, vector-plant pathogen interaction, management of vectors for controlling diseases

EXPERIMENTS

1. Demonstration of Koch's postulates in fungal, bacterial and viral plant pathogens.
2. Study of important diseases of crop plants by cutting sections of infected plant material - *Albugo*, *Puccinia*, *Ustilago*, *Fusarium*, *Colletotrichum.*

SUGGESTED READINGS

1. Agrios GN. (2006). Plant Pathology. 5th edition. Academic press, San Diego,
2. Lucas JA. (1998). Plant Pathology and Plant Pathogens. 3rd edition. Blackwell Science, Oxford.
3. Mehrotra RS. (1994). Plant Pathology. Tata McGraw-Hill Limited.
4. Rangaswami G. (2005). Diseases of Crop Plants in India. 4th edition. Prentice Hall of India Pvt. Ltd., New Delhi.
5. Singh RS. (1998). Plant Diseases Management. 7th edition. Oxford & IBH,Delhi.

Semester – V

16MBU514A MICROBIAL BIOTECHNOLOGY- PRACTICAL (3H – 1C)

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 6 Hours

COURSE OBJECTIVE

- To make students understand the aspects of industrial, soil, environmental, agricultural microbiology.
- To understand the methods for Production of industrially important compounds from fungal source.
- This paper is designed to provide an exposure to the students about the potential of fungi as food and in field of biotechnology as source of different enzymes, secondary metabolites, vitamins, polysaccharides, polyhydric alcohols, pigments and lipids.
- Develop an understanding of various aspects of bioprocess technology.
- Evaluate nanotechnology and microbial production of therapeutic compounds
- The laboratory training in addition to theory is included so that the students will acquire the skills to qualify for a broad range of positions in research, industry, consultancy, education and public administration, or for further education in a doctoral program.

COURSE OUTCOME

- Impart knowledge on applications of microorganisms in various fields
- Provides skill development on microbial products.
- To study the immobilization techniques and fungal pigment production.
- Develop a xylanase and lipase production technology.
- Demonstration of algal single cell proteins.
- State of art knowledge about various methodological and analytic approaches that are used within the specialization.

EXPERIMENTS

1. Study yeast cell immobilization in calcium alginate gels.
2. Study enzyme immobilization by sodium alginate method.
3. Pigment production from fungi (*Trichoderma* / *Aspergillus* / *Penicillium*).
4. Isolation of xylanase or lipase producing bacteria.
5. Study of algal Single Cell Proteins.

SUGGESTED READINGS

1. Ratledge, C and Kristiansen, B. (2001). Basic Biotechnology, 2nd edition, Cambridge University Press.
2. Demain, A. L and Davies, J. E. (1999). Manual of Industrial Microbiology and Biotechnology, 2nd edition, ASM Press.
3. Swartz, J. R. (2001). Advances in Escherichia coli production of therapeutic proteins. Current
4. Opinion in Biotechnology, 12, 195–201.
5. Prescott, Harley and Klein's Microbiology by Willey JM, Sherwood LM, Woolverton CJ (2014), 9th edition, Mc Graw Hill Publishers.
6. Gupta PK (2009) Elements of Biotechnology 2nd edition, Rastogi Publications.
7. Glazer AN and Nikaido H (2007) Microbial Biotechnology, 2nd edition, Cambridge University Press.
8. Glick BR, Pasternak JJ, and Patten CL (2010) Molecular Biotechnology 4th edition, ASM Press.

9. Stanbury PF, Whitaker A, Hall SJ (1995) Principles of Fermentation Technology 2nd edition, Elsevier Science.
10. Crueger W, Crueger A (1990) Biotechnology: A text Book of Industrial Microbiology 2nd edition Sinauer assciates, Inc.

Semester – V

16MBU514B INHERITANCE BIOLOGY - PRACTICAL (3H – 1C)

Instruction Hours / week: L: 0 T: 0 P: 3 Marks: Internal: **40** External:**60** Total: **100**

End Semester Exam: 6 Hours

COURSE OBJECTIVE

- To make students understand the principles of Genetics and inheritance biology.
- Students will learn the basic principles of inheritance at the molecular, cellular and organismal levels
- Students will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.
- Describe the principal cell types comprising each tissue system
- Identify location and function of apical meristems, and describe their general structure
- Explain DNA repair and recombination in terms of mutation and evolution
- The objective of the course is to make student understand about the structure and function of biologically important molecules.

COURSE OUTCOME

- Imparts knowledge on the different aspects of genetics and pedigree analysis.
- Students will understand the cellular components underlying mitotic cell division
- Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function.
- Identify the organs and tissue systems of plants, and explain their respective function
- Understand how molecular cell biology forms the foundation of biotechnology
- Students will learn about DNA, RNA and the molecular events that govern cell functions

EXPERIMENTS

1. Mendelian deviations in dihybrid crosses
2. Studying Barr Body with the temporary mount of human cheek cells
3. Studying *Rhoeo* translocation with the help of photographs
4. Karyotyping with the help of photographs
5. Chi-Square Analysis
6. Study of polytene chromosomes using temporary mounts of salivary glands of *Chiromonas / Drosophila* larvae
7. Study of pedigree analysis
8. Analysis of a representative quantitative trait

SUGGESTED READINGS

1. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8th Ed. Wiley-India.
2. Snustad DP, Simmons MJ (2011). Principles of Genetics. 6th Ed. John Wiley and Sons Inc.
3. Weaver RF, Hedrick PW (1997). Genetics. 3rd Ed. McGraw-Hill Education.
4. Klug WS, Cummings MR, Spencer CA, Palladino M (2012). Concepts of Genetics. 10th Ed. Benjamin Cummings.
5. Griffith AJF, Wessler SR, Lewontin RC, Carroll SB. (2007). Introduction to Genetic Analysis. 9th Ed. W.H.Freeman and Co., New York
6. Hartl DL, Jones EW (2009). Genetics: Analysis of Genes and Genomes. 7th Ed, Jones and Bartlett Publish.

Semester – VI

16MBU601A **MUSHROOM CULTIVATION** **(4H – 4C)**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To evaluate the biology and health benefits of mushrooms.
- To encode the importance of the role of microorganisms in food industries
- To obtain a good understanding of production and multiplication of spawn by different composting techniques.
- To obtain knowledge in harvest, storage, marketing and economic impacts on mushroom cultivation.
- To gain knowledge about nutritional profile and medicinal properties of mushroom.
- To obtain knowledge in depth the problem in mushroom cultivation.

COURSE OUTCOME

- Able to Know the architecture of mushrooms
- To know the methods used to cultivate mushroom.
- Students are able to predict where the mushroom placed in vegetable kingdom
- Able to cultivate mushrooms from agricultural waste.
- Have an idea about packaging and storing.
- Have understand nutritional value of mushrooms.

Unit I – Mushroom morphology and classification

Mushroom morphology: Different parts of a typical mushroom and variations in mushroom morphology. Key to differentiate edible from poisonous mushrooms. Mushroom Classification: Based on occurrence – Epigenous and hypogenous, Natural habitats – Humicolous, Lignicolous & Coprophilous, Color of spores – white, yellow, pink, purple brown and black. Ainsworth et al classification (8^{th} edition) and Bisby's 'Dictionary of Fungi'.

Unit II – Biology of mushrooms

Biology of Mushrooms: Vegetative characters, general morphology, spore germination and life cycle of button mushroom (*Agaricus bisporus*), milky mushroom (*Calocybe indica*), oyster mushroom (*Pleurotus sajorcaju*) and paddy straw mushroom (*Volvariella volvcea*).

Unit III – Mushroom technology

Equipment and sterilization techniques. Isolation and culture of spores, culture media preparation. Production of mother spawn, multiplication of spawn – Inoculation technique – Cultivation technology – Substrates, composting technology, bed, polythene bag preparation, spawning – casing – cropping – Mushroom production – harvest – packing, storage and marketing.

Unit IV – Health benefits of mushrooms

Nutritional profile of Mushrooms: protein, amino acids, calorific values, carbohydrates, fats, vitamins & minerals. Medicinal Properties of Mushrooms: Antibacterial, antifungal, antiviral, anti-tumour effect and hematological value. Cardiovascular and renal effect, in therapeutic diets, adolescence, for aged persons and diabetes mellitus. Mushroom nutriceuticals.

Unit V – Diseases of mushroom and mushroom economics

Problems in cultivation – diseases, pests and nematodes, weed moulds and their management strategies. Mushroom economics: economics of spawn and mushroom, cultivation, postharvest technologies. Processing and preservation of mushrooms. Mushroom research centres in India.

SUGGESTED READINGS

1. Alice, D., Muthusamy and Yesuraja, M. (1999). Mushroom Culture. Agricultural College, Research Institute Publications, Madurai.
2. Marimuthu, T. et al. (1991). Oyster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.
3. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
5. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
6. Tripathi, D. P. (2005). Mushroom Cultivation. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Semester – VI

16MBU601B FOOD FERMENTATION TECHNIQUES (4H – 4C)

Instruction Hours / week:L: 4 T: 0 P: 0 Marks: Internal: **40**External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To encode the importance of the role of microorganisms in food industries in beneficial ways.
- To Understand the significance and activities of microorganisms in food and role of intrinsic and extrinsic factors on growth and survival of microorganisms in foods
- To Know the spoilage mechanisms in foods and thus identify methods to control deterioration and spoilage
- To Recognize and describe the characteristics of important pathogens and spoilage microorganisms in foods.
- To Learn various methods for their isolation, detection and identification of microorganisms in food and employ in industries
- To Identify ways to control microorganisms in foods and thus know the principles involving various methods of food preservation

COURSE OUTCOME

- Students Imparts knowledge on various microorganisms involved in food fermentation and develops the skills on Fermented Foods and production process.
- Students able to Identify ways to control microorganisms in foods and thus know the principles involving various methods of food preservation
- Understand of the basis of food safety regulations and Discuss the rationale for the use of standard methods and procedures for the microbiological analysis of food
- Acquire, discover, and apply the theories and principles of food microbiology in practical, real-world situations and problems.
- Have knowledge in fermented products and the role of microorganisms.
- Able to discriminate pathogens and legatee.

Unit I – Fermented Foods and Probiotic Foods

Definition, types, advantages and health benefits

Unit II– Milk Based Fermented Foods

Curd, Yogurt, Buttermilk and cheese: Preparation of inoculums, types of microorganisms and production process

Unit III – Grain Based Fermented Foods

Soy sauce, Bread, Idli and Dosa: Microorganisms and production process

Unit IV – Vegetable Based Fermented Foods

Pickels, Saeurkraut: Microorganisms and production process

Unit V – Fermented Meat and Fish

Pickles, Fermented Meat and Fish, Types, microorganisms involved fermentation process.

SUGGESTED READINGS

1. Hui YH, Meunier-Goddik L, Josephsen J, Nip WK, Stanfield PS (2004) Handbook of food and fermentation technology, CRC Press.
2. Holzapfel W (2014) Advances in Fermented Foods and Beverages, Woodhead Publishing.
3. Yadav JS, Grover, S and Batish VK (1993) A comprehensive dairy microbiology, Metropolitan.
4. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer.

Semester – VI

16MBU602A BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS (4H – 4C)

Instruction Hours / week:L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To learn the basic handling of microorganisms.
- To understand the various biological containments.
- To emphasize on IPR issues and need for knowledge in patents in biotechnology.
- The ethical and philosophical issues associated with international agreements.
- Various modes of presenting and disseminating patent licensing and agreements.
- Enable students to acquire expertise in the use and application of the methods of data collection and analysis.

COURSE OUTCOME

- Provides knowledge on safety aspects in biological laboratory and to create awareness on the Intellectual property rights and patenting of biotechnological processes.
- To gain knowledge on steps of a patenting process and the role of biosafety committee.
- To emphasize the components and design of laboratory.
- Provide learning opportunities to critically evaluate research methodology and findings
- Enable students to acquire expertise in the use and application of the methods of data collection and analysis.
- Enable students to be reflexive about their role and others' roles as researchers.

Unit I

Biosafety: Introduction; biosafety issues in biotechnology; Biological Safety Cabinets & their types; Primary Containment for Biohazards; Biosafety Levels of Specific Microorganisms.

Unit II

Biosafety Guidelines: Biosafety guidelines and regulations (National and International); GMOs/LMOs- Concerns and Challenges; Role of Institutional Biosafety Committees (IBSC), RCGM, GEAC etc. for GMO applications in food and agriculture; Environmental release of GMOs; Risk Analysis; Risk Assessment; Risk management and communication; Overview of International Agreements - Cartagena Protocol.

Unit III

AERB/RSD/RES guidelines for using radioisotopes in laboratories and precautions. Agreements and Treaties: GATT, TRIPS Agreements; Role of Madrid Agreement; Hague Agreement; WIPO Treaties; Budapest Treaty on international recognition of the deposit of microorganisms; UPOV & Brene conventions; Patent Co-operation Treaty (PCT); Indian Patent Act 1970 & recent amendments.

Unit IV

Introduction to Intellectual Property: Patents, Types, Trademarks, Copyright & Related Rights, Industrial Design and Rights, Traditional Knowledge, Geographical Indications- importance of IPR – patentable and non patentables – patenting life – legal protection of biotechnological inventions – World Intellectual Property Rights Organization (WIPRO).

Unit V

Grant of Patent and Patenting Authorities: Types of patent applications: Ordinary, PCT, Conventional, Divisional and Patent of Addition; An introduction to Patent Filing Procedures; Patent licensing and agreement; Patent infringement- meaning, scope, litigation, case studies, Rights and Duties of patent owner.

SUGGESTED READINGS

1. Bare Act, (2007).Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., New Delhi.
2. Kankanala C (2007). Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt. Ltd. New Delhi.
3. Mittal, D.P. (1999). Indian Patents Law, Taxmann, Allied Services (p) Ltd.
4. Singh K K (2015). Biotechnology and Intelectual Property Rights: Legal and SocialImpliications, Springer India.
5. Goel D & Prashar S (2013). IPR, Biosafety and Bioethics. Pearson.
6. Senthil Kumar Sadhasivam and Mohammed Jaabir, M. S. (2008). IPR, Biosafety and biotechnology Management. Jasen Publications, Tiruchirappalli, India.

Semester – VI

16MBU602B MICROBES IN SUSTAINABLE AGRICULTURE AND DEVELOPMENT (4H – 4C)

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVE

- The goal of sustainable agriculture is to meet society's food and textile needs in the present without compromising the ability of future generations to meet their own needs**.**
- Able to evaluate the application of ecological principles and concepts in sustainable agriculture system.
- To know the role of microbes which make crop output more and increase the fertility of crops.
- To know the basics and concepts of various biotechnological related terms
- To know the physiological processes that occur during plant growth and development of methodology involved in plant growth
- To make them to understand issues related to plant nutrition, quality improvement, environmental adaptation, transgenic crops and their use in agriculture.

COURSE OUTCOME

- Develops the programmatic activities in sustainable agriculture and food systems
- Able to relate their knowledge about ecology to its relevance in sustainable agriculture
- Provides detailed idea about biofertilizer production and develop entrepreneur skill related to agriculture field**.**
- Understand on soil characteristics and biogeochemical cycling.
- Students able to the uses of microorganisms as bio control agents.
- Understand transgenic crops and their use in agriculture.

Unit I– Soil Microbiology

Soil as Microbial Habitat, Soil profile and properties, Soil formation, Diversity and distribution of microorganisms in soil, Mineralization of cellulose, hemicelluloses, lignocelluloses, lignin and humus, phosphate, nitrate, silica, potassium

Unit II– Microbial Activity in Soil and Green House Gases

Carbon dioxide, methane, nitrous oxide, nitric oxide – production and control

Unit III– Microbial Control of Soil Borne Plant Pathogens

Biocontrol mechanisms and ways, Microorganisms used as biocontrol agents against Microbial plant pathogens, Insects, Weeds.

Unit IV– Biofertilization, Phytostimulation, Bioinsecticides

Plant growth promoting bateria, biofertilizers – symbiotic (*Bradyrhizobium, Rhizobium, Frankia*), Non Symbiotic (*Azospirillum, Azotobacter*, Mycorrhizae, MHBs, Phosphate solubilizers, algae), Novel combination of microbes as biofertilizers, PGPRs.

Unit V– Secondary Agriculture Biotechnology

Biotech feed, Silage, Biomanure, biogas, biofuels – advantages and processing parameters, Advantages, social and environmental aspects, Bt crops, golden rice, transgenic animals.

SUGGESTED READINGS

1. Agrios GN. (2006). Plant Pathology. 5th edition. Academic press, San Diego.
2. Singh RS. (1998). Plant Diseases Management. 7th edition. Oxford & IBH,New Delhi.
3. Glick BR, Pasternak JJ, and Patten CL (2010) Molecular Biotechnology 4th edition, ASM Press,
4. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA.
5. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press.
6. Barton LL & Northup DE (2011). Microbial Ecology. 1st edition, WileyBlackwell, USA.
7. Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.
8. Coyne MS. (2001). Soil Microbiology: An Exploratory Approach. DelmarThomson Learning.
9. Altman A (1998). Agriculture Biotechnology, Ist edition, Marcel decker Inc.
10. Mahendra K. Rai (2005). Hand Book of Microbial Biofertilizers, The Haworth Press, Inc. New York.
11. Reddy, S.M. et. al. (2002). Bioinoculants for Sustainable Agriculture and Forestry, Scientific Publishers.
12. Saleem F and Shakoori AR (2012) Development of Bioinsecticide, Lap Lambert Academic Publishing GmbH KG

Semester – VI

16MBU603A **CELL BIOLOGY** **(3H – 3C)**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To study cell structure and functions of organelle.
- Exposure on transportations through cell membrane.
- To focus on different receptors and model of signaling.
- To introduce the concept of cell signaling.
- To obtain knowledge in cell death and cell renewal.
- To gain knowledge in structural aspects of cells.

COURSE OUTCOME

- Basic concept of cell structure, membrane, cellular functions of different types of cell, modes of cellular signaling and signal amplification.
- Students able to annotating cell organization of prokaryotic and Eukaryotic.
- Students able to paraphrase cell death and cell renewal.
- Able to bullet pointing protein sorting and transport
- Expertise in interpreting cell internal organelles.
- Knowledge in induced pleuripotent stem cells.

Unit I – Structure and organization of Cell

Cell Organization – Eukaryotic (Plant and animal cells) and prokaryotic. Plasma membrane: Structure and transport of small molecules. Cell Wall: Eukaryotic cell wall, Extra cellular matrix and cell matrix interactions, Cell-Cell Interactions - adhesion junctions, tight junctions, gap junctions, and plasmodesmata (only structural aspects). Mitochondria, chloroplasts and peroxisomes. Cytoskeleton: Structure and organization of actin filaments, association of actin filaments with plasma membrane, cell surface protrusions, intermediate filaments, microtubules.

Unit II – Nucleus

Nuclear envelope, nuclear pore complex and nuclear lamina. Chromatin – Molecular organization. Nucleolus.

Unit III – Protein Sorting and Transport

Ribosomes, Endoplasmic Reticulum – Structure, targeting and insertion of proteins in the ER, protein folding, processing and quality control in ER, smooth ER and lipid synthesis, export of proteins and lipids. Golgi Apparatus – Organization, protein glycosylation, protein sorting and export from Golgi Apparatus Lysosomes.

Unit IV– Cell Signalling

Signalling molecules and their receptors. Function of cell surface receptors. Pathways of intra-cellular receptors – Cyclic AMP pathway, cyclic GMP and MAP kinase pathway.

Unit V– Cell Cycle, Cell Death and Cell Renewal

Eukaryotic cell cycle and its regulation, Mitosis and Meiosis, Development of cancer, causes and types, Programmed cell death, Stem cells, Embryonic stem cell, induced pleuripotent stem cells.

SUGGESTED READING

1. Hardin J, Bertoni G and Kleinsmith LJ. (2010). Becker's World of the Cell. 8th edition. Pearson.
2. Karp G. (2010) Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons. Inc.
3. De Robertis, EDP and De Robertis EMF. (2006). Cell and Molecular Biology. 8th edition. Lipincott Williams and Wilkins, Philadelphia.
4. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5^{th} Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.

Semester – VI

16MBU603B **MOLECULAR BIOLOGY** **(3H – 3C)**

Instruction Hours / week: L: 3 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVE

- To provide an experience for the students in an interdisciplinary research program connecting animal genomics with animal reproduction and biotechnology.
- To impart information on the historical developments in Molecular Biology
- An in-depth study on structure and organization of chromosome and mutagenesis.
- To expose the students on the basic understanding of various techniques used in molecular studies.
- To gather information to know mechanism of DNA replication.
- To gain the knowledge of translational machinery in prokaryotes and eukaryotes.

COURSE OUTCOME

- Explores technologies using molecular biology, embryo manipulation, cell and tissue culture.
- Manipulate the genomes of animals for ways to improve the live stock for food production and biomedical purpose.
- Develop the skills in molecular biology.
- Executing concept of RNA splicing and mRNA and its significance.
- Students able to inferring various model of DNA replication
- Students able to contrast translational machinery.

Unit I – Structures of DNA and RNA / Genetic Material

DNA Structure: Miescher to Watson and Crick- historic perspective, DNAStructure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves. DNA topology - linking number, topoisomerases; Organization of DNA Prokaryotes,Viruses, Eukaryotes.RNA Structure, Organelle DNA -- mitochondria and chloroplast DNA.

Unit II – Replication of DNA (Prokaryotes and Eukaryotes)

Bidirectional and unidirectional replication, semi- conservative, semi- discontinuous replication Mechanism of DNA replication: Enzymes and proteins involved in DNA replication –DNA polymerases, DNA ligase, primase, telomerase – for replication of linear ends. Various models of DNA replication including rolling circle, D- loop (mitochondrial), (theta) mode of replication and other accessory protein, Mismatch and excision repair.

Unit III – Transcription in Prokaryotes and Eukaryotes & Post-Transcriptional Processing

Transcription: Definition, difference from replication, promoter - concept and strength of promoter RNA Polymerase and the transcription unit, Transcription in Eukaryotes: RNA polymerases, general Transcription factors. Split genes, concept of introns and exons, RNA splicing, spliceosome machinery**,** concept of alternative splicing, Polyadenylation and capping, Processing of rRNA, RNA interference: si RNA, miRNA and its significance

Unit IV – Translation (Prokaryotes and Eukaryotes)

Translational machinery, Charging of tRNA, aminoacyl tRNA synthetases, Mechanisms of initiation, elongation and termination of polypeptides in both prokaryotes and eukaryotes, Fidelity of translation, Inhibitors of protein synthesis in prokaryotes and eukaryote

Unit V – Regulation of gene Expression in Prokaryotes and Eukaryotes

Principles of transcriptional regulation, regulation at initiation with examples from *lac* and *trp* operons, Sporulation in *Bacillus*,Yeast mating type switching , Changes in Chromatin Structure - DNA methylation and Histone Acetylation mechanisms.

SUGGESTED READINGS

1. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 6th edition, Cold Spring Harbour Lab. Press, Pearson Publication.
2. Becker WM, Kleinsmith LJ, Hardin J and Bertoni GP (2009) The World of the Cell, 7th edition, Pearson Benjamin Cummings Publishing, San Francisco.
3. De Robertis EDP and De Robertis EMF (2006) Cell and Molecular Biology, 8th edition. LippincottWilliams and Wilkins, Philadelphia.
4. Karp G (2010) Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc.
5. Sambrook J and Russell DW. (2001). Molecular Cloning: A Laboratory Manual. 4th Edition, ColdSpring Harbour Laboratory press.
6. Krebs J, Goldstein E, Kilpatrick S (2013). Lewin's Essential Genes, 3rd Ed., Jones and Bartlett Learning.
7. Gardner EJ, Simmons MJ, Snustad DP (2008).). Principles of Genetics. 8th Ed. Wiley-India.

Semester – VI

16MBU611A MUSHROOM CULTIVATION - PRACTICAL (4H – 2C)

Instruction Hours / week:L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 6 Hours

COURSE OBJECTIVES

- To teach on cultivation, diseases and health benefits of mushrooms.
- To provide practical knowledge of different sterilization procedures and learn handling of mushrooms.
- To enhance the student's knowledge and impress upon them the important aspects of mushroom.
- To understand to know pure culture techniques and methods of culturing preservation and maintenance of mushrooms.
- To make the students more knowledge on mushroom cultivation.
- To make the students to know the classification.

COURSE OUTCOME

- To impart knowledge on various mushrooms and its cultivation techniques to became an entrepreneur.
- Students able to predict classification of edible mushroom.
- Able to cultivate spawn from waste materials.
- Have a knowledge in sterilization and handling of mushroom.
- Students understand the application of mushroom biotechnology.
- Students understand the characteristics and importance of mushrooms.

EXPERIMENTS

1. Oyster cultivation and demonstration of Button mushroom cultivation
2. Tissue isolation and sub culturing
3. Spawn making using sorghum
4. Fruiting bags production – preparing beds (chopping and sterilization of straw)
5. Field trip to commercial mushroom farms and scientific institutions.

SUGGESTED READINGS

1. Alice, D., Muthusamy and Yesuraja, M. (1999). Mushroom Culture. Agricultural College, Research Institute Publications, Madurai.
2. Marimuthu, T. et al. (1991). Oyster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.
3. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
5. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
6. Tripathi, D. P. (2005). Mushroom Cultivation. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
7.

Semester – VI

16MBU611B FOOD FERMENTATION TECHNIQUES – PRACTICAL (4H – 2C)

Instruction Hours / week:L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 6 Hours

COURSE OBJECTIVES

- To encode the importance of the role of microorganisms in food industries in beneficial ways.
- Understand the significance and activities of microorganisms in food and role of intrinsic and extrinsic factors on growth and survival of microorganisms in foods
- To learn various methods for their isolation, detection and identification of microorganisms in food and employ in industries
- To Identify ways to control microorganisms in foods and thus know the principles involving various methods of food preservation
- To Understand the use of standard methods and procedures for the microbiological analysis of food
- Acquire, discover, and apply the theories and principles of food microbiology in practical, real-world situations and problems.

COURSE OUTCOME

- To impart knowledge on various microorganisms involved in food fermentation.
- To nurture the student to gain employability in industrial area.
- Recognize and describe the characteristics of important pathogens and spoilage microorganisms in foods.
- Understand the beneficial role of microorganisms in fermented foods and in food processing and the microbiology of different types of fermented food products – dairy, pickles, Legume and cereal based food products
- Have an idea to isolate beneficial microorganisms from spoiled food.
- Identify methods to control deterioration and spoilage

EXPERIMENTS

1. Preparation of Yogurt.
2. Preparation of Sauerkraut.
3. Beer production.
4. Wine production.
5. Isolation of Microbes from spoiled Meet and Fish.

SUGGESTED READINGS

1. Hui YH, Meunier-Goddik L, Josephsen J, Nip WK, Stanfield PS (2004) Handbook of food and fermentation technology, CRC Press.
2. Holzapfel W (2014) Advances in Fermented Foods and Beverages, Woodhead Publishing.
3. Yadav JS, Grover, S and Batish VK (1993) A comprehensive dairy microbiology, Metropolitan.
4. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer.

Semester – VI

16MBU612A BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS –PRACTICAL (4H-2C)

Instruction Hours / week:L: 0 T: 0 P: 4 **Marks:** Internal: **40**External: **60** Total: **100**

End Semester Exam: 6 Hours

COURSE OBJECTIVES

- To learn the basic handling of microorganisms.
- To understand the various biological containments.
- To emphasize on IPR issues and need for knowledge in patents in biotechnology.
- To gain knowledge on steps of a patenting process and the role of biosafety committee.
- To emphasize the components and design of laboratory.
- Provide learning opportunities to critically evaluate research methodology and findings

COURSE OUTCOME

- Able to understand safety aspects in biological laboratory.
- To create awareness on the Intellectual property rights and patenting of biotechnological processes.
- To equip students with a basic understanding of the underlying principles of quantitative and qualitative patenting methods.
- Provide students with in-depth training on the conduct and management of patent filing from inception
- Enable students to acquire expertise in the use and application of the methods of data collection and analysis.
- Enable students to be reflexive about their role and others' roles as researchers.

EXPERIMENTS

1. Study of components and design of a BSL-III laboratory
2. Filing applications for approval from biosafety committee
3. Filing primary applications for patents
4. Study on steps of a patenting process

SUGGESTED READINGS

1. Bare Act, 2007.Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., New Delhi.
2. Kankanala C (2007). Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt. Ltd. New Delhi.
3. Mittal, D.P. (1999). Indian Patents Law, Taxmann, Allied Services (p) Ltd.
4. Singh K K (2015). Biotechnology and Intelectual Property Rights: Legal and Social Implications, Springer India.
5. Goel D & Prashar S (2013). IPR, Biosafety and Bioethics. Pearson.

Semester – VI

(4H – 2C)

16MBU612B MICROBES IN SUSTAINABLE AGRICULTURE AND DEVELOPMENT - PRACTICAL

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External:**60** Total: **100**

End Semester Exam: 6 Hours

COURSE OBJECTIVES

- Able to relate their knowledge about ecology to its relevance in sustainable agriculture
- Able to evaluate the application of ecological principles and concepts in sustainable agriculture system.
- To know the role of microbes which make crop output more and increase the fertility of crops**.**
- To analyses the degrading microorganisms by various techniques.
- Able to design biogas plant.
- To obtain knowledge in entrepreneur in agricultural area.

COURSE OUTCOME

- Able to relate their knowledge about ecology to its relevance in sustainable agriculture
- Provides detailed idea about biofertilizer production and develop entrepreneur skill related to agriculture field**.**
- Able to device biogas plant
- Students will be annotate various zone in soil profile
- Students will be isolate various degrading microorganisms for agricultural use.
- Criticize the role of soil microbes in crop production.

EXPERIMENTS

1. Study soil profile
2. Study microflora of different types of soils
3. *Rhizobium* as soil inoculants characteristics and field application
4. *Azotobacter* as soil inoculants characteristics and field application
5. Design and functioning of a biogas plant
6. Isolation of cellulose degrading organisms

SUGGESTED READINGS

1. Agrios GN. (2006). Plant Pathology. 5th edition. Academic press, San Diego,
2. Singh RS. (1998). Plant Diseases Management. 7th edition. Oxford & IBH, New Delhi.
3. Glick BR, Pasternak JJ, and Patten CL (2010) Molecular Biotechnology 4th edition, ASM Press.
4. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications.4th edition. Benjamin/Cummings Science Publishing, USA.
5. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press.
6. Barton LL & Northup DE (2011). Microbial Ecology. 1st edition, Wiley Blackwell, USA.
7. Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.

8. Coyne MS. (2001). Soil Microbiology: An Exploratory Approach. Delmar Thomson Learning.
9. Altman A (1998). Agriculture Biotechnology, Ist edition, Marcel decker Inc.
10. Mahendra K. Rai (2005). Hand Book of Microbial Biofertilizers, The Haworth Press, Inc. New York.
11. Reddy, S.M. et. al. (2002). Bioinoculants for Sustainable Agriculture and Forestry, Scientific Publishers.
12. Saleem F and Shakoori AR (2012). Development of Bioinsecticide, Lap Lambert Academic Publishing GmbH KG

Semester – VI

16MBU613A **CELL BIOLOGY - PRACTICAL** **(3H – 1C)**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 6 Hours

COURSE OBJECTIVES

- To study cell structure and functions of organelle.
- Exposure on transportations through cell membrane.
- To focus on different receptors and model of signaling.
- To introduce the concept of cell signaling.
- The course will facilitate in understanding of cell biology by examining common processes and principles in cells.
- Knowledge about detailed structure of cell organelles and electron micro graphs.

COURSE OUTCOME

- To understand the basic concept of cell structure, membrane, cellular functions of different types of cell
- Able to analyses modes of cellular signaling and signal amplification.
- Able to categorize cell internal organs.
- Able to retrieve polypoid stage in vegetables
- Able to predict cancer cells through photomicrograph
- Knowledge about detailed structure of cell organelles and electron micro graphs.

EXPERIMENTS

1. Study a representative plant and animal cell by microscopy.
2. Study of the structure of cell organelles through electron micrographs.
3. Cytochemical staining of DNA – Feulgen.
4. Demonstration of the presence of mitochondria in striated muscle cells/ cheek epithelial cell using vital stain Janus Green B.
5. Study of polyploidy in Onion root tip by colchicine treatment.
6. Identification and study of cancer cells by photomicrographs.
7. Study of different stages of Mitosis.
8. Study of different stages of Meiosis.

SUGGESTED READINGS

1. Hardin J, Bertoni G and Kleinsmith LJ. (2010). Becker's World of the Cell. 8th edition. Pearson.
2. Karp G. (2010) Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons. Inc.
3. De Robertis, EDP and De Robertis EMF. (2006). Cell and Molecular Biology. 8th edition. Lipincott Williams and Wilkins, Philadelphia.
4. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5th Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.

Semester – VI

16MBU613B **MOLECULAR BIOLOGY - PRACTICAL** **(3H – 1C)**

Instruction Hours / week: L: 0 T: 0 P: 3 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 6 Hours

COURSE OBJECTIVE

- To provide an experience for the students in an interdisciplinary research program connecting animal genomics with animal reproduction and biotechnology.
- The course will facilitate in understanding of molecular biology by examining common processes and principles in genes to illustrate complexity.
- To obtain knowledge in resolution and visualization of proteins
- To evaluate genetic material in different samples.
- The student will receive hands-on training in various culturing and molecular techniques for studying microbial diversity and microbial activity.
- To introduce the student to the advanced concepts in molecular biology.

COURSE OUTCOME

- Explores technologies using molecular biology, cell and tissue culture to manipulate the genomes of animals for ways.
- Develop the skills in molecular biology.
- Student capable of explaining process involved in genetic changes and mutations
- The identification of genetic regulatory mechanism and distinguishing different mechanism of gene regulation
- The design of different techniques based on utilizing the genetic mechanism of microbes.
- Hand on experience of different microbial genetic modification strategies.

EXPERIMENTS

1. Study of different types of DNA and RNA using micrographs and model / schematic representations.
2. Study of semi-conservative replication of DNA through micrographs / schematic representations.
3. Isolation of genomic DNA from *E. coli.*
4. Estimation of salmon sperm / calf thymus DNA using colorimeter (diphenylaminereagent) or UV spectrophotometer (A260 measurement).
5. Estimation of RNA using colorimeter (orcinol reagent) or UV spectrophotometer (A260 measurement).
6. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
7. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE).

SUGGESTED READINGS

1. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 6th edition, Cold Spring Harbour Lab. Press, Pearson Publication
2. Becker WM, Kleinsmith LJ, Hardin J and Bertoni GP (2009) The World of the Cell, 7th edition, Pearson Benjamin Cummings Publishing, San Francisco

3. De Robertis EDP and De Robertis EMF (2006) Cell and Molecular Biology, 8th edition. Lippincott Williams and Wilkins, Philadelphia
4. Karp G (2010) Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc.
5. Sambrook J and Russell DW. (2001). Molecular Cloning: A Laboratory Manual. 4th Edition, Cold Spring Harbour Laboratory press.
6. Krebs J, Goldstein E, Kilpatrick S (2013). Lewin's Essential Genes, 3rd Ed., Jones and Bartlett Learning.

Semester – VI

16MBU691 **PROJECT** **(6C)**

Instruction Hours / week: L: 8 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

28.03.2016

DEPARTMENT OF MICROBIOLOGY
KARPAGAM ACADEMY OF HIGHER EDUCATION
PG – MICROBIOLOGY CURRICULUM (CBCS)
(2016 – 2017 Batch)

Course code	Name of the course	Objectives and out comes		Hrs / Week	Marks			Exam Hrs	Credit (s)
		PEOs	POs		CIA	ESE	Total		
SEMESTER – I									
16MBP101	Fundamentals of Microbiology and Classification	I	a	4	40	60	100	3	4
16MBP102	Microbial Physiology and Metabolism	II	a	4	40	60	100	3	4
16MBP103	Molecular genetics	II	b	4	40	60	100	3	4
16MBP104	Bioinstrumentation	VI	b	4	40	60	100	3	4
16MBP105A	Marine microbiology	I	a						
16MBP105B	Computer applications and Bioinformatics	VI I	c,d	4	40	60	100	3	4
16MBP105C	Biochemistry	II	A						
16MBP111	Basic Practical – I	VI	b, e	4	40	60	100	9	2
16MBP112	Basic Practical – II	VI	b, e	4	40	60	100	9	2
Journal Paper Analysis & Presentation		IV	c, e	2	-	-	-	-	-
Semester total				**30**	**280**	**420**	**700**	**-**	**24**
SEMESTER – II									
16MBP201	Virology	I	a, b	4	40	60	100	3	4
16MBP202	Medical Bacteriology	I	a, c	4	40	60	100	3	4
16MBP203	Microbial Technology and Intellectual Property Rights	V	b, d	4	40	60	100	3	4
16MBP204	Environmental and agricultural microbiology	I	a,i	4	40	60	100	3	4
16MBP205A	Cell biology	I	a,c						
16MBP205B	Quality assurance and quality control	I	a,d,e	4	40	60	100	3	4
16MBP205C	Bioprocess engineering	I V	a,e						
16MBP211	Advanced Practical – III	I	b,e,f	4	40	60	100	9	2
16MBP212	Advanced Practical – IV	I	b,e,f	4	40	60	100	9	2
Journal Paper Analysis & Presentation		IV	c,e	2	-	-	-	-	-
Semester total				**30**	**280**	**420**	**700**	**-**	**24**
SEMESTER – III									

16MBP301	Advanced Immunology	II	b, d	4	40	60	100	3	4
16MBP302	Food and Industrial Microbiology	IV	a, c	4	40	60	100	3	4
16MBP303	Medical Mycology and Parasitology	I	a,e,f	4	40	60	100	3	4
16MBP304	Biostatistics and Research Methodology	VI	c,d,g	4	40	60	100	3	4
16MBP305A	Biofertilizer and Biomanure Technology	I	a,i	4	40	60	100	3	4
16MBP305B	Laboratory animal care	V	b,d,f						
16MBP305C	Bio nanotechnology	IV	a,d,g						
16MBP311	Application Oriented Practical – V	I	b,h	4	40	60	100	9	2
16MBP312	Application Oriented Practical – VI	I	b,i	4	40	60	100	9	2
Journal Paper Analysis & Presentation		IV	c,d,e	2	-	-	-	-	-
Semester total				**30**	**280**	**420**	**700**	**-**	**24**

Course code	Name of the course	Hrs / Week	Marks			Exam Hrs	Credit (s)
			CIA	ESE	Total		
SEMESTER – IV							
16MBP491	Project and Viva Voce	-	80	120	200	-	15
Semester total		**-**	**80**	**120**	**200**	**-**	**15**
		90	**920**	**1380**	**2300**		**87**

Elective courses*

Elective – 1 (16MBP105)		Elective – 2 (16MBP205)		Elective – 3 (16MBP305)	
Course code	**Name of the course (Theory)**	**Course Code**	**Name of the course (Theory)**	**Course Code**	**Name of the course (Theory)**
16MBP105A	Marine microbiology	**16MBP205A**	Cell biology	**16MBP305A**	Biofertilizer and Biomanure Technology
16MBP105B	Computer applications and Bioinformatics	**16MBP205B**	Quality assurance and quality control	**16MBP305B**	Laboratory animal care
16MBP105C	Biochemistry	**16MBP205C**	Bioprocess engineering	**16MBP305C**	Bio nanotechnology

*Colour fonts highlights

Red colour : Entrepreneurship course
Green colour : Employability courses
Blue colour : Skill development courses

Postgraduate Programme – M.Sc

Microbiology Programme Outcomes

Programme Outcomes of PG Microbiology: Students of all postgraduate microbiology degree Programmes at the time of graduation will be able to

a. Science Observation: Microbiology majors able to discuss science and scientific methodology as a way of knowing. Microbiology majors will make observations, develop hypotheses and design and execute experiments using appropriate methods. They will be able to explain how the nature of science is applied to everyday problems.

b. Laboratory Skills: Microbiology students will master the following laboratory skills: aseptic pure culture techniques, preparation of and viewing samples for microscopy, use appropriate methods to identify microorganisms, estimate the number of microorganisms in a sample and use common lab equipment. They will be able to practice safe microbiology using appropriate protective and emergency procedures. Student able to gain the good knowledge of the development process and the planning process involved in the microbial products and enhance the entrepreneurship.

c. Data analysis skills: Microbiology majors will be able to systematically collect, record and analyze data, identify sources of error, interpret the result and reach logical conclusions. They will be able to appropriately format data into tables, graphs and charts for presentation and publication.

d. Critical Thinking Skills: Microbiology majors will be able to (1) differentiate between fact and opinion, (2) recognize and evaluate author bias and rhetoric, (3) develop inferential skill, (4) recognize logical fallacies and faulty reasoning and (5) make decisions and judgments by drawing logical conclusions using sound quantitative and statistically – basedreasoning.

e. Problem Solving Skills: Microbiology majors will be competent problem-solvers. They should be able to assess the elements of a problem and develop and test a solution based on logic and the best possible information. Microbiology students should be able to analyze and interpret results from a variety of microbiological methods and apply these methods to analogous situations. They will use mathematical and graphing skills and reasoning to solve problems in microbiology

Programme Specific Outcomes (PSOs)

f. Upon master graduation, Microbiology majors will mastered a set of advanced skills, which would be useful to function effectively as professionals and to their continued development and learning within the field of Microbiology.

g. Our candidates will be able to explain why microorganisms are ubiquitous in nature, inhabiting a multitude of habitats and occupying a wide range of ecological habitats.

h. Able to cite examples of the vital role of microorganisms in biotechnology, fermentation, medicine and other industries important to human well being.

i. Able to demonstrate that microorganisms have an indispensible role in the environment, including elemental cycles, biodegradation etc.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Programme Educational Objectives of PG Microbiology: The major objectives of the postgraduate course is

PEO-I: To provide detailed knowledge of Microbiology (bacteriology, virology, parasitology and mycology) and their application fields (Medical, Agricultural and Marine Microbiology). To understand the beneficial and harmful role of microorganisms in the environment and in the industries.

PEO-II: To understand the fundamentals of physiological reactions including metabolic pathways and biochemical reactions in microorganisms. To understand the fundamental concepts of immunology, biochemistry, biotechnology and genetics etc.

PEO-III: To develop human resource and entrepreneurs in Microbiology with the ability to independently start their own ventures or small biotech units in the field of biotechnology.

PEO-IV: Understand modern microbiology - practices and approaches with an emphasis in technology application in pharmaceutical, medical, industrial, environmental and agricultural areas.

PEO-V: Gain experience with standard molecular tools and approaches utilized: manipulate genes, gene products and organisms. Become familiar with handling of Laboratory animals for the research purpose. Interpret differences in data distributions via visual displays.

PEO-VI: Become familiar with public policy, biosafety, bioinformatics and intellectual property rights issues related to microbiology applications.

POs	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**H**	**i**
PEO I	X					X	X	X	
PEO II	X	X							X
PEO III			X	X	X	X			
PEO IV	X					X	X	X	X
PEO V		X	X	X					
PEO VI	X			X	X	X	X		

Semester – I

16MBP101 FUNDAMENTALS OF MICROBIOLOGY AND CLASSIFICATION

4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURE OBJECTIVES

- The course in designed to provide a basic understanding on the fundamental aspects of microbiology from historical development.
- To improve the proficiency and knowledge of the candidate on the study of microbial techniques for well exploitation of microorganisms.
- To comprehend the various methods for identification of unknown microorganisms
- This course enables the students to understand various physical and chemical means of sterilization and also learn various techniques for isolation of pure cultures.
- This course figures out them to know about culture collection and maintenance of microbial cultures.
- The beneficial and harmful manifestations of microorganisms especially of bacteria and their role in microbial mineralization and disease processes

COURSE OUTCOME (CO'S)

1. Understand the basic microbial structure and functions of various physiological groups of prokaryotes and eukaryotes.
2. Learn the theory and practical skills in microscopy handling and staining techniques know various culture media and their applications.
3. Study microbial nutritions- Autotrophy and heterotrophy modes of nutrition.
4. Identify the unknown organisms by using microbial tools.
5. Demonstrate electricity generation from the organic matter.
6. Understand the microbial transport systems and the modes and mechanisms of energy conservation in microbial metabolism – Autotrophy and heterotrophy

UNIT – I

History and scope of Microbiology. Microbial evolution and Diversity – Taxonomic ranks - Classification system – Phenetic and Phylogenetic Haeckel's three–kingdom concept, Whittaker's Five-kingdom concept, Three-domain concept of Carl Woese.

UNIT – II

Microscopy –Simple, Compound, Dark-field, Phase contrast, Fluorescent and Electron microscopes. (SEM and TEM), Confocal microscopy – Principles and their applications. Stains and Staining techniques: Simple and Differential staining methods.

UNIT – III

Classification of bacteria - Bergey's manual and its importance. Classification of algae Clamydomonas, volvox, diatoms, red and brown algae. Classification of virus – DNA, RNA viruses. Classification and taxonomy of fungi – Alexopolous. Economical importance of Fungi. Classification of protozoa – *Entamoeba histolytica*, *Giardia*, *Trichomonas*, *Plasmodium*.

UNIT – IV

Sterilization and disinfection, Culture methods: Auxenic and synchronous, aerobic and anaerobic, culture media and nutritional types, growth curve, generation time and growth kinetics. Factors influencing microbial growth. Preservation methods and quality control.

UNIT – V

Modern Microbiology: Molecular taxonomy, 16S/18S rRNAs and its importance in identification of microorganisms. Phylogenetic tree, Molecular tools in assessing microbial diversity, probiotics and their applications, microbial fuel cells.

SUGGESTED READINGS

TEXT BOOKS

1. Dubey, R.C., and Maheswari, D.K., (2010). *A Text book of Microbiology*. (3rd Ed), S. Chand and Company, New Delhi.
2. Modi, H. A. (1996). *Elementary Microbiology*. Vol.2, AKTA Prakashan Nadiad, Gujarat
3. Powar, C.B., and Daginawala, H.F., (2008). *General Microbiology*. Vol: 2. Himalaya Publishing House.
4. Singh, R.P. (2007). *General Microbiology*. Kalyani Publishers, New Delhi.
5. Frobisher, H., Hinsdil, R.D., Crabtree, K.T., and Goodhert, D.R., (2005). *Fundamentals of Microbiology,* Saunder and Company, London.

REFERENCES

1. Holt, J.G., Krieg, N.R., Sneath, P.H.A., Staley, J.T., and Williams, S.T., (2000). *Bergey's Manual of Determinative Bacteriology*. (9th ed.). Lippincott Williams and Wilkins Publishers. Baltimore.
2. Pelczar Jr. M.J., Chan, E.C.S., and Kreig, N.R., (2004). *Microbiology*. (5th ed.). Tata McGraw-Hill Publishing Company, New Delhi.
3. Prescott, L.M., Harley, J.P., and Klein, C.A., (2003). *Microbiology*, (5th ed.). McGraw Hill Publishing Company Limited, New York.
4. Salle, A.J. (2007). *Fundamental Principles of Bacteriology*. (7th ed.)., Envins Press, New York.
5. Tortora, G.J., Funke, B.R., and Case, C.L., (2010). *Microbiology: An Introduction*. (10th ed.). Pearson Education, Singapore.
6. Alcomo, I.E., (2006). *Fundamentals of Microbiology*. (8th ed.). Jones and Bartlett Publishers, Sudbury, Massachusetts.
7. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L., and Painter, P.R., (2008). *General Microbiology*. (5th ed.). Macmillan Press Ltd, London.
8. Talaro, K.P., and Talaro, A., (2006). *Foundations in Microbiology*. (6th ed.). McGraw-Hill College, Dimensi.

Semester – I

16MBP102 MICROBIAL PHYSIOLOGY AND METABOLISM 4H–4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To gain the knowledge with the various inner and outer structures of prokaryotes and eukaryotes in detail.
- To provide information on sources of energy and its utilization by microorganisms. Microorganisms play important role in environment as producers, consumers and decomposers.
- To impart knowledge on metabolic function and biochemical reaction going on inside the microbial cell.
- To teach metabolic pathways, their regulation and engineering, and methods used in their elucidation.
- To teach students about cell cycle, growth and methods to determine microbial growth.
- Understand the microbial transport systems and the modes and mechanisms of energy conservation in microbial metabolism – Autotrophy and heterotrophy

COURSE OUTCOME (CO'S)

1. The students will be able to understand and predict the various metabolic reactions in microbial cell.
2. This will make them to predict the intermediate products which can be employed in industrial production processes.
3. The students will be able to know how bacterial and archaeal structure lead to function, how metabolic processes are regulated.
4. The course makes them to understand how microbes respond to environmental stressors, and how microbes can be manipulated to enhance their growth or the production of desired products.
5. Know the various Physical and Chemical growth requirements of bacteria and get equipped with various methods of bacterial growth measurement
6. The students will be able to understand how the organisms communicate to the population by using various mechanisms.

UNIT – I

Microbial Anatomy - Prokaryotic cell structure and organization - cell wall, plasma membrane, cytoplasmic matrix, inclusion bodies, ribosome, nucleiod, capsule, slime layers, S layers, pili, fimbriae, flagella and motility. Eukaryotic cell structure and its organelles. Lichens and microalgae: Structural organization and their properties. Mycoplasma. Basic structure of viruses.

UNIT – II

Formation of specialized structures: Structure of bacterial endospore, endospore formation in *Bacillus* spp. Exospore formation in *Streptomyces*. Sporulation in fungi: *Aspergillus* sp., *Penicillium* sp. Spore cycle, factors affecting spore formation. Biofilm and biosurfactant production in bacteria

UNIT – III

EMP, HMP and ED pathway, TCA cycle, Glyoxylate cycle. Aerobic respiration and anaerobic respiration. Generation of energy: Substrate level and oxidative phosphorylation – ATP generation.

UNIT – IV

Biosynthesis of fatty acids, nucleotides, amino acids, phospholipids. Archaeal lipids. Cell wall biosynthesis of Gram positive and Gram negative bacteria. Cell membrane synthesis and synthesis of secondary metabolites. Toxins – characterization, mechanism of action.

UNIT – V

Photosynthetic bacteria – Oxygenic (Cyanobacteria) and anoxygenic (Purple/green sulfur and non-sulfur bacteria). Bacterial photosynthetic pigments. Methanogenesis – assimilation of carbondioxide. Bioluminescence and Quorum sensing – mechanism, importance and applications.

SUGGESTED READINGS

TEXT BOOKS

1. Berg, J.M., Tymoczko, J.L., Stryer, L., and Clarke, N.D., (2001). *Biochemistry*. (5^{th} ed.). WH Freeman & Co.
2. Doelle, H.W. (2005. *Bacterial Metabolism*. Elsevier India Pvt. Ltd., New Delhi.
3. Moat, A,G., and Foster J.W., (2003). *Microbial Physiology*. John Wiley and Sons, New York.
4. Nelson, D., and Cox, M.M., (2009). *Principles of Biochemistry*. W.H. Freeman and Company, New York.

REFERENCES

1. Atlas, R.M., (1997). *Principles of Microbiology*. (2^{nd} ed.). Wm. C. Brown Publishers, Lowa, US
2. Caldwell, D.R. (2008). *Microbial Physiology and Metabolism*. (2^{nd} ed.). Wm C Brown Publishers, England.
3. Madigan, M.T., Martinko, J.M., and Parker, J., (2003). *Brock Biology of Microorganisms*. (10^{th} ed.). Prentice Hall, New Jersey.
4. Rose, A.H. (2008). *Chemical Microbiology – An Introduction to Microbial Physiology*. (International Ed.). Plenum Publishing Corporation.
5. White, D. (2003). *Physiology and Biochemistry of Prokaryotes*. (2^{nd} ed.). Oxford University Press, NY.
6. Voet, D., and Voet J.G., (2003). *Biochemistry*. John Wiley and Sons, New York.

Semester – I

16MBP103 MOLECULAR GENETICS 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- The course presents methods and experimental tools used in modern molecular genetics with emphasis on prokaryotes and eukaryotes.
- The theoretical grounds of methods and their applications in research will be discussed.
- The course also deals with the genome structure, stability, organization, and its expression.
- To provide molecular mechanisms underlying mutations, detection of mutations and DNA damage and repair mechanisms
- The course includes among others model systems, genetics behind complex diseases, identification of disease genes and different types of mutations.
- It helps the students to explore genetic engineering techniques.

COURSE OUTCOME (CO'S)

1. This course allows the candidate to recollect the basics of molecular genetics and apply a cognitive thinking on the application-oriented sectors of genetics.
2. Students would be able to practically apply this knowledge in different sectors with possibilities ranging from the treatment of human diseases to the development of novel medicines.
3. A thorough understanding of the process of translation and operons along with recombination of DNA.
4. An in-depth study of mutagenesis and genetic analysis with gene mapping.
5. Have a conceptual knowledge about DNA as a genetic material, enzymology, and replication strategies.
6. Full understanding of all aspects of all-important techniques used for the study of biomolecules.

UNIT – I

Genetics – historical introduction – Mendelian principles – nucleic acid as genetic material Experimental evidence. The duplex DNA – chemical and physical structure of DNA – circular and super helical DNA - different forms of DNA. DNA replication – enzymology of DNA replication – different modes, models and types of DNA replication – Eukaryotic DNA replication.

UNIT – II

Mutagen, mutagenesis and mutation. Luria Delbruck experiment and its significance. Molecular basis of mutation. Spontaneous and induced mutations. Different types of mutation, mutant detection, mutant selection and carcinogenicity testing. DNA damage – types of damage (deamination, oxidative damage, alkylation, Pyrimidine dimers) – DNA repair mechanism (base excision, nucleotide excision, recombination repair, SOS repair).

UNIT – III

Genetic code: DNA transcription in prokaryotes and eukaryotes. Trancriptional control and modification system – RNA translation in prokaryotes and eukaryotes. Polypeptide synthesis (maturation and processing of RNA) – Translational modification. Regulation of gene expression – Operon model (Lac, Trp, Ara) – Regulation of gene expression in eukaryotes.

UNIT – IV

Genetic recombination in bacteria – conjugation, transformation, transduction. Linkage and genetic mapping. Phage genetics (Replication cycle) – Phage T4 mutants (detection and isolation) –– Genetic map of T4 phage.

UNIT – V

Yeast genetics – Life cycle, metabolism, genome and extra chromosomal element. Genetic nomenclature in yeast. Tetrad analysis, Petite mutants (mutant isolation and complementation). Genetic mapping in yeast, *Neurospora* and *Drosophila*.

SUGGESTED READINGS

TEXT BOOKS

1. Malacinski, G.M. (2008). *Freifelder's Essentials of Molecular Biology*. Narosa Publishing House, New Delhi.
2. Verma, P.S., and Agarwal, V.K., (2008). *Cell Biology, Genetics, Molecular Biology and Evolution*. S. Chand & Company Ltd, New Delhi
3. Gardner, E.J., Simmons, M.J., and Snustad, D.P., (2008). *Principles of Genetics*. (8^{th} ed.). John Wiley and Sons, NY.
4. Guthrie, C., and Fink, G., (2002). *Guide to Yeast Genetics and Molecular Cell Biology*. Elsevier Publication, USA.
5. Klug, W.S., Cummings, M.R. Spencer, C.A., and Palladino, M.A., (2009). *Essentials of Genetics*. (7^{th} ed.). Prentice Hall, New Jersey.
6. Maloy, S.R., Cronan Jr, J.E., and Freifelder, D., (2001). *Microbial Genetics*. Narosa Publishing House. New Delhi.
7. Weaver, R.F. (2002). *Molecular Biology*. (2^{nd} ed.). McGraw-Hill, New York.

REFERENCES

1. Alberts. (2008). *Molecular Biology of The Cell*, (5^{th} ed.). Garland Science, Taylor and Francis group, LIC, an Inforrma Science.
2. Griffiths *et al.*, (2002). *Modern genetic analysis*, (2^{nd} ed.). Freeman.
3. Hartl and Jones, (1998). *Genetics-Principles and Analysis*, (4th ed.). Jones & Bartlett.
4. Krebs, E,J., S.T.Kilpatrick and E.S.Goldstein, (2008). *Lewin's Genes X*, (10^{th} ed.). Jones and Bartlett publishers, Canada.
5. Nelson, D., and Cox, M.M., (2008). *Lehninger's Principles of Biochemistry*, (5^{th} ed.). McMillan.
6. Tamarin, R.H. (2001). *Principles of Genetics*. (7^{th} ed.). Wm. C. Brown Publishers. England
7. Turner, P., McLennan, A., Bates, A., and White, M., (2005). *Molecular Biology*. (3^{rd} ed.). Taylor and Francis group.
8. Watson, J.D., Baker, T., Bell, S., Gann, A., Levine, M., and Losick, R., (2008). *Molecular Biology of Genes*. (6^{th} ed.). Pearson Education.

Semester – I

16MBP104 BIOINSTRUMENTATION 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

COURSE OBJECTIVES

- Introduce the basic concept of qualitative and quantitative analysis of a given sample
- To Study various spectroscopic techniques and its instrumentation.
- To know the concept of separation science and its applications.
- To understand the basic laboratory skills that are essential for beginning-level employment in clinical, pharmaceutical, microbiology, biochemistry and biotechnology laboratories.
- To impart the concept of radiochemical analysis along with industrial analyzers
- To understand working of different laboratory equipment's used in microbiological laboratories

COURSE OUTCOME (CO'S)

1. This enables students to be able to explain bioinstrumentation techniques, design and application.
2. To know the concepts and operation of various lab instruments and related terms.
3. Acquire knowledge and lab skills to perform experiments in laboratory.
4. Connect the concepts of physics, chemistry and engineering principles in the instrumentation.
5. The students will be able to know all the basic principles, technology and applications of various instruments in life science.
6. Comprehend the techniques and the underlying principles in bioinstrumentation.

UNIT – I

Spectroscopy – properties of electromagnetic radiations. Instrumentation and applications of – UV-Visible spectrophotometer, spectrofluorimeter, atomic spectroscopy, FTIR, NMR spectroscopy, MALDI-TOF and flow cytometer.

UNIT – II

Centrifugation: principle and types of centrifuges. Principles and applications of analytical and preparative centrifuges. Relative molecular mass determination and sedimentation coefficient. Sub-cellular Fractionation of cellular components. Density gradient and ultra centrifugation.

UNIT – III

Chromatography & Microscopy – principle, instrumentation and applications of ion exchange, affinity, gel filtration, Low pressure liquid chromatography (LPLC) and high performance liquid chromatography (HPLC) and fast protein liquid chromatography (FPLC), gas liquid chromatography-mass spectroscopy (GC-MS). Microscopy SEM and TEM.

UNIT – IV

Electrophoresis - principle, instrumentation and applications of agarose gel electrophoresis, native PAGE, sodium dodecyl sulphate - polyacrylamide gel electrophoresis (SDS-PAGE), isoelectric focusing, immuno electrophoresis, pulse field gel electrophoresis, capillary electrophoresis, gel documentation – applications.

UNIT – V

Radioisotopic techniques – introduction, nature of radio activity, types and rate of radioactive decay, units of radio activity, detection and measurement of radio activity. Principle, instrumentation and applications of Geiger-Muller counter, solid and liquid scintillation counter and autoradiography. Biosafety methods in radioactive laboratory.

SUGGESTED READINGS

TEXT BOOKS

1. John Enderle., (2006). *Bioinstrumentation*. (2006). Morgan and Claypool Publishers, NJ.
2. Richard Normann. (1988). *Principles of bioinstrumentation*. Wiley Publishers,US.
3. Keith Wilson and John Walker. (2010). *Principle and Techniques of Biochemistry and molecular biology*. (7th ed.). Cambridge university press, NY.

REFERENCES

1. Boyer, R. (2000). *Modern Experimental Biochemistry*. (3rd ed.). Addison Wesley Longman, New Delhi.
2. Chatwal, G.R., and Anand, S.K., (2003). *Instrumental Methods of Chemical Analysis*. (5th ed.). Himalaya Publishing House, Mumbai
3. Friedfelder, D. (2001). *Physical Biochemistry: Applications to biochemistry and molecular biology*. Oxford Publishers, New York.
4. Sharma, B.K. (2007). *Instrumental Methods of Chemical Analysis*, Krishna Prakashan Media (P) Ltd, India.
5. Wilson, K., and Walker, J., (2010). *Principles and Techniques of Biochemistry and Molecular Biology*, (7th Low Price ed.). Cambridge University Press, India.

16MBP105A **MARINE MICROBIOLOGY** **Semester - I**
4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To provide students with basic knowledge on the biology and ecology of marine microorganisms, and their ecological role.
- To know the basic biology of marine microorganisms and their activities
- To impart modern techniques for the characterization and study of marine microorganisms and microbial communities.
- To understanding the ecological role of marine microorganisms and marine microbial communities.
- To know the main techniques of modern use necessary for the characterization and study of marine microbes.
- To understand basic biological processes that occur in and between organisms in nature.

COURSE OUTCOME (CO'S)

1. Capable of describing and explaining both biological interaction processes and their importance to ecosystems.
2. To acquire knowledge of the most common research methods used to develop our knowledge of biological processes.
3. learn to work independently in collecting and analysing scientific data, both in the field and in the laboratory.
4. Understand the architecture of marine ecosystem and its essential role
5. Specify the biological significance of biomolecules in metabolism
6. To understand computer applications and Bioinformatics

UNIT – I
Marine microorganisms: collection, preservation, enumeration (total and viable counts), isolation of culture and identification based on morphological, physiological and biochemical characteristics. International and national collection centres.

UNIT – II
Extremophiles: Thermopiles, basophiles, halophiles, psychrophiles, acid – alkalinophiles, oligotroph, toxitolerant, xerotolerant, endolith – Extremophiles and their environment, biodiversity. Genomics of extremophiles, phylogeny of extremophiles, 16S RNA classification in mitochondrial DNA genome, RAPD, RFLP studies.

UNIT – III
Microbiology of degradation of xenobiotic environment: Ecological considerations, decay behaviour, degradative plasmids, hydrocarbons, oil pollution, surfactants, pesticides, Bioremediation:- Factors

affecting bioremediation – role of microbes in the marine nutrient cycles – diseases of marine organisms and its impact on marine biodiversity.

UNIT – IV

Brief account of photosynthetic and accessory pigments: Chlorophyll – bacterial chlorophyll – carotenoids – rhodopsin, phycobilliprotein, carbohydrates, anabolism – autotrophy – photosynthesis – autotrophic generation of ATP, fixation of CO_2 – Calvin cycle– C_3 and C_4 pathway.

UNIT – V

Bar coding of marine organisms: Genome sequencing and physical mapping of genome. Composting of domestic, agricultural and industrial wastes, vermicomposting. SCP production; Mushroom cultivation.

SUGGESTED READINGS

TEXT BOOKS

1. Colin Munn. (2011). *Marine Microbiology: Ecology & Applications*. (2nd ed.). Black Well Publishers.
2. David Sigee. (2005). *Freshwater Microbiology: Biodiversity and Dynamic Interactions of Microorganisms in the Aquatic Environment*. (1st ed.). Black well Publishers.
3. Se-Kwon Kim. (2013). *Bioactive compounds and biotechnological applications*. CLS Publishers

REFERENCES

1. Dube, H.C. (1994). *A text book of fungi, bacteria and viruses*. Vikas Publishing House, New Delhi.
2. Dale, J.W. (1994). *Molecular genetics of Bacteria*. John Wiley and Stones.
3. Pelczar, M., JR., Chan, E.C.S., and Noel, R. K., (2006). *Microbiology*. Tata McGraw, Hill. Co. (5th ed.). New Delhi.
4. Presscott, L.N., Harley, J.P. and Klein, D.A., (1999). *Microbiology*. W.C. Brown Publishers.
5. Stanier, R.Y., Ingharam, J.L., Wheelis, M.L., and Painter, P.R., (1986). *General Waste water engineering Treatment, Disposal and Reuse*. Metcaff and Eddy. Inc., Tata Mc Grew Hill, New Delhi.

Semester - II

16MBP105B COMPUTER APPLICATIONS AND BIOINFORMATICS 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To detail the importance of computer in field of life sciences.
- To obtain good understanding about the interpretation of biological data base. To uptake knowledge in latest tools and technology.
- To describe the history, scope and importance of Bioinformatics and role of internet in Bioinformatics
- Provide an overview of the application areas of bioinformatics, with a focus on the topics that will be taught in the course
- To get introduced to the basic concepts of Bioinformatics and its significance in Biological data analysis
- Classify different types of Biological Databases

COURSE OUTCOME (CO'S)

1. The students will have an understanding about the information on the search engines and various software tools involved in bioinformatics.
2. Additional knowledge on different operating systems would enable the candidate to work with versatility.
3. Provides computational skill on search engines and various software tools involved in bioinformatics
4. It will impart computational based techniques which includes genomics and proteomics in Bioinformatics.
5. Retrieve information from available databases and use them for microbial identifications and drug designing
6. Gain ability to modify gene and protein structures in simulated systems.

UNIT – I

Information networks-internet, web browsers, HTTP,HTML and URLs. EMBnet – NCBI, Virtual tourism. Introduction to Operating systems like Windows, UNIX & LINUX - Computer Viruses – Overview and prevention.

UNIT – II

Bioinformatics tools - Global Vs local alignment – Similarity searching –Pair wise alignment and multiple alignments – Biological Databases – Literature, Sequence and Structure – identification and retrieving data from databases.

UNIT – III

Protein information resources –primary sequence database, Composite protein sequence database, secondary database, and Composite protein structure database. Protein structure prediction - Proteomic tools at ExPASy server.

UNIT – IV

Protein structure comparison and classification – RNA structure analysis – Plasmid mapping and Primer designing– Structure visualization softwares – Phylogenetics – Tree types and construction methods.

UNIT – V

DNA sequencing –Specialized genomic resources. DNA microarray – principles and databases – Genomics and Proteomics – genes prediction, splices sites and regulatory regions – Drug designing and Commercial Bioinformatics.

SUGGESTED READINGS

TEXT BOOKS

1. Rashidi, H., and Buehler, L.K., (2005). *Bioinformatics Basics: Applications in Biological Science and Medicine*. CRC Press/Taylor & Francis Group.
2. Krawetz, S.A., David, D., Womble, S.A., Krawetz, D.D., Womble, D., (2003). *Introduction to Bioinformatics: A theoretical and Practical approach*. Humana Press, USA.
3. Bergeron, B. (2002). *Bioinformatics Computing*. Prentice Hall Publishres.

REFERENCES

1. MountD. W. (2001). *Bioinformatics. Sequence and Genome Analysis*, Cold Spring Harbor Laboratory Press.
2. Higginns, D., and Taylor, W., (2000). *Bioinformatics. Sequence, Structure and databanks – A Practical Approach*, Oxford University Press.
3. Baxevanis, A.D., and Francis Ouellette, B.F., (2001) *Bioinformatics – A Practical Guide to the Analysis of Genes and Proteins*, Wiley – Interscience.
4. Gibson, G., and Muse, S.V., (2002). *A Primer of Genome Science, Sinauer Associates*, Inc. Publishers.
5. Misener, S., and Krawetz, S.A., (2000). *Methods in Molecular Biology – Bioinformatics. Methods and Protocols*, Humana Press.
6. Attwood, T.K., and Parry-Smith, D. J., (2001). *Introduction to Bioinformatics*, Pearson Education Asia.
7. Claverie, J.M., and Notredame, C., (2003). *Bioinformatics for Dummies***,** Wiley Publishing, Inc

Semester - III

16MBP105C **BIOCHEMISTRY** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To provide the knowledge on basics of biochemistry and its applications and to highlight the technical skill.
- To describe the classification and functions of lipids.
- To summarize the structure and classification of enzymes
- To state the Structure and types of DNA
- To analyse the functions and properties of phosphoglycerides
- To understand about storage and structural polysaccharides.

COURSEOUTCOME

1. Understand the structures of enzymes, proteins, carbohydrates and fats
2. Understand the functions of biomolecules
3. Analyze the process of metabolism
4. Understand of nucleic acids and their importance to combine and analyses information.
5. Explain the structure and mechanism of enzyme action
6. Summarize the DNA & RNA structure and base pairing schemes.

UNIT - I
Definition and scope of biochemistry, cellular basis of life, molecular composition of cells, elements and compounds of life Biochemical functions of cell organelles.

UNIT - II
Proteins- protein content of various type of cells, biological role of proteins; primary, secondary, tertiary, quaternary structure of proteins. Classification of proteins.

UNIT - III
Saccharides - Mono, oligo and polysaccharides; isomerism, chain and ring structure of carbohydrates, structure of starch, cellulose, glycogen and mucopolysaccarides.

UNIT - IV
Fatty acids- properties and nomenclature, essential and non-essential fatty acids. Classification of lipids and storage of lipids.

UNIT - V
DNA- Properties, structure, and importance. Prokaryotic and Eukaryotic cell differences. DNA as genetic material and genetic code

SUGGESTED READINGS

TEXT BOOKS

1. Ambika, S. (2004). *Fundamentals of Biochemistry for Medical Students*, CIT Chennai.
2. Deb, C. (2011). *Fundamentals of Biochemistry*, (9^{th} ed.). New Central Book Agency, Calcutta.
3. Jain, J.L., Jain, S., and Jain, N., (2005). *Fundamentals of Biochemistry,* S. Chand and Company Ltd, New Delhi.

RFERENCES

1. Wood, E.J., and Pickering, W.R., (1982). *Introducing biochemistry*. ELBS/John Muray.
2. Lehninger, A.L. (1982). *Principles of biochemistry*, Worth Publishers, Inc. New York.
3. Conn, E.E., and Stumpf, P.K., (1976). *Outlines of biochemistry*. Wiley Eastern, New Delhi.
4. Stryerm, L. (1995). *Biochemistry* W.H. Freeman Press, San Francisco, USA

Semester – I

16MBP111 BASIC PRACTICAL – I 4H – 2C

Instruction Hours / week: L: 0 T: 0 P:4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 9 Hours

COURSE OBJECTIVES

- This course is put forward with the objectives of equipping the candidates with practical knowledge on basic techniques involved in the isolation, characterization and identification of different types of microorganism.
- Know various Culture media and their applications and also understand various physical and chemical means of sterilization.
- Know General bacteriology and microbial techniques for isolation of pure cultures.
- Master aseptic techniques and be able to perform routine culture handling tasks safely and effectively.
- Comprehend the various methods for identification of unknown microorganisms.
- Understand the microbial transport systems and the modes and mechanisms of energy conservation in microbial metabolis

COURSE OUTCOME

1. A student able to skillfully isolate and identify the microorganisms using different microbiological techniques needed in laboratory.
2. To enhance the ability of the student skills in medical laboratories and research sectors.
3. Demonstrate practical skills in the use of tools, technologies and methods common to microbiology.
4. To apply the scientific method and hypothesis testing in the design and execution of experiments
5. To develope theoretical and practical skills in the design and execution of experiments.
6. Know the various Physical and Chemical growth requirements of bacteria and get equipped with various methods of bacterial growth measurement.

EXPERIMENTS

1. Micrometry
2. Measurement of pH
3. Staining techniques: Simple, Gram, Negative and Endospore
4. Motility determination - Hanging drop and SIM inoculation

5. Cultivation of anaerobic microorganisms – Wrights tube – Mc Intosh anaerobic jar - roll tube methods.
6. Permanent slide preparation
7. Lactophenol cotton blue mounting of fungi - *Aspergillus* sp, *Mucor* sp, *Rhizopus* sp, *Fusarium* sp, *Penicillium* sp
8. Measurement of microbial growth – Viable count – Direct count – Turbidity methods
9. Biochemical characterization
   a) Indole
   b) MR
   c) VP
   d) Citrate utilization tests
   e) TSI test
   f) Catalase
   g) Oxidase
   h) Urease
   i) Nitrate
   j) Hydrogen sulphide production test
   k) Litmus milk reduction test
   l) Carbohydrate fermentation tests
   m) Amino acid utilization
   n) Hydrolysis of polymers- Starch, Lipid, Casein, Gelatin.

SUGGESTED READINGS

REFERENCES

1. Aneeja, K.R. (2001). *Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology*, (3^{rd} ed.)., New Age International (P) Limited Publishers, New Delhi.
2. Cappucino, J.G. and Sherman, N., (2001). *Microbiology A Laboratory Manual*, (6^{th} ed.). Benjamin Cummings, New York.
3. Dubey, R.C., and Maheshwari, D.K., (2002). *Practical Microbiology*, (1^{st} ed.). S. Chand and Company Ltd, New Delhi.
4. Gunasekaran, P. (1996). *Lab Manual in Microbiology*, (1^{st} ed.). New Age International (P) Ltd, Publishers , New Delhi.

Semester – I

16MBP112 **BASIC PRACTICAL – II** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 9 Hours

COURSE OBJECTIVES

- To acquire skill on the different molecular mechanism of gene transfer, mutations and separation of nucleic acids.
- This course is put forward with the objectives of equipping the candidates with practical knowledge on basic techniques.
- To impart skills of isolation, characterization and identification of different types of microorganism.
- Know various Culture media and their applications and also understand various physical and chemical means of sterilization.
- To make students understand the principles of Genetics
- Students will learn the basic principles of inheritance at the molecular, cellular and organismal levels.

COURSE OUTCOME

1. A student undertaking this course will be learning the principles behind the molecular techniques which would enable him to work in competent molecular biology based laboratories.
2. Imparts knowledge on the different aspects of genetics and pedigree analysis.
3. Students will apply their knowledge of to selected examples of changes or losses in cell function.
4. Identify the organs and tissue systems of plants,
5. and explain their respective function.
6. Impart knowledge on applications of microorganisms in various fields

EXPERIMENTS

1. Spontaneous Mutation – gradient plate technique
2. Induced Mutagenesis-chemical and physical - UV
3. Replica plating technique.
4. Transformation in Bacteria
5. Bacterial Conjugation
6. Induction of Lac operon
7. Measurement of growth-one step growth curve using a T even phage
8. Titration of phages (T4)
9. Nuclear staining for nucleic acid identification.
10. Spectrophotometric estimation of protein – BSA
11. Analysis of amino acid by Paper chromatography
12. Analysis of amino acid by Thin layer chromatography

13. Purification of proteins by column chromatography
14. Analysis of amino acid by HPLC – Demonstration

SUGGESTED READINGS

REFERENCES

1. Arora, B., and Arora, D.R., (2007). *Practical Microbiology*, (1st ed.). CBS Publishers and Distributors, Bangalore.
2. Benson, H.J. (1998). *Microbiological Application (Laboratory Manual in General Microbiology)*, (7th ed.). WCB.
3. Palanivelu, P. (2004). *Analytical Biochemistry and Separation Techniques*, (3rd ed.). Twenty First Century Publication, Madurai.
4. Chakraborthy, P., and Pal, N.K., (2008). *Manual of Practical Microbiology and Parasitology*, New Central Book Agency (P) Ltd, India.
5. Gaud, R.S., and Gupta, G.D., (1999). *Practical Microbiology*, 1st Ed.). Nirali Prakashan, Pune.

Semester – II

16MBP201 **VIROLOGY** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- Virology, often considered a part of microbiology or of pathology, is the study of biological viruses and virus like agents.
- Viral structure, classification and evolution, their ways to infect and exploit cells of virus reproduction, the disease they cause.
- The techniques to isolate and culture them and their potential uses in research and therapy.
- To know how viruses are classified
- To understand the architecture of viruses
- To understand the interactions between viruses and the host immune system

COURSE OUTCOMES

1. Describe the structure and replication strategies of the viruses, the processes of entry into cells, control of gene transcription and where relevant translation and gene product stability, control of and mechanism of genome replication, virion assembly and egress from the cell.
2. Define the process of virus latency and describe in molecular terms control of the process and activation of viral genomes during reactivation.
3. Describe the growth behavior differences between normal cells and cells transformed by oncogenic DNA and RNA viruses.
4. Integrate experimental strategies learned in the context of viral systems into the design of experiments involving other systems.
5. Discern the replication strategies of representative viruses from the seven Baltimore classes
6. To understand the interactions between viruses and the host immune system

UNIT – I

Historical perspective of virology - Scope of virology -Viral classification and properties of viruses – Replication of viruses, cultivation of viruses (animal inoculation, Embroyanated egg and tissue culture) - properties of viroids and Prions.

UNIT – II

Animal viruses- DNA viruses - morphology, replication, pathogenesis and laboratory diagnosis of Pox virus, Adeno virus, Hepatitis viruses – type A,B and D. Herpes simplex viruses, oncogenic viruses- Papova virus,- oncogenes and Oncogenesis.

UNIT – III

Animal viruses - RNA viruses - morphology, replication, pathogenesis and laboratory diagnosis of Poliovirus. Rabies virus, Influenza virus, mumps virus, Measles virus and rubella virus, Retro virus - HIV virus. Dengue and Japanese Encephalitis, SARS, Swine Flu.

UNIT – IV

Plant viruses – RNA viruses – TMV, Cowpea mosaic virus, Bromomosaic viruses, Satellite viruses – Double stranded DNA viruses - CaMV – Single stranded DNA viruses – Gemini virus. Structure and replication of Bacteriophage (T4) – Filamentous phage (ΦX174).

UNIT – V

Common type of hospital infections – hospital waste disposal. Viral vaccines and interferons - Antiviral drugs - strategies to develop AIDS vaccines - Rabies vaccines preparation (animal and cell culture) and their immunization dosage.

SUGGESTED READINGS

TEXT BOOKS

1. Ananthanarayanan, R., and Panicker, C.K.J., (2005). *Text book of Microbiology*. (7th ed.). Orient Longman, New Delhi.
2. Carter, J., and Saunders, V., (2007). *Virology: Principles and Applications*. (1st ed). Wiley.
3. Chakraborty, P. (2003). *A Text book of Microbiology*. (2nd ed.). New Central Book Agency (P) Ltd, Calcutta.
4. Dubey, R.C., and Maheswari, D.K., (2004). *A Text book of Microbiology*. (1st ed.). S. Chand and Company Ltd, New Delhi.
5. Pelczar, Jr. M.J., Chan, E.C.S., and Kreig, K.R., (2003). *Microbiology*. (5th ed.). Tata McGraw-Hill Publishing Company, New Delhi.

REFERENCES

1. Acheson, N.H. (2006). *Fundamentals of Molecular Virology*. Wiley publication.
2. Cann, A.J. (2005). *Principles of Molecular Virology*, Academic Press.
3. Dimmock, N.J., Easton, A.J., and Leppard, K.N., (2007). *Introduction to Modern Virology*, (6th ed.). Blackwell Scientific Publications, Oxford, UK.
4. Flint, S.J., Racaniello, V.R., Enquist, L.W., Rancaniello, V. R., and Skalka, A. M., (2003). *Principles of Virology: Molecular Biology, Pathogenesis, and Control of Animal Viruses*. American Society Microbiology.
5. Jawetz, E., Melnic, J.L, and Adelberg, E.A., (2001). *Review of Medical Microbiology*. (22nd ed.). Lange Medical Publishers, NY.
6. Levy, J. A., Fraenkel-Conrat, H., and Owens, O. S., (1994).*Virology*. (3rd ed.). Benjamin Cummings.
7. Knipe D.M., Howley P.M., and Griffin D.E., (2006). *Fields Virology*. (5th ed). Vols - I,II. Lippincott, Williams & Wilkins.
8. Prescott, M., Harley, J.P., and Klein, D.A., (2007). *Microbiology*. (7th ed.). McGraw-Hill Inc. New York.
9. White, D. O., and Fenner, F.J., (1994). *Medical Virology*, (4th ed.). Academic Press, New York.

Semester - II

16MBP202 **MEDICAL BACTERIOLOGY** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- Virology, often considered a part of microbiology or of pathology, is the study of biological viruses and virus like agents.
- Viral structure, classification and evolution, their ways to infect and exploit cells of virus reproduction, the disease they cause.
- The techniques to isolate and culture them and their potential uses in research and therapy.
- To know how viruses are classified
- To understand the architecture of viruses
- To understand the interactions between viruses and the host immune system

COURSE OUTCOMES

1. Describe the structure and replication strategies of the viruses, the processes of entry into cells, control of gene transcription and where relevant translation and gene product stability, control of and mechanism of genome replication, virion assembly and egress from the cell.
2. Define the process of virus latency and describe in molecular terms control of the process and activation of viral genomes during reactivation.
3. Describe the growth behavior differences between normal cells and cells transformed by oncogenic DNA and RNA viruses.
4. Integrate experimental strategies learned in the context of viral systems into the design of experiments involving other systems.
5. Discern the replication strategies of representative viruses from the seven Baltimore classes
6. To understand the interactions between viruses and the host immune system

UNIT – I

Laboratory precaution and guidelines – Aseptic collection – transportation – handling and examination of pathological specimens – methods of isolation, identification and interpretation of pathogenic organisms – antibiotic susceptibility testing..

UNIT – II

Infections – types – methods – infectious disease cycle. Definitions of Epidemics, Endemics Pandemics and investigation of epidemics and control. Definition of pathogens, Saprophytes and Copmmensals. Quality control in microbiology lab.

UNIT – III

Gram positive organisms: Morphology, cultural characteristics, antigenic property, pathogenecity, laboratory diagnosis and treatment. *Staphylococcus* sp., *Streptococcus* sp., *Bacillus* sp., *Corynebacterium* sp., *Clostridium sp.* and *Mycobacterium* sp.

UNIT – IV

Gram negative organisms*:* Morphology, cultural characteristics, antigenic property, pathogenecity, laboratory diagnosis and treatment. *E.coli*, *Klebsiella* sp., *Proteus* sp., *Pseudomonas* sp., *Vibrio* sp., *Salmonella* sp., *Shigella* sp., *Treponema* sp., *Neisseria* sp. and *Haemophilus* sp.

UNIT – V

Nosocomial infection – Urinary tract infection, Respiratory tract infection, Sexually transmitted disease – Immunoprophylaxis – Vaccines and antibiotics.- Phage typing and bacteriocin typing.

SUGGESTED READINGS

TEXT BOOKS

1. Ananthanarayanan, R., and Panicker, C.K.J., (2005). *Text Book of Microbiology* (7^{th} ed.). Orient Longman, New Delhi.
2. Salle, A.J. (2008). *Fundamentals principles of bacteriology*. T.M.H. Ed.). Mc Graw Hill.
3. Carl Fraenkel. (2012). *Text book of bacteriology*. Printing company publishers, New York.

REFERENCES

1. Brook,G.F., J., Butel, S., Stephen, A., and Morse, A., (2003). *Medical Microbiology*, (22^{nd} ed.). Mc Graw Hill.
2. Chakraborty, P. (2003). *A Text book of Microbiology*. (2^{nd} ed.). New Central Book Agency (P) Ltd., Calcutta.
3. Dismukes, W.E., Pappas, P.G., and Sobel, D., (2003). *Clinical Mycology*. Oxford University Press, UK.
4. Jawetz, E., Melnic, J.L., and Adelberg, E.A., (2001). *Review of Medical Microbiology*. (22^{nd} ed.). Lange Medical Publishers. NY.

Semester – II

16MBP203 MICROBIAL TECHNOLOGY AND INTELLECTUAL PROPERTY RIGHTS **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- Microbial technology is concerned with the industrial processing of materials by microorganisms to provide desirable products or serve other useful purposes.
- This paper emphasizes the application of biological systems to the manufacturing and service industries or the use of biological processes within the framework of technical operations and industrial production.
- It creates awareness on the Intellectual property rights and patenting of biotechnological processes.
- This course will provide technical skill majorly deals with DNA.
- To familiarize the students, with the principles of bioethical concepts
- To emphasize on IPR issues and need for knowledge in patents in biotechnology.

COURSE OUTCOME (CO'S)

1. To learn the basic tools in recombinant technology
2. To understand the various concepts of cloning vectors
3. To learn the cloning strategies
4. To familiarize the students, with the principles of bioethical concepts
5. To emphasize on IPR issues and need for knowledge in patents in biotechnology.
6. To aware students with current research.

UNIT – I

Introduction to microbial technology, restriction enzymes – nomenclature – types – and its properties, isolation of DNA, plasmids and RNA. Handling and quantification of nucleic acids, radiolabelling and non radiolabelling of nucleic acids, gel electrophoresis - Blotting techniques – Southern, Northern and Western blotting techniques.

UNIT – II

Cloning vectors: Plasmid as cloning vectors - pBR322, Bacteriophage - □, M13; Cosmid, phagemids. Yeast vector. Expression vectors. Prokaryotic hosts: *E.coli*, Eukaryotic hosts: Yeast cell. Gene cloning - basic steps, cloning construction of cDNA, selection and screening method of recombinants. Biolabelling of genes and proteins.

UNIT – III

Trrangenic plants: Methodology, development of herbicide resistance plants, delayed fruit ripening, Biocontrol agents - Insecticidal toxin of BT, cry gene and baculovirus. Trangenic animals.

Methodology, development of transgenic mice – its application. DNA diagnostic in medical forensics. Biosafety and Bioethics.

UNIT – IV

Patenting – fundamental requirements – patenting multicellular organisms – patenting and fundamental research. Patenting of biological materials, Product patents, conditions for patenting, Patenting of liveforms, regulating recombinant technology, Food and food ingredients. Trade secrets. How do write a patent?

UNIT – V

Discrepancies in biotechnology / chemical patenting. IPR – historical perspective – recent developments – IPR in India, IPR and the rights of farmers in developing countries.

SUGGESTED READINGS

TEXT BOOKS

1. Sathyanarayana, U. (2005). *Biotechnology*. (1st ed.). Books and Allied (P) Ltd, Kolkata, India.
2. Dubey, R.C. (2002). *Text book of Biotechnology*. S. Chand and Company Ltd, New Delhi.
3. Ramawat, K.G. (2003). *Text book of Plant Biotechnology*. S. Chand and Company Ltd, New Delhi.
4. Watson, J.D., Gilman, M., and Wikowski, J., (2001). *Recombinant DNA*. (2nd ed.)., Scientific American Books. W.H. Freeman and Co. NY.
5. Verma, A., and Podila, G.K., (2005). *Biotechnological Applications of Microbes*. I.K. International Publishing House, New Delhi.

REFERENCES

1. Brown, T.A. (2001). *Gene Cloning and DNA analysis: An Introduction*. (4th ed.). Blackwell Publishing, USA.
2. Glick, B.K., and Pasternak, J.J., (2003). *Molecular Biotechnology*. *Principles and Applications of Recombinant DNA*. (3rd ed.). ASM Press, Washington.
3. Old, R.M., and Primrose, S.B., (2003). *Principles of Gene Manipulation*. (6th ed.). Blackwell Scientific Publication, London.
4. Primrose, S.B. (2001). *Molecular Biotechnology*. (2nd ed.). Blackwell Scientific Publishers, Oxford Press, London.
5. Winnacker, E.L. (2003). *From Genes to Clones: Introduction to Gene Technology*. (1st ed.). VCH. Weinhein, Germany.
6. Slater, A., and Scott, N., (2003). *Plant Biotechnology - The Genetic Manipulations of plants*. (2nd ed.)., Oxford University Press, New York.

Semester – II

16MBP204 ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To educate the students about concepts of designs of water distribution systems, sewer networks, working principles and design of various physical, chemical and biological treatment systems of water and wastewater.
- To study about the biofertilizers, plant disease and increasing soil fertility.
- To impart a skilled knowledge on Microbes and environment and ecological importance.
- The main goal is to know and understand the role of microbes in biogeochemical processes in different ecosystems. The students will learn the basic microbiological principles, the methods in microbial ecology and their theoretical and practical use.
- The knowledge can give the base for understanding processes and changes in the environment.
- The students can get some skills to recognise the ecological problems and critical evaluation of the human impacts on pollution, climate changes and as well as environmental protection.

COURSE OUTCOME (CO'S)

1. This course will provide the student insights into these invaluable areas of Environmental microbiology, which play a crucial role in determining its future use and applications in environmental management.
2. Students able to know detailed idea about biofertilizer production and plant disease.
3. Students able to become Entrepreneur after understanding this process and product development.
4. This course will determine microbial role in nutrient cycling
5. This course can able to determine water quality.
6. It will explain the degradation of natural organic compounds and selected pollutants in the environment.

UNIT – I

Aquatic environment - microbiology of water - water pollution and water borne pathogens. Bacteriological examination of water, indicator organism. Microbiology of sewage. Chemical and biochemical characteristic of sewage. methods of sewage treatment - physical screening, chemical, biological (sludge digestion; activated sludge, aerating filters, oxidation pond).

UNIT – II

Microbiology of air - Microbial contaminants of air, sources of contamination, microbial indicators of air pollution. Enumeration of bacteria in air. Air samplers and Sampling techniques. Air sanitation.

UNIT – III

Bioremediation – contaminated soil, aquifers, marine pollutants, air pollutants, stimulation of oil spills degradation. Bioremediation of air pollutants. Bioleaching – recovery of metal from ores – oxidation of minerals – testing for biodegradability.

UNIT – IV

Biological nitrogen fixation - symbiotic and non-symbiotic microorganisms, root nodule formation, nitrogen fixers, hydrogenase, Nitrogenase, *Nif* gene regulation. Biochemistry of nitrogen fixation, Rhizosphere- R: S ratio, Interaction of microbes with plants. Bioconversion of agricultural wastes.

UNIT – V

Biofertilizer - Application of biofertilizers and biomanures – A combination of biofertilizer and manure applications with reference to soil, seed and leaf sprays. Laboratory and field application; Cost-benefit analysis of biofertilizer and biomanure production.

SUGGESTED READINGS

TEXT BOOKS

1. Subba Rao, N.S. (1999). *Biofertilizers in Agriculture and Agroforestry*. Oxford and IBH, New Delhi.
2. Rangaswami, G., and Bhagyaraj, D.J., (2001). *Agricultural Microbiology*. (2^{nd} ed.). Prentice Hall, New Delhi.
3. Rao, N.S. (1995). *Soil Microorganisms and plant Growth*. Oxford and IBH Publishing Co., New Delhi.
4. Pelzar, M.J., and Reid, M., (2003). *Microbiology*. (5^{th} ed.). Tata Mc Graw-Hill, New York.
5. Reinheimer, G. (1991). *Aquatic Microbiology*. (4^{th} ed.). John Wiley and Sons, New York.

REFERENCES

1. Deniel, J.C. (1996). *Environmental aspects of microbiology*, British Sun Publication, Chennai.
2. Abbasi, S.A. (1998). *Environmental pollution and its control*. Cogent International publishers, Pondicherry.
3. Sen, K., and Ashbolt, N.J., (2010). *Environmental Microbiology: Current Technology and Water Applications.*
4. Josdand, S.N. (1995). *Environmental Biotechnology*. Himalaya Publishing House, Bombay.
5. Maier, R.M., Pepper, I,L., and Gerba, C.P., (2009). *Environmental Microbiology*. (2^{nd} ed.). Elsevier Publisher.
6. Metcalf, R.L., and Luckmann, W.H., (1994). *Introduction to insect pest management.* (3^{rd} ed). John Willey and Sons, Inc.
7. Atlas, R.M., and Bartha, M., (2000). *Microbial Ecology - Fundamental and Applications*. (3^{rd} ^{e}d.). Redwood City CA. Benjamin/Cumming Science Publishing Co., New Delhi.

8. Maier, R.M., Pepper, I.L., and Gerba, C.P., (2000). *Environmental Microbiology*. (1st ed.). Academic Press, New York.
9. Mitchell, R. (1992). *Introduction to Environmental Microbiology*; Prentice Hall. Inc. Englewood Clifs- New Jersey.
10. Motsara, M.R., Bhattacharyya, P., and Srivastava, B., (1995). *Biofertilizer- Technology, Marketing and Usage. Fertilizer Development and Consultant Organization*, New Delhi.

Semester - III

16MBP205A **CELL BIOLOGY** **4H - 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** External: **100** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To study cell structure, functions of organelle and gain exposure on transportations through cell membrane and to focus on different receptors and model of signaling.
- Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
- Students will understand how these cellular components are used to generate and utilize energy in cells.
- To gain the knowledge base in genetics, molecular biology and cell physiology.
- To engage the students in review of scientific literature in the areas of cell mediated biomedical studies.
- Conceptualize and describe protein structure, folding and sorting

COURSE OUTCOME

1. Students upon completion of this paper will have clear knowledge on various cellular functions such as transportation and signaling.
2. It will enable the students to enter into cellular function level research for their future.
3. Students will understand the cellular components underlying mitotic and meiotic cell division.
4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function.
5. Students will get the knowledge of common and advanced laboratory practices 7in cell and molecular biology
6. Conceptual knowledge of properties, structure, function of enzymes, enzyme kinetics and their regulation, enzyme engineering, Application of enzymes in large scale industrial processes

UNIT – I

Cell- Definitions and properties, cell theory. Difference between prokaryotes and eukaryotes. Ultrastructure of eukaryotic cell - plant and animal. Bacterial cell wall structure and composition and their functions.

UNIT – II
Plasma membrane - structure and functions. Transportaion – types and methods. Role of microtubules and microfilaments.

UNIT – III
Cell organelles – Endoplasmic reticulum, Golgi complex, Mitochondria, Chloroplast, Ribosomes, Lysosomes, Peroxisomes, Nucleus and Vacuoles.

UNIT – IV
Mitosis – properties and significance, mitotic cell division and five phases of mitosis.

UNIT – V
Meiosis - properties and significance, Phases of meiosis and Cellular aging:

SUGGESTED READINGS

TEXT BOOKS

1. Najman, S. (2012). *Current Frontiers and Perspectives in Cell Biology*.
2. Twesigye, C. K. *Cell Biology and Genetics*.
3. Cooper, G.M., and Hausman, R. E., (2007). *The Cell: A Molecular Approach*. (4th ed.). Sinauer Associates, Incorporated Publications
4. Ge Yang. (2011). *Engineering Molecular Cell Biology*. Garland Science Publishers.
5. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter, P., (2002). *Molecular Biology of the Cell*. (4th ed.). Garland Science Publications.

REFERENCES

1. Albert, B., Bray, D., Lewis, J., Raff, M., Roberts, K., and Watson, V., (1989). *Molecular Biology of the Cell*, Garland Publishing Inc, London.
2. Sadava, D.E. (1993). *Cell biology: Organelle structure and functions*. (1st ed.). Jones and Bartlett Publishers, USA.
3. Karp, G. (1984). *Cell biology*, (2nd ed.). Mc Graw-Hill Publications, USA.
4. Gupta, M.L., and Jangir, M.L., (2001). *Cell Biology: Fundamentals and Applications*, (1st ed.). Agrobios, Jodhpur, India.
5. Verma, P.S., and Agarwal, V.K., (2005). *Cell Biology*, (24th ed.)., S. Chand and Company Limited, India.

16MBP205B QUALITY ASSURANCE AND QUALITY CONTROL 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To inculcate the quality standards and the quality control practice followed in the industry.
- To bring awareness about biosafety and to enhance the entrepreneurship and employability.
- Knowledge of the principles and documentation of the quality system is a prerequisite for the course.
- Develop goal-oriented standards, policies, and procedures based on user-defined data quality requirements.
- Confirm that draft standards are acceptable to all users.
- Ensure that developed standards conform to the primary goals of the organization.

COURSE OUTCOME

1. Set up and Assess Food Quality Assurance Plans.
2. Create and Critically Evaluate quality specifications for raw materials, and associated final product and appropriate packaging.
3. Design and critically evaluate appropriate testing and recording procedures for raw materials and associated Final product.
4. Design, and evaluate processing documentation including Standard Operating procedures.
5. To realize the importance of significance of quality
6. Identify requirements of quality improvement programs

UNIT - I

An introduction to industrial microbiology. Definition of Quality assurance- roles and responsibilities of Quality assurance in industrial Microbiology. Roles and responsibilities of Quality control in industrial Microbiology.

UNIT - II

Antimicrobial agents – Definitions, properties, mode of action and applications. Antimicrobial agents for external usage - Chemical antimicrobial agents, synthetic antimicrobial agents, naturally antimicrobial agents.

UNIT - III

Sterilization – Types and methods of sterilization. Sterility testing and assessment of Microbial Contamination. Quality parameter to asses Natural products, Nutraceutical product, Pharmaceutical products.

UNIT - IV

Disinfection – Types and methods. Disinfection agents- properties and mode of action (Phenol, isopropyl alcohol and ethanol). Antibiotics and antimicrobial drug resistance, search for new antimicrobial agents.

UNIT - V

Quality assurance and Quality control – pharmacopeias, quality checking, routine examination and validation of industry. International disinfectant testing protocols, assessment of biocide effectiveness.

SUGGESTED READINGS

TEXT BOOKS

1. Rowland, M., and Tozer, T.N., (1995). *Clinical Pharmacokinetics: Concepts and Applications*. Williams & Wilkins publishers.
2. Tozer, T.M., and Rowland, M., (2006). *Introduction to Pharmacokinetics and Pharmacodynamics: The Quantitative Basis of Drug Therapy*. Lippincott Williams & Wilkins Publishers.
3. Pandit, N.K. (2007). *Introduction to the Pharmaceutical Sciences*. Lippincott Williams & Wilkins Publishers.

REFERENCES

1. Hugo, W. B., and Russel, A.D., (2006). *Pharmaceutical Microbiology*. (4th ed). Blackwell Scientific Publications.
2. Brock-Madigan M.T. (2006). *Biology of Microorganisms*. (11th ed.). Pearson- Prentice Hall, USA.
3. Gunasekaran, P. (1996). *Laboratory Manual in Microbiology*. (1st ed.). New Age International Pvt. Ltd, New Delhi.
4. Beckett, H., and Stenlake, J. B., (2003). *Practical Pharmaceutical Chemistry, Part I and Part II*, (4th ed.). Continuum International Publishing Group.
5. Jeffery, G. H., Basset, J., Mendham, J., and Denny, R.C., (Rev. by) (1989). *Vogels Text Book of Quantitative Chemical Analysis*, (5th ed.)., Bathpress, UK

Semester - II

15MBP205C **BIOPROCESS ENGINEERING** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- This course encompasses the use of microorganisms in the manufacture of food or industrial products.
- The use of microorganisms for the production of food, either human or animal, the microorganisms used in bio processes may be natural isolates; laboratory selected mutants or genetically engineered organisms.
- To know the basics and concepts of various biotechnological related terms
- Elucidate the significance of transgenic plants as bioreactors for the production of enzymes.
- Address bioethical and biosafety issues related to plant transgenics
- Elucidate the molecular techniques involved in gene manipulation and rDNA technology

COURSE OUTCOME

1. This course will enable the students to design the various microbial fermentation products and their production, purification for various applications
2. To know the process protocol for the, synthesis and characterization of nanoparticles
3. Explain the gene transfer methods for the production of transgenic animals
4. Gain experimental knowledge to perform animal biotechnology related experiments
5. Explain the application of biotechnology in medical and its allied fields, gene therapy, genetic counseling
6. Address the bioethical issues & concerned linked to medical biotechnology

UNIT–I

Design of a basic fermenter, bioreactor configuration, design features, computer control of fermentation process, measurement and control of process. Reactors for specialized applications: Tube reactors, packed bed reactors, fluidized bed reactors, cyclone reactors, trickle flow reactors, their basic construction and types for distribution of gases.

UNIT – II

Transport phenomena in fermentation: Gas- liquid exchange and mass transfer, oxygen transfer, critical oxygen concentration, heat transfer, aeration/agitation, its importance. Sterilization of Bioreactors, nutrients, air supply, products and effluents, process variables and control, scale-up of bioreactors.

UNIT – III

Growth of cultures in the fermenter. Importance of media in fermentation, media formulation and modification. Kinetics of growth in batch culture, continuous culture with respect to substrate utilization, specific growth rate, steady state in a chemostat, fed-batch fermentation, yield of biomass, product, calculation for productivity. Storage of cultures for repeated fermentations, scaling up of process form shake flask to industrial fermentation.

UNIT – IV

Biomass separation by centrifugation, filtration, flocculation and other recent developments. Cell disintegration: Physical, chemical and enzymatic methods. Extraction: Solvent, two phase, liquid extraction, whole broth, aqueous multiphase extraction. Purification by different methods. Concentration by precipitation, ultra-filtration, reverse osmosis, Drying and crystallization, Column chromatography, HPLC and GC.

UNIT – V

Isolation, selection and improvement of microbial cultures. Strain improvement for the selected organism: Use of recombinant DNA technology, protoplast fusion techniques for strain improvement. Improvement of characters other than products and its application in the industry. Preservation of cultures after strain improvement programme.

SUGGESTED READINGS

TEXT BOOKS

1. Demain, A.L., and Davies, J.E., (1999). *Manual of Industrial Microbiology and Biotechnology*. (2nd ed.). A.S.M. Press, Washington, D.C.
2. Hugo, W.B., and Russell, A.D., (1998). *Pharmaceutical Microbiology*. (6th ed.). Publisher Blackwell Science Ltd.
3. Mansi, E.M.T., and Bryce, C.F.A., (2002). *Fermentation Microbiology and Biotechnology*. Taylor and Francis, New York.
4. Patel, A.H. (2003). *Industrial Microbiology*. Macmillan India Ltd. New Delhi.

REFERENCES

1. Reed, G. (2002). *Presscott and Dunn's Industrial Microbiology*. (5th ed.). CBS Publishers, New Delhi.
2. Shuler, M.L., and Kargi, F., (2005). *Bioprocess Engineering Basic Concepts*. Pearson Education, New Delhi.
3. Stanbury, P.T., and Whitaker, A., (2005). *Principles of Fermentation Technology*, Pergamon Press, NY.
4. Waites, M. J. (2007). *Industrial Microbiology*. Blackwell Publishing Company. UK.

Semester – II

16MBP211 **ADVANCED PRACTICAL – III** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 9 Hours

COURSE OBJECTIVES

- To obtain outstanding practical skill in various techniques in Microbial Biotechnology and Agricultural Microbiology.
- The course provides the basics of microbiology to build a foundation for more advanced studies in microbiology and biotechnology
- In this course students will learn key methods of microbial production (e.g. fermentation, recombinant protein production and purification).
- Practice in research project planning, in different methods for biotechnology, and for conducting scientific research project.
- To develop an understanding of the major principles of and current issues in the several topical areas that collectively constitute Microbiology Techniques.
- It will distinguish the students to acquire practical skills on advanced laboratory analysis.

COURSE OUTCOME (CO'S)

1. This practical course renders a candidate the knowledge of advanced techniques involved in Microbial Biotechnology and Agricultural Microbiology.
2. Candidates would be able to understand and perform molecular techniques which forms an integral part of core Microbiology.
3. This practical course renders a candidate the knowledge of advanced techniques involved in microbial biotechnology.
4. He/she will be able to judge how microbes and enzymes could be applied in industry.
5. Candidates would be skilled enough to perform a molecular technique which forms an integral part of industrial microbiology.
6. Students can develop entrepreneur skills for applications in biotechnology based industries.

EXPERIMENTS

1. Isolation of plasmid DNA from Bacteria
2. Isolation of chromosomal DNA from Bacteria
3. Determination of molecular weight by SDS Polyacrylamide gel electrophoresis
4. Isolation of microbes from soil
5. Isolation of free-living N_2 fixation from soil - Azotobacter
6. Isolation of symbiotic nitrogen fixers from root odule - Rhizobium
7. Isolation of phosphate solublisers, ammonifiers and denitrifers
8. Study of Mycorrhizae, Cynobacteria and Azolla

9. Determination of Dissolved oxygen of water
10. Determination of BOD (Biochemical Oxygen Demand) of water
11. Determination of COD (Chemical Oxygen Demand) of water

REFERENCES

1. Aneja K.R. (2001). *Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology*, (3rd ed.). New Age International (P) Limited Publishers, New Delhi
2. Cappucino, J.G., and Sherman, N., (2001). *Microbiology A Laboratory Manual*, (6th ed.). Benjamin Cummings, New York.
3. Chirikjan, J.G., Kisailus, E.C., King, B., Krasner, R., and Mortensen, H., (1995). *Biotechnology. Theory and Techniques*, Vol II, Jones and Bartlett Publishers, London.
4. Palanivelu, P. (2004). *Analytical Biochemistry and Separation Techniques*, (3rd ed.). Twenty First Century Publication, Madurai.

Semester - II

16MBP212 **ADVANCED PRACTICAL – IV** **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 9 Hours

COURSE OBJECTIVES

- To acquire practical knowledge in numerous diagnostic tests and procedures used in the microbiology laboratory.
- To understand the importance of diagnostic procedures and gain skills related to the laboratory experiments.
- To learn the techniques pertaining to amplification of biological molecules
- To provide hands-on experience to determine microorganisms in clinical samples
- To understand the importance of diagnostic procedures and gain skills related to the laboratory experiments.
- It helps the students to study the advanced laboratory diagnosis procedures.

COURSE OUTCOME (CO'S)

1. This course provides the current medical aspects on the clinical diagnosis of infection providing the combined treatment of bacteriology and virology.
2. It will also provide opportunities for a student to develop diagnostic skills in microbiology, including the practical application and interpretation of laboratory tests for the diagnosis of infectious diseases.
3. It will also provide opportunities for a student to develop diagnostic skills in microbiology, including the practical application and interpretation of laboratory tests for the diagnosis of infectious diseases.
4. The significance of bacterial genetic variation (in drug resistance, pathogenesis or virulence and variation, diagnosis, and vaccination), and manipulation of cloned DNA.
5. To know the Virulence of bacteria, bacterial virulence factors and their regulation.
6. To understand drug resistance, drug-bacteria relationship, clinical implications, and prevention

EXPERIMENTS

1. Laboratory diagnosis of pyogenic infections – tuberculosis – enteric fever – diarrhea – UTI – anaerobic infections
2. Isolation and identification of *Candida albicans*
3. Antibiotic sensitivity test disc preparation
4. Antibiotic sensitivity test – Kirby - Bauer, Stroke's method

5. MIC determination by Broth dilution technique, filter paper disc assay
6. Wet mount preparation of parasites- Saline, iodine
7. Identification of parasites-formal ether concentration, floatation methods
8. Morphological examination of fungi in tissues
9. Cultivation of viruses-Egg inoculation
10. Isolation of coli phage from sewage using membrane filter technique.
11. Examination of plant diseases: Wilt of potato, Citrus canker, Rice dwarf virus

SUGGESTED READINGS

REFERENCES

1. Arora, B., and Arora, D.R., (2007). *Practical Microbiology*, (1st ed.). CBS Publishers and Distributors, Bangalore.
2. Cappucino, G.J., and Sherman, N., (2001. *Microbiology A Laboratory Manual*. (6th ed.). Benjamin Cummings, New York.
3. Baron, E.O., and Finegold, S., (1990). *Bailey and Scott's Diagnostic Microbiology*. (8th ed.). C V Mosby Company, St Louis.
4. Gaud, R.S., and Gupta, G.D., (1999). *Practical Microbiology*. (1st ed.). Nirali Prakashan, Pune.
5. Mukherjee, K.L. (2005). *Medical Laboratory Technology*, Vol. 3, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
6. Reddy, S.M., and Reddy, S.R., (2004). *Microbiology A Laboratory Manual*. (3rd ed.). Sri Padmavathi Publication, Hyderabad.
7. Sundararaj, T. (2005). *Microbiology laboratory manual*. Aswathy Sundararaj Publishers. Chennai.
8. Vandepilte, J., Verhaegan, J., Engbaek, K., Rohner, P., Prot, P., and Heuck, C.C., (2004). *Basic Laboratory Procedures in Clinical Bacteriology*. (2nd ed.). A.I.T.B.S Publishers and Distributors, Delhi.

Semester - III

16MBP301 **ADVANCED IMMUNOLOGY** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- Imparting advanced technological knowledge through a detailed study of topics such as immunodiagnosis, assessment of cell mediated immunity and current trends in immunology of diseases.
- The students will be able to identify the cellular and molecular basis of immune responsiveness.
- The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease.
- The students will be able to describe immunological response and how it is triggered and regulated.
- The students will be able to demonstrate a capacity for problem-solving about immune responsiveness.
- Students will be able to transfer knowledge of immunology into clinical decision-making through case studies presented in class.

COURSE OUTCOME (CO'S)

1. To strengthen the technical skill on the immune system, their structure and classification, genetic control of antibody production, Types, structure of antigens and immunodiagnostics.
2. To obtain knowledge of through Molecular immunology, hypersensitive immune reaction and Latest trends in immunology.
3. Upon completion students will gain knowledge of immune system, cells involved along with complement system and autoimmunity.
4. Develop understanding about immune system, antigen antibody interactions.
5. Gain theoretical knowledge of various diseased conditions generated due to interplay of immune system components.
6. Introducing the employment aspect of immunology and to study various types of immune systems their classification structure and mechanism of immune activation.

UNIT – I

Immunity – types. Cells of the immune system - lymphoid cells, mononuclear cells, granulocytic cells and mast cells. T & B – cell maturation, activation and differentiation. Organs of the immune system - primary and secondary lymphoid organs – cutaneous / mucosal - associated lymphoid tissues

UNIT – II

Antigens - factor influence immunogenicity - Epitopes - Haptens - study of antigenicity. Immunoglobulins – structure – types and biological activities. Antigenic determinants. Monoclonal antibodies.

UNIT – III

Hypersensitive reactions – Type. Complement system - classical, alternative and lectin pathways, biological consequences. T - cell receptor. Cytokines – Structure, functions and receptors. Major Histocompatibility complex, classes, structure and its functions.

UNIT – IV

Autoimmune diseases: Antigen processing and presentation - Transplantation immunology - Transplantation antigens, HLA typing. Tumor immunology - treatment of tumors. Immune response to infectious disease.

UNIT – V

Antigen - Antibody reactions: Agglutination and precipitation. Complement fixation test, Immunofluorescence, ELISA, RIA, Immuno electron microscopy. Forensic serology, Immunohaematology – ABO, RH incompatibility.

SUGGESTED READINGS

TEXT BOOKS

1. Ananthanarayanan, R., and Panicker, C.K.J., (2004). *Text Book of Microbiology*. Orient Longman. New Delhi.
2. Coleman, R.M., Lombard, M.F., and Sicard, R.E., (2000). *Fundamental Immunology* (4nd ed.). Wm. C. Publishers. London.
3. Fathima, D., and Arumugam, N., (2005). *Immunology*. Saras Publications, Nagercoil.

REFERENCES

1. Coleman, R.M., Lombard, M.F., and Sicard, R.E., (2000). *Fundamentals of Immunology* (4th ed.). WMC Publications. London.
2. Goldsby, R.A., Barbara, T.J.K., and Osborne, A., (2006). *Kuby Immunology*. (6th ed.). W.H. Freeman and Company, New York.
3. Hyde, R.M. (2000). NMS - *Immunology*. (4th ed.). Lippincott Williams and Wilkins, Baltimore.
4. Janeway, Jr. C.A., Walport, P.T.M., and Shlomchick, M.J., (2001). *Immunobiology - The Immune System in Health and Disease*. (5th ed.). Churchill Livingstone - Garland Publishing Company, New York.
5. Pathaka, S., and Palan, U., (2005). *Immunology – Essentials and Fundamentals*. (2nd ed.). Capital Publishing Company, New Delhi.
6. Roitt, I.M., Brostaff, J.J., and Male, D.K., (2002). *Immunology*. (6th ed.). C.V. Mosby Publishers. St. Louis.
7. Delves, P., Martin, S., Burton, D., and Roitt, I., (2006). *Roitt's Essential Immunology*, Wiley-Blackwell, London

Semester - III

16MBP302 FOOD AND INDUSTRIAL MICROBIOLOGY 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To encompasses the employability use of microorganisms in the manufacture of food or industrial products.
- The aim of the course is to give the students broad theoretical and practical skills in food and industrial microbiology.
- This paper adds information about the role of microorganisms in many food, beverage and pharma industries both in production and spoilage processes.
- The students will be able to discuss the role of microorganisms in industry, as well as to carry out experiments to produce microbial metabolites.
- It will make the students to explore their practical skills in entrepreneurial activities.
- It will deliver the large-scale production of microbial products techniques in advanced level.

COURSE OUTCOME (CO'S)

1. Provides knowledge in the large-scale production of industrial product, providing the trends to cater the needs of industry.
2. This will help the students to enhance their employment knowledge on microbiology based commercial products.
3. The aim of the course is to give the students broad theoretical and practical skills in industrial microbiology.
4. To encode the importance of the role of microorganisms in food industries both in beneficial and harmful ways.
5. To obtain a good understanding of industrial microbiology and become qualified as microbiologist in food and other industries and candidate able to become entrepreneur after understanding this entire course.
6. Explain why microbiological quality control programmes are necessary in food production.

UNIT – I

Food and microorganisms – Important microorganisms in food – Fungi, Bacteria; Intrinsic and extrinsic parameters of food affecting microbial growth – sources of contamination of food. Food sanitation – indicators of food safety – Coliform bacteria.

UNIT – II

Food preservation – principles – factors affecting preservation – food preservation using temperature – low temperature food preservation – characteristics of psychrotrophs – high temperature food preservation – characteristics of thermophiles – preservation of foods by drying chemicals and radiation – limitations – commercial application.

UNIT – III

Food borne diseases - food poisoning - food borne infection and intoxication- Food control agencies - microbiological criteria for food, microbial quality control and food laws, Hazard Analysis Critical Control Point (HACCP).

UNIT – IV

History and chronological development of industrial microbiology. Industrially important strains – isolation and preservation. Inoculum development for various fermentation processes - strain development – mutation, recombinant DNA technology and protoplast fusion. Fermentation – submerged, solid state, batch and continuous.

UNIT – V

Fermentor design – scale-up process. Types of fermentors - Tower, cylindroconical, airlift and Components of CSTR. Downstream process – intracellular and extracellular product separation column chromatography, affinity. Production of beverages – beer, vitamins - vitamin B12, Riboflavin, antibiotics.

SUGGESTED READINGS

TEXT BOOKS

1. Banwart, G.J. (2004). *Basic Food Microbiology*. (2nd ed.). CBS Publishers and Distributors New Delhi.
2. Casida, L.E. Jr., (2003). *Industrial Microbiology*. New Age International Publishers, New Delhi.
3. Doyle, M.P., Beuchat, R.L., and Montuille, T.J., (2001). *Food Microbiology – Fundamentals and Frontiers*. ASM press.
4. Frazier, W.C., and Westhoff, D.C., (1995). *Food Microbiology*. Tata McGraw-Hill Publishing Company Limited, New Delhi.
5. Patel, A.H. (2003). *Industrial Microbiology*, Macmillan India Ltd, New Delhi.
6. Shuler, M.L., and Kargi, F., (2005). *Bioprocess Engineering Basic Concepts.* Pearson Education, New Delhi.

REFERENCES

1. Atlas, R.N., and Bartha, R., (2000). *Microbial Ecology - Fundamental and Applications*. (3rd ed.). Redwood City CA. Benjamin/Cumming Science Publishing Co., New Delhi.
2. Gould, G.W. (1996). *New Methods of Food Preservation*. Blackie Academic and Professional, Madras.
3. Jay, J.M. (2000). *Modern Food Microbiology*. CBS Publishers and Distributors, New Delhi.
4. Mansi, E.M.T., and Bryce, C.F.A., (2002). *Fermentation Microbiology and Biotechnology*. Taylor and Francis, New York.
5. Reed, G. (2002). *Presscott and Dunn’s Industrial Microbiology*. (5th ed.). CBS Publishers, New Delhi.
6. Stanbury, P.T., and Whittaker, A., (2005). *Principles of Fermentation Technology*. Pergamon Press, NY.
7. Waites, M.J. (2007). *Industrial Microbiology,* Blackwell Publishing. UK.

Semester - III

16MBP303 MEDICAL MYCOLOGY AND PARASITOLOGY 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- Medical Bacteriology introduces basic principles and then applies clinical relevance of many etiological agents responsible for infectious diseases.
- The infectious disease cycle of the pathogens enables to solve the epidemics.
- The territory covered by infections and the immune response
- We focus on pathogenic mechanisms in order to foster a student's ability to solve problems in their future clinical career and able to establish the medical laboratory.
- This course provides learning opportunities in the basic principles of medical microbiology and infectious disease
- It covers mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora

COURSE OUTCOMES

1. Demonstrate an understanding at an advanced level of microbial virulence mechanisms and host response toinfection.
2. Application of molecular techniques to medical microbiology; biochemical and genetic mechanisms of antimicrobial agent activity, microbial susceptibility and resistance to antimicrobialagents.
3. Demonstrate an understanding of skin and respiratory tract infections (microbial causes, pathogenesis, transmission of infection, diagnosis, prevention and treatment) by being able to identify a unknown organisms in clinical samples, and describe the pathogenesis of important pathogens.
4. It also provides opportunities to develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases.
5. To understand the importance of pathogenic bacteria in human disease with respect to infections of. the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue
6. Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.

UNIT – I

General Properties of Fungi - Isolation and identification of medically important fungi – diagnosis of fungal disease - routine mycological techniques - antifungal agents

UNIT – II

Superficial mycosis –Pityriasis versicolor, Tinea nigra, piedra. Cutaneous mycosis – Dermatophytes. Systemic mycosis –Opportunistic mycosis – Candidosis, Cryptococcosis, aspergillosis. Subcutaneous mycosis - Sporotrichosis, Chromoblastomycosis, Mycetoma

UNIT – III

Introduction to Parasitology - protozoa-amoebae – flagellates - Laboratory techniques in parasitology - Ova, cyst analysis direct and concentration methods. Blood smear examination - antiprotozoan therapy.

UNIT – IV

Protozoan infections - *Entamoeba histolytica, Plasmodium falciparum, Leishmania donovani - Giardia intestinalis Trichomonas vaginalis, Toxoplasma gondii, Pneumocystis carinii*

UNIT – V

Helminthic infections – *Taenia solium. Trematodes - Schistosoma haematobium*, Nematodes - *Trichuris trichiura - Ascaris lumbricoides, Ancylostoma duodenale, Wuchereria Bancrofti.*

SUGGESTED READINGS

TEXT BOOKS

1. Ananthanarayanan, R., and Panicker, C.K.J., (2009). *Text Book of Microbiology*. (8^{th} ed.). Orient Longman. New Delhi.
2. Chakraborty, P. (2003). *A Text book of Microbiology*. (2^{nd} ed.). New Central Book Agency (P) Ltd., Calcutta.
3. Chander, J. (2002). *A Text book of Medical Mycology*. Interprint Mehta Publishers, New Delhi.
4. Chatterjee, K.D. (1980). *Parasitology in Relation To Medicine*, (12^{th} ed.). Chatterjee Medical Publishers, Calcutta.

REFERENCES

1. Chunin, J. (2000). *Parasitology*. New York Publishers, London.
2. Dismukes, W.E., Pappas, P.G., and Sobel, D., (2003). *Clinical Mycology*. Oxford University Press. UK.
3. Jawetz, E., Melnic, J.L., and Adelberg, E.A., (2001). *Review of Medical Microbiology*. (22^{nd} ed.). Lange Medical Publishers, New York.
4. Mehrotra, R.S., and Aneja, K.R., (2007). *Introduction to Mycology*. New Age International Ltd, New Delhi.
5. Panjarathinam, R. (2007). *Text book of Medical Parasitology*, (2^{nd} ed.). Orient Longman Publishers.
6. Parija, S.C. (2008). *A Text book of Medical Parasitology*. (3^{rd} ed.). All India Publishers and Distributors, New Delhi.

Semester - III

16MBP304 BIOSTATISTICS AND RESEARCH METHODOLOGY 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- About collection, interpretation and presentation of statistical data
- The analytics of data, probability, and hypothesis testing of samples
- The essential role of statistics in present, future use and applications of Biology.
- To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.
- Provide students with in-depth training on the conduct and management of research from inception to completion using a wide range of techniques
- The ethical and philosophical issues associated with research in education

COURSE OUTCOMES

1. Apply basic statistical concepts commonly used in health and medical sciences
2. Use basic analytical techniques to generate results
3. Interpret results of commonly used statistical analyses in written summaries.
4. Demonstrate statistical reasoning skills correctly and contextually.
5. Provide learning opportunities to critically evaluate research methodology and findings.
6. Enable students to be reflexive about their role and others' roles as researchers.

UNIT-I

Definitions-Scope of Biostatistics- Variables in biology, collection, classification and tabulation of data- Graphical and diagrammatic representation.

Measures of central tendency – Arithmetic mean, median and mode. Measures of dispersion-Range, standard deviation, Coefficient of variation.

UNIT – II

Correlation – Meaning and definition - Scatter diagram –Karl pearson's correlation coefficient. Rank correlation.

Regression: Regression in two variables – Regression coefficient problems – uses of regression.

UNIT – III

Test of significance: Tests based on Means only-Both Large sample and Small sample tests - Chi square test - goodness of fit. Analysis of variance – one way and two way classification. CRD, RBD Designs.

UNIT – IV

Research: Scope and significance – Types of Research – Research Process – Characteristics of good research – Problems in Research – Identifying research problems. Research Designs – Features of good designs.

UNIT – V

Sampling Design: Meaning – Concepts – Steps in sampling – Criteria for good sample design. Scaling measurements – Techniques – Types of scale.

SUGGESTED READINGS

REFERENCES

1 .Jerrold H. Zar. (2003). *Biostatistical Analysis*. (4^{th} ed.). Pearson Education (P) Ltd, New Delhi.
2. Kothari. C.R. (2004). *Research Methodology – Methods and Techniques*. (2^{nd} ed.). New Age International Pvt. Ltd, New Delhi.

Semester - III

16MBP305A BIOFERTILIZER AND BIOMANURE TECHNOLOGY **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To study about the biofertilizers, plant disease and increasing soil fertility.
- To provide the knowledge on biomanure and biofertilizer and to become an entrepreneur in the field.
- To Provides detailed idea about biofertilizer production and plant disease.
- To provide the student knowledge about ecofriendly product which play a crucial role in determining its future use and applications in environmental management.
- The students will be able to make qualitative and quantitative description of the basic enzymatic phenomena and processes.
- To provide the student for entrepreneur.

COURSE OUTCOME (CO'S)

1. This course has been designed to provide the student knowledge about eco friendly product.
2. Product play a crucial role in determining its future use and applications in environmental management.
3. Provides detailed idea about biofertilizer production and plant disease.
4. To produce and impart training of ecofriendly agricultural inputs so as to nullify the ill effects of chemical fertilizers.
5. To demonstrate the know-how technology pertinent to microbiological and physico-chemical analyses of soil samples and their assessment.
6. Provides detailed entrepreneurial idea about biofertilizer production and plant disease.

UNIT – I
Fertilizer - importance and present status of types of fertilizers and application. Nitrogen; Carbon, phosphorus and sulphur cycles. Biogeocycles associated with microorganisms.

UNIT – II
Biofertilizers – Nostoc, Anabaena, Gloeocaps and Scytonema; Free living forms – Azatobacter, Azospirillum; Symbiotic forms – Rhizobium; Legume Association; *Pseudomonas*; Non-legume association.

UNIT – III
Mycorrhizal association - Vescicular arbuscular mycorrizal association (VAM) –Actimomycetes associations in biofertilizer.

UNIT – IV
Biomanures- Properties, production and applications; Composts – production and applications.Agro wastes – Poultry manure and saw-dust.

UNIT – V
Vermi composting– Properties, production and applications Types of compost pits and biodegradation. Application of biofertilizers and biomanures.

SUGGESTED READINGS

TEXT BOOKS
1.Subba Rao, N.S., (1999. *Biofertilizers in Agriculture and Agroforestry*. Oxford and IBH, New Delhi.
2. Rangaswami, G. and D.J. Bhagyaraj, (2001. *Agricultural Microbiology*. 2nd Ed.). Prentice Hall, New Delhi.
3. Rao, N.S., (1995. *Soil Microorganisms and plant Growth*. Oxford and IBH Publishing Co., New Delhi.
4. Pelzar, M.J. and M. Reid, (2003. *Microbiology*. 5th Ed.). Tata Mc Graw-Hill. New York.

REFERENCES

1. Burns, R.C., and Hardy, R.W.F., (1975). *Nitrogen fixation in bacteria and higher plants*. Springer – Verlag, Bertin.
2. Gallen and Chaplin, (1987). *Introduction to Nitrogen fixation*. Elsvier Publications.
3. Harley, J.L., and Smith, S.E., (1983). *Mycorrhizal Symbiosis*. Academic Press, London.
4. Kumar, H.D. (1990). *Introductory Phycology*. Affiliated East-West Press Ltd., Madras.
5. Marks, G.C., and Koslowski, T.T., (1973). *Ectomycorrhizae*, Academic Press, London.
6. Rao, N.S., Venkataraman, G.S., and Kannaiyan, S., (1983). *Biological N2 fixation*, ICAR Publications, New Delhi.
7. Sandera, F.E., Mosse, B., and Tinke, P.B., (1975). *Endomycorrhizae*, Academic Press, London.
8. Rao, N.S. (1980). *Biofertilizers in Agriculture*. Oxford & IBH Publishing Co., Pvt., Ltd., Bombay.
9. Thompson, L.M., and Fredrick, T., (1979). *Soils and Soil Fertility*. Tata Mc Graw-Hill Publishing Co., New Delhi.
10. Tilak, K.V.B.R. (1990). *Bacterial Biofertilizers*. IARI Publications, New Delhi.
11. Tirdale, S.L. Nelson, L., Werver, L., and Becton, J.D., (1985). *Soil fertility and fertilizers*. Macmillan Publishing Co., New York.

Semester - III

16MBP305B LABORATORY ANIMAL CARE 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- Aimed to provide training on various methods of handling.
- Concerning the care and use of laboratory animals.
- Laboratory animal care provides the proper handling and care for various species of animals used in research, testing, and in education.
- It extensively deals with the amended act on the Animal Welfare and the concept, availability, and use of research or testing methods that limit the use of animals or minimize animal distress.
- It extensively deals with the amended act on the Animal Welfare and the concept, availability, and use of research or testing methods that limit the use of animals or minimize animal distress.
- To study the preclinical studies.

COURSE OUTCOME (CO'S)

1. Laboratory animal care provides the proper handling and care for various species of animals used in research, testing, and in education.
2. It extensively deals with the amended act on the Animal Welfare and the concept, availability, and use of research or testing methods that limit the use of animals or minimize animal distress.
3. This course content will enhance the employment in drug testing field.
4. Validation for equipment, methods, cleaning and process
5. Students can develop their entrepreneurial skills in analysis of pens design and environment.
6. Ethical knowledge for use of animals in research.

UNIT – I

Modern methods of care, management breeding and maintenance of Laboratory animals – rabbit.

UNIT - II

Modern methods of care, management breeding and maintenance of Laboratory animals – mice.

UNIT - III

Modern methods of care, management breeding and maintenance of Laboratory animals – rat.

UNIT – IV

Modern methods of care, management breeding and maintenance of Laboratory animals– guinea pig. Specific pathogen free animal – gnotobiotic animal

UNIT – V

Handling – various routes of inoculation and bleeding. Laboratory use of animals in microbiology - antibody production. Disposal of animal house wastes and carcasses.

SUGGESTED READINGS

TEXT BOOKS

1. *The IACUC Handbook*, 2nd ed., eds. Silverman, Murthy, Suckow. CRC Press, (2006.
2. *Anesthesia and Analgesia in Laboratory Animals*. American College of Laboratory Animal Medicine, second ed.)., eds. Richard Fish, Peggy Danneman, Marilyn Brown, and Alicia Karas. Academic Press, (2008.
3. *The Mouse in Biomedical Research*, second ed.)., eds. James G. Fox, Muriel T. Davisson, Fred W. Quimby, Stephen W. Barthold, Christian E. Newcomer and Abigail L. Smith. Elsevier, (2007.
4. *The Laboratory Rat*, (2nd ed.). American College of Laboratory Animal Medicine. eds. Suckow, weisbroth and Franklin. Elsevier, (2006).
5. *Handbook on Genetically Standardized Mice.* (6th ed.). Ed. Joanne Currer, The Jackson Laboratory, Bar Harbor, Maine, (2009).
6. *Laboratory Animal Medicine*, (2nd ed.). American College of Laboratory Animal Medicine, eds. Fox, Anderson, Lowe, Quimby. Academic Press, (2002).
7. Percy, D.H., and Barthold, S.W., (2007). *Pathology of Laboratory* Rodents and Rabbits, (3rd ed.). Blackwell Publishing Company.

REFERENCES

1. Nalinasundari, M.S., and Santhi, R., (2006). *Entomology*. MJP Publishers, Chennai.
2. Pelczar, Jr. M.J., Chan, E.C.S., and Kreig, N.R., (1993). *Microbiology* McGraw-Hill Inc. New York.
3. Prescott, M., Harley, J.P., and Klein, D.A., (1993). *Microbiology*, (2nd ed.). McGraw-Hill Inc, NY.
4. Roy, D.N., and Brown, A.W.A., (2003). *Entomology – Medical and Veterinary*. (1st ed.). Part – I, Biotech Books, New Delhi.
5. Warren, D. M. (2002). *Small Animal Care and Management*. (2nd ed.). Delmar – Thomson Learning, Columbia, NY.
6. Yadav, M. (2004). *Applied Entomology*. (1st ed.). Discovery Publishing House, New Delhi.

Semester - II

16MBP305C BIO NANOTECHNOLOGY 4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

End Semester Exam: 3 Hours

COURSE OBJECTIVE

- This course has been intended to provide knowledge about the Bio nanomaterials synthesis and its advancement.
- To foundational knowledge of the Nanoscience and related fields.
- To make the students acquire an understanding the Nanoscience and Applications
- To help them understand in broad outline of Nanoscience and Nanotechnology.
- Understand the synthesis of nanomaterials and their application and the impact of nanomaterials on environment
- Apply their learned knowledge to develop Nanomaterial's.

COURSE OUTCOME (CO'S)

1. Students get an idea about application of nanotechnology in biology.
2. It provide analytical knowledge of trends and developments in the field of nanotechnology
3. Acquire knowledge in nanotechnology and how it will support the employment greatly.
4. Students able to construct hierarchy strategy in machine.
5. Able to describe self-application and machine phase biotechnology.
6. Students have an enhanced knowledge and understanding of chemical transformation and biomolecular sensing.

UNIT – I

Biotechnology to Bionanotechnology: Bionanomachines – Modern bionano materials – protein, nucleic acid, lipids used for carrying information – polysaccharides use in special structural roles – Present status of bionanotechnology.

UNIT – II

Molecular design for nanotechnology: Recombinant DNA technology – X-ray crystallography, NMR spectroscopy and electron microscopy, use in nanotechnology – Computer modeling to bionanomachines and computer assisted molecular design.

UNIT – III

Structural principles of Bionanotechnology: Natural bionanotechnology design for specific environment – Biomolecular structure as low materials – Hierarchical strategy in construction of nanomachines – protein folding – self organization – molecular recognition – flexibility.

UNIT – IV
Functional principles of Bionanotechnology: Information driven nano assembly – chemical transformation – biomolecular sensing – self application – machine phase bionanotechnology.

UNIT – V
Future of Bionanotechnology: Problems in bionanotechnology – Abide finger problem – Sticky finger problem – role of enzyme to solve these problems – Core studies – nomotuble synthesis, nanoscale assembler, nanozurveillance – ethical consideration – respect for life, potential dangers, fuel

SUGGESTED READINGS

TEXT BOOKS

1. David, S. (2004). Goodsell. *Bionanotechnology*. Wiley-Blackwell.
2. Gonsalves, K., Halberstadt, C., and Laurencin, C.T., (2007). *Biomedical Nanostructures*. Wiley-Blackwell.
3. Sabliov, C., Hongda, A., Yada, R., (2015). *Nanotechnology and Functional Foods*. Wiley-Blackwell Publishers
4. Rakesh Kumar, and Tiwari, K., (2013). *A Textbook of Nanoscience*. Publisher: S.K. Kataria & Sons.

REFERENCES

1. Goosell, D.S. (2004). *Bionanotechnology: Lessons from nature*. John Wiley & Sons Inc. publication.
2. Goodsell, D.S. (1996). *Biomolecules and Nanotechnology.* Ancient Scientist, 88, 230 – 237.
3. Blundell, T.L., and Johnson, L.N., (1976). *Protein crystallography.* New York.
4. Eisenberg, D., and Crothers, D., (1979). *Physical Chemistry with Applications to the Life Sciences*. Benjamin Cummings, Menlo Park, California.
5. Ausubel, F.M., Breut, R., Kingston, R.E., Moore, D.D., Siedman, J.G., Smith, J.A., and Struhl K., (1999). *Short protocols in Molecular Biology*. (4^{th} ed.). Wiley, New York.

Semester – III

16MBP311 APPLICATION ORIENTED PRACTICAL – V 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 9 Hours

COURSE OBJECTIVES

- The general objectives of the lab will be to introduce immunology and basic serological techniques.
- To develop the skill in health clinic
- To enhance knowledge in research.
- To give employment opportunities.
- Technical skill of immunology techniques.
- To understand disease mechanisms.

COURSE OUTCOME (CO'S)

1. This practical is to provide the student with a basic knowledge and technical skill of immunology and make them to understand the significance to human disease.
2. Upon completion students will gain knowledge of immune system, cells involved along with complement system and autoimmunity
3. Develop understanding about immune system, antigen antibody interactions.
4. Gain theoretical knowledge of various diseased conditions generated due to interplay of immune system components.
5. After course completion, students can apply the knowledge in further studies and higher education.
6. Introducing the science of immunology and to study various types of immune systems their classification structure and mechanism of immune activation.

EXPERIMENTS

1. Separation of serum / plasma
2. ABO Blood grouping - Rh typing and cross matching. Estimation of hemoglobin content of human blood.
3. Agglutination tests.
    - WIDAL - slide and tube test
    - RA test.
    - RPR test.
    - ASO test.
    - CRP test.
    - β -HCG test
4. ELISA- thyroid hormone analysis

5. Ouchterlony's Double Immunodiffusion test (ODD)
6. Counter immunoelectrophoresis (CIE)

SUGGESTED READINGS

REFERENCES

1. Baron, E.O., and Finegold, S., (1990). *Bailey and Scott's Diagnostic Microbiology*. (8^{th} ed.). CV Mosby Company, St Louis.
2. Benson, H.J. (1998). *Microbiological Application - Laboratory Manual in General Microbiology*. (7^{th} ed.). WCB McGraw – Hill, New York.
3. Talwar, G.P., and Gupta, S.K., (1993). *A Handbook of Practical and Clinical Immunology*, (2^{nd} ed.). Vol. 2, CBS Publishers and Distributors, New Delhi.
4. Kindt, T.J., Osborne, B.A., and Goldsby, R.A., (2007). *Immunology*. W.H.Freeman.
5. Coleman, R.M., Lombard, M.F., and Sicard, R.E., (1992). *Fundamental Immunology*, (2^{nd} ed.). Dubuque, Iowa:Wm. C.Brown.
6. Wise, D.J., and Carter, G.R., (2002). *Immunology: a comprehensive review*. Wiley-Blackwell.
7. Janeway, C.A., and Travers, P., (1997), *Immunobiology: The immune system in health and disease*, (3^{rd} ed.). New York, Garland Publishing.
8. Kuby, J. (1997). *Immunology*, (3^{rd} ed.). New York, W.H. Freeman.
9. Male, D., Champion, B., Cooke, A., and Owen, M., (1991). *Advanced immunology*. Mosby publication, Baltimore.
10. Roitt, I., Brustoff, J., and Male, D., (1999). *Immunology*. (5^{th} ed.). Harcourt Brace and Co., Asia PTE Ltd.

Semester - III

16MBP312 APPLICATION ORIENTED PRACTICAL – VI 4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4 Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 9 Hours

COURSE OBJECTIVES

- The general objectives of the lab will be to introduce immunology and basic serological techniques.
- To develop the skill in health clinic
- To enhance knowledge in research.
- To give employment opportunities.
- Technical skill of immunology techniques.
- To understand disease mechanisms.

COURSE OUTCOME (CO'S)

7. This practical is to provide the student with a basic knowledge and technical skill of immunology and make them to understand the significance to human disease.
8. Upon completion students will gain knowledge of immune system, cells involved along with complement system and autoimmunity
9. Develop understanding about immune system, antigen antibody interactions.
10. Gain theoretical knowledge of various diseased conditions generated due to interplay of immune system components.
11. After course completion, students can apply the knowledge in further studies and higher education.
12. Introducing the science of immunology and to study various types of immune systems their classification structure and mechanism of immune activation.

EXPERIMENTS

1. Production of enzymes – Solid state & Submerged fermentation – GUS assay – Amylase
2. Production of protease from submerged fermentation
3. Production of sauerkraut ,yoghurt, wine
4. Enumeration of Microorganisms from Food samples
5. Detection and enumeration of Microorganisms present in Utensils.
6. Analysis of Milk quality by MBRT
7. Detection of coliforms from water - MPN test
8. Isolation of plant pathogens – Bacteria and fungi
9. Citric acid production
10. Mushroom Cultivation
11. Immobilization technique (Sodium alginate method)
12. Bacterial endotoxin test (BET)

SUGGESTED READINGS

REFERENCES

1. Adams, M.R., and Moss, M.O., (2000). *Food Microbiology*. Royal Society of Chemistry. Cambridge, U.K.
2. Ahmed, E.Y., and Carlstrom, C., (2003). *Food Microbiology: A Laboratory Manual*, John Wiley and Sons, Inc. New Jeresy.
3. Arora, B., and Arora, D.R., (2007). *Practical Microbiology*. (1st ed.). CBS Publishers and Distributors, Bangalore.
4. Cappucino, G.J., and Sherman, N., (2001). *Microbiology A Laboratory Manual*. (6th ed.). Benjamin Cummings, New York.
5. Demain, A.L., and Davies, J.E., (1999). *Manual of Industrial Microbiology and Biotechnology* (2nd ed.). ASM Press, Washington.
6. Garg, N., Garg, K.L., and Mukerji, K.G., (2010). *Laboratory Manual of Food Microbiology*. I.K. International Publishing House, New Delhi.
7. Harry, W., Seeley, Jr., and Denmark, P.N., (1984). *Microbes in Actions: A lab Manual of Microbiology*. D. B. Taraporwalla and Sons.
8. Jay, J.M., Loessner, M.J., Golden, D.A., (2005). *Modern Food Microbiology*. Springer Science, USA.
9. Davies, J.E., and Demain, A.L., (2009). *Manual of Industrial Microbiology and Biotechnology* ASM Publisher, USA.
10. Baltz, R.H., Davies, J.E., and Demain, A.L., (2010). *Manual of Industrial Microbiology and Biotechnology.* (3rd ed.). ASM Publisher, USA.

emester - IV

16MBP491 PROJECT VIVA VOCE 15C

Instruction Hours / week: L: 0 T: 0 P: 0 **Marks:** Internal: **80** External: **120** Total: **200**

B.Sc., PHYSICS
CHOICE BASED CREDIT SYSTEM (CBCS)

Syllabus
2016 – 2017

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)

(Established Under Section 3 of UGC Act 1956)

Eachanari Post, Coimbatore – 641 021

SEMESTER – I

16LSU101 **தமிழ் முதல் தாள்** **L T P C**
(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது) **4 - - 4**

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I : இக்கால இலக்கியம்: (10 **மணிநேரம்**)

கல்வி : மகாகவி பாரதியார் – சுயசரிதை - ஆங்கிலக் கல்வி.

இன்றைய நிலை : கவிமணி தேசிக விநாயகம் பிள்ளை – ஒற்றுமையே உயிர்நிலை.

மனிதநேயம் : கவிஞர் சிற்பி பாலசுப்பிரமணியன் –மலையாளக் காற்று.

சூழலியல் : **கவிஞர்** வைதீஸ்வரன் - விரல் மீட்டிய மழை.

பெண்ணியம் : **கவிஞர்** சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை.

அலகு – II : அற இலக்கியம்: (10 **மணிநேரம்**)

கொன்றை வேந்தன்: 1-50 பாடல்கள்

திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்
பழமொழி நானூறு: 5 பாடல்கள்

அலகு - III : சிற்றிலக்கியம்: **(10 மணிநேரம்)**

மூவருலா: 1-26 கண்ணிகள், திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்
கலிங்கத்துப் பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV : கட்டுரை: **(10 மணிநேரம்)**

1. **உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்**
2. **கட்டிடக்கலை** - அ. இராசமாணிக்கனார்
3. **வாழ்க்கை** - இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V : மொழிப்பயிற்சி: **(8 மணிநேரம்)**

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப் பயிற்சிகள்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

	SEMESTER I	**L T P C**
16ENU101	**ENGLISH – 1**	**4 - - 4**

Course Objectives:

- To help students enhance their Language skills
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar

Course Outcome:

1. Develop the four types of skills
2. Reading and comprehending literary works
3. Genres of literature to provide moral education
4. Develop communication skills in business environment
5. Interpersonal skills will be developed.
6. Betterment of language competence

UNIT I

Prose: Google Guys (Extract) – Richard L Brandt
Poetry: The Blind Pedlar – Osbert Sitwell
Short Story: A Garden So Rich – Christie Craig
Vocabulary: Prefix, Antonyms, Sentence Completion
Grammar: Article, Adverb, Pronoun

UNIT II

Prose: Happiness 101 – Geeta Padmanabhan
Poetry: An Old Woman **–** Arun Kolatkar
Vocabulary: Suffix, Analogies
Grammar: Noun, Adjective

UNIT III

Prose: Structured Procrastination – John Perry
Short Story: The Umbrella Man – Roald Dahl
One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan
Vocabulary: Synonyms, Euphemisms, Word Definitions
Grammar: Verb, Conjunction and Interjection, Indirect/Reported Speech

UNIT IV

Poetry: No Sentence – Anjum Hassan

One-Act Play: While the Auto Waits- O' Henry

Vocabulary: Words Often Confused, Anagrams

Grammar: Preposition, Voice- Active and Passive

UNIT V

Short Story: The Bird **–** Amar Jalil

One-Act Play: The Cellphone Epidemic – Claudia I. Haas

Vocabulary: Portmanteau Words, One Word Substitution

Grammar: Question, Pronunciation

Prescribed Text:

Rao, G. Chandralekha et al. Spring 2013**.** Emerald Publishers: Chennai.

Suggested Reading:

Shyamala, V. English for Communication. 2006. Emerald Publishers: Chennai

	SEMESTER – I	**L T P C**
16PHU101	**MECHANICS**	**5 - - 5**

Course Objectives

- To know how to use Newton's laws of motion
- To solve advanced problems involving the dynamic motion of mechanical systems and other advanced mathematics in the solution of the problems.
- To find the use of conservation of energy and linear and angular momentum
- To solve dynamics problems.
- To understand the concept of oscillations.
- To gain the knowledge on elasticity.

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Understand the basic concepts of mechanics
2. Understand the concepts of simple harmonic motion
3. Define the motion of mechanical systems and their degrees of freedom.
4. Study the interaction of forces between solids in mechanical systems.
5. Application of the vector theorems of mechanics and interpretation of their results.
6. Analyse the mechanics as a systematic tool for problem solving.

UNIT - I

Vectors: Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.

UNIT - II

Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets. Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum.

UNIT - III

Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite in circular orbit and applications. Special Theory of Relativity: Constancy of speed of light. Postulates of special theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.

UNIT - IV

Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations.

UNIT - V

Elasticity: Hooke's law- Stress-strain diagram - Elastic moduli-Relation between elastic constants- Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants- Work done in stretching & work done in twisting a wire- Twisting couple on a cylinder-Determination of Rigidity modulus by static torsion- Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q, η & by Searles method.

Suggested Readings:

1. Upadhyaya J.C. (1969), General Properties of Matter, Vol- I., Agra, Ram Prasad & Sons.
2. Mathur D.S. (2014), Mechanics, New Delhi, S. Chand & Co.
3. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley
4. D. S. Mathur "Elements of Properties of Matter" S. Chand & Co.
5. University Physics. FW Sears, MW Zemansky & HD Young 13/e, 1986.Addison-Wesley
6. Mechanics Berkeley Physics course, v.1:Charles Kittel, et.al. 2007, Tata McGraw-Hill
7. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press
8. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
9. https://lecturenotes.in/notes/15822-note-for-mechanics-mech-by-amity-kumar

	SEMESTER – I	**L T P C**
16PHU102	**SOLID STATE PHYSICS**	**5 - - 5**

Course Objective:

- This course integrates theory of Solid State Physics with experimental demonstrations in the Physics Lab.
- The course will provide a valuable theoretical introduction and an overview of the fundamental applications of the physics of solids.
- It includes theoretical description of crystal and electronic structure, lattice dynamics, and optical properties of different materials (metals, semiconductors, dielectrics, magnetic materials and superconductors), based on the classical and quantum physics

principles.

- To calculate thermal and electrical properties in the free-electron model.
- To gain a basic knowledge of crystal systems and spatial symmetries.
- To know what phonons are, and be able to perform estimates of their dispersive and thermal properties.

Course Outcomes

After successful completion of the course, the student is expected to

1. Account for interatomic forces and bonds.
2. Have a basic knowledge of crystal systems and spatial symmetries.
3. Account for how crystalline materials are studied using diffraction, including concepts like form factor, structure factor, and scattering amplitude.
4. Know what phonons are, and be able to perform estimates of their dispersive and thermal properties.
5. Calculate thermal and electrical properties in the free-electron model.
6. Explain superconductivity using BCS theory
7. Outline the importance of solid state physics in the modern society.

UNIT - I

Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals. Bragg's Law. Atomic and Geometrical Factor.

UNIT - II

Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons.Qualitative Description of the Phonon Spectrum in Solids.Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids (qualitative only). T^3 law

UNIT - III

Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia– and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss.

UNIT - IV

Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons.

UNIT - V

Elementary band theory: Kronig Penny model. Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect, Hall coefficient. Superconductivity: Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors.

Suggested Books:

1. Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley India Pvt. Ltd.
2. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
3. Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning
4. Solid State Physics, Rita John, 2014, McGraw Hill
5. Solid State Physics, M.A. Wahab, 2011, Narosa Publications.
6. http://www.physics.udel.edu/~bnikolic/teaching/phys624/lectures.html
7. https://www.youtube.com/watch?v=RImqF8z91fU.

	SEMESTER – I	L T P C
16PHU103	**MATHEMATICAL PHYSICS - I**	**4 - - 4**

Course Objectives

- To provide students with a repertoire of mathematical methods that are essential to the solution of advanced problems encountered in the fields of applied physics and engineering.
- In addition, intended to prepare the student with mathematical tools and techniques that are required in advanced courses offered in the applied physics
- To communicate mathematical and physical knowledge and ideas to the students.
- To learn the fundamentals and applications of Complex Variable, Analyticity, Cauchy-Riemann and Cauchy’s Integral.

- To contribute innovations and application of basic research.
- To get knowledge to find the relationship between observation and theory and their use in building the basic concepts of computing.

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Communicate mathematical and physical knowledge and ideas to the students.
2. Get introduced to Special functions like Gamma function, Beta function, Delta function, Bessel functions and their recurrence relations
3. Learn the fundamentals and applications of Complex Variable, Analyticity, Cauchy-Riemann and Cauchy's Integral.
4. Build connections between mathematical development and conceptual understanding.
5. Understand the relationship between observation and theory and their use in building the basic concepts of computing.
6. Contribute innovations and application of basic research.

UNIT - I

Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration. Constrained Maximization using Lagrange Multipliers. Linear interpolation: Newton forward interpolation formula and backward interpolation formula - Bessel's Formula. Interpolation with unequal intervals: Lagrange's interpolation formula. Trapezoidal rule - Simpson's 1/3 rule and 3/8 rule- Bisection method - method of successive approximations - Regula Falsi method - Newton-Raphson method

UNIT - II

Fourier Series: Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only).Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients. Even and odd functions and their Fourier expansions. Application. Summing of Infinite Series.

UNIT - III

Frobenius Method and Special Functions: Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations. Legendre, Bessel Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Orthogonality. Simple recurrence relations.

UNIT - IV

Some Special Integrals: Beta and Gamma Functions and Relation between them. Expression of Integrals in terms of Gamma Functions. Partial Differential Equations: Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular, cylindrical and spherical symmetry.

UNIT - V

Complex Analysis: Brief revision of Complex numbers & their graphical representation.

Euler's formula, rk Method (II & IV), Roots of Complex Numbers. Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of singularity. Integration of a function of a complex variable. Cauchy's Integral formula.

SUGGESTED BOOKS:

1. Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier. Fourier Analysis by M.R. Spiegel, 2004, Tata McGraw-Hill.
2. Mathematics for Physicists, Susan M. Lea, 2004, Thomson Brooks/Cole.
3. An Introduction to Ordinary Differential Equations, E.A Coddington, 1961, PHI Learning Differential Equations, George F. Simmons, 2006, Tata McGraw-Hill.
4. Essential Mathematical Methods, K.F.Riley and M.P.Hobson, 2011, Cambridge University Press.
5. https://nptel.ac.in/courses/115/103/115103036/
6. https://www.physics.uu.se/digitalAssets/405/c_405910-l_1-k_notes_v3_0.pdf

	SEMESTER – I	L T P C
16PHU111	**MECHANICS (PRACTICAL)**	**- - 2 1**

Course Objective

1. To impart knowledge on various types of Mechanisms and instruments
2. To impart skills to analyze the position, velocity and acceleration.
3. To understand basic laws governing mechanics of a system.
4. To determine the acceleration due to gravity using various methods.
5. To determine the Moment of Inertia using various methods.
6. To know forces their relationship to engineering applications

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Understand and analyze basic theory and principles of forces in mechanics
2. Know forces their relationship to engineering applications
3. Analyze motion, forces and motion, work and energy problems and their relationship to engineering applications
4. Understand basic laws governing mechanics of a system.
5. Determine the acceleration due to gravity using various methods.
6. Determine the Moment of Inertia using various methods.

ANY SIX EXPERIMENTS

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To determine the Height of a Building using a Sextant.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the Elastic Constants of a Wire by Searle's method.
7. To determine g by Bar Pendulum.
8. To determine g by Kater's Pendulum.
9. To determine g and velocity for a freely falling body using Digital Timing Technique.
10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g

Suggested Books

1. Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. Engineering Practical Physics, S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd.
4. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

SEMESTER – I **L T P C**

16PHU112 SOLID STATE PHYSICS (PRACTICAL) - - 2 1

Course Objectives:

- The course is to understand the basic knowledge on magnetic properties of materials.
- To understand the various parameters of the Hysteresis loop
- Acquire the knowledge of semiconducting and dielectric materials.
- To comprehend the concepts of superconductivity and magnetic properties of solids.
- To verify the dielectric constant of a material by experimentally.
- To understand the importance of new materials in modern technology.

Course Outcome:

After successful completion of the course, the student is expected to

1. Basic practical knowledge on magnetic materials.
2. Understand the basic idea about the dielectric Properties of Solids
3. Experience the behavior of Hysteresis loop of a crystal.
4. Measure the suceptability of magnetic materials.
5. Verify the dielectric constant of a material by experimentally.
6. Understand the importance of new materials in modern technology.

ANY SIX EXPERIMENTS

1. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method)
2. To measure the Magnetic susceptibility of Solids.
3. To determine the Coupling Coefficient of a Piezoelectric crystal.
4. To measure the Dielectric Constant of a dielectric Materials with frequency
5. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR) technique.
6. To determine the refractive index of a dielectric layer using SPR technique.
7. To study the PE Hysteresis loop of a Ferroelectric Crystal.
8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.
9. To measure the resistivity of a semiconductor (Ge) crystal with temperature (up to 150^{o}C) by four-probe method and to determine its band gap.
10. To determine the Hall coefficient of a semiconductor sample.

Suggested Books

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India

SEMESTER – I

16PHU113	**MATHEMATICAL PHYSICS – I (PRACTICAL)**	**L T P C**
		- - 4 2

Course Objectives

- To provide students with a repertoire of mathematical methods that are essential to the solution of advanced problems encountered in the fields of applied physics and engineering.
- In addition, intended to prepare the student with mathematical tools and techniques that are required in advanced courses offered in the applied physics
- To communicate mathematical and physical knowledge and ideas to the students.

- To demonstrate the utility and limitations of a variety of powerful calculational techniques and to provide a deeper understanding of the mathematics underpinning theoretical physics.
- To find the solution through programming languages.
- To write the coding for physical problems

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Communicate mathematical and physical knowledge and ideas to the students.
2. Demonstrate the utility and limitations of a variety of powerful calculational techniques and to provide a deeper understanding of the mathematics underpinning theoretical physics.
3. Evaluate the definite integrals using computer programming techniques
4. Find the solution through programming languages.
5. Write the coding for physical problems
6. Solve complex problems through modeling.

ANY SIX EXPERIMENTS

Topics	Descriptions with Applications
Introduction and Overview	Computer architecture and organization, memory and
	Input/output devices
Basics of scientific computing	Binary and decimal arithmetic, Floating point numbers,
algorithms, Sequence, Selection and	
	Repetition, single and double precision arithmetic,
	underflow and overflow - emphasize the importance
	of making equations in terms of dimensionless
	variables, Iterative methods
Errors and error Analysis	Truncation and roundoff errors, Absolute and relative
	errors, Floating point computations
	Introduction to Programming, constants, variables
	and data types, operators and Expressions, I/O
	statements, scanf and printf, cin and cout
Review of C & C++	,Manupulators for data formatting, Control
	statements (decision making and looping statements)
Programming	
	(if-statement, if-else statement, nested if statement,
fundamentals	
	else-if statement, ternary operator, goto statement,
	switch statement, unconditional and conditional
	looping, while and do while loop, for loop,nested
	loops, break and continue statements). Arrays (1D

	and 2D)and strings, user defined functions, Structures and Unions, Idea of classes and objects
Programs: using C/C++ language	Sum and average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending descending order, Binary search
Random number generation	Area of circle, area of square, volume of sphere, value of pi
Solution of Algebraic and Transcendental equations by Bisection, Newton Raphson and Secant methods	Solution of linear and quadratic equation, solving
Interpolation by Newton Gregory Forward and Backward difference formula, Error estimation of linear interpolation	Evaluation of trigonometric functions e.g. *sin* , *cos* , *tan* etc
Numerical differentiation (Forward and Backward difference formula) and Integration (Trapezoidal and Simpson rules), Monte Carlo method	Given Position with equidistant time data calculate velocity and acceleration and vice versa. Find the area of BH Hysteresis loop
Solution of Ordinary Differential Equations (ODE) First order Differential equation Euler, modified Euler and Runge-Kutta (RK) second and fourth order methods	First order differential equation Radioactive decay Current in RC, LC circuits with DC source Newton's law of cooling Classical equations of motion

Suggested Books

1. Introduction to Numerical Analysis, S.S. Sastry, 5th Edn., 2012, PHI Learning Pvt. Ltd. Schaum's Outline of Programming with C++. J.Hubbard, 2000, McGraw- Hill Pub.
2. Numerical Recipes in C++: The Art of Scientific Computing, W.H. Press et.al., 2nd Edn., 2013, Cambridge University Press.

3. A first course in Numerical Methods, U.M. Ascher & C. Greif, 2012, PHI Learning.
4. An Introduction to computational Physics,T.Pang,2nd Edn., 2006,CambridgeUniv. Press

SEMESTER – II

16LSU201 **தமிழ் இரண்டாம் தாள்** **L T P C**

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது) 4 - - 4

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I : பக்தி இலக்கியம் **(10 மணிநேரம்)**

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. **சைவம்** - பெரியபுராணம் - திருமூலநாயனார் புராணம்.

2. **வைணவம்** - பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

அலகு – II : சங்க இலக்கியம் : (15 மணிநேரம்)

சங்க இலக்கியங்கள் அறிமுகம்

அ). **எட்டுத்தொகை**

நற்றிணை : பிரசம் கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு – உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : சுடர்தொடீ கேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு : அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி - 48

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

ஆ). **பத்துப்பாட்டு**

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு முருகன் இருப்பிடங்கள் – 'சிறுதினை மலரொடு' என்பதிலிருந்துதொடங்கி, 'அறிந்தவாறே' என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – 'தெய்வம் சான்ற' என்பதிலிருந்து தொடங்கி, 'நல்குமதி' என்பது வரையிலான தொடர்கள்: 286-295.

அலகு - III : காப்பியம் (6 மணிநேரம்)

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: **(21-29) – கண்ணகியின் சிறப்பு:** 'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி,

‘கண்ணகி என்பாண் மன்னோ’ என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234) - சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: ‘அருந்திறலரசர்’ என்பதிலிருந்து தொடங்கி, ‘மன்னவரேறென்’ என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485) - செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: ‘என்னே’ என்பதிலிருந்து தொடங்கி, ‘விசும்பில் தோன்றுமால்’ என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை: பத்தினிப் பெண்டிர் எழுவர் கதை: ‘நீர்வார் கண்ணை’ என்பதிலிருந்து தொடங்கி, ‘புகாரென் பதியே’ என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: ‘வன்னி மரமும்’ என்பதிலிருந்து தொடங்கி, ‘பதிப்பிறந்தேன்’ என்பது வரையிலான தொடர்கள்.

அலகு – IV : **சிறுகதை** (10 **மணிநேரம்**)

1. **குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்**
2. காட்டில் ஒரு மான் - அம்பை
3. நாற்காலி – கி.ராஜநாராயணன்
4. **நகரம் – சுஜாதா**

அலகு- V : **மொழிப்பயிற்சி** (7 **மணிநேரம்**)

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை) மொழிபெயர்ப்பு

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

SEMESTER – II

		L T P C
16PHU201	**ELECTRICITY AND MAGNETISM**	**5 - - 5**

Course Objectives

- To establish grounding in electromagnetism in preparation for more advanced courses.
- The major concepts covered are: the abstraction from forces to fields using the examples of the gravitational, electric and magnetic fields, with some applications; the connection between conservative forces and potential energy; how charges move through electric circuits; the close connection between electricity and magnetism, leading to the discovery of electromagnetic waves.
- To use electromagnetic theory and principles in a wide range of applications.
- To understand the calculus along with physical principles
- To effectively solve problems encountered in everyday life, further study in science, and in the professional world.
- To gain confidence in their ability to apply mathematical methods to understand electromagnetic problems to real-life situations.

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Apply knowledge of electricity and magnetism to explain natural physical processes and related technological advances.
2. Gain confidence in their ability to apply mathematical methods to understand electromagnetic problems to real-life situations.
3. Use an understanding of calculus along with physical principles to effectively solve problems encountered in everyday life, further study in science, and in the professional world.
4. Be able to use electromagnetic theory and principles in a wide range of applications.
5. Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies.
6. To develop an understanding of the principles of electricity and magnetism.

UNIT – I

Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor.

UNIT - II

Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

UNIT - III

Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law.

Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials.

UNIT – IV

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.

UNIT – V

Maxwell`s equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

Suggested Books:

1. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
2. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
3. D.J.Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
4. D Halliday, R Resnick and J Walker, Fundamentals of Physics (Extended) 6th ed., John Wiley, 2001.
5. https://ocw.mit.edu/courses/physics/8-02t-electricity-and-magnetism-spring-2005/lecture-notes/
6. https://cpb-us-e1.wpmucdn.com/cobblearning.net/dist/e/1364/files/2014/03/Magnets-webquest-answers-2jdthlu.pdf

SEMESTER II

16PHU202	ANALOG SYSTEMS AND APPLICATIONS	L T P C
		5 - - 5

Course Objectives

- The objective of this paper is to give information about different analog electronic circuits and their applications.
- To understand operation of semiconductor devices.
- To understand DC analysis and AC models of semiconductor devices.
- To implement mini projects based on concept of electronics circuit concepts.
- To apply concepts for the design of Regulators and Amplifiers.
- To verify the theoretical concepts through laboratory and simulation experiments.

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Apply concepts for the design of Regulators and Amplifiers.
2. Acquire knowledge about how a semiconductor diode rectifies an input ac signal
3. Verify the theoretical concepts through laboratory and simulation experiments.
4. Be able to know about the Field Effect Transistors, their principles and applications
5. Learn how to construct a transistor amplifier and how its gain varies with frequency
6. To implement mini projects based on concept of electronics circuit concepts.

UNIT I

Semiconductor Diodes: P and N type semiconductors. Energy Level Diagram. Conductivity and Mobility, Concept of Drift velocity. PN Junction Fabrication (Simple Idea). Barrier Formation in PN Junction Diode. Static and Dynamic Resistance. Current Flow Mechanism in Forward and Reverse Biased Diode. Drift Velocity. Derivation for Barrier Potential, Barrier Width and Current for Step Junction. Current Flow Mechanism in Forward and Reverse Biased Diode.

UNIT II

Two-terminal Devices and their Applications: Rectifier Diode: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, C-filter, Zener Diode and Voltage Regulation. Principle and structure of LEDs, Photodiode and Solar Cell.

Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains α and β Relations between α and β. Load Line analysis of Transistors. DC Load line and Q-point. Physical Mechanism of Current Flow. Active, Cutoff and Saturation Regions.

UNIT III

Amplifiers: Transistor Biasing and Stabilization Circuits. Fixed Bias and Voltage Divider Bias. Transistor as 2-port Network. h-parameter Equivalent Circuit. Analysis of a single-stage

CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Classification of Class A, B & C Amplifiers. Coupled Amplifier: Two stage RC-coupled amplifier and its frequency response.

Feedback in Amplifiers: Effects of Positive and Negative Feedback on Input Impedance, Output Impedance, Gain, Stability, Distortion and Noise.

UNIT IV

Sinusoidal Oscillators: Barkhausen's Criterion for self-sustained oscillations. RC Phase shift oscillator, determination of Frequency. Hartley & Colpitts oscillators.

Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical Op-Amp. (IC 741) Open-loop and Closed-loop Gain. Frequency Response. CMRR. Slew Rate and concept of Virtual ground.

UNIT V

Applications of Op-Amps: Inverting and non-inverting amplifiers, Adder, Subtractor, Differentiator, Integrator, Log amplifier, Zero crossing detector, Wein bridge oscillator. **Conversion:** Resistive network (Weighted and R-2R Ladder). Accuracy and Resolution. A/D Conversion (successive approximation)

Suggested Books:

1. Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
2. Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
3. Solid State Electronic Devices, B.G.Streetman & S.K.Banerjee, 6th Edn.,2009, PHI Learning
4. Electronic Devices & circuits, S.Salivahanan & N.S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill
5. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall
6. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
7. Electronic circuits: Handbook of design & applications, U.Tietze, C.Schenk,2008, Springer
8. Semiconductor Devices: Physics and Technology, S.M. Sze, 2nd Ed., 2002, Wiley India
9. Microelectronic Circuits, M.H. Rashid, 2nd Edition, Cengage Learning Electronic Devices, 7/e Thomas L. Floyd, 2008

	SEMESTER II	L T P C
16PHU203	MATHEMATICAL PHYSICS – II	4 - - 4

Course Objectives

- To provide students with a repertoire of mathematical methods that are essential to the solution of advanced problems encountered in the fields of applied physics and engineering.
- In addition, intended to prepare the student with mathematical tools and techniques that are required in advanced courses offered in the applied physics.
- To contribute innovations and application of basic research.
- To communicate mathematical and physical knowledge and ideas to the students.
- To build connections between mathematical development and conceptual understanding.
- To get introduced to Special functions like Gamma function, Beta function, Delta function, Bessel functions and their recurrence relations

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Communicate mathematical and physical knowledge and ideas to the students.
2. Get introduced to Special functions like Gamma function, Beta function, Delta function, Bessel functions and their recurrence relations
3. Learn the fundamentals and applications of Complex Variable, Analyticity, Cauchy-Riemann and Cauchy's Integral.
4. Build connections between mathematical development and conceptual understanding.
5. Understand the relationship between observation and theory and their use in building the basic concepts of computing.
6. Contribute innovations and application of basic research.

UNIT I

Fourier Series: Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients. Complex representation of Fourier series. Expansion of functions with arbitrary period. Expansion of non-periodic functions over an interval. Even and odd functions and their Fourier expansions. Application. Summing of Infinite Series. Term-by-Term differentiation and integration of Fourier Series. Parseval Identity.

UNIT II

Special Functions: Legendre, Bessel, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Generating Function, Orthogonality. Simple recurrence relations. Expansion of function in a series of Legendre Polynomials.

UNIT III

Bessel Functions of the First Kind: Generating Function, simple recurrence relations. Zeros of Bessel Functions (Jo(x) and J1(x))and Orthogonality.

UNIT IV

Some Special Integrals: Beta and Gamma Functions and Relation between them. Expression of Integrals in terms of Gamma Functions. Error Function (Probability Integral).

Theory of Errors: Systematic and Random Errors. Propagation of Errors. Normal Law of Errors. Standard and Probable Error. Least-squares fit. Error on the slope and intercept of a fitted line.

UNIT V

Partial Differential Equations: Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular, cylindrical and spherical symmetry. Wave equation and its solution for vibrational modes of a stretched string, rectangular and circular membranes. Diffusion Equation.

Suggested Books:

1. Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier.
2. Fourier Analysis by M.R. Spiegel, 2004, Tata McGraw-Hill.
3. Mathematics for Physicists, Susan M. Lea, 2004, Thomson Brooks/Cole.
4. Differential Equations, George F. Simmons, 2006, Tata McGraw-Hill.
5. Partial Differential Equations for Scientists & Engineers, S.J. Farlow, 1993, Dover Pub.
6. Engineering Mathematics, S.Pal and S.C. Bhunia, 2015, Oxford University Press
7. Mathematical methods for Scientists & Engineers, D.A. McQuarrie, 2003, Viva Books

SEMESTER – II **L T P C**

16PHU211 ELECTRICITY AND MAGNETISM (PRACTICAL) **- - 2 1**

Course Objectives

- To establish grounding in electromagnetism in preparation for more advanced courses.
- Assess the contributions of physics to our evolving understanding of global change and sustainability while placing the development of physics in its historical and cultural context.
- To gain practical knowledge on RC Circuit
- To develop skills in the basic concept of electric forces.
- To understand Gauss law and its applications.
- To gain practical knowledge on magnetic moment.

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Gain practical knowledge on RC Circuit
2. Develop skills in the basic concept of electric forces.
3. Understand Gauss law and its applications.
4. Gain practical knowledge on magnetic moment.
5. Determine a Low Resistance by Carey Foster's Bridge
6. Compare capacitances using De'Sauty's bridge

ANY SIX EXPERIMENTS

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. Ballistic Galvanometer:
   (i) Measurement of charge and current sensitivity
   (ii) Measurement of CDR
   (iii) Determine a high resistance by Leakage Method
   (iv) To determine Self Inductance of a Coil by Rayleigh's Method.
3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength B & its variation in a Solenoid (Determine dB/dx).
5. To study the Characteristics of a Series RC Circuit.
6. To study a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor
7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b)

Quality factor Q

8. To determine a Low Resistance by Carey Foster's Bridge.
9. To verify the Thevenin and Norton theorem
10. To verify the Superposition, and Maximum Power Transfer Theorem

Suggested Books

1. Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
2. Engineering Practical Physics, S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd.
3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

SEMESTER II

		L	T	P	C
16PHU212	ANALOG SYSTEMS AND APPLICATIONS (PRACTICAL)	-	-	2	1

Course Objectives

- The objective of this paper is to give information about different analog electronic circuits and their applications.
- To understand operation of semiconductor devices.
- To study the characteristics of a Bipolar Junction Transistor in CE configuration.
- To study the various biasing configurations of BJT for normal class A operation.
- To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias.
- To design an inverting amplifier using Op-amp for dc voltage circuits

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Understand the basics of diode
2. Analyse the characteristics of Bipolar Junction Transistor
3. Perform the procedures for the working of RC-coupled transistor
4. Analyse the relationship between V-I & power curves
5. Understand the applications of Op-amp
6. Develop the ability to analyze and design analog electronic circuits using discrete components.
7. Acquire a basic knowledge in solid state electronics including diodes, MOSFET, BJT, and operational amplifier.

Any 6 experiments

1. To study V-I characteristics of PN junction diode, and Light emitting diode.
2. To study the V-I characteristics of a Zener diode and its use as voltage regulator.
3. Study of V-I & power curves of solar cells, and find maximum power point & efficiency.
4. To study the characteristics of a Bipolar Junction Transistor in CE configuration.
5. To study the various biasing configurations of BJT for normal class A operation.
6. To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias.
7. To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
8. To design a Wien bridge oscillator for given frequency using an op-amp.
9. To design a phase shift oscillator of given specifications using BJT.
10. To study the Colpitt`s oscillator.

11. To design a digital to analog converter (DAC) of given specifications.
12. To study the analog to digital convertor (ADC) IC.
13. To design an inverting amplifier using Op-amp (741,351) for dc voltage of given gain
14. To design inverting amplifier using Op-amp (741,351) and study its frequency response
15. To design non-inverting amplifier using Op-amp (741,351) & study its frequency response
16. To study the zero-crossing detector and comparator
17. To add two dc voltages using Op-amp in inverting and non-inverting mode
18. To design a precision Differential amplifier of given I/O specification using Op-amp.
19. To investigate the use of an op-amp as an Integrator.
20. To investigate the use of an op-amp as a Differentiator.
21. To design a circuit to simulate the solution of a $1^{st}/2^{nd}$ order differential equation.

Suggested Books:

1. Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994, Mc-Graw Hill.
2. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4^{th} edition, 2000, Prentice Hall.
3. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.
4. Electronic Devices & circuit Theory, R.L. Boylestad & L.D. Nashelsky, 2009, Pearson

SEMESTER II

16PHU213 **MATHEMATICAL PHYSICS – II (PRACTICAL)**

L	T	P	C
-	-	4	2

Course Objectives

This course enables the students to learn

- To solve simultaneous linear algebraic equations using various methods.
- To evaluate definite integrals using numerical techniques.
- To problem-solving through (computer language) programming.
- To write the coding for physical problems
- To solve complex problems through modeling.
- To find the solution for given problems through computer programming.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Familiarize with the programming environment for numerical methods.
2. Develop proficiency in skills to solve the algebraic equations.
3. Evaluate the definite integrals using computer programming techniques
4. Find the solution through programming.
5. Write the coding for physical problems
6. Solve complex problems through modeling.

Introduction to Numerical computation software Scilab

Introduction to Scilab, Advantages and disadvantages, Scilab environment, Command window, Figure window, Edit window, Variables and arrays, Initialising, variables in Scilab, Multidimensional arrays, Subarray, Special values, Displaying output data, data file, Scalar, and array operations, Hierarchy of operations, Built in Scilab functions, Introduction to plotting, 2D and 3D plotting, Branching Statements and program design, Relational & logical operators, the while loop, for loop, details of loop operations, break & continue statements, nested loops, logical arrays and vectorization User defined functions, Introduction to Scilab functions, Variable passing in Scilab, optional arguments, preserving data between calls to a function, Complex and Character data, string function, Multidimensional arrays an introduction to Scilab file processing, file opening and closing, Binary I/o functions, comparing binary and formatted functions, Numerical methods and developing the skills of writing a program.

Curve fitting, Least square fit: Goodness Ohms law to calculate R, Hooke's law to calculate spring of fit, standard deviation constant

Solution of Linear system of equations Solution of mesh equations of electric circuits (3 meshes), by Gauss elimination method and Gauss, Seidal method. Diagonalization of Solution of coupled spring mass systems (3 masses matrices, Inverse of a matrix, Eigen vectors, eigen values problems

Generation of Special functions using User defined functions in Scilab
Generating and plotting Legendre Polynomials Generating and plotting Bessel function
Solution of ODE First order differential equation
First order Differential equation Euler, modified Euler and Runge-Kutta second order methods: Newton's law of cooling, Classical equations of motion
Second order differential equation, Fixed difference method: Second order Differential Equation Harmonic oscillator (no friction) Damped Harmonic oscillator Over damped, Critical damped, Oscillatory, Forced Harmonic oscillator, Transient and Steady state solution

Suggested Books:

1. Mathematical Methods for Physics and Engineers, K.F Riley, M.P. Hobson and S. J. Bence, 3rd ed., 2006, Cambridge University Press
2. Complex Variables, A.S. Fokas & M.J. Ablowitz, 8th Ed., 2011, Cambridge Univ. Press
3. First course in complex analysis with applications, D.G. Zill and P.D. Shanahan, 1940, Jones & Bartlett
4. Computational Physics, D.Walker, 1st Edn., 2015, Scientific International Pvt. Ltd.
5. A Guide to MATLAB, B.R. Hunt, R.L. Lipsman, J.M. Rosenberg, 2014, 3rd Edn., Cambridge University Press
6. Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific and Engineering Applications: A.V. Wouwer, P. Saucez, C.V. Fernández. 2014 Springer Scilab by example: M. Affouf 2012, ISBN: 978-1

	SEMESTER - II	L T P C
16AEF201	**ENVIRONMENTAL STUDIES**	**4 - - 4**

Course Objectives

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- To apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- To gain knowledge on environmental issues.

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
7. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and / or practitioners.

UNIT-I

Environment: Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs. Classification of ecosystem.

UNIT -II

Natural Resources

Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources: Use and over-utilization, exploitation. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Fire accidents and prevention.

UNIT -III

Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT- IV

Environmental Pollution: Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Diaster management: Foods, earthquake, cyclone and landslides.

UNIT -V

Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rahabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

Suggested Books

1. Tripathy.S.N. & Sunakar Panda. (2004). Fundamentals of Environmental Studies. 2nd Edition. New Delhi: Vrianda Publications Private Ltd.
2. Arvind Kumar . (2004). A Textbook of Environmental Science. New Delhi: APH Publishing Corporation.
3. Verma P.S., & .Agarwal. V.K. (2001). Environmental Biology :Principles of Ecology. New Delhi: S.Chand and Company Ltd.
4. Anubha Kaushik, C.P. & Kaushik, (2004). Perspectives in Environmental Studies. New Delhi: New Age International Pvt. Ltd. Publications.
5. Singh, M.P., Singh, B.S. & Soma S. Dey, (2004). Conservation of Biodiversity and Natural Resources. Delhi: Daya Publishing House.

6. Daniel B.Botkin & Edward A.Keller. (1995). Environmental Science. NewYork: John Wiley and Sons, Inc.
7. Uberoi, N.K., (2005). Environmental Studies, New Delhi, India: Excel Books Publications.

SEMESTER - III **L T P C**

16PHU301 **THERMAL PHYSICS & STATISTICAL MECHANICS** **4 - - 4**

Course Objectives

- The objective of this course is to give awareness on different laws of thermodynamics and its effect on different aspects in life.
- The aim of statistical mechanics is to give knowledge on the laws of classical thermodynamics for macroscopic systems using the properties of its atomic particles.
- To apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.
- To apply the concepts and laws of thermodynamics to solve problems in thermodynamic systems such as gases, heat engines and refrigerators etc.
- To give knowledge on the statistical mechanics and explain the applications of thermodynamics.
- To provide the correlation of thermodynamical problems with statistical concepts.

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, chemical potential, Free energies, partition functions.
2. Realize the importance of thermo dynamical functions and their applications.
3. Statistical physics methods, such as Boltzmann distribution, Gibbs distribution, Fermi-Dirac and Bose-Einstein distributions to solve problems in some physical systems.
4. Become familiar with various thermodynamic process and work done in each of these process.
5. Apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.
6. Apply the concepts and laws of thermodynamics to solve problems in thermodynamic systems such as gases, heat engines and refrigerators etc.

UNIT - I

Laws of Thermodynamics: Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_P and C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient, Reversible and irreversible processes, Second law, Entropy, Carnot's cycle & theorem, Entropy changes in reversible and irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.

UNIT - II

Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations and applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for ($C_P - C_V$), C_P/C_V, TdS equations.

UNIT - III

Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases.

UNIT - IV

Statistical Mechanics

Introduction – Liouville's theorem – Measurement of macro-properties of a thermodynamic system – Ensemble – Microcanonical and Canonical ensembles – Entropy of an ideal gas – microcanonical ensemble – Application of Gibbs canonical ensembles – Fluctuations in thermodynamic variables – Stirling's approximation or Stirling's formula – Relation between entropy and probability – Boltzman theorem.

UNIT – V

Statistical Mechanics: Phase space, Macrostate Thermodynamic probability, Maxwell-Boltzmann Quantum statistics, Fermi-Dirac distribution law, comparison of three statistics. and Microstate, Entropy and law, distribution of velocity, Bose-Einstein distribution law.

Suggested Books:

1. Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill. A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.
2. Heat and Thermodynamics, M.W.Zemasky and R. Dittman, 1981, McGraw Hill Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears and G.L.Salinger. 1988, Narosa
3. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
4. Thermal Physics, A. Kumar and S.P. Taneja, 2014, R. chand Publications.
5. https://study.com/academy/lesson/introduction-to-thermal-physics.html.
6. https://farside.ph.utexas.edu/teaching/sm1/Thermal.pdf

SEMESTER – III **L T P C**

16PHU302 PHYSICS OF DEVICES AND COMMUNICATION **4 - - 4**

Course Objective

- To know about power semiconductor devices frequently used in industries.
- To have an idea about the principle and operation of circuits using semiconductor devices to control various operations.
- To acquaint with industrial and domestic applications of power semiconductor devices.
- To understand the concepts of electronic devices and their communication systems.
- To develop their knowledge on digital communication technology.
- To design the electronic circuits and their block diagrams with number of different electronic components.

Course outcomes

After successful completion of the course, the student is expected to

1. Understand the construction and working of different semiconductor devices.
2. Study about Basics electronics Technology
3. Develop explicit problem-solving strategies that emphasize qualitative analysis steps to describe and clarify the problem.
4. Develop knowledge on design trade-offs in various digital electronic families with a view towards reduced power consumption
5. Realize the importance of different electronic communication systems.
6. Design power electronic circuit for real time application like rectifier and convertor etc.

Unit 1

Devices: Characteristic and small signal equivalent circuits of UJT and JFET. Metal semiconductor Junction. Metal oxide semiconductor (MOS) device. Ideal MOS and Flat Band voltage. SiO2-Si based MOS. MOSFET– their frequency limits. Enhancement and Depletion Mode MOSFETS, CMOS. Charge coupled devices. Tunnel diode.

Unit II

Power supply and Filters: Block Diagram of a Power Supply, Qualitative idea of C and L Filters. IC Regulators, Line and load regulation, Short circuit protection. Active and Passive Filters, Low Pass, High Pass, Band Pass and band Reject Filters.
Multivibrators: Astable and Monostable Multivibrators using transistors.

Unit III

Phase Locked Loop(PLL): Basic Principles, Phase detector(XOR & edge triggered), Voltage Controlled Oscillator (Basics, varactor). Loop Filter– Function, Loop Filter Circuits, transient response, lock and capture. Basic idea of PLL IC (565 or 4046).

Processing of Devices: Basic process flow for IC fabrication, Electronic grade silicon. Crystal plane and orientation. Defects in the lattice. Oxide layer. Oxidation Technique for Si. Metallization technique. Positive and Negative Masks. Optical lithography. Electron lithography. Feature size control and wet anisotropic etching. Lift off Technique. Diffusion and implantation.

Unit IV

Digital Data Communication Standards:

Serial Communications: RS232, Handshaking, Implementation of RS232 on PC.

Universal Serial Bus (USB): USB standards, Types and elements of USB transfers. Devices (Basic idea of UART). Parallel Communications: General Purpose Interface Bus (GPIB), GPIB signals and lines, Handshaking and interface management, Implementation of a GPIB on a PC. Basic idea of sending data through a COM port.

Unit V

Introduction to CRO: Block Diagram of CRO. Applications of Oscilloscope: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency and Phase Difference. Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, Zener Diode and Voltage Regulation Timer IC: IC 555 Pin diagram and its application as Astable and Monostable Multivibrator.

Suggested Books:

1. Physics of Semiconductor Devices, S.M. Sze & K.K. Ng, 3rd Ed.2008, John Wiley & Sons
2. Electronic devices and integrated circuits, A.K. Singh, 2011, PHI Learning Pvt. Ltd.
3. Op-Amps & Linear Integrated Circuits, R.A.Gayakwad,4 Ed. 2000,PHI Learning Pvt. Ltd
4. Electronic Devices and Circuits, A. Mottershead, 1998, PHI Learning Pvt. Ltd.
5. Electronic Communication systems, G. Kennedy, 1999, Tata McGraw Hill.
6. Introduction to Measurements & Instrumentation, A.K. Ghosh, 3rd Ed., 2009, PHI Learning Pvt. Ltd.
7. Semiconductor Physics and Devices, D.A. Neamen, 2011, 4th Edition, McGraw Hill
8. PC based instrumentation; Concepts & Practice, N.Mathivanan, 2007, Prentice-Hall of India.
9. https://www.electronics-tutorials.ws/
10. https://www.electrical4u.com/

	SEMESTER III	L T P C
16PHU303	ELECTROMAGNETIC THEORY	4 - - 4

Course Objective

The aim and objective of the course

- The aim of this course is to provide the students with the fundamental principles of electrical energy (electro- magnetism).
- It is very important to understand the propagation of waves in different media, its transmission and reception.
- To understand the relation between electric and magnetic fields.
- To gain the knowledge on electromagnetic wave propagations.
- To describe simple models for electromagnetic interaction with media
- To experience the wave propagation in different media.

Course Outcome

After successful completion of the course, the student is expected to

1. Calculate electric and magnetic fields from stationary and dynamic charge and current distributions.
2. Use electromagnetic wave theory and principles in a wide range of applications.
3. Solve such problems in simple geometries using separation of variables and the method of images.
4. Define and derive expressions for the energy both for the electrostatic and magnetostatic fields.
5. Gain confidence in their ability to apply mathematical methods to understand electromagnetic problems to real-life situations.
6. Solve simple electrostatic boundary problems.
7. Describe simple models for electromagnetic interaction with media
8. Choose adequate models and solution methods for specific problems.

UNIT I

Maxwell Equations: Review of Maxwell's equations. Displacement Current. Vector and Scalar Potentials. Gauge Transformations: Lorentz and Coulomb Gauge. Boundary Conditions at Interface between Different Media. Wave Equations. Plane Waves in Dielectric Media. Poynting Theorem and Poynting Vector. Electromagnetic (EM) Energy Density. Physical Concept of Electromagnetic Field Energy Density, Momentum Density and Angular Momentum Density.

UNIT II

EM Wave Propagation in Unbounded Media: Plane EM waves through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant, wave impedance. Propagation through conducting media, relaxation time, skin depth. Wave propagation through dilute plasma, electrical conductivity of ionized gases, plasma frequency, refractive index, skin depth, application to propagation through ionosphere.

UNIT III

EM Wave in Bounded Media: Boundary conditions at a plane interface between two media. Reflection & Refraction of plane waves at plane interface between two dielectric media-Laws of Reflection & Refraction. Fresnel's Formulae for perpendicular & parallel polarization cases, Brewster's law. Reflection & Transmission coefficients. Total internal reflection, evanescent waves. Metallic reflection (normal Incidence).

UNIT IV

Polarization of Electromagnetic Waves: Description of Linear, Circular and Elliptical Polarization. Propagation of E.M. Waves in Anisotropic Media. Symmetric Nature of Dielectric Tensor. Fresnel's Formula. Uniaxial and Biaxial Crystals. Light Propagation in Uniaxial Crystal. Double Refraction. Polarization by Double Refraction. Nicol Prism. Ordinary & extraordinary refractive indices. Production & detection of Plane, Circularly and Elliptically Polarized Light. Phase Retardation Plates: Quarter-Wave and Half-Wave Plates. Babinet Compensator and its Uses. Analysis of Polarized Light

UNIT V

Wave Guides: Planar optical wave guides. Planar dielectric wave guide. Condition of continuity at interface. Phase shift on total reflection. Eigenvalue equations. Phase and group velocity of guided waves. Field energy and Power transmission.

Optical Fibres:- Numerical Aperture. Step and Graded Indices (Definitions Only). Single and Multiple Mode Fibres (Concept and Definition Only).

Reference Books:

1. Introduction to Electrodynamics, D.J. Griffiths, 3rd Ed., 1998, Benjamin Cummings.
2. Elements of Electromagnetics, M.N.O. Sadiku, 2001, Oxford University Press.
3. Introduction to Electromagnetic Theory, T.L. Chow, 2006, Jones & Bartlett Learning
4. Fundamentals of Electromagnetics, M.A.W. Miah, 1982, Tata McGraw Hill
5. Electromagnetic field Theory, R.S. Kshetrimayun, 2012, Cengage Learning
6. Engineering Electromagnetic, Willian H. Hayt, 8th Edition, 2012, McGraw Hill.
7. Electromagnetic Field Theory for Engineers & Physicists, G. Lehner, 2010, Springer
8. https://fas.org/man/dod-101/navy/docs/es310/propagat/Propagat.htm
9. https://www.olympus-lifescience.com/en/microscope-resource/primer/java/polarized light/emwave/.
10. https://ocw.mit.edu/courses/physics/8-311-electromagnetic-theory-spring-2004/#:~:text=Electromagnetic%20Theory%20covers%20the%20basic,magnetic%20 properties%20of%20matter%2C%20and

SEMESTER – III

16PHU304A RENEWABLE ENERGY AND ENERGY HARVESTING (SEC 1 A)

L	T	P	C
3	-	-	3

Course Objective

- To understand the various forms of conventional energy resources.
- To learn the present energy scenario and the need for energy conservation
- To explain the concept of various forms of renewable energy
- Give outline division aspects and utilization of renewable energy sources for both domestics and industrial application.
- To provide the awareness and need of renewable energy.
- To describe the uses, needs and applications of various renewable energy sources.

Course Outcome

After successful completion of the course, the student is expected to

1. Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
2. Understand the concept of hydro energy resources and their classification.
3. Describe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc.
4. Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.
5. Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications.
6. Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.

UNIT I

Fossil fuels and Alternate Sources of energy: Fossil fuels and nuclear energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, solar energy, biomass, biochemical conversion, biogas generation,

UNIT II

Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.

UNIT III

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies. Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices.

Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass.

UNIT - IV

Hydro Energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources. Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power.

UNIT - V

Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications, Geothermal Energy: Geothermal Resources, Geothermal Technologies. Carbon captured technologies, cell, batteries, power consumption, Environmental issues and Renewable sources of energy, sustainability.

Suggested Books:

1. Non-conventional energy sources, B.H. Khan, McGraw Hill
2. Solar energy, Suhas P Sukhative, Tata McGraw - Hill Publishing Company Ltd.
3. Renewable Energy, Power for a sustainable future, Godfrey Boyle, 3rd Edn., 2012, Oxford University Press.
4. Renewable Energy, 3rd Edition,
5. Solar Energy: Resource Assesment Handbook, P Jayakumar, 2009
6. J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).
7. https://www.edfenergy.com/for-home/energywise/renewable-energy-sources
8. https://www.nrdc.org/stories/renewable-energy-clean-facts
9. https://www.nationalgeographic.com/environment/energy/reference/renewable-energy/

SEMESTER – III

16PHU304B	**PHYSICS WORKSHOP SKILL**	**L T P C**
	(SEC 1 B)	**3 - - 3**

Course Objectives:

The objective of this course is

- To enable the students to familiar and experience with various mechanical and electrical tools through hands-on mode.
- To extend their skill on workshop tools and their usages.
- To apply their knowledge on making new materials by using various operating machines.
- To develop their knowledge about household electrical appliances, electric shock, etc.
- To use their knowledge towards industries.
- To think and correlate the physics of engineering materials and their applications.

Course outcome

After successful completion of the course, the student is expected to

1. Acquire knowledge about various types of wiring systems, wiring tools, lighting & wiring accessories, wiring estimation & costing, etc.
2. To get familiarized with the welding process.
3. Understand the concept of machining, forming and welding process.
4. Develop knowledge on Operation of oscilloscope.
5. Acquire knowledge about household electrical appliances, electric shock, etc.
6. To get familiarized with the properties of different materials- metals and non metals

UNIT I

Introduction: Measuring units. conversion to SI and CGS. Familiarization with meter scale, Vernier calliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

UNIT II

Mechanical Skill: Concept of workshop practice. Overview of manufacturing methods: casting, foundry, machining, forming and welding. Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood.

UNIT III

Concept of machine processing, introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet.

UNIT IV

Electrical and Electronic Skill: Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor and relay.

UNIT V

Introduction to prime movers: Mechanism, gear system, wheel, Fixing of gears with motor axel. Lever mechanism, Lifting of heavy weight using lever. braking systems, pulleys, working principle of power generation systems. Demonstration of pulley experiment.

Suggested Books:

1. A text book in Electrical Technology - B L Theraja – S. Chand and Company.
2. Performance and design of AC machines – M.G. Say, ELBS Edn.
3. Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
4. Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn., Editor Newnes [ISBN: 0750660732]
5. New Engineering Technology, Lawrence Smyth/Liam Hennessy, The Educational Company of Ireland [ISBN: 0861674480]

SEMESTER – III

16PHU311	**THERMAL PHYSICS AND STATISTICAL MECHANICS (PRACTICAL)**	**L T P C**
		- - 4 2

Course Objectives

- The objective of this course is to learn how to apply thermodynamic principles in order to interpret thermodynamic systems and predict their behaviors.
- To determine Stefan's Constant.
- To determine the coefficient of thermal conductivity of Cu by Searle's Apparatus.
- To apply the theoretical knowledge into the experiments and find the solutions.
- To apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.
- To experience the practical difficulties to find the physical constant values.

Course Outcome

After successful completion of the course, the student is expected to

1. Understand the process of thermal conductivity, viscosity and diffusion in gases
2. Able to correlate theory and practicals.
3. Understand the basic thermal properties via experiments.
4. Verify the Newton's law.
5. Analyse the characteristics of Bipolar Junction Transistor
6. Understand the applications of thermal conductance materials.
7. Apply the laws of thermodynamics to real physical systems and processes.
8. Apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.

Any 8 Experiments

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.
2. Measurement of Planck's constant using black body radiation.
3. To determine Stefan's Constant.
4. To determine the coefficient of thermal conductivity of Cu by Searle's Apparatus.
5. To determine the Coefficient of Thermal conductivity of Cu by Angstrom's Method.
6. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.

7. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.
8. To study the variation of thermo emf across two junctions of a thermocouple with temperature.
9. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system
10. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge

Suggested Books

1. Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, KitabMahal, New Delhi.
4. A Laboratory Manual of Physics for Undergraduate Classes, D.P.Khandelwal, 1985, Vani Publication.

SEMESTER III

16PHU312	**PHYSICS OF DEVICES AND COMMUNICATION (PRACTICAL)**	**L T P C** **- - 4 2**

Course Objective

- To know about semiconductor devices frequently used in industries.
- To acquaint industrial and domestic applications of semiconductor devices.
- To experience the practical difficulties to find the physical constant values.
- To apply the theoretical knowledge into the experiments and find the solutions.
- To understand operation of diodes, transistors in order to design basic circuits.
- To design, fabricate and test the different electronic circuit.

Course Outcome

After successful completion of the course, the student is expected to

1. By the end of this subject, students should have acquired reasonable proficiency in the analysis and design of basic electronic circuits.
2. Apply the concepts of basic electronic devices to design various circuits.
3. Understand operation of diodes, transistors in order to design basic circuits.
4. Design small and large signal amplifier circuits for various practical applications.
5. The course as a whole outlines some ways of thinking about analog circuits that hopefully will help to develop intuition.
6. Design, fabricate and test small electronic circuit.

Any 8 Experiments

1. To design a power supply using bridge rectifier and study effect of C-filter.
2. To design the active Low pass and High pass filters of given specification.
3. To design the active filter (wide band pass and band reject) of given specification.
4. To study the output and transfer characteristics of a JFET.
5. To design a common source JFET Amplifier and study its frequency response.
6. To study the output characteristics of a MOSFET.
7. To study the characteristics of a UJT and design a simple Relaxation Oscillator.
9. To design an Amplitude Modulator using Transistor.
10. To design PWM, PPM, PAM and Pulse code modulation using ICs.
11. To design an Astable multivibrator of given specifications using transistor.
12. To study a PLL IC (Lock and capture range).
13. To study envelope detector for demodulation of AM signal.
14. Study of ASK and FSK modulator.
15. Glow an LED via USB port of PC.

16. Sense the input voltage at a pin of USB port and subsequently glow the LED onnected with another pin of USB port.

Suggested Books:

1. Physics of Semiconductor Devices, S.M. Sze & K.K. Ng, 3rd Ed.2008, John Wiley & Sons
2. Electronic devices and integrated circuits, A.K. Singh, 2011, PHI Learning Pvt. Ltd.
3. Op-Amps & Linear Integrated Circuits, R.A.Gayakwad,4 Ed. 2000,PHI Learning Pvt. Ltd
4. Electronic Devices and Circuits, A. Mottershead, 1998, PHI Learning Pvt. Ltd.
5. Electronic Communication systems, G. Kennedy, 1999, Tata McGraw Hill.
6. Introduction to Measurements & Instrumentation, A.K. Ghosh, 3rd Ed., 2009, PHI Learning Pvt. Ltd.
7. Semiconductor Physics and Devices, D.A. Neamen, 2011, 4th Edition, McGraw Hill
8. PC based instrumentation; Concepts & Practice, N.Mathivanan, 2007, Prentice-Hall of India.
9. https://www.electronics-tutorials.ws/
10. https://www.electrical4u.com/

	SEMESTER III	L T P C
16PHU313	ELECTROMAGNETIC THEORY (PRACTICAL)	- - 4 2

Course Objective

- The aim of this course is to provide the students by correlating the fundamental principles of electrical energy (electro- magnetism) practically.
- To experience the practical difficulties to find the physical constant values.
- To apply the theoretical knowledge into the experiments and find the solutions.
- To find the value of Boltzman constant.
- To calculate the wavelength and velocity of ultrasonic waves in a liquid by studying the diffraction through ultrasonic grating.
- To differentiate the experimental issues with theoretical aspects.

Course Outcome

After successful completion of the course, the student is expected to

1. Find electric and magnetic fields from stationary and dynamic charge and current distributions.
2. describe simple models for electromagnetic interaction with media
3. Choose adequate models and solution methods for specific problems.
4. Operate the polarimeter to find the polarization behavior of liquid and crystalline materials.
5. Calculate the wavelength and velocity of ultrasonic waves in a liquid by studying the diffraction through ultrasonic grating.
6. Verify the Faraday's law of electromagnetism.

Any 8 experiments

1. To verify the law of Malus for plane polarized light.
2. To determine the specific rotation of sugar solution using Polarimeter.
3. To analyze elliptically polarized Light by using a Babinet's compensator.
4. To study dependence of radiation on angle for a simple Dipole antenna.
5. To determine the wavelength and velocity of ultrasonic waves in a liquid (Kerosene Oil, Xylene, etc.) by studying the diffraction through ultrasonic grating.
6. To study the reflection, refraction of microwaves
7. To study Polarization and double slit interference in microwaves.
8. To determine the refractive index of liquid by total internal reflection using Wollaston's air-film.
9. To determine the refractive Index of (1) glass and (2) a liquid by total internal reflection using a Gaussian eyepiece.
10. To study the polarization of light by reflection and determine the polarizing angle for

air-glass interface.

11. To verify the Stefan`s law of radiation and to determine Stefan’s constant.
12. To determine the Boltzmann constant using V-I characteristics of PN junction diode.

Suggested Books

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Ed., 2011, Kitab Mahal
4. Electromagnetic Field Theory for Engineers & Physicists, G. Lehner, 2010, Springer

SEMESTER – III

16PHU314A	**RENEWABLE ENERGY AND ENERGY HARVESTING (PRACTICAL) (SEC 1 A)**	**L T P C** **- - 3 1**

Course Objective

- To describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment.
- To experience the practical difficulties to find the physical constant values.
- To apply the theoretical knowledge into the experiments and find the solutions.
- To obtain knowledge on renewable energy sources.
- To experience the needs of renewable energy sources.
- To develop the new concept of renewable energy sources.

Course Outcome

After successful completion of the course, the student is expected to

1. Demonstrate Training modules on Solar energy, wind energy, etc.
2. Convert units of energy-to quantify energy demands and make comparisons among energy uses, resources, and technologies.
3. Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.
4. Understand the needs of renewable energy sources.
5. Experience the calculation of wind velocity.
6. Study of box type solar cooker.

Any 5 Experiments

1. Fuel value of wood/charcoal.
2. Study of sensible heat storage using liquid.
3. Selective and Non-selective coatings – Determination of Selectivity ratio.
4. Thermal efficiency of liquid – flat plate collector.
5. Study of box type solar cooker.
6. Determination of instantaneous thermal efficiency of parabolic collector.
7. Efficiency and fill factor of solar cells.

Suggested Books:

1. Non conventional Energy sources, G. D. RAI (4th edition), Khanna Publishers, Delhi.
2. Solar Energy, S.P. Sukhatme (second edition), Tata Mc.Graw Hill Ltd, New Delhi.
3. Solar Energy Utilisation, G. D. RAI (5th edition), Khanna Publishers,Delhi.

SEMESTER – III

16PHU314B	PHYSICS WORKSHOP SKILL (PRACTICAL) (SEC 1 B)	L T P C
		- - 3 1

Course Objectives

- To understand concepts of various basic equipments and devices.
- To gain a knowledge and to understand fundamental physical concepts.
- To experience the practical difficulties to find the physical constant values.
- To apply the theoretical knowledge into the experiments and find the solutions.
- To develop the skill on operating the modern machines.
- To enhance their knowledge on foundry tools.

Course Outcomes

After successful completion of the course, the student is expected to

1. Develop skills in assessing the quality of one's own and others' work
2. Develop skills in observation, interpretation, reasoning, synthesis, generalizing, predicting, and questioning as a way to learn new knowledge.
3. Use the multimeters and other electronic kits.
4. Operate the oscilloscope and PCB.
5. Make different shape of materials using foundry tools.
6. Construct the circuit of regulated power supply. Timer circuit, Electronic switch using transistor and relay.

List of Experiments

1. Screw guage, Vernier Calipers, Spherometer, Least count, Zero error, Measurement of thickness of the scale, breadth of scale, radius of curvature of a concave and convex surface.
2. Cutting of a metal sheet using blade. Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block.
3. Use of bench vice and tools for fitting. Make funnel using metal sheet.
4. Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB.
5. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor and relay.

Suggested Books:

1. A text book in Electrical Technology - B L Theraja – S. Chand and Company.
2. Performance and design of AC machines – M.G. Say, ELBS Edn.
3. Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
4. Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn., Editor Newnes [ISBN: 0750660732]
5. New Engineering Technology, Lawrence Smyth/Liam Hennessy, The Educational Company of Ireland [ISBN: 0861674480]

16PHU401	SEMESTER IV WAVES AND OPTICS	L T P C 4 - - 4

Course Objective

- This course builds the ideas of harmonic motion to cover in depth concept of waves in physics with particular emphasis on light waves as an example.
- The foundation of the course is Fourier theory, which will then be used to understand dispersion of waves, image formation in optics and diffraction and other aspects of Fourier optics.
- Understand how the principle of superposition is applied when two pulses meet
- Define three terms to describe periodic waves: speed, wavelength, and frequency
- Explain the characteristics of transverse and longitudinal waves.
- Identify the relationship between the speed, wavelength, and frequency of a wave.

Course Outcome

After successful completion of the course, the student is expected to

1. To develop an understanding of the principles of optics.
2. Understand linear, time-invariant systems.
3. Understand the role of the wave equation and appreciate the universal nature of wave motion in a range of physical systems
4. To build connections between mathematical development and conceptual understanding.
5. Understand dispersion in waves and model dispersion using Fourier theory.
6. Understand optical phenomena such as polarization, birefringence, interference and diffraction in terms of the wave model.

UNIT - I

Superposition of Two Collinear Harmonic oscillations: Simple harmonic motion (SHM). Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats). Superposition of Two Perpendicular Harmonic Oscillations: Graphical and Analytical Methods. Lissajous Figures (1:1 and 1:2) and their uses. Waves Motion- General: Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity.

UNIT - II

Sound: Sound waves, production and properties. Intensity and loudness of sound. Decibels. Intensity levels. musical notes. musical scale. Acoustics of buildings (General idea). Wave Optics: Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle.

UNIT – III

Interference: Interference: Division of amplitude and division of wavefront. Young's Double

Slit experiment. Lloyd's Mirror & Fresnel's Biprism.Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index. Michelson's Interferometer: Construction and working. Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index, and Visibility of fringes.

UNIT – IV

Diffraction: Fraunhofer diffraction: Single slit; Double Slit. Multiple slits & Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis.

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UNIT-V

Polarization: Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization. Hygiene's explanation of double refraction, positive and negative uniaxial crystals, quarter and half wave plates, types of polarized light, production and analysis of plane, circularly and elliptically polarized light, optical activity.

Suggested Books:

1. Fundamentals of Optics, F.A Jenkins and H.E White, 1976, McGraw-Hill Principles of Optics, B.K. Mathur, 1995, Gopal Printing
2. Fundamentals of Optics, A. Kumar, H.R. Gulati and D.R. Khanna, 2011, R. Chand Publications
3. University Physics. F.W. Sears, M.W. Zemansky and H.D. Young. 13/e, 1986. Addison-Wesley.
4. Pedrotti, Frank L.; Pedrotti, Leno S.; Pedrotti, Leno Matthew, Introduction to optics, 3.ed.: Harlow, Essex: Pearson, 2014.
5. Young, Hugh D.; Freedman, Roger A.; Ford, A. Lewis; Sears, Francis Weston 13th ed., international edition: San Francisco: Pearson Addison Wesley, cop. 2012.
6. https://www.cleariitmedical.com/2019/05/physics-notes-wave-optics.html
7. https://nucleoniitjeekota.com/topic-notes.php?topic=Wave%20Optics.

SEMESTER – IV | L T P C

16PHU402	NUCLEAR AND PARTICLE PHYSICS	4 - - 4

Course Objective

- This is a basic course in Physics which deals with the phenomena taking place in the nuclear domain. Students will be given an insight into the dimensions of a nucleus.
- The aim is to tell them about the stability of nucleus and various other properties.
- The students will learn about various types of radiations and their interaction with matter.
- Students will learn the methods to find the mass and charge of any nucleus by using some instruments.
- To gain knowledge in the content areas of nuclear and particle physics.
- Students will learn the concept of nuclear reactions.

Course Outcomes

After successful completion of the course, the student is expected to

1. Determine the charge, mass of any nucleus by using various spectrographs.
2. They are able to understand the size of nucleus and all its properties.
3. Develop and communicate analytical skills in subatomic physics.
4. This course has led the students to understand interaction of various types of radiation with matter which they observe in their daily life. It's easy for them now to relate the theory to practical.
5. Acquire knowledge in the content areas of nuclear and particle physics, focusing on concepts that are commonly used in this area.
6. Students now know various methods of accelerating various types of particles to perform scattering experiments.

UNIT I

General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties, quantitative facts about size, mass, charge density (matter energy), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments, nuclear excites states.

UNIT II

Nuclear Models: Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.

UNIT III

Nuclear Reactions: Nuclear fission - Energy released in fission - Bohr and Wheeler's theory of nuclear fission - Chain reaction - Multiplication factor - Natural uranium and chain reaction - Design of nuclear reactor - Breeder reactor - Nuclear fusion - Source of stellar energy - Thermonuclear reactions - Transuranic elements.

Ionization chamber – Geiger-Muller counter – Proportional counter – Wilson's cloud chamber – Bubble chamber – Their principles and working.

UNIT IV

Nuclear Reactions: Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct reaction, resonance reaction, Coulomb scattering (Rutherford scattering).

UNIT V

Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model.

Suggested Books:

1. Introductory nuclear Physics by Kenneth S.Krane (Wiley India Pvt. Ltd., 2008). Concepts of nuclear physics by Bernard L.Cohen.(Tata Mcgraw Hill, 1998).
2. Introduction to the physics of nuclei & particles, R.A.Dunlap. (Thomson Asia, 2004)
3. Introduction to Elementary Particles, D. Griffith, John Wiley & Sons
4. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000)
5. Nuclear and Particle Physics, Axel Maas, Lecture in SS 2016 at the KFU Graz.
6. Nuclear and Particle Physics, B. R. Martin, Online ISBN:9780470035474, 2006 John Wiley & Sons, Ltd.
7. https://www.springer.com/gp/physics/particle-nuclear-physics
8. https://iopscience.iop.org/book/978-0-7503-1140-3
9. https://www.wiley.com/en-us/Nuclear+and+Particle+Physics%3A+An+Introduction-p-9780470035474.

SEMESTER IV — L T P C

16PHU403 **DIGITAL SIGNAL PROCESSING** 4 - - 4

Course Objective

- Digital signal processing has lot of applications in different fields of life.
- This paper is to give knowledge to students about the theory of signal processing and the different methods involved in it.
- Apply the principles of discrete-time signal analysis to perform various signal operations
- Apply the principles of z-transforms to finite difference equations.
- Apply the principles of Fourier transform analysis to describe the frequency characteristics of discrete-time signals and systems
- To understand the digital filters and their classifications based on the response, design and algorithm.

Course Outcome

After successful completion of the course, the student is expected to

1. Fundamental classification of signals and systems based on the parameters which define them.
2. Concept of Discrete-Time Fourier Transform and Z-transform on signals and its properties.
3. Concept of Discrete Fourier Transform, different convolution techniques, filters and their classifications.
4. Fluency in using Fast Fourier Transform.
5. Understanding of Digital Filters and their classifications based on the response, design and algorithm.
6. Signal generation, realization of systems and finding their transfer function, characterization using pole-zero plots and designing digital filters using Scilab simulations.

Unit I

Discrete-Time Signals and Systems: Classification of Signals, Transformations of the Independent Variable, Periodic and Aperiodic Signals, Energy and Power Signals, Even and Odd Signals, Discrete-Time Systems, System Properties. Impulse Response, Convolution Sum; Graphical Method; Analytical Method, Properties of Convolution; Commutative; Associative; Distributive; Shift; Sum Property System Response to Periodic Inputs, Relationship Between LTI System Properties and the Impulse Response; Causality; Stability; Invertibility, Unit Step Response.

Unit II

Discrete-Time Fourier Transform: Fourier Transform Representation of Aperiodic Discrete-Time Signals, Periodicity of DTFT, Properties; Linearity; Time Shifting; Frequency Shifting; Differencing in Time Domain; Differentiation in Frequency Domain; Convolution Property.

Unit III

The *z*-Transform: Bilateral (Two-Sided) *z*-Transform, Inverse *z*-Transform, Relationship Between *z*-Transform and Discrete-Time Fourier Transform, *z*-plane, Region-of-Convergence; Properties of ROC, Properties; Time Reversal; Differentiation in the *z*-Domain; Power Series Expansion Method (or Long Division Method); Analysis and Characterization of LTI Systems; Transfer Function and Difference-Equation System. Solving Difference Equations.

Unit IV

Filter Concepts: Phase Delay and Group delay, Zero-Phase Filter, Linear-Phase Filter, Simple FIR Digital Filters, Simple IIR Digital Filters, All pass Filters, Averaging Filters, Notch Filters.

Discrete Fourier Transform: Frequency Domain Sampling (Sampling of DTFT), The Discrete Fourier Transform (DFT) and its Inverse, DFT as a Linear transformation, Properties; Periodicity; Linearity; Circular Time Shifting; Circular Frequency Shifting.

Unit V

Fast Fourier Transform: Direct Computation of the DFT, Symmetry and Periodicity, Properties of the Twiddle factor (*WN*), Radix-2 FFT Algorithms; Decimation-In-Time (DIT) FFT Algorithm; Decimation-In-Frequency (DIF) FFT Algorithm, Inverse DFT Using FFT Algorithms.

Realization of Digital Filters: Non Recursive and Recursive Structures, Canonic and Non Canonic Structures, Equivalent Structures (Transposed Structure), FIR Filter structures; Direct-Form; Cascade-Form; Basic structures for IIR systems; Direct-Form I.

Suggested Books:

1. Digital Signal Processing, Tarun Kumar Rawat, 2015, Oxford University Press, India
2. Digital Signal Processing, S. K. Mitra, McGraw Hill, India.
3. Modern Digital and Analog Communication Systems, B.P. Lathi, 1998, 3rd Edn. Oxford University Press.
4. Fundamentals of Digital Signal processing using MATLAB, R.J. Schilling and S.L. Harris, 2005, Cengage Learning.
5. Fundamentals of signals and systems, P.D. Cha and J.I. Molinder, 2007, Cambridge University Press.
6. Proakis, John G. Digital signal processing: principles algorithms and applications. Pearson Education India.
7. Hayes, Monson H. Digital signal processing Tata McGraw-Hill edition 2004
8. Digital Signal Processing Principles Algorithm & Applications, J.G. Proakis and D.G. Manolakis, 2007, 4th Edn., Prentice Hall.
9. Digital Signal Processing: Principles, Algorithms, and Applications by J. G. Proakis and D. G. Manolakis.
10. https://www.sciencedirect.com/book/9780750689762/digital-signal-processing.
11. https://www.dspguide.com/pdfbook.htm.

SEMESTER IV

16PHU404A	**BASIC INSTRUMENTATION SKILL**	**L T P C**
	(SEC 2 A)	**3 - - 3**

Course Objectives

- This course is to get exposure with various aspects of instruments and their usage through hands-on mode.
- To impart physical measurement skills.
- To make the students understand coherence between theoretical and practical measurement.
- Identify the signals and systems.
- To use the techniques, skills and modern technical tools necessary for technical or engineering practice.
- The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis of instruments.

Course Outcome

After successful completion of the course, the student is expected to

1. Develop skills to impart practical knowledge in real time solutions.
2. Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.
3. Understand the terminology used in various instruments.
4. Gain knowledge of new concept in the solution of practical oriented problems and to understand more deep knowledge about the solution to theoretical problems.
5. Connect concepts with the instruments to enhance understanding.
6. Understand measurement technology, usage of new instruments and real time applications in engineering studies.

UNIT I

Basic of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. **Multimeter:** Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

UNIT II

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. **AC millivoltmeter:** Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance.

UNIT III

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance.

UNIT IV

Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

UNIT V

Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges.

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.

SUGGESTED BOOKS

1. A text book in Electrical Technology - B L Theraja - S Chand and Co.
2. Performance and design of AC machines - M G Say ELBS Edn.
3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
4. Logic circuit design, Shimon P. Vingron, 2012, Springer.
5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
6. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill
7. Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer
8. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India

	SEMESTER IV	**L T P C**
16PHU404B	**RADIATION SAFETY**	**3 - - 3**

Course Objective

- To identify the parts of the x-ray machine and explain their purpose and function.
- Explain how x-rays are produced and how they travel.
- Compare the effects that x-radiation has on a variety of biological and non-biological materials.
- Describe the spectrum of electromagnetic radiation.
- The goal is for the students to develop a basic knowledge of the methods employed in veterinary hospitals and clinics to protect employees and the veterinarians themselves against radiation exposure.
- Discuss the difference between a rotating anode and a fixed anode.
- Discuss which types of machines today have fixed and which have rotating anodes.

Course Outcomes

After successful completion of the course, the student is expected to

1. List and describe the function the parts of the x-ray machine
2. Describe the spectrum of electromagnetic radiation.
3. Understand the terminology used in radiation safty.
4. Gain knowledge of new concept in the field of radiation.
5. They are able to understand the Interaction of Radiation with matter.
6. Discuss the advantages to the utilization of a rotating anode.
7. Impact knowledge on different radiation detector.

UNIT I

Basics of Atomic and Nuclear Physics: Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron, The composition of nucleus and its properties, mass number, isotopes of element, spin, binding energy, stable and unstable isotopes, law of radioactive decay, Mean life and half life, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission.

UNIT II

Interaction of Radiation with matter: Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources, **Interaction of Photons** - Photo-electric effect, Compton Scattering, Pair Production, Linear and Mass Attenuation Coefficients, **Interaction of Charged Particles:** Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation. Beta Particles- Collision and Radiation loss (Bremsstrahlung), **Interaction of Neutrons**- Collision, slowing down and Moderation.

UNIT III

Radiation detection and monitoring devices: Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived Air Concentration (DAC).

UNIT IV

Radiation detection: Basic concept and working principle of *gas detectors* (Ionization Chambers, Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter), Scintillation Detectors **(**Inorganic and Organic Scintillators), Solid States Detectors and Neutron Detectors, Thermo luminescent Dosimetry.

UNIT V

Radiation safety management: *Biological effects of ionizing radiation*, Operational limits and basics of radiation hazards evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for waste management.

Suggested Books:

1. W.E. Burcham and M. Jobes – Nuclear and Particle Physics – Longman (1995)
2. G.F.Knoll, Radiation detection and measurements
3. Thermoluninescense Dosimetry, Mcknlay, A.F., Bristol, Adam Hilger (Medical Physics Handbook 5)
4. W.J. Meredith and J.B. Massey, "Fundamental Physics of Radiology". John Wright and Sons, UK, 1989.
5. J.R. Greening, "Fundamentals of Radiation Dosimetry", Medical Physics Hand Book Series, No.6, Adam Hilger Ltd., Bristol 1981.
6. Practical Applications of Radioactivity and Nuclear Radiations, G.C. Lowental and P.L. Airey, Cambridge University Press, U.K., 2001
7. Martin and S.A. Harbisor, An Introduction to Radiation Protection, John Willey & Sons, Inc. New York, 1981.
8. NCRP, ICRP, ICRU, IAEA, AERB Publications.
9. W.R. Hendee, "Medical Radiation Physics", Year Book – Medical Publishers Inc. London, 1981.
10. http://www.barc.gov.in/publications/nl/2003/200301-2.pdf

	SEMESTER – IV	**L T P C**
16PHU411	**WAVES AND OPTICS (PRACTICAL)**	**- - 4 2**

Course Objective

- Understand and working of polarimeter.
- Understand the resolving power of different optical instruments.
- To experience the practical difficulties to find the physical constant values.
- To apply the theoretical knowledge into the experiments and find the solutions.
- Students will be observe the readings practically.
- Students will experience the phenomena of reflection, refraction, etc.,

Course Outcomes

After successful completion of the course, the student is expected to

1. Gain knowledge on various theories of light.
2. Acquire skills to identify and apply formulas of optics and wave physics.
3. Understand the properties of light like reflection, refraction, interference, and diffraction etc.,
4. Understand the applications of diffraction and polarization.
5. Determine the different optical properties by using various apparatus.
6. Know the importance of optical materials in the industrials.

Any 8 Experiments

1. To investigate the motion of coupled oscillators
2. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify λ^2 – T Law.
3. To study Lissajous Figures
4. Familiarization with Schuster`s focussing; determination of angle of prism.
5. To determine the Refractive Index of the Material of given Prism using Na Light.
6. To determine Dispersive Power of the Material of a given Prism using Hg Light
7. To determine the value of Cauchy Constants of a material of a prism.
8. To determine the Resolving Power of a Prism.
9. To determine wavelength of sodium light using Fresnel Biprism.
10. To determine wavelength of sodium light using Newton's Rings.
11. To determine the wavelength of Laser light using Diffraction grating.
12. To determine wavelength of (1) Sodium and (2) Mercury light using plane diffraction Grating
13. To determine the Resolving Power of a Plane Diffraction Grating.

Suggested Books

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

SEMESTER IV

16PHU412 **NUCLEAR AND PARTICLE PHYSICS (PRACTICAL)** L T P C

\- - 4 2

Course Objectives

- To understand the operation of G.M. counter.
- To study the general properties of nucleus
- To study the nuclear forces and nuclear reactions.
- To analyse the B-H curve and their concepts practically.
- To introduce the concept of elementary particles practically.
- To apply the theoretical knowledge into the experiments and find the solutions.

Course Outcomes

After successful completion of the course, the student is expected to

1. Acquire basic knowledge about nuclear and particle physics
2. Develop the nuclear reactions and neutron physics.
3. Know the calculations of e/m and their applications.
4. Understand the operation of G.M. counter
5. Verify the B-H curve of radiative materials.
6. Understand the difference between Magnetron and Thomson methods.

Any 4 Experiments

1. Young's Modulus – Elliptical Fringes (Cornu's method).
2. Viscosity of liquid – Mayer's oscillating disc method.
3. Michelson Interferometer – Determination of λ and dλ.
4. 'e/m' by Thomson's method and Magnetron method.
5. Young's Modulus – Hyperbolic Fringes (Cornu's method).
6. 'e' by Millikan's method.
7. Young's Double slit – Determination of Wavelength of monochromatic source.
8. G.M.Counter-Absorption co-efficient and inverse square law.

Suggested Books

1. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000)
2. Nuclear and Particle Physics, Axel Maas, Lecture in SS 2016 at the KFU Graz.
3. Nuclear and Particle Physics, B. R. Martin, Online ISBN:9780470035474, 2006 John Wiley & Sons, Ltd.

SEMESTER IV

16PHU413 **DIGITAL SIGNAL PROCESSING (PRACTICAL)** L T P C

- - 4 2

Course Objectives

- Digital signal processing has lot of applications in different fields of life.
- This objective of this paper is to give knowledge to students about the practical knowledge of signal processing and the different methods involved in it.
- To experience the practical difficulties to find the physical constant values.
- To apply the theoretical knowledge into the experiments and find the solutions.
- Students will learn writing program and perform the analysis using scilab software.
- Write the computer programme and verify the results by manipulation of data.

Course Outcome

After successful completion of the course, the student is expected to

1. Fluency in writing program and perform the analysis using scilab software.
2. Verify the data using scilab programs.
3. Concept of Discrete-Time Fourier Transform and Z-transform on signals and its properties.
4. Concept of Discrete Fourier Transform, different convolution techniques, filters and their classifications.
5. Apply the knowledge on Fourier Transform and verify the results by manipulation of data.
6. Understanding of Digital Filters and their classifications based on the response, design and algorithm.
7. Signal generation, realization of systems and finding their transfer function, characterization using pole-zero plots and designing digital filters using Scilab simulations.
8. Write the program and algorithm of Scilab.

Any 8 Experiments

Scilab based simulations experiments based problems like

1. Write a program to generate and plot the following sequences: (a) Unit sample sequence $\delta(n)$, (b) unit step sequence $u(n)$, (c) ramp sequence $r(n)$, (d) real valued exponential sequence $x(n) = (0.8)^n u(n)$ for $0 \leq n \leq 50$.

2. Write a program to compute the convolution sum of a rectangle signal (or gate function) with itself for N = 5

$$x(n) = rect\left(\frac{n}{2N}\right) = \Pi\left(\frac{n}{2N}\right) = \begin{cases} 1 & -N \leq n \leq N \\ 0 & otherwise \end{cases}$$

3. An LTI system is specified by the difference equation
$$y(n) = 0.8y(n-1) + x(n)$$
(a) Determine $H(e^{jw})$
(b) Calculate and plot the steady state response $y_{ss}(n)$ to
$$x(n) = \cos(0.5\pi n)u(n)$$

4. Given a casual system
$$y(n) = 0.9y(n-1) + x(n)$$
(a) Find $H(z)$ and sketch its pole-zero plot
(b) Plot the frequency response $|H(e^{jw})|$ and $\angle H(e^{jw})$

5. Design a digital filter to eliminate the lower frequency sinusoid of $x(t) = \sin 7t + \sin 200t$. The sampling frequency is $f_s = 500\, Hz$. Plot its pole zero diagram, magnitude response, input and output of the filter.

6. Let $x(n)$ be a 4-point sequence:
$$x(n) = \underset{\uparrow}{\{1,1,1,1\}} = \begin{cases} 1 & 0 \le n \le 3 \\ 0 & otherwise \end{cases}$$
Compute the DTFT $X(e^{jw})$ and plot its magnitude
(a) Compute and plot the 4 point DFT of $x(n)$
(b) Compute and plot the 8 point DFT of $x(n)$ (by appending 4 zeros)
(c) Compute and plot the 16 point DFT of $x(n)$ (by appending 12 zeros)

7. Let $x(n)$ and $h(n)$ be the two 4-point sequences,
$$x(n) = \underset{\uparrow}{\{1,2,2,1\}}$$
$$h(n) = \underset{\uparrow}{\{1,-1,-1,1\}}$$
Write a program to compute their linear convolution using circular convolution.

8. Using a rectangular window, design a FIR low-pass filter with a pass-band gain of unity, cut off frequency of 1000 Hz and working at a sampling frequency of 5 KHz. Take the length of the impulse response as 17.

9. Design an FIR filter to meet the following specifications:
passband edge $F_p = 2\, KHz$
stopband edge $F_s = 5\, KHz$
Passband attenuation $A_p = 2\, dB$
Stopband attenuation $A_s = 42\, dB$
Sampling frequency $F_s = 20\, KHz$

10. The frequency response of a linear phase digital differentiator is given by
$$H_d(e^{jw}) = jwe^{-j\tau w} \qquad |w| \le \pi$$
Using a Hamming window of length M = 21, design a digital FIR differentiator. Plot the amplitude response.

Suggested Books:

1. Digital Signal Processing, Tarun Kumar Rawat, Oxford University Press, India.
2. A Guide to MATLAB, B.R. Hunt, R.L. Lipsman, J.M. Rosenberg, 2014, 3rd Edn., Cambridge University Press.

3. Fundamentals of Digital Signal Processing using MATLAB, R.J.Schilling and S.L. Harris, 2005, Cengage Learning.
4. Digital Signal Processing, S.K. Mitra, McGraw Hill, India.
5. Fundamentals of signals and systems, P.D. Cha and J.I. Molinder, 2007, Cambridge Unversity Press.
6. Simulation of ODE/PDE models with MATLAB, OCTAVE and SCILAB: Scientific and Engineering Applications: A. Vande Wonwer, P. Saucez, C.V. Fernanderz. 2014 Springer ISBN: 978-3319067896.
7. Scilab by example: M. Affouf, 2012, ISBN: 978-1479203444.
8. Scilab Image Processing: L.M. Surhone, 2010, Betascript Pub., ISBN: 978-6133459274

SEMESTER IV

16PHU414A BASIC INSTRUMENTATION SKILL (PRACTICAL) (SEC 2 A)

L	T	P	C
-	-	3	1

Course Objectives:

- To familiarize the students with working, design and analysis of basic amplifier circuits.
- To design and analyze wave shaping circuits, rectifiers and power supply circuits
- Introduce the basic concept of qualitative and quantitative analysis of an instruments.
- Study the concept of separation science and its applications.
- To demonstrate their knowledge in designing the control loops for these processes.
- To apply the theoretical knowledge into the experiments and find the solutions.

Course Outcomes:

After successful completion of the course, the student is expected to

1. Handle any kind of process by framing it in block diagram, mathematical model and different process variables.
2. Use modern engineering tools and techniques in the practice of electronic devices.
3. Know all the industrial processes and demonstrate their knowledge in designing the control loops for these processes.
4. Understand the working of various types of amplifiers, oscillators, wave shaping and power supply circuits
5. Design and Analyze the various types of amplifiers, oscillators, wave shaping and power supply circuits for any practical situation.
6. Discuss the terms, principle, instrumentation, operation and applications of instruments.

The test of lab skills will be of the following test items:

1. Use of an oscilloscope.
2. CRO as a versatile measuring device.
3. Circuit tracing of Laboratory electronic equipment,
4. Use of Digital multimeter/VTVM for measuring voltages
5. Circuit tracing of Laboratory electronic equipment,
6. Winding a coil / transformer.
7. Study the layout of receiver circuit.
8. Trouble shooting a circuit
9. Balancing of bridges

Laboratory Exercises:

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3. To measure Q of a coil and its dependence on frequency, using a Q- meter.
4. Measurement of voltage, frequency, time period and phase angle using CRO.
5. Measurement of time period, frequency, average period using universal counter/ frequency counter.
6. Measurement of rise, fall and delay times using a CRO.
7. Measurement of distortion of a RF signal generator using distortion factor meter.
8. Measurement of R, L and C using a LCR bridge/ universal bridge.

Open Ended Experiments

1. Using a Dual Trace Oscilloscope
2. Converting the range of a given measuring instrument (voltmeter, ammeter)

Suggested Books:

1. A text book in Electrical Technology - B L Theraja - S Chand and Co.
2. Performance and design of AC machines - M G Say ELBS Edn.
3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
4. Logic circuit design, Shimon P. Vingron, 2012, Springer.
5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
6. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill
7. Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India

SEMESTER IV — L T P C

16PHU414B **RADIATION SAFETY (PRACTICAL)** - - 3 1

Course Objectives:

- Student will get idea about the basic radiation principle.
- To know the nuclear interactions with matter and detection.
- To identify the Biological effects of radiation and measurement.
- To give the demonstration of Gamma spectrum of Gas Light mantle
- To know the Shielding of nuclear radiation.
- To know the importance of background radiation levels using Radiation meter.

Course Outcomes:

After successful completion of the course, the student is expected to

1. Understood the concepts of nuclear radiation.
2. Know the interaction of nuclear radiation with matter.
3. Detect the nuclear radiation.
4. Be familiar with dosimeters and measurements.
5. Know the importance of background radiation levels using Radiation meter.
6. Identify the α particles using reference source & determining its half-life using spark counter.

Any 4 Experiments

1. Study the background radiation levels using Radiation meter
2. Characteristics of Geiger Muller (GM) Counter**:** Study of characteristics of GM tube and determination of operating voltage and plateau length using background radiation as source (without commercial source).
3. Study of counting statistics using background radiation using GM counter.
4. Study of radiation in various materials (e.g. KSO4 etc.). Investigation of possible radiation in different routine materials by operating GM at operating voltage.
5. Study of absorption of beta particles in Aluminum using GM counter.
6. Detection of α particles using reference source & determining its half-life using spark counter.
7. Gamma spectrum of Gas Light mantle (Source of Thorium)

Suggested Books:

1. W.E. Burcham and M. Jobes – Nuclear and Particle Physics – Longman (1995)
2. G.F.Knoll, Radiation detection and measurements
3. Thermoluninescense Dosimetry, Mcknlay, A.F., Bristol, Adam Hilger (Medical

Physics Handbook 5)

4. W.J. Meredith and J.B. Massey, "Fundamental Physics of Radiology". John Wright and Sons, UK, 1989.
5. J.R. Greening, "Fundamentals of Radiation Dosimetry", Medical Physics Hand Book Series, No.6, Adam Hilger Ltd., Bristol 1981.
6. Practical Applications of Radioactivity and Nuclear Radiations, G.C. Lowental and P.L. Airey, Cambridge University Press, U.K., 2001
7. Martin and S.A. Harbisor, An Introduction to Radiation Protection, John Willey & Sons, Inc. New York, 1981.
8. NCRP, ICRP, ICRU, IAEA, AERB Publications.
9. W.R. Hendee, "Medical Radiation Physics", Year Book – Medical Publishers Inc. London, 1981

SEMESTER V

16PHU501A **COMPUTATIONAL PHYSICS** **L T P C**

(SEC 3 A) **3 - - 3**

Course Objective

- The aim of this course is not just to teach computer programming and numerical analysis but to emphasize its role in solving problems in Physics.
- Students should be able to tackle with problems in the physical science using computer and different software.
- Identify and describe the characteristics of various numerical methods.
- Independently program computers using leading-edge tools,
- Formulate and computationally solve a selection of problems in physics,
- Use the tools, methodologies, language and conventions of physics to test and communicate ideas and explanations.

Course Outcome

After successful completion of the course, the student is expected to

1. Demonstrate basic knowledge of numerical methods.
2. Demonstrate basic programming skills.
3. Demonstrate an understanding of the applicability of numerical methods for modeling physical systems and its advantages and disadvantages.
4. Demonstrate the ability to estimate the errors in the use of numerical methods.
5. Demonstrate skills to write and develop simple programs in FORTRAN.
6. Understand the Importance of graphical analysis and its limitations.

UNIT I

Introduction: Importance of computers in Physics, paradigm for solving physics problems for solution**.** Usage of linux as an Editor. **Algorithms and Flowcharts:** Algorithm: Definition, properties and development. Flowchart: Concept of flowchart, symbols, guidelines, types. Examples: Cartesian to Spherical Polar Coordinates, Roots of Quadratic Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin(x) as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal.

UNIT II

Scientific Programming: Some fundamental Linux Commands (Internal and External commands). Development of FORTRAN, Basic elements of FORTRAN: Character Set, Constants and their types, Variables and their types, Keywords, Variable Declaration and concept of instruction and program. Operators: Arithmetic, Relational, Logical and Assignment Operators. Expressions: Arithmetic, Relational, Logical, Character and Assignment Expressions. Fortran Statements: I/O Statements (unformatted/formatted), Executable and Non-Executable Statements, Layout of Fortran Program, Format of writing Program and concept of coding, Initialization and Replacement Logic. Examples from physics problems.

UNIT III

Control Statements: Types of Logic (Sequential, Selection, Repetition), Branching Statements (Logical **IF**, Arithmetic IF, Block IF, Nested Block IF, SELECT CASE and ELSE IF Ladder statements), Looping Statements (DO-CONTINUE, DO-ENDDO, DO-WHILE, Implied and Nested DO Loops), Jumping Statements (Unconditional GOTO, Computed GOTO, Assigned GOTO) Subscripted Variables (Arrays: Types of Arrays, DIMENSION Statement, Reading and Writing Arrays), Functions and Subroutines (Arithmetic Statement Function, Function Subprogram and Subroutine), RETURN, CALL, COMMON and EQUIVALENCE Statements), Structure, Disk I/O Statements, open a file, writing in a file, reading from a file. Examples from physics problems.

UNIT IV

Scientific word processing: Introduction to LaTeX: TeX/LaTeX word processor, preparing a basic LaTeX file, Document classes, Preparing an input file for LaTeX, Compiling LaTeX File, LaTeX tags for creating different environments, Defining LaTeX commands and environments, Changing the type style, Symbols from other languages. **Equation representation:** Formulae and equations, Figures and other floating bodies, Lining in columns- Tabbing and tabular environment, Generating table of contents, bibliography and citation, Making an index and glossary, List making environments, Fonts, Picture environment and colors, errors.

UNIT V

Visualization: Introduction to graphical analysis and its limitations. Introduction to Gnuplot. importance of visualization of computational and computational data, basic Gnuplot commands: simple plots, plotting data from a file, saving and exporting, multiple data sets per file, physics with Gnuplot (equations, building functions, user defined variables and functions), Understanding data with Gnuplot

Suggested Books:

1. Introduction to Numerical Analysis, S.S. Sastry, 5th Edn., 2012, PHI Learning Pvt. Ltd.
2. Computer Programming in Fortran 77". V. Rajaraman (Publisher: PHI).
3. LaTeX–A Document Preparation System", Leslie Lamport (Second Edition, Addison-Wesley, 1994).
4. Gnuplot in action: understanding data with graphs, Philip K Janert, (Manning 2010)
5. Schaum's Outline of Theory and Problems of Programming with Fortran, S Lipsdutz and A Poe, 1986Mc-Graw Hill Book Co.
6. Computational Physics: An Introduction, R. C. Verma, et al. New Age International Publishers, New Delhi(1999)
7. A first course in Numerical Methods, U.M. Ascher and C. Greif, 2012, PHI Learning
8. Elementary Numerical Analysis, K.E. Atkinson, 3rd Edn., 2007, Wiley India Edition.
9. https://onlinecourses.nptel.ac.in/noc20_ph20/preview
10. https://iopscience.iop.org/book/978-1-6817-4896-2

SEMESTER V

16PHU501B	**WEATHER FORECASTING**	**L T P C**
	(SEC 3 B)	**3 - - 3**

Course Objective:

- The aim of this course is not just to impart theoretical knowledge to the students but to enable them to develop an awareness
- To understand the causes and effects of different weather phenomenon and basic forecasting techniques.
- To know the role of air, water, and wind in weather systems.
- Assess variability and change within this expanded, extended and quality assured network.
- To explain what causes different types of weather.
- To understand the concept of Ecosystems and climate interactions

Course Outcome

After successful completion of the course, the student is expected to

1. Understand the various components that go into forecasting the weather
2. Produce rudimentary weather forecasts based on weather maps
3. Gain knowledge on Ecosystems and climate interactions
4. Know the effects of climate change on life cycles
5. Understand the concept of Biodiversity, Weather vs climate
6. Acquire knowledge on greenhouse effect, Treaty rights
7. Understand the traditional ecological knowledge and climate change and related issues.

UNIT I

Introduction to atmosphere: Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; temperature sensors: types; atmospheric pressure: its measurement; cyclones and anticyclones: its characteristics.

UNIT II

Measuring the weather: Wind; forces acting to produce wind; wind speed direction: units, its direction; measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws.

UNIT III

Weather systems: Global wind systems; air masses and fronts: classifications; jet streams; local thunderstorms; tropical cyclones: classification; tornadoes; hurricanes.

UNIT IV

Climate and Climate Change: Climate: its classification; causes of climate change; global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate.

UNIT V

Basics of weather forecasting: Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts.

Suggested Books:

1. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
2. The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.
3. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
4. Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.
5. https://www.sciencedirect.com/science/article/abs/pii/S0065268708603118
6. https://cimss.ssec.wisc.edu/satmet/modules/7_weather_forecast/wf-1.html
7. https://www.outdoorproject.com/articles/weather-forecasting-101-how-predict-weather-go

SEMESTER V

16PHU502A	ELEMENTS OF MODERN PHYSICS	L T P C 4 - - 2

Course Objective

- To identify the circumstances, in Modern Physics. Enumerate and understand the postulate of relativity.
- To learn about the speed of light as a natural limit to speed.
- To understand the work of Planck, Bohr, Heisenberg, uncertainty principle and the other features of Quantum Mechanics.
- Acquaintance with basic fields of modern physics
- Ability of searching solutions of physical problems in scientific and technical literature.
- Understanding of physical processes and technology

Course Outcome

After successful completion of the course, the student is expected to

1. Recall and apply knowledge in the areas of optics and waves, special relativity and quantum physics (developing the knowledge capability dimension);
2. Conduct relevant experiments, analyse data and report results in written form (developing the technical capability and communication dimensions).
3. Analyse the plank's constant using different experimental technique.
4. Find the wavelength of any laser sources.
5. Differentiate the interference and diffraction properties by the experiments.
6. Understand the theory and practical knowledge of light and other properties.

Unit I

Planck's quantum, Planck's constant and light as a collection of photons; Blackbody Radiation: Quantum theory of Light; Photo-electric effect and Compton scattering. DeBroglie wavelength and matter waves; Davisson-Germer experiment. Wave descriptionof particles by wave packets. Group and Phase velocities and relation between them.Two-Slit experiment with electrons. Probability. Wave amplitude and wave functions.

Unit II

Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle (Uncertainty relations involving Canonical pair of variables): Derivation from Wave Packets impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle- application to virtual particles and range of an interaction.

Unit III

Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles; Momentum and Energy operators; stationary states; physical interpretation of a wave function, probabilities and normalization; Probability and probability current densities in one dimension.

Unit IV

One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; Quantum dot as example; Quantum mechanical scattering and tunneling in one dimension-across a step potential & rectangular potential barrier. Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, Liquid Drop model: semi-empirical mass formula and binding energy, Nuclear Shell Model and magic numbers.

Unit V

Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli's prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus.

Suggested Books:

1. Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill.
2. Introduction to Modern Physics, Rich Meyer, Kennard, Coop, 2002, Tata McGraw Hill
3. Introduction to Quantum Mechanics, David J. Griffith, 2005, Pearson Education.
4. Physics for scientists and Engineers with Modern Physics, Jewett and Serway, 2010, Cengage Learning.
5. Modern Physics, G.Kaur and G.R. Pickrell, 2014, McGraw Hill
6. Quantum Mechanics: Theory & Applications, A.K.Ghatak & S.Lokanathan, 2004, Macmillan
7. Modern Physics, J.R. Taylor, C.D. Zafiratos, M.A. Dubson, 2004, PHI Learning.
8. Theory and Problems of Modern Physics, Schaum`s outline, R. Gautreau and W. Savin, 2nd Edn, Tata McGraw-Hill Publishing Co. Ltd.
9. Quantum Physics, Berkeley Physics, Vol.4. E.H.Wichman, 1971, Tata McGraw-Hill Co.
10. Basic ideas and concepts in Nuclear Physics, K.Heyde, 3rd Edn., Institute of Physics Pub. Six Ideas that Shaped Physics: Particle Behave like Waves, T.A.Moore, 2003, McGraw Hill.
11. https://www.arsdcollege.ac.in/wp-content/uploads/2020/04/Presentation_1-11_compressed.pdf
12. http://web.sbu.edu/physics/courses/physics-203p.pdf

	SEMESTER V	**L T P C**
16PHU502B	**MEDICAL PHYSICS**	**4 - - 2**

Course Objective

- The objective of the course is to educate and to train students to a competency level sufficient to practice radiation oncology physics independently.
- This prepares the students for clinical practices in radiation therapy (RT) physics through a structured clinical trainings and didactic courses.
- To know the energetic charged particle interactions and transport in matter.
- The program is supervised and mentored by highly qualified clinical practitioners.
- This paper is aimed at giving idea to the students regarding the nature of human body and usage of different radiations for the treatment of body.
- To active participation in clinical research, teaching, and training.

Course Outcomes

After successful completion of the course, the student is expected to

1. Different areas of research in Medical Physics
2. Understand and apply key concepts specific to energy deposition for both ionizing photon interactions and transport in matter
3. Know the energetic charged particle interactions and transport in matter.
4. Understanding the working of a manual optical eye-testing machine
5. Familiarization with the Use of a Vascular Doppler.
6. Realize the real time examples of medical instruments.

UNIT – I

PHYSICS OF THE BODY-I

Basic Anatomical Terminology: Standard Anatomical Position, Planes. Familiarity with terms like- Superior, Inferior, Anterior, Posterior, Medial, Lateral, Proximal and Distal. **Mechanics of the body:** Skeleton, forces, and body stability. Muscles and dynamics of body movement. Physics of Locomotors Systems: joints and movements, Stability and Equilibrium.

Energy household of the body: Energy balance in the body, Energy consumption of the body, Heat losses of the body, Thermal Regulation.

Pressure system of body: Physics of breathing, Physics of cardiovascular system.

UNIT – II

PHYSICS OF THE BODY-II

Acoustics of the body: Nature and characteristics of sound, Production of speech, Physics of the ear, Diagnostics with sound and ultrasound.

Optical system of the body: Physics of the eye.

Electrical system of the body: Physics of the nervous system, Electrical signals and information transfer.

UNIT - III

PHYSICS OF DIAGNOSTIC AND THERAPEUTIC SYSTEMS-I

X-RAYS: Electromagnetic spectrum, production of x-rays, x-ray spectra, Brehmsstrahlung, Characteristic x-ray. **X-ray tubes & types** : Coolidge tube, x-ray tube design, tube cooling stationary mode, Rotating anode x-ray tube, Tube rating, quality and intensity of x-ray. X-ray generator circuits, half wave and full wave rectification, filament circuit, kilo voltage circuit. Single and three phase electric supply. Power ratings. Types of X-Ray Generator, high frequency generator, exposure timers and switches, HT cables.

UNIT - IV

RADIATION PHYSICS: Radiation units exposure, absorbed dose, units: rad, gray, relative biological effectiveness, effective dose- Rem & Sievert, inverse square law. Interaction of radiation with matter Compton & photoelectric effect, linear attenuation coefficient. **Radiation Detectors**: ionization (Thimble chamber, condenser chamber), chamber. Geiger Muller counter, Scintillation counters and Solid State detectors, TFT.

UNIT - V

MEDICAL IMAGING PHYSICS: Evolution of Medical Imaging, X-ray diagnostics and imaging, Physics of nuclear magnetic resonance (NMR), NMR imaging, MRI Radiological imaging, Ultrasound imaging, Physics of Doppler with applications and modes, Vascular Doppler. Radiography: Filters, grids, cassette, X-ray film, film processing, fluoroscopy. **Computed tomography scanner-** principle and function, display, generations, mammography. Thyroid uptake system and Gamma camera (Only Principle, function and display)

Suggested Books:

1. Medical Physics, J.R. Cameron and J.G.Skofronick, Wiley (1978)
2. Basic Radiological Physics Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)
3. Christensen’s Physics of Diagnostic Radiology: Curry, Dowdey and Murry Lippincot Williams and Wilkins (1990)
4. Physics of the human body, Irving P. Herman, Springer (2007).
5. Physics of Radiation Therapy : F M Khan - Williams and Wilkins, 3rd edition (2003)
6. The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and Boone Lippincot Williams and Wilkins, Second Edition (2002)
7. Handbook of Physics in Diagnostic Imaging: R.S.Livingstone: B.I. Publication Pvt Ltd.
8. The Physics of Radiology-H E Johns and Cunningham.
9. https://sites.google.com/a/northgeorgia.edu/ngcsu-physics-note-sharing/home/medical
10. http://www.sprawls.org/ppmi2/IMGCHAR/
11. http://www.sprawls.org/ppmi2/

SEMESTER V **L T P C**

16PHU503A DIGITAL, ANALOG CIRCUITS AND INSTRUMENTATION 4 - - 4

Course Objectives

- The objective of this paper is to give information about different analog electronic circuits and their applications.
- To understand operation of semiconductor devices.
- To understand DC analysis and AC models of semiconductor devices.
- To acquire knowledge about how a semiconductor diode rectifies an input ac signal.
- To apply concepts for the design of Regulators and Amplifiers.
- To implement mini projects based on concept of electronics circuit concepts.

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Apply concepts for the design of Regulators and Amplifiers.
2. Acquire knowledge about how a semiconductor diode rectifies an input ac signal
3. Verify the theoretical concepts through laboratory and simulation experiments.
4. Know about the Field Effect Transistors, their principles and applications
5. Learn how to construct a transistor amplifier and how its gain varies with frequency
6. Implement mini projects based on concept of electronics circuit concepts.

UNIT-I: Digital Circuits

Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates.

De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.

Binary Addition. Binary Subtraction using 2's Complement Method). Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor.

UNIT – II: Semiconductor Devices and Amplifiers:

Semiconductor Diodes: P and N type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static and Dynamic Resistance. Principle and structure of (1) LEDs, (2) Photodiode, (3) Solar Cell. Bipolar Junction transistors: n-p-n and p-n-p Transistors.

UNIT III

Characteristics of CB, CE and CC Configurations. Active, Cutoff & Saturation regions Current gains α and β. Relations between α and β. Load Line analysis of Transistors. DC Load line & Q-point. Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of single-stage CE amplifier using hybrid Model. Input & output Impedance. Current, Voltage and Power gains. Class A, B & C Amplifiers

UNIT-IV Operational Amplifiers (Black Box approach):
Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop and closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: Inverting and non-inverting Amplifiers, Adder, Subtractor, Differentiator, Integrator, Zero crossing detector.
Sinusoidal Oscillators: Barkhausen's Criterion for Self-sustained Oscillations. Determination of Frequency of RC Oscillator

UNIT-V: Instrumentations: Introduction to CRO: Block Diagram of CRO. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference. Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, Zener Diode and Voltage Regulation. Timer IC: IC 555 Pin diagram and its application as Astable and Monostable Multivibrator.

Suggested Books:

1. Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
2. Electronic devices & circuits, S. Salivahanan & N.S. Kumar, 2012, Tata Mc-Graw Hill
3. Microelectronic Circuits, M.H. Rashid, 2nd Edn., 2011, Cengage Learning.
4. Modern Electronic Instrumentation and Measurement Tech., Helfrick and Cooper, 1990, PHI Learning
5. Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, 7th Ed., 2011, Tata McGraw Hill
6. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
7. Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
8. OP-AMP & Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd.
9. https://www.allaboutcircuits.com/textbook/direct-current/chpt-9/analog-and-digital-signals/
10. https://circuitglobe.com/digital-instrument.html
11. http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=147076.

SEMESTER V

16PHU503B	EMBEDDED SYSTEM	L T P C
	INTRODUCTION TO MICROCONTROLLER	4 - - 4

Course Objective

- This paper gives introduction to microcontroller and embedded systems.
- To learn the architecture of embedded systems, their classification and application.
- To learn about the microprocessors and the organization of microprocessor based systems.
- To acquire knowledge of microcontrollers and their role in 1/0 port programming and their interface with peripherals.
- To know the Input/output operations and manipulation for arithmetic and logical operations.
- To know the basics of embedded system development and product development with a brief introduction to Arduino.

Course Outcome

After successful completion of the course, the student is expected to

1. Embedded systems including its generic architecture, design and classifications, Embedded processors and microcontrollers.
2. Organization of intel microprocessor 8085, its architecture, pin diagram, timing diagram, instruction set and programming in assembly language.
3. Organization of Intel 8051 microcontroller, its architecture, instruction set, programming and its memory organization, timing diagram.
4. Programming with and without interrupt service request.
5. Interfacing parallel and serial ADC and DAC.
6. Design, fabricate, test and run the programs.

UNIT I

Embedded system introduction: Introduction to embedded systems and general purpose computer systems, architecture of embedded system, classifications, applications and purpose of embedded systems, challenges & design issues in embedded systems, operational and non-operational quality attributes of embedded systems, elemental description of embedded processors and microcontrollers.

UNIT II

Review of microprocessors: Organization of Microprocessor based system, 8085μp pin diagram and architecture, concept of data bus and address bus, 8085 programming model, instruction classification, subroutines, stacks and its implementation, delay subroutines, hardware and software interrupts.

UNIT III

8051 microcontroller: Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and Program Status Word (PSW) register, Jump, loop and call instructions.

UNIT IV

8051 I/O port programming: Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description & their functions, I/O port programming in 8051 (using assembly language), I/O programming: Bit manipulation.

Programming: 8051 addressing modes and accessing memory using various addressing modes, assembly language instructions using each addressing mode, arithmetic and logic instructions, 8051 programming in C: for time delay & I/O operations and manipulation, for arithmetic and logic operations, for ASCII and BCD conversions.

UNIT V

Timer and counter Programming: Programming 8051 times, counter programming.

Serial port programming with and without interrupt: Introduction to 8051 interrupts, programming timer interrupts, programming external hardware interrupts and serial communication interrupt, interrupt priority in the 8051. **(6 Lectures)**

Interfacing 8051 microcontroller to peripherals: Parallel and serial ADC, DAC interfacing, LCD interfacing.

Programming Embedded Systems: Structure of embedded program, infinite loop, compiling, linking and locating, downloading and debugging. **(3 Lectures)**

Suggested Books:

1. Embedded Systems: Architecture, Programming & Design, R.Kamal, 2008,Tata McGraw Hill
2. The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
3. Embedded microcomputor system: Real time interfacing, J.W.Valvano, 2000, Brooks/Cole
4. Microcontrollers in practice, I. Susnea and M. Mitescu, 2005, Springer.
5. Embedded Systems: Design & applications, S.F. Barrett, 2008, Pearson Education India
6. Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011, Cengage Learning.
7. https://www.tutorialspoint.com/embedded_systems/es_overview.htm
8. https://users.ece.cmu.edu/~koopman/lectures/index.html

	SEMESTER V	**L T P C**
16PHU504A	**CLASSICAL MECHANICS**	**4 - - 4**

Course Objective

- The emphasis of the course is on applications in solving problems of interest to physicists.
- Students are to be examined on the basis of problems, seen and unseen.
- To demonstrate knowledge and understanding of the following fundamental concepts in the dynamics of system of particles, motion of rigid body, Lagrangian and Hamiltonian formulation of mechanics.
- To represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics.
- To develop math skills as applied to physics.
- They will use critical thinking skills to formulate and solve quantitative problems in applied physics.

Course Outcome

After successful completion of the course, the student is expected to

1. Define and understand basic mechanical concepts related to discrete and continuous mechanical systems,
2. Describe and understand the vibrations of discrete and continuous mechanical systems,
3. Describe and understand planar and spatial motion of a rigid body,
4. Describe and understand the motion of a mechanical system using Lagrange-Hamilton formalism.
5. Solve the Newton equations for simple configurations using various methods.
6. Use critical thinking skills to formulate and solve quantitative problems in applied physics.

UNIT I

Classical Mechanics of Point Particles: Review of Newtonian Mechanics; Application to the motion of a charge particle in external electric and magnetic fields- motion in uniform electric field, magnetic field- gyroradius and gyrofrequency, motion in crossed electric and magnetic fields. Generalized coordinates and velocities, Hamilton's principle, Lagrangian and the Euler-Lagrange equations, one-dimensional examples of the Euler-Lagrange equations- one-dimensional Simple Harmonic Oscillations and falling body in uniform gravity; applications to simple systems such as coupled oscillators Canonical momenta & Hamiltonian. Hamilton's equations of motion.

UNIT II

Applications: Hamiltonian for a harmonic oscillator, solution of Hamilton's equation for Simple Harmonic Oscillations; particle in a central force field- conservation of angular momentum and energy.

UNIT III

Small Amplitude Oscillations: Minima of potential energy and points of stable equilibrium, expansion of the potential energy around a minimum, small amplitude oscillations about the minimum, normal modes of oscillations example of N identical masses connected in a linear fashion to (N -1) - identical springs.

UNIT IV

Special Theory of Relativity: Postulates of Special Theory of Relativity. Lorentz Transformations. Minkowski space. The invariant interval, light cone and world lines. Space-time diagrams. Time -dilation, length contraction and twin paradox. Four-vectors: space-like, time-like and light-like. Four-velocity and acceleration. Metric and alternating tensors. Four-momentum and energy-momentum relation. Doppler effect from a four-vector perspective. Concept of four-force. Conservation of four-momentum. Relativistic kinematics. Application to two-body decay of an unstable particle.

UNIT V

Fluid Dynamics: Density □ and pressure P in a fluid, an element of fluid and its velocity, continuity equation and mass conservation, stream-lined motion, laminar flow, Poiseuille's equation for flow of a liquid through a pipe, Navier-Stokes equation, qualitative description of turbulence, Reynolds number.

Suggested Books:

1. Classical Mechanics, H.Goldstein, C.P. Poole, J.L. Safko, 3rd Edn. 2002,Pearson Education.
2. Mechanics, L. D. Landau and E. M. Lifshitz, 1976, Pergamon.
3. Classical Electrodynamics, J.D. Jackson, 3rd Edn., 1998, Wiley.
4. The Classical Theory of Fields, L.D Landau, E.M Lifshitz, 4th Edn., 2003, Elsevier.
5. Introduction to Electrodynamics, D.J. Griffiths, 2012, Pearson Education.
6. Classical Mechanics, P.S. Joag, N.C. Rana, 1st Edn., McGraw Hall.
7. Classical Mechanics, R. Douglas Gregory, 2015, Cambridge University Press.
8. Classical Mechanics: An introduction, Dieter Strauch, 2009, Springer.
9. Solved Problems in classical Mechanics, O.L. Delange and J. Pierrus, 2010, Oxford Press
10. https://ocw.mit.edu/courses/physics/8-09-classical-mechanics-iii-fall-2014/lecture-notes/
11. https://ocw.mit.edu/courses/physics/8-01l-physics-i-classical-mechanics-fall-2005/lecture-notes/
12. https://iopscience.iop.org/book/978-0-7503-1398-8

SEMESTER V **L T P C**

16PU504B ADVANCED MATHEMATICAL PHYSICS 4 - - 4

Course Objective

- The emphasis of the course is on applications in solving problems of interest to physicists. Students are to be examined on the basis of problems, seen and unseen.
- To apply calculus of variations to diverse problems in physics including isoperimetric problems.
- To find solutions to integral equations using different methods.
- To know the method of contour integration to evaluate definite integrals of varying complexity.
- To familiar with the method of Green's function to solve linear differential equations with inhomogeneous term.
- To understand the concept of linear vector space.

Course Outcome

After successful completion of the course, the student is expected to

1. Know the method of contour integration to evaluate definite integrals of varying complexity.
2. Have gained ability to apply group theory to physics problems, which is a pre-requisite for deeper understanding of crystallography, particle physics, quantum mechanics and energy bands in solids.
3. Apply calculus of variations to diverse problems in physics including isoperimetric problems.
4. Know another interesting aspect is the use of Lagrange multipliers in solving physics problems.
5. Become familiar with the method of Green's function to solve linear differential equations with inhomogeneous term.
6. Find solutions to integral equations using different methods.

UNIT I

Linear Vector Spaces: Abstract Systems. Binary Operations and Relations. Introduction to Groups and Fields. Vector Spaces and Subspaces. Linear Independence and Dependence of Vectors. Basis and Dimensions of a Vector Space. Change of basis. Homomorphism and Isomorphism of Vector Spaces. Linear Transformations. Algebra of Linear Transformations. Non-singular Transformations. Representation of Linear Transformations by Matrices.

UNIT II

Matrices: Addition and Multiplication of Matrices. Null Matrices. Diagonal, Scalar and Unit Matrices. Upper-Triangular and Lower-Triangular Matrices. Transpose of a Matrix. Symmetric and Skew-Symmetric Matrices. Conjugate of a Matrix. Hermitian and Skew-Hermitian Matrices. Singular and Non-Singular matrices. Orthogonal and Unitary Matrices. Trace of a Matrix. Inner Product. Eigen-values and Eigenvectors. Cayley-Hamiliton

Theorem. Diagonalization of Matrices. Solutions of Coupled Linear Ordinary Differential Equations. Functions of a Matrix.

UNIT III

Cartesian Tensors: Transformation of Co-ordinates. Einstein's Summation Convention. Relation between Direction Cosines. Tensors. Algebra of Tensors. Sum, Difference and Product of Two Tensors. Contraction. Quotient Law of Tensors. Symmetric and Anti-symmetric Tensors. Invariant Tensors : Kronecker and Alternating Tensors. Association of Antisymmetric Tensor of Order Two and Vectors.

UNIT IV

Vector Algebra and Calculus using Cartesian Tensors : Scalar and Vector Products, Scalar and Vector Triple Products. Differentiation. Gradient, Divergence and Curl of Tensor Fields. Vector Identities. Tensorial Formulation of Analytical Solid Geometry : Equation of a Line. Angle Between Lines. Projection of a Line on another Line. Condition for Two Lines to be Coplanar. Foot of the Perpendicular from a Point on a Line. Rotation Tensor (No Derivation). Isotropic Tensors. Tensorial Character of Physical Quantities. Moment of Inertia Tensor. Stress and Strain Tensors : Symmetric Nature. Elasticity Tensor. Generalized Hooke's Law.

UNIT V

General Tensors: Transformation of Co-ordinates. Minkowski Space. Contravariant & Covariant Vectors. Contravariant, Covariant and Mixed Tensors. Kronecker Delta and Permutation Tensors. Algebra of Tensors. Sum, Difference & Product of Two Tensors. Contraction. Quotient Law of Tensors. Symmetric and Anti-symmetric Tensors. Metric Tensor.

Suggested Books:

1. Mathematical Tools for Physics, James Nearing, 2010, Dover Publications
2. Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, and F.E. Harris, 1970, Elsevier.
3. Modern Mathematical Methods for Physicists and Engineers, C.D. Cantrell, 2011, Cambridge University Press
4. Introduction to Matrices and Linear Transformations, D.T. Finkbeiner, 1978, Dover Pub.
5. Linear Algebra, W. Cheney, E.W.Cheney & D.R.Kincaid, 2012, Jones & Bartlett Learning
6. Mathematics for Physicists, Susan M. Lea, 2004, Thomson Brooks/Cole
7. Mathematical Methods for Physicis & Engineers, K.F.Riley, M.P.Hobson, S.J.Bence, 3rd Ed., 2006, Cambridge University Press.

SEMESTER V

16PHU511A COMPUTATIONAL PHYSICS (PRACTICAL) (SEC 3 A)

L T P C
- - 3 1

Course Objective

- The aim of this course is not just to teach computer programming and numerical analysis but to emphasize its role in solving problems in Physics.
- Both experimental and theoretical physics are incomplete without the option to compute whenever it is necessary.
- The goal of computational physics is not to replace theory or experiment, but to enhance our understanding of physical processes.
- The aim of this course is to lay the grounds for the development of the computational skills.
- To apply the theoretical knowledge into the experiments and find the solutions.
- To understand the applicability of numerical methods for modeling physical systems and its advantages and disadvantages.

Course Outcome

After successful completion of the course, the student is expected to

1. Demonstrate basic knowledge of numerical methods.
2. Demonstrate basic programming skills.
3. Demonstrate an understanding of the applicability of numerical methods for modeling physical systems and its advantages and disadvantages.
4. Solve the problems by computing.
5. Understand the differences of theory, computing and experiments.
6. Solve the complex equations using different software packages.

Head on Exercises

1. To compile a frequency distribution and evaluate mean, standard deviation etc.
2. To evaluate sum of finite series and the area under a curve.
3. To find the product of two matrices
4. To find a set of prime numbers and Fibonacci series.
5. To write program to open a file and generate data for plotting using Gnuplot.
6. Plotting trajectory of a projectile projected horizontally.
7. Plotting trajectory of a projectile projected making an angle with the horizontally.
8. Creating an input Gnuplot file for plotting a data and saving the output for seeing on the screen. Saving it as an eps file and as a pdf file.
9. To find the roots of a quadratic equation.
10. Motion of a projectile using simulation and plot the output for visualization.
11. Numerical solution of equation of motion of simple harmonic oscillator and plot the outputs for visualization.
12. Motion of particle in a central force field and plot the output for visualization.

Suggested Books:

1. Introduction to Numerical Analysis, S.S. Sastry, 5th Edn., 2012, PHI Learning Pvt. Ltd.
2. Computer Programming in Fortran 77”. V. Rajaraman (Publisher: PHI).
3. LaTeX–A Document Preparation System”, Leslie Lamport (Second Edition, Addison-Wesley, 1994).
4. Gnuplot in action: understanding data with graphs, Philip K Janert, (Manning 2010)
5. Schaum’s Outline of Theory and Problems of Programming with Fortran, S Lipsdutz and A Poe, 1986Mc-Graw Hill Book Co.
6. Computational Physics: An Introduction, R. C. Verma, et al. New Age International Publishers, New Delhi(1999)
7. A first course in Numerical Methods, U.M. Ascher and C. Greif, 2012, PHI Learning
8. Elementary Numerical Analysis, K.E. Atkinson, 3rd Edn., 2007 , Wiley India Edition.

SEMESTER V

16PHU511B	**WEATHER FORECASTING (PRACTICAL)**	**L T P C**
	(SEC 3 B)	**3 - - 3**

Course Objective:

- The aim of this course is not just to impart theoretical knowledge to the students but to enable them to develop an awareness
- To understand the causes and effects of different weather phenomenon and basic forecasting techniques.
- To know the role of air, water, and wind in weather systems.
- Assess variability and change within this expanded, extended and quality assured network.
- To explain what causes different types of weather.
- To understand the concept of Ecosystems and climate interactions

Course Outcome

After successful completion of the course, the student is expected to

1. Know the idea on Ecosystems and climate interactions
2. Know the Effects of climate change on life cycles
3. Know the Biodiversity, Weather vs climate
4. Understand the greenhouse effect, Treaty rights
5. Understand traditional ecological knowledge.
6. Understand the importance of weather changes.

Demonstration and Experiments:

1. Study of synoptic charts & weather reports, working principle of weather station.
2. Processing and analysis of weather data:
3. To calculate the sunniest time of the year.
4. To study the variation of rainfall amount and intensity by wind direction.
5. To observe the sunniest/driest day of the week.
6. To examine the maximum and minimum temperature throughout the year.
7. To evaluate the relative humidity of the day.
8. To examine the rainfall amount month wise.
9. Exercises in chart reading: Plotting of constant pressure charts, surfaces charts, upper wind charts and its analysis.
10. Formats and elements in different types of weather forecasts/ warning (both aviation and non aviation)

Suggested books

1. Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.
2. https://www.sciencedirect.com/science/article/abs/pii/S0065268708603118
3. https://cimss.ssec.wisc.edu/satmet/modules/7_weather_forecast/wf-1.html
4. https://www.outdoorproject.com/articles/weather-forecasting-101-how-predict-weather-go
5. https://www.weatheronline.in/.
6. https://www.weatheronline.in/weather/maps/city?WMO=43321&CONT=inin&LAND=II&ART=PRE&LEVEL=162&MOD=tab
7. https://www.worldweatheronline.com/hwd/

SEMESTER – V

16PHU512A ELEMENTS OF MODERN PHYSICS (PRACTICAL) L T P C

- - 4 2

Course Objective

- To identify the circumstances, in Modern Physics. Enumerate and understand the postulate of relativity.
- To learn about the speed of light as a natural limit to speed.
- To understand the work of Planck, Bohr, Heisenberg, uncertainty principle and the other features of Quantum Mechanics.
- Acquaintance with basic fields of modern physics
- Ability of searching solutions of physical problems in scientific and technical literature.
- Understanding of physical processes and technology

Course Outcome

After successful completion of the course, the student is expected to

1. Recall and apply knowledge in the areas of optics and waves, special relativity and quantum physics (developing the knowledge capability dimension);
2. Conduct relevant experiments, analyse data and report results in written form (developing the technical capability and communication dimensions).
3. Analyse the plank's constant using different experimental technique.
4. Find the wavelength of any laser sources.
5. Differentiate the interference and diffraction properties by the experiments.
6. Understand the theory and practical knowledge of light and other properties.

Any 8 Experiments

1. Measurement of Planck's constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. To determine work function of material of filament of directly heated vacuum diode.
4. To determine the Planck's constant using LEDs of at least 4 different colours.
5. To determine the wavelength of H-alpha emission line of Hydrogen atom.
6. To determine the ionization potential of mercury.
7. To determine the absorption lines in the rotational spectrum of Iodine vapour.
8. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
9. To setup the Millikan oil drop apparatus and determine the charge of an electron.
10. To show the tunneling effect in tunnel diode using I-V characteristics.

11. To determine the wavelength of laser source using diffraction of single slit.
12. To determine the wavelength of laser source using diffraction of double slits.
13. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating

Suggested Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Edn, 2011,Kitab Mahal.

SEMESTER V

16PHU512B	**MEDICAL PHYSICS (PRACTICAL)**	**L T P C**
		- - 4 2

Course Objective

- The objective of the course is to educate and to train students to a competency level sufficient to practice radiation oncology physics independently.
- This prepares the students for clinical practices in radiation therapy (RT) physics through a structured clinical trainings and didactic courses.
- To know the energetic charged particle interactions and transport in matter.
- The program is supervised and mentored by highly qualified clinical practitioners.
- This paper is aimed at giving idea to the students regarding the nature of human body and usage of different radiations for the treatment of body.
- To active participation in clinical research, teaching, and training.

Course Outcomes

After successful completion of the course, the student is expected to

1. Different areas of research in Medical Physics.
2. Understand and apply key concepts specific to energy deposition for both ionizing photon interactions and transport in matter.
3. Know the energetic charged particle interactions and transport in matter.
4. Understanding the working of a manual optical eye-testing machine.
5. Familiarization with the Use of a Vascular Doppler.
6. Realize the real time examples of medical instruments.

Any 8 experiments

1. Understanding the working of a manual Hg Blood Pressure monitor and measure the Blood Pressure.
2. Understanding the working of a manual optical eye-testing machine and to learn eye-testing procedure.
3. Correction of Myopia (short sightedness) using a combination of lenses on an optical bench/breadboard.
4. Correction of Hypermetropia/Hyperopia (long sightedness) using a combination of lenses on an optical bench/breadboard.
5. To learn working of Thermoluminescent dosimeter (TLD) badges and measure the background radiation.
6. Familiarization with Geiger-Muller (GM) Counter and to measure background radiation.

7. Familiarization with Radiation meter and to measure background radiation.
8. Familiarization with the Use of a Vascular Doppler.

Suggested Books:

1. Basic Radiological Physics, Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)
2. Christensen's Physics of Diagnostic Radiology: Curry, Dowdey and Murry - Lippincot Williams and Wilkins (1990)
3. Physics of Radiation Therapy: F M Khan - Williams and Wilkins, 3rd edition (2003)
4. The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and Boone Lippincot Williams and Wilkins, Second Edition (2002)
5. Handbook of Physics in Diagnostic Imaging: Roshan S. Livingstone: B. I. Publications Pvt Ltd.
6. The Physics of Radiology-H E Johns and Cunningham.

SEMESTER V

16PHU513A DIGITAL, ANALOG CIRCUITS AND INSTRUMENTATION (PRACTICAL) L T P C
- - 4 2

Course Objectives

- The objective of this paper is to give information about different analog electronic circuits and their applications.
- To understand operation of semiconductor devices.
- To understand DC analysis and AC models of semiconductor devices.
- To acquire knowledge about how a semiconductor diode rectifies an input ac signal.
- To apply concepts for the design of Regulators and Amplifiers.
- To implement mini projects based on concept of electronics circuit concepts.

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Understand the basics of diode
2. Analyse the characteristics of Bipolar Junction Transistor
3. Perform the procedures for the working of RC-coupled transistor
4. Analyse the relationship between V-I & power curves
5. Understand the applications of Op-amp
6. Develop the ability to analyze and design analog electronic circuits using discrete components.
7. Acquire a basic knowledge in solid state electronics including diodes, MOSFET, BJT, and operational amplifier.

Any 8 Experiments

1. To measure (a) Voltage, and (b) Frequency of a periodic waveform using CRO
2. To verify and design AND, OR, NOT and XOR gates using NAND gates.
3. To minimize a given logic circuit.
4. Half adder, Full adder and 4-bit Binary Adder.
5. Adder-Subtractor using Full Adder I.C.
6. To design an astable multivibrator of given specifications using 555 Timer.
7. To design a monostable multivibrator of given specifications using 555 Timer.
8. To study IV characteristics of PN diode, Zener and Light emitting diode
9. To study the characteristics of a Transistor in CE configuration.
10. To design a CE amplifier of given gain (mid-gain) using voltage divider bias.
11. To design an inverting amplifier of given gain using Op-amp 741 and study its frequency response.

12. To design a non-inverting amplifier of given gain using Op-amp 741 and study its Frequency Response.
13. To study Differential Amplifier of given I/O specification using Op-amp.
14. To investigate a differentiator made using op-amp.
15. To design a Wien Bridge Oscillator using an op-amp.

Suggested Books:

1. Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994, Mc-Graw Hill.
2. Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
3. OP-Amps & Linear Integrated Circuit, R.A. Gayakwad, 4^{th} Edn, 2000, Prentice Hall.
4. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.

SEMESTER V

16PHU513B EMBEDDED SYSTEM L T P C

INTRODUCTION TO MICROCONTROLLER (PRACTICAL) - - 4 2

Course Objective

- This paper gives introduction to microcontroller and embedded systems.
- To learn the architecture of embedded systems, their classification and application.
- To learn about the microprocessors and the organization of microprocessor based systems.
- To acquire knowledge of microcontrollers and their role in 1/0 port programming and their interface with peripherals.
- To know the Input/output operations and manipulation for arithmetic and logical operations.
- To know the basics of embedded system development and product development with a brief introduction to Arduino.

Course Outcome

After successful completion of the course, the student is expected to

1. Embedded systems including its generic architecture, design and classifications, Embedded processors and microcontrollers.
2. Organization of intel microprocessor 8085, its architecture, pin diagram, timing diagram, instruction set and programming in assembly language.
3. Organization of Intel 8051 microcontroller, its architecture, instruction set, programming and its memory organization, timing diagram.
4. Programming with and without interrupt service request.
5. Interfacing parallel and serial ADC and DAC.
6. Student shall be able to design, fabricate, test and run the programs.

ANY 8 EXPERIMENTS

1. To find that the given numbers is prime or not.
2. To find the factorial of a number.
3. Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.
4. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's .
5. Program to glow the first four LEDs then next four using TIMER application.
6. Program to rotate the contents of the accumulator first right and then left.
7. Program to run a countdown from 9-0 in the seven segment LED display.
8. To interface seven segment LED display with 8051 microcontroller and display

‘HELP’ in the seven segment LED display.

9. To toggle ‘1234’ as ‘1324’ in the seven segment LED display.
10. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clockwise direction.
11. Application of embedded systems: Temperature measurement, some information on LCD display, interfacing a keyboard.

Arduino based programs and experiments:

1. Make a LED flash at different time intervals.
2. To vary the intensity of LED connected to Arduino
3. To control speed of a stepper motor using a potential meter connected to Arduino
4. To display “PHYSICS” on LCD/CRO.

Suggested Books:

1. Embedded Systems: Architecture, Programming& Design, R.Kamal,]2008,Tata McGraw Hill
2. The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
3. Embedded Microcomputor System: Real Time Interfacing, J.W.Valvano, 2000, Brooks/Cole
4. Embedded System, B.K. Rao, 2011, PHI Learning Pvt. Ltd.
5. Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011, Cengage Learning

SEMESTER V

16PHU514A **CLASSICAL MECHANICS (PRACTICAL)** L T P C

\- - 4 2

Course Objective

- The aim of this course is not just to teach computer programming and numerical analysis but to emphasize its role in solving problems in classical mechanics.
- The emphasis of the course is on applications in solving problems of interest to physicists.
- Students are to be examined on the basis of problems, seen and unseen.
- To demonstrate knowledge and understanding of the following fundamental concepts in the dynamics of system of particles, motion of rigid body, Lagrangian and Hamiltonian formulation of mechanics.
- To represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics.
- To develop math skills as applied to physics.
- They will use critical thinking skills to formulate and solve quantitative problems in applied physics.

Course Outcome

After successful completion of the course, the student is expected to

1. Demonstrate basic knowledge to solve the problems on motion.
2. Understand the basic concept of trajectories using programming skills.
3. Verify the principles and equations using modeling and analyse its advantages and disadvantages.
4. Solve the problems equations through softwares.
5. Understand the differences of theory, computing skill and experiments.
6. Study the different phenomena of physical variables.

Any 8 experiments

1. To determine the coupling coefficient of coupled pendulums.
2. To determine the coupling coefficient of coupled oscillators.
3. To determine the coupling and damping coefficient of damped coupled oscillator.
4. To study population models e.g. exponential growth and decay, logistic growth, species competition, predator-prey dynamics, simple genetic circuits.
5. To study rate equations for chemical reactions e.g. auto catalysis, bistability.
6. To study examples from game theory.
7. Computational visualization of trajectories in the Sinai Billiard.
8. Computational visualization of trajectories Electron motion in mesoscopic conductors

as a chaotic billiard problem.

9. Computational visualization of fractal formations of Deterministic fractal.
10. Computational visualization of fractal formations of self-similar fractal.
11. Computational visualization of fractal formations of Fractals in nature – trees, coastlines, earthquakes.
12. Computational Flow visualization - streamlines, pathlines, Streaklines.

Suggested Books:

1. Nonlinear Dynamics and Chaos, Steven H. Strogatz, Levant Books, Kolkata, 2007
2. Understanding Nonlinear Dynamics, Daniel Kaplan and Leon Glass, Springer.
3. An Introduction to Fluid Dynamics, G.K.Batchelor, Cambridge Univ. Press, 2002
4. Fluid Mechanics, 2nd Edn, L.D.Landau & E.M. Lifshitz, Pergamon Press, Oxford, 1987
5. Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific and Engineering Applications: A. Vande Wouwer, P. Saucez, C. V. Fernández. 2014 Springer ISBN: 978-3319067896
6. Scilab by example: M. Affouf, 2012, ISBN: 978-1479203444
7. Scilab Image Processing: L.M.Surhone. 2010, Betascript Pub., ISBN: 978-6133459274

SEMESTER V

16PU514B ADVANCED MATHEMATICAL PHYSICS (PRACTICAL) L T P C
- - 4 2

Course Objective

- The emphasis of the course is on applications in solving problems of interest to physicists. Students are to be examined on the basis of problems, seen and unseen.
- To apply calculus of variations to diverse problems in physics including isoperimetric problems.
- To find solutions to integral equations using different methods.
- To know the method of contour integration to evaluate definite integrals of varying complexity.
- To familiar with the method of Green's function to solve linear differential equations with inhomogeneous term.
- To understand the concept of linear vector space.

Course Outcome

After successful completion of the course, the student is expected to

1. Understand variation principle and apply it to calculate the physical variables.
2. Acquire basic concept of Hamiltonian, Hamilton's principle and Hamiltonian equation of motion, Poisson and Lagrange brackets.
3. Learn elementary group theory, i.e., definition and properties of groups, subgroups, Homomorphism, isomorphism, normal and conjugate groups, representation of groups, Reducible and Irreducible groups.
4. Learn the theory of probability, Random variables and probability distributions, Expectation values and variance. Various examples of probability distributions used in physics.
5. Gain the knowledge on Cartesian Tensors and its applications .
6. Understand the concept of Matrices and their problems associated with physical concepts.

Scilab/ C^{++} based simulations experiments based on Mathematical Physics problems like

1. Linear algebra:
2. Multiplication of two 3 x 3 matrices.
3. Eigenvalue and eigenvectors of

8. 9. 3 11. 12
7. 20. 2 21. 1
28 19 29. 4 31. 22 3

4. Orthogonal polynomials as eigenfunctions of Hermitian differential operators.
5. Determination of the principal axes of moment of inertia through diagonalization.
6. Vector space of wave functions in Quantum Mechanics: Position and momentum differential operators and their commutator, wave functions for stationary states as

eigenfunctions of Hermitian differential operator.
7. Lagrangian formulation in Classical Mechanics with constraints.
8.Study of geodesics in Euclidean and other spaces (surface of a sphere, etc).
9.Estimation of ground state energy and wave function of a quantum system.

Suggested Books:

1. Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific and Engineering Applications: A. Vande Wouwer, P. Saucez, C. V. Fernández. 2014 Springer ISBN: 978-3319067896
2. Scilab by example: M. Affouf, 2012, ISBN: 978-1479203444
3. Scilab Image Processing: L.M.Surhone. 2010, Betascript Pub., ISBN: 978-6133459274

SEMESTER VI — L T P C

16PHU601A **ELECTRICAL CIRCUITS AND NETWORK SKILLS** — 3 - - 3

Course Objectives

- The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode.
- To use Circuit Theory as a carrier of the fundamentals of Linear System and Continuous Signal Analysis so that the students are well-prepared to take up a detailed study of higher level subjects
- To apply their knowledge to analog and digital electronics, pulse electronics, analog and digital communication systems, digital signal processing, control systems, and power electronics at a later stage.
- To make the students understand coherence between theoretical and practical measurement.
- To use the techniques, skills and modern technical tools necessary for technical or engineering practice.
- The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis of instruments.

Course Outcome

After successful completion of the course, the student is expected to

1. Electromagnetic spectra and different frequency bands.
2. Understand various types of DC and AC circuits and making electrical
3. Drawings with symbols for various systems.
4. Understand and operate generators, transformers and electric motors.
5. Develop knowledge of solid state devices and their uses.
6. Do electrical wiring with assured electrical protection devices.

UNIT I

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter.

UNIT II

Understanding Electrical Circuits: Main electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source. Power factor. Saving energy and money.

UNIT III

Electrical Drawing and Symbols: Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop.

UNIT IV

Generators and Transformers: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers.

Electric Motors: Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor.

UNIT V

Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Response of inductors and capacitors with DC or AC Sources.

ElectricalProtection: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Interfacing DC or AC sources to control elements (relay protection device)

Suggested Books:

1. A text book in Electrical Technology - B L Theraja - S Chand & Co.
2. A text book of Electrical Technology - A K Theraja
3. Performance and design of AC machines - M G Say ELBS Edn.
4. William H. Hayt, Jr. And Jack E. Kemmerly, Engineering Circuit Analysis, New York: McGraw-Hill, 1962
5. M. E. Van Valkenburg, Network Analysis, PHI, 1974
6. K V V Murthy, M S Kamath, Basic Circuit Analysis, Tata McGraw-Hill Publishing Company, 1989
7. Charles A. Desoer, Ernest S. Kuh, Basic Circuit Theory, New York: McGrawHill 1962
8. Ernst A. Guillemin, Introductory Circuit Theory, New York: Wiley, 1953
9. Ernst A. Guillemin, The Mathematics of Circuit Analysis, New York: Wiley,1949
10. N. Balbanian, T. A. Bickart, Electric Network Theory, New York: Wiley, 1969
11. https://library.automationdirect.com/basic-electrical-theory/
12. https://www.anixter.com/en_au/resources/literature/technical-references/the-basic-principles-of-electricity.html
13. https://www.tinsontraining.co.uk/CourseBooks/Electrical%20B%20v6.0%20.pdf

	SEMESTER VI	**L T P C**
16PHU601B	**APPLIED OPTICS**	**3 - - 3**

Course Objectives

- Study of non-linear optical properties of materials is very important as many of such materials are used in different instruments etc.
- This paper gives basic knowledge about different nonlinear optical properties and their theoretical aspects.
- To be able to apply the fundamental concepts of optics in lasers, optical fiber communications and optoelectronics.
- Apply the concept of optical fiber, its construction and importance in communication physics.
- To analyze different laser systems and its applications in various fields.
- To identify few different applications of optics i.e. Laser, Fiber Optics, Optoelectronics and Non Linear Optics.
- To understand the basic lasing mechanism, types of Lasers, characteristics of Laser Light, types of Lasers,

Course Outcome

After successful completion of the course, the student is expected to

1. Familiar with optical phenomena and technology.
2. Qualitative understanding of basic lasing mechanism, types of Lasers, characteristics of Laser Light, types of Lasers,
3. Know the applications in developing LED, Holography.
4. The idea of propagation of electromagnetic wave in a nonlinear media – Fibre optics as an example will enable the student to practice thinking in a logical process, which is essential in science.
5. Experiments in this course will allow the students to discuss in peer groups to develop their cooperative skills and reinforce their understanding of concepts.
6. Identify few different applications of optics i.e. Laser, Fiber Optics, Optoelectronics and Non Linear Optics.
7. Classify the concepts of opto-isolaters and opto-couplers.
8. Interpret the concepts of Non Linear Optics (NLO) and will able to distinguish the different harmonic generation NLO materials.
9. Understand the concept of polarizability and dielectric tensor.

UNIT I

Review of the concepts of polarizability and dielectric tensor of a medium. Frequency dependence of the dielectric tensor – wave vector dependence of the dielectric tensor – electromagnetic waves in an isotropic dielectrics.

UNIT II

Introduction to non linear optics- Nonlinear dielectric response of matter – frequency variation of the nonlinear susceptibilities – properties of non linear susceptibilities- time domain descrption of optical non- linear susceptibilities- wave vector dependence of the nonlinear susceptibilities.

UNIT III

Second harmonic generation – perturbation theory – phase matching evolution of SHW under phase matching conditions. Four wave mixing spectroscopy – optical phase conjugation – nonlinear materials.

UNIT IV

Scattering of light – Raman scattering – Quantum theory of Raman scattering – Brillouin scattering. Interaction of atoms with nearly resonant fields – wave function under near resonant conditions. Bloch equations – self induced transparency.

UNIT V

Fibre optics – normal modes of optical fibres – nonlinear Schrodinger equations – linear theory. Basic concepts of solutions and non-linear periodic structures. Effect of fibre loss – effect of waveguide property of a fibre – conditions of generation of a solutions in optical fibres.

Suggested Books:

1. D.L. Mills,1st edition 1998 Basic Concepts of Nonlinear Optics ,Springer
   Reference Books:
2. F. Zernike and J.E. Midwinter, Applied Nonlinear Optics , revised edition 2006, Dover books
3. G.C. Baldwin,1st edition 1969 An Introduction to Nonlinear Optics Tata McGraw Hills
4. Ajoy Ghatak & Tyagarajan 1st edition 2011,Introduction to Fibre Optics Tata McGraw Hills
5. https://ocw.mit.edu/courses/mechanical-engineering/2-71-optics-spring-2009/
6. http://www.physics.usyd.edu.au/~bedding/optics/optics-adv-notes1.pdf
7. https://www.goodtheorist.science/files/louro_optics.pdf

	SEMESTER VI	**L T P C**
16PHU602A	**QUANTUM MECHANICS**	**4 - - 4**

Course Objectives

- This paper explains the shortcomings of quantum mechanics in explaining different subatomic physics and the evolution of quantum mechanics.
- This course is part one of a two semester course focused on a rigorous exposition to the principles of Quantum mechanics.
- The Dirac bra-ket formalism will be introduced and used throughout to present the principles of Quantum Mechanics in a general context.
- We will discuss analytic solutions to the Schriodinger equation for a variety of potentials in one, two and three dimensions.
- The role of symmetries as the underlying principle of Quantum Mechanics will be emphasized throughout the course.
- The use of symmetry principles and operators methods will be discussed.

Course Outcome

After successful completion of the course, the student is expected to

1. Understand the interpretation of wave function of quantum particle.
2. Know the quantum phenomena are exposed to the student.
3. Understanding the behavior of quantum particle encountering a i) barrier, ii) Potential.
4. Gets exposed to solving non-relativistic hydrogen atom, for its spectrum and eigenfunctions.
5. Study of influence of electric and magnetic fields on atoms will help in understanding Stark effect and Zeeman Effect respectively.
6. Understand the difference between classical and quantum concept.
7. Use the superposition principle to predict experimental outcomes for measurement of observables on simple quantum systems.
8. Apply the uncertainty principle and heuristic arguments to obtain rough descriptions of quantum systems.
9. Describe generally the physical implications, such as possible bound states and un-bound states for any given hamiltonian.

UNIT I

Time dependent Schrodinger equation: Time dependent Schrodinger equation and dynamical evolution of a quantum state; Properties of Wave Function. Interpretation of Wave Function Probability and probability current densities in three dimensions; Conditions for Physical Acceptability of Wave Functions. Normalization. Linearity and Superposition Principles. Eigenvalues and Eigenfunctions. Position, momentum & Energy operators; commutator of position and momentum operators; Expectation values of position & momentum. Wave Function of a Free Particle.

UNIT II

Time independent Schrodinger equation-Hamiltonian, stationary states and energy eigenvalues; expansion of an arbitrary wavefunction as a linear combination of energy eigenfunctions; General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states; Application to the spread of Gaussian wavepacket for a free particle in one dimension; wave packets, Fourier transforms and momentum space wavefunction; Position-momentum uncertainty principle.

UNIT III

General discussion of bound states in an arbitrary potential- continuity of wave function, boundary condition and emergence of discrete energy levels; application to one-dimensional problem- square well potential; Quantum mechanics of simple harmonic oscillator-energy levels and energy eigenfunctions using Frobenius method.

UNIT IV

Quantum theory of hydrogen-like atoms: time independent Schrodinger equation in spherical polar coordinates; separation of variables for the second order partial differential equation; angular momentum operator and quantum numbers; Radial wavefunctions from Frobenius method; Orbital angular momentum quantum numbers l and m; s, p, d,.. shells (idea only)

UNIT V

Atoms in Electric and Magnetic Fields:- Electron Angular Momentum. Space Quantization. Electron Spin and Spin Angular Momentum. Larmor's Theorem. Spin Magnetic Moment. Stern-Gerlach Experiment. Normal Zeeman Effect: Electron Magnetic Moment and Magnetic Energy. Many electron atoms: Pauli's Exclusion Principle. Symmetric and Antisymmetric Wave Functions. Spin orbit coupling. Spectral Notations for Atomic States. Total Angular Momentum. Spin-orbit coupling in atoms-L-S and J-J couplings.

Suggested Books:

1. A Text book of Quantum Mechanics, P.M. Mathews and K. Venkatesan, 2nd Ed., 2010, McGraw Hill
2. Quantum Mechanics, Robert Eisberg and Robert Resnick, 2ndEdn.,2002, Wiley. Quantum Mechanics, Leonard I. Schiff, 3rdEdn. 2010, Tata McGraw Hill.
3. Quantum Mechanics, G. Aruldhas, 2ndEdn. 2002, PHI Learning of India.
4. Quantum Mechanics, Bruce Cameron Reed, 2008, Jones and Bartlett Learning
5. Introduction to Quantum Mechanics, D.J. Griffith, 2nd Ed. 2005, Pearson Education
6. http://wcchew.ece.illinois.edu/chew/course/QMALL20121005.pdf
7. https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/lecture-notes/
8. http://pages.physics.cornell.edu/~ajd268/Notes/QM-Notes.pdf
9. http://stanford.edu/~oas/SI/QM/papers/QMGreensite.pdf
10. https://www.ks.uiuc.edu/Services/Class/PHYS480/qm_PDF/QM_Book.pdf

	SEMESTER VI	**L T P C**
16PHU602B	**ATMOSPHERIC PHYSICS**	**4 - - 4**

Course Objective

- The objective of this course is to give knowledge to students about the different activities in the atmosphere and different methods of monitoring the atmosphere.
- Students can demonstrate the ability to apply principles of cloud microphysics and atmospheric chemistry to the solution of atmospheric problems.
- The Atmospheric Physics and Weather Group carries out weather and climate research, studying processes and phenomena related to moist thermodynamics and the hydrologic cycle in the atmosphere
- To demonstrate knowledge of basic atmospheric chemistry and its role in atmospheric phenomena.
- To determine if the atmosphere is stable or unstable from a vertical temperature profile
- To understand atmospheric general circulation and the basic principles of physical and applied climatology and climate change.

Course Outcome

After successful completion of the course, the student is expected to

1. Demonstrate knowledge of cloud properties.
2. Demonstrate knowledge of the thermodynamic drivers of cloud development and evolution.
3. Demonstrate knowledge of basic atmospheric chemistry and its role in atmospheric phenomena.
4. Determine if the atmosphere is stable or unstable from a vertical temperature profile
5. Understand atmospheric general circulation and the basic principles of physical and applied climatology and climate change.
6. Explain the composition and structure of the atmosphere.

UNIT I

General features of Earth's atmosphere: Thermal structure of the Earth's Atmosphere, Ionosphere, Composition of atmosphere, Hydrostatic equation, Potential temperature, Atmospheric Thermodynamics, Greenhouse effect and effective temperature of Earth, Local winds, monsoons, fogs, clouds, precipitation, Atmospheric boundary layer, Sea breeze and land breeze. Instruments for meteorological observations, including RS/RW, meteorological processes and different systems, fronts, Cyclones and anticyclones, thunderstorms.

UNIT II

Atmospheric Dynamics: Scale analysis, Fundamental forces, Basic conservation laws, The Vectorial form of the momentum equation in rotating coordinate system, scale analysis of equation of motion, Applications of the basic equations, Circulations and vorticity, Atmospheric oscillations, Quasi biennial oscillation, annual and semi-annual oscillations, Mesoscale circulations, The general circulations, Tropical dynamics.

UNIT III

Atmospheric Waves: Surface water waves, wave dispersion, acoustic waves, buoyancy waves, propagation of atmospheric gravity waves (AGWs) in a nonhomogeneous medium, Lamb wave, Rossby waves and its propagation in three dimensions and in sheared flow, wave absorption, non-linear consideration

UNIT IV

Atmospheric Radar and Lidar: Radar equation and return signal, Signal processing and detection, Various type of atmospheric radars, Application of radars to study atmospheric phenomena, Lidar and its applications, Application of Lidar to study atmospheric phenomenon. Data analysis tools and techniques.

UNIT V

Atmospheric Aerosols: Spectral distribution of the solar radiation, Classification and properties of aerosols, Production and removal mechanisms, Concentrations and size distribution, Radiative and health effects, Observational techniques for aerosols, Absorption and scattering of solar radiation, Rayleigh scattering and Mie scattering, Bouguert-Lambert law, Principles of radiometry, Optical phenomena in atmosphere, Aerosol studies using Lidars.

Suggested Books:

1. Fundamental of Atmospheric Physics – Murry L Salby; Academic Press, Vol 61, 1996
2. The Physics of Atmosphere – John T. Houghton; Cambridge University press, 3rd edn. 2002.
3. An Introduction to dynamic meteorology – James R Holton; Academic Press, 2004
4. Radar for meteorological and atmospheric observations – S Fukao and K
5. Hamazu, Springer Japan, 2014.
6. https://science.jpl.nasa.gov/EarthScience/AtmosphericPhysicsWeather/index.cfm
7. https://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12-842-climate-physics-and-chemistry-fall-2008/lecture-notes/
8. https://ocw.mit.edu/courses/chemical-engineering/10-571j-atmospheric-physics-and-chemistry-spring-2006/lecture-notes/
9. https://nptel.ac.in/courses/119/102/119102007/

SEMESTER VI — L T P C

16PHU603A **NANO MATERIALS AND APPLICATIONS** 4 - - 4

Course Objective:

- This course covers the different classes of nanomaterials that have been developed in recent years in light of various technological applications.
- In order to understand the behavior of these nanomaterials, quantum phenomena and the limitations of basic physical laws that are important at the nanometer length scale are introduced and developed.
- In particular, properties that exhibit size effects (including electronic, magnetic, photonic, and mechanical) at the nanometer length scale will be presented so that nanomaterials becoming increasing relevant to modern technologies can be better understood.
- The course will cover recent breakthroughs and assess the impact of this burgeoning field.
- Specific nanofabrication topics include epitaxy, beam lithographies, self- assembly, biocatalytic synthesis, atom optics, and scanning probe lithography.
- The course consists of topics in fundamental nanoscale science, plus an overview of areas in nanotechnology.

Course Outcome

After successful completion of the course, the student is expected to

1. Explain the fundamental principles of nanotechnology and their application to biomedical engineering.
2. Apply engineering and physics concepts to the nano-scale and non-continuum domain.
3. Identify and compare state-of-the-art nanofabrication methods
4. perform a critical analysis of the research literature.
5. Design processing conditions to engineer functional nanomaterials.
6. Evaluate current constraints, such as regulatory, ethical, political, social and economical, encountered when solving problems in living systems.

UNIT - I

NANOSCALE SYSTEMS: Length scales in physics, Nanostructures: 1D, 2D and 3D nanostructures (nanodots, thin films, nanowires, nanorods), Band structure and density of states of materials at nanoscale, Size Effects in nano systems, Quantum confinement: Applications of Schrodinger equation- Infinite potential well, potential step, potential box, quantum confinement of carriers in 3D, 2D, 1Dnanostructures and its consequences.

UNIT - II

SYNTHESIS OF NANOSTRUCTURE MATERIALS: Top down and Bottom up approach, Photolithography. Ball milling. Gas phase condensation. Vacuum deposition. Physical vapor deposition (PVD): Thermal evaporation, E-beam evaporation, Pulsed Laser deposition.

Chemical vapor deposition (CVD).Sol-Gel. Electro deposition. Spray pyrolysis. Hydrothermal synthesis. Preparation through colloidal methods. MBE growth of quantum dots.

UNIT - III
CHARACTERIZATION: X-Ray Diffraction. Optical Microscopy. Scanning Electron Microscopy. Transmission Electron Microscopy. Atomic Force Microscopy.Scanning Tunneling Microscopy. Fourier Transform Infrared spectroscopy, UV-visible spectroscopy

UNIT – IV
OPTICAL PROPERTIES: Coulomb interaction in nanostructures. Concept of dielectric constant for nanostructures and charging of nanostructure. Quasi-particles and excitons. Excitons in direct and indirect band gap semiconductor nanocrystals. Quantitative treatment of quasi-particles and excitons, charging effects. Radiative processes: General formalization-absorption, emission and luminescence. Optical properties of heterostrctures and nanostructures.

UNIT - V ELECTRON TRANSPORT: Carrier transport in nanostrcutures. Coulomb blockade effect, thermionic emission, tunneling and hoping conductivity. Defects and impurities: Deep level and surface defects.
APPLICATIONS: Applications of nanoparticles, quantum dots, nanowires and thin films for photonic devices (LED, solar cells). Single electron transfer devices (no derivation). CNT based transistors. Nanomaterial Devices: Quantum dots heterostructure lasers, optical switching and optical data storage. Magnetic quantum well; magnetic dots -magnetic data storage. Micro Electromechanical Systems (MEMS), Nano Electromechanical Systems (NEMS).

Suggested Books:

1. C.P.Poole, Jr. Frank J.Owens, Introduction to Nanotechnology (Wiley India Pvt. Ltd.). S.K. Kulkarni,
2. Nanotechnology: Principles & Practices (Capital Publishing Company) K.K. Chattopadhyay and A. N. Banerjee,
3. Introduction to Nanoscience and Technology (PHI Learning Private Limited).
4. Introduction to Nanoelectronics, V.V. Mitin, V.A. Kochelap and M.A. Stroscio, 2011, Cambridge University Press.
5. Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons).
6. Mark C. Hersam (2006), "MSE 376 Nanomaterials," https://nanohub.org/resources/1914.
7. https://nanohub.org/resources/7313.
8. https://ocw.mit.edu/courses/mechanical-engineering/2-674-micro-nano-engineering-laboratory-spring-2016/lecture-notes/MIT2_674S16_Lec7Nano.pdf
9. https://nptel.ac.in/courses/118/104/118104008/

	SEMESTER VI	**L T P C**
16PHU603B	**BIOLOGICAL PHYSICS**	**4 - - 4**

Course Objectives:

- The course aims to provide students with a foundation in the basic concepts of Biophysics.
- Biophysics is an interdisciplinary science that employs and develops theories and methods of the physical sciences for the investigation of biological systems.
- Topics will include canonical and non-canonical structures of nucleic acids, structure of proteins, enzymes etc.
- Fundamental concepts that underlie biomolecular interactions will be discussed and biophysical methods that are employed for the structural analysis of these systems will be introduced at an elementary level.
- To Understand the concept of life of molecules.
- The physical quantities such as temperature, energy, enthalpy, entropy, and free energy will be employed to understand why a biological system choses particular state at conditions under study.

Course Outcome

After successful completion of the course, the student is expected to

1. Demonstrate knowledge of the fundamental concepts in physics and chemistry that underlie biological processes.
2. Define the structural characteristics of nucleic acids and proteins
3. Examine parameters that variously determine their stability and function(s).
4. Describe the principles that govern biomolecular interactions
5. Appreciate how established methods of research and enquiry are employed to analyze the different aspects of these interactions.
6. Understand the concept of life of molecules.

UNIT I Overview

The boundary, interior and exterior environment of living cells. Processes: exchange of matter and energy with environment, metabolism, maintenance, reproduction, evolution. Self-replication as a distinct property of biological systems. Time scales and spatial scales. Universality of microscopic processes and diversity of macroscopic form. Types of cells. Multicellularity. Allometric scaling laws.

UNIT II Molecules of life

Metabolites, proteins and nucleic acids. Their sizes, types and roles in structures and processes. Transport, energy storage, membrane formation, catalysis, replication, transcription, translation, signaling. Typical populations of molecules of various types present in cells, their rates of production and turnover. Energy required to make a bacterial cell. Simplified mathematical models of transcription and translation, small genetic circuits and signaling pathways. Random walks and applications to biology. Mathematical models to be studied analytically and computationally.

UNIT III The Complexity of life

At the level of a multicellular organism: Numbers and types of cells in multicellular organisms. Cell types as distinct attractors of a dynamical system. Stem cells and cellular differentiation. Pattern formation and development. Brain structure: neurons and neural networks. Brain as an information processing system. Associative memory models. Memories as attractors of the neural network dynamics.

UNIT V

At the level of an ecosystem and the biosphere: Foodwebs. Feedback cycles and self-sustaining ecosystems.

Evolution: The mechanism of evolution: variation at the molecular level, selection at the level of the organism. Models of evolution. The concept of genotype-phenotype map. Examples.

Suggested Books:

1. Physics in Molecular Biology; Kim Sneppen & Giovanni Zocchi (CUP 2005)
2. Biological Physics: Energy, Information, Life; Philip Nelson (W H Freeman & Co, NY, 2004)
3. Physical Biology of the Cell (2nd Edition), Rob Phillips et al (Garland Science, Taylor & Francis Group, London & NY, 2013)
4. An Introduction to Systems Biology; Uri Alon (Chapman and Hall/CRC, Special Indian Edition, 2013)
5. Evolution; M. Ridley (Blackwell Publishers, 2009, 3rd edition)
6. http://www.physics.drexel.edu/~brigita/COURSES/BIOPHYS_2011-2012/
7. https://www.easybiologyclass.com/biophysics-free-online-classes-lecture-notes-references-study-materials/

SEMESTER VI

16PHU611A ELECTRICAL CIRCUITS AND NETWORK SKILLS (PRACTICAL) **L T P C**
- - 3 1

Course Objectives

- This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit.
- The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode.
- To use Circuit Theory as a carrier of the fundamentals of Linear System and Continuous Signal Analysis so that the students are well-prepared to take up a detailed study of higher level subjects
- To apply their knowledge to analog and digital electronics, pulse electronics, analog and digital communication systems, digital signal processing, control systems, and power electronics at a later stage.
- To make the students understand coherence between theoretical and practical measurement.
- To use the techniques, skills and modern technical tools necessary for technical or engineering practice.
- The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis of instruments.

Course Outcome

After successful completion of the course, the student is expected to

1. Understand and operate generators, transformers and electric motors.
2. Develop knowledge of solid state devices and their uses.
3. Do electrical wiring with assured electrical protection devices.
4. Acquire knowledge about the single phase and three base electrical circuits
5. Awareness of general structure of power systems
6. Become familiar with the curricular structure of Electrical circuits.
7. Study balance and unbalanced 3-φ circuits
8. Apply fourier analysis to electrical circuits
9. Learn basics for the design of digital circuits and fundamental concepts used in the design of digital systems.

Electrical Wiring:

1. Different types of conductors and cables.
2. Basics of wiring-Star and delta connection.
3. Voltage drop and losses across cables and conductors.
4. Instruments to measure current, voltage, power in DC and AC circuits.

5. Insulation. Solid and stranded cable. Conduit.
6. Cable trays.
7. Splices: wirenuts, crimps, terminal blocks, split bolts, and solder. Preparation of extension board.

Suggested Boos

1. A text book in Electrical Technology - B L Theraja - S Chand & Co.
2. A text book of Electrical Technology - A K Theraja
3. Performance and design of AC machines - M G Say ELBS Edn.
4. William H. Hayt, Jr. And Jack E. Kemmerly, Engineering Circuit Analysis, New York: McGraw-Hill, 1962
5. M. E. Van Valkenburg, Network Analysis, PHI, 1974
6. K V V Murthy, M S Kamath, Basic Circuit Analysis, Tata McGraw-Hill Publishing Company, 1989
7. Charles A. Desoer, Ernest S. Kuh, Basic Circuit Theory, New York: McGrawHill 1962
8. Ernst A. Guillemin, Introductory Circuit Theory, New York: Wiley, 1953
9. Ernst A. Guillemin, The Mathematics of Circuit Analysis, New York: Wiley,1949
10. N. Balbanian, T. A. Bickart, Electric Network Theory, New York: Wiley, 1969
11. https://library.automationdirect.com/basic-electrical-theory/
12. https://www.anixter.com/en_au/resources/literature/technical-references/the-basic-principles-of-electricity.html
13. https://www.tinsontraining.co.uk/CourseBooks/Electrical%20B%20v6.0%20.pdf

SEMESTER VI

16PHU611B	APPLIED OPTICS (PRACTICAL)	L T P C
		- - 3 1

Course Objective

- This course develops an understanding of the basic elements of Optics and Photonics.
- Students will get knowledge on light models and properties (geometrical, electromagnetic, polarization and basic-quantum), propagation of light (rays), classical interaction of light with matter (reflection, refraction, absorption, scattering, chromatic dispersion), classical interaction of light with light (interferences, diffraction).
- To calculate the properties of various lasers and the propagation of laser beams
- To calculate properties of and design modern optical fibres and photonic crystals.
- To understand the fundamentals and the basic tools which explain these phenomena.
- To use the basic techniques involved in the geometrical theory of imaging systems.

Course Outcome

After successful completion of the course, the student is expected to

1. Know basic optical phenomena involved in the generation of color of objects from a physical point of view.
2. Understand the fundamentals and the basic tools which explain these phenomena.
3. Use the basic techniques involved in the geometrical theory of imaging systems.
4. Know the clear idea of the influence of aberrations and diffraction in the quality of images.
5. Calculate the properties of various lasers and the propagation of laser beams
6. Calculate properties of and design modern optical fibres and photonic crystals.

Any 6 Experiments

1. Determination of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid state laser.
2. To find the width of the wire or width of the slit using diffraction pattern obtained by a He-Ne or solid state laser.
3. To find the polarization angle of laser light using polarizer and analyzer
4. V-I characteristics of LED
5. Thermal expansion of quartz using laser
6. Study the characteristics of solid state laser
7. Study the characteristics of LDR
8. Photovoltaic Cell
9. Characteristics of IR sensor

Suggested Books

1. F. Zernike and J.E. Midwinter, Applied Nonlinear Optics , revised edition 2006, Dover books
2. G.C. Baldwin,1st edition 1969 An Introduction to Nonlinear Optics Tata McGraw Hills
3. Ajoy Ghatak & Tyagarajan 1st edition 2011,Introduction to Fibre Optics Tata McGraw Hills
4. https://ocw.mit.edu/courses/mechanical-engineering/2-71-optics-spring-2009/
5. http://www.physics.usyd.edu.au/~bedding/optics/optics-adv-notes1.pdf
6. https://www.goodtheorist.science/files/louro_optics.pdf

	SEMESTER VI	**L T P C**
16PHU612A	**QUANTUM MECHANICS (PRACTICAL)**	**- - 4 2**

Course Objectives

- This paper explains the shortcomings of quantum mechanics in explaining different subatomic physics and the evolution of quantum mechanics.
- This paper explains the shortcomings of quantum mechanics in explaining different subatomic physics and the evolution of quantum mechanics.
- This course is part one of a two semester course focused on a rigorous exposition to the principles of Quantum mechanics.
- We will discuss analytic solutions to the Schriodinger equation for a variety of potentials in one, two and three dimensions.
- To understand the behavior of quantum particle encountering a i) barrier, ii) Potential using scilab.
- To Understand the interpretation of wave function of quantum particle using computer languages.
- To gets exposed to solving non-relativistic hydrogen atom, for its spectrum and eigenfunctions.
- The use of symmetry principles and operators methods will be discussed.

Course Outcome

After successful completion of the course, the student is expected to

1. The experiments using Sci-lab will enable the student to appreciate nuances involved in the theory.
2. This basic course will form a firm basis to understand quantum many body problems.
3. In the laboratory course, with the exposure in computational programming in the computer lab, the student will be in a position to solve Schrodinger equation for ground state energy and wave functions of various simple quantum mechanical onedimensional and three dimensional potentials.
4. Understanding the behavior of quantum particle encountering a i) barrier, ii) Potential using scilab.
5. Understand the interpretation of wave function of quantum particle using computer languages.
6. Gets exposed to solving non-relativistic hydrogen atom, for its spectrum and eigenfunctions.

Use C/C^{++}/Scilab for solving the following problems based on Quantum Mechanics like

1. Solve the s-wave Schrodinger equation for the ground state and the first excited state of the hydrogen atom: corresponding wavefunctions. Note that the ground state energy of hydrogen atom is -13.6 eV. Take e = 3.795 (eVÅ)$^{1/2}$, ħc = 1973 (eVÅ)

and m = 0.511×10^6 eV/c^2.

2. Solve the s-wave radial Schrodinger equation for an atom: where m is the reduced mass of the system (which can be chosen to be the mass of an electron), for the screened coulomb potential.
3. Find the energy (in eV) of the ground state of the atom to an accuracy of three significant digits. Also, plot the corresponding wavefunction. Take e = 3.795 $(eVÅ)^{1/2}$, m = 0.511×10^6 eV/c^2 , and a = 3 Å, 5 Å, 7 Å. In these units ħc = 1973 (eVÅ). The ground state energy is expected to be above -12 eV in all three cases.
4. Solve the s-wave radial Schrodinger equation for a particle of mass m: significant digits. Also, plot the corresponding wave function. Choose m = 940 MeV/c^2, k = 100 MeV fm^{-2}, b = 0, 10, 30 MeV fm^{-3} In these units, cħ = 197.3 MeV fm. The ground state energy I expected to lie between 90 and 110 MeV for all three cases.
5. Solve the s-wave radial Schrodinger equation for the vibrations of hydrogen molecule: Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of three significant digits. Also plot the corresponding wave function. Take: m = 940×10^6 eV/C^2, D = 0.755501 eV, α = 1.44, r_o = 0.131349 Å
6. Study of Electron spin resonance- determine magnetic field as a function of the resonance frequency
7. Study of Zeeman effect: with external magnetic field; Hyperfine splitting

Suggested Books:

1. Schaum's Outline of Programming with C++. J.Hubbard, 2000, McGraw- Hill Pub. Numerical Recipes in C:The Art of Scientific Computing, W.H. Press et.al., 3rd Edn., 2007, Cambridge University Press.
2. A Guide to MATLAB, B.R. Hunt, R.L. Lipsman, J.M. Rosenberg, 2014, 3rd Edn., Cambridge University Press
3. Elementary Numerical Analysis, K.E. Atkinson, 3 r d E d . 2 0 0 7 , Wiley India Edition
4. Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific
5. Engineering Applications: A.V. Wouwer, P. Saucez, C.V. Fernández.2014 Springer Quantum Mechanics, Leonard I. Schiff, 3rd Edn. 2010, Tata McGraw Hill.

	SEMESTER VI	L T P C
16PHU612B	ATMOSPHERIC PHYSICS (PRACTICAL)	- - 4 2

Course Objective

- The objective of this course is to give knowledge to students about the different activities in the atmosphere and different methods of monitoring the atmosphere.
- Students can demonstrate the ability to apply principles of cloud microphysics and atmospheric chemistry to the solution of atmospheric problems.
- The Atmospheric Physics and Weather Group carries out weather and climate research, studying processes and phenomena related to moist thermodynamics and the hydrologic cycle in the atmosphere
- To demonstrate knowledge of basic atmospheric chemistry and its role in atmospheric phenomena.
- To determine if the atmosphere is stable or unstable from a vertical temperature profile
- To understand atmospheric general circulation and the basic principles of physical and applied climatology and climate change.

Course Outcome

After successful completion of the course, the student is expected to

1. Demonstrate proficiency in using computer based weather visualization packages.
2. Demonstrate the ability to communicate weather information in written and oral form.
3. Understand the Earth-Sun relationships and their application to the concepts of radiative energy transfer and energy budgets.
4. Understand the underlying physical principles and measurement of meteorological variables
5. Understand the operating principles and performance characteristics of instruments used to make those measurements.
6. Use and interpret weather charts, maps, and diagrams.
7. Diagnose and forecast synoptic and mesoscale weather phenomena.

Scilab/C++ based simulations experiments based on Atmospheric Physics problems like

1. Numerical Simulation for atmospheric waves using dispersion relations
   Atmospheric gravity waves (AGW)
   Kelvin waves
   Rossby waves, and mountain waves
2. Offline and online processing of radar data
   VHF radar,
   X-band radar, and
   UHF radar

3. Offline and online processing of LIDAR data
4. Radiosonde data and its interpretation in terms of atmospheric parameters using vertical profiles in different regions of the globe.
5. Handling of satellite data and plotting of atmospheric parameters using radio occultation technique
6. Time series analysis of temperature using long term data over metropolitan cities in India – an approach to understand the climate change

Suggested Books:

1. Fundamental of Atmospheric Physics – Murry L Salby; Academic Press, Vol 61, 1996
2. The Physics of Atmosphere – J.T. Houghton; Cambridge Univ. Press; 3rd edn. 2002.
3. An Introduction to dynamic meteorology – James R Holton; Academic Press, 2004
4. Radar for meteorological and atmospheric observations – S Fukao and K Hamazu, Springer Japan, 2014.

SEMESTER VI

		L T P C
16PHU613A	NANO MATERIALS AND APPLICATIONS (PRACTICAL)	- - 4 2

Course Objective

- To provide knowledge of the Nanoscience and related fields.
- To make the students acquire an understanding the Nanoscience and Applications
- To help them understand in broad outline of Nanoscience and Nanotechnology.
- The course will cover recent breakthroughs and assess the impact of this burgeoning field.
- Specific nanofabrication topics include epitaxy, beam lithographies, self- assembly, biocatalytic synthesis, atom optics, and scanning probe lithography.
- The course consists of topics in fundamental nanoscale science, plus an overview of areas in nanotechnology.

Course Outcome

After successful completion of the course, the student is expected to

1. Understand the methods synthesis of nanomaterials
2. Understand their application and the impact of nanomaterials on environment
3. Apply their learned knowledge to develop Nanomaterials.
4. Bring new materials to the socity.
5. Gain knowledge on different spectroscopic techniques.
6. Apply their learned knowledge to develop the new devices.

Any 8 experiments

1. Synthesis of metal nanoparticles by chemical route.
2. Synthesis of semiconductor nanoparticles.
3. Surface Plasmon study of metal nanoparticles by UV-Visible spectrophotometer.
4. XRD pattern of nanomaterials and estimation of particle size.
5. To study the effect of size on color of nanomaterials.
6. To prepare composite of CNTs with other materials.
7. Growth of quantum dots by thermal evaporation.
8. Prepare a disc of ceramic of a compound using ball milling, pressing and sintering, and study its XRD.
9. Fabricate a thin film of nanoparticles by spin coating (or chemical route) and study transmittance spectra in UV-Visible region.
10. Prepare a thin film capacitor and measure capacitance as a function of temperature or frequency.
11. Fabricate a PN diode by diffusing Al over the surface of N-type Si and study its V-I characteristic.

Suggested Books:

1. C.P.Poole, Jr. Frank J.Owens, Introduction to Nanotechnology (Wiley India Pvt. Ltd.). S.K. Kulkarni,
2. Nanotechnology: Principles & Practices (Capital Publishing Company). K.K. Chattopadhyay and A.N. Banerjee,
3. Introduction to Nanoscience & Technology (PHI Learning Private Limited).
4. Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons).

	SEMESTER VI	**L T P C**
16PHU613B	**BIOLOGICAL PHYSICS (PRACTICAL)**	**- - 4 2**

Course Objective

- To provide knowledge of the Nanoscience and related fields.
- To make the students acquire an understanding the Nanoscience and Applications
- To help them understand in broad outline of Nanoscience and Nanotechnology.
- Fundamental concepts that underlie biomolecular interactions will be discussed and biophysical methods that are employed for the structural analysis of these systems will be introduced at an elementary level.
- To Understand the concept of life of molecules.
- The physical quantities such as temperature, energy, enthalpy, entropy, and free energy will be employed to understand why a biological system choses particular state at conditions under study.

Course Outcome

After successful completion of the course, the student is expected to

1. Understand the methods synthesis of nanomaterials
2. Understand their application and the impact of nanomaterials on environment
3. Apply their learned knowledge to develop Nanomaterials.
4. Bring new materials to the socity.
5. Gain knowledge on different spectroscopic techniques.
6. Apply their learned knowledge to develop the new devices.

Any 8 Experiments

1. Measurement of the skin temperature by thermistor
2. Estimation of relative humidity
3. Continual spectrum of visible light
4. Measurement of concentration in coloured solution
5. Maesurement of human hair thickness by microscope
6. Blood pressure measurement
7. Estimation of audibility threshold by audiometer
8. Recording and analysis of ECG signals
9. Verification of Beers and Lambert's Law
10. Absorption spectrum of Blood/Chlorophyll.
11. PH Value of Ammino acids.
12. Study of DNA melting
13. Bimolecular model building using standard kits.

Suggested Books:

1. Introduction to Biophysics - by P. Narayanan.New Age P.
2. Medical Instrumentation - by Khandpur, TMH
3. Laboratory Manuals of Biophysics Instruments - by P.B. Vidyasagar
4. Biophysics -by VatsalaPiramal, Dominant Publisher and Distributors, New Delhi-110002
5. Textbook of Biophysics - by R.N. Roy 6. Photosynthesis - by Hall and Rao.

	SEMESTER VI	**L T P C**
16PHU691	**PROJECT**	**- - 8 6**

Course Objectives

- The aim of the B.Sc. project work is to expose the students to preliminaries and methodology of research in Theoretical Physics and Experimental Physics.
- Students get the opportunity to participate in some ongoing research activity and development of a laboratory experiment.
- To explain the physics problem and its solution in both words and appropriately specific equations to both experts and non-experts.
- To understand the objective of a physics laboratory experiment, properly carry out the experiments, and appropriately record and analyze the results.
- To use computers in data acquisition and processing and how to use available software as a tool in data analysis.
- To think creatively about scientific problems and their solutions.
- To design experiments, and to constructively question results they are presented with, whether these results are in a newspaper, in a classroom, or elsewhere.

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Complete an independent research project, resulting in research outputs in terms of publications in journals and conference proceedings.
2. To apply his/her knowledge and skills to carry out advanced tasks and projects.
3. Apply their knowledge to develop the instruments.
4. Verify the basic principles and laws experimentally as a project.
5. Demonstrate knowledge of contemporary issues in their chosen field of research.
6. Demonstrate an ability to present and defend their research work.
7. Successfully pursue career objectives in graduate school or professional schools, in a scientific career in government or industry, in a teaching career, or in a related career.
8. Think creatively about scientific problems and their solutions.
9. Design experiments, and to constructively question results they are presented with, whether these results are in a newspaper, in a classroom, or elsewhere.
10. Explain the physics problem and its solution in both words and appropriately specific equations to both experts and non-experts.
11. Understand the objective of a physics laboratory experiment, properly carry out the experiments, and appropriately record and analyze the results.
12. Use computers in data acquisition and processing and how to use available software as a tool in data analysis.

M.Sc. PHYSICS

CHOICE BASED CREDIT SYSTEM (CBCS)

Syllabus

2016 – 2017

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)

(Established Under Section 3 of UGC Act 1956)

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SEMESTER – I | L T P C

16PHP101 **CONDENSED MATTER PHYSICS** 4 - - 4

Course Objectives

- This course provide the study of properties of materials is very important at all times, to choose the correct material for the correct use.
- With the development of nanotechnology, it is important to give an idea about the preparation methods and characterization of different materials.
- This paper is intended to give the students an idea about importance of crystals and their properties.
- This course will teach you the fundamental physics behind different materials we commonly see in the world around us.
- The course will demonstrate the link between microscopic structure and bulk properties in a variety of systems in hard and soft condensed matter
- To study some of the basic properties of the condensed phase of matter especially solids.

Course Outcomes (COs)

After completing the course the students will have the ability to:

1. Differentiate between different Lattice types and explain the concepts of reciprocal lattice and crystal diffraction.
2. Predict electrical and thermal properties of solids and explain their origin.
3. Explain the concept of energy bands and effect of the same on electrical properties.
4. Describe the dielectric properties of insulators.
5. Explain various types of magnetic phenomenon, physics behind them, their properties and applications.
6. Explain superconductivity, its properties, important parameters related to possible applications.
7. Students will learn the importance of different materials in a variety of applications

UNIT – I

Inter planar spacing: Inter planar spacing for SC, FCC, BCC lattices - diamond cubic structure - NaCl structure - The reciprocal lattice and their properties - Bragg condition in terms of reciprocal lattice - Rotatory crystal method of X ray diffraction -Neutron diffraction – experiment.

Lattice: Vibrations of one dimensional diatomic linear lattice-acoustic and optical branches - Semi conductors and their properties - Hall effect - Dielectrics - Lorentz field in dielectrics -The Clausius –Mossoti equation - Ferro electric crystals - Ferro electric domains.

UNIT - II

Crystal defects: Classification of defects - Points defect - The Schottky defect - The Frenkel defect -colour centers - F center - other colour centers - Production of colour centers by X rays or practice irradiation – Defect and energy state.

Dislocations - Slip and plastic deformation - Shear strength of single crystals - Edge dislocation - Screw dislocation - Stress field around an edge dislocation.

Ultrasonics: Non destructive testing and applications.

UNIT - III `

Heat capacity of the electron gas: Experimental electrical resistivity of metals – Free electron theory of metals – Debye's equation - superconductivity - Electron phonon interaction - Cooper pairs – BCS theory - Energy gap and its temperature dependence - London equation – Josephson effect and its applications.

Langevin theory of Para magnetism: Quantum theory of Para Magnetism - Curie law- Ferro Magnetism - Weiss molecular field theory - Domain theory - Anti Ferro magnetism -Neel theory - Ferri Magnetism – Ferrites – spin – waves - Experimental techniques to study the magnetic properties.

UNIT - IV

NANOSCIENCE

Structure: Size dependence of properties – Crystal Structures – Face centrednano particles – Particle size determination – Surface structure - Metal nano particles - Magic numbers – Theoretical model of nano particles – Geometric structure – Reactivity – Fluctuations – Magnetic clusters – Bulk to nano transitions Semi conducting nano particles – optical properties – photo fragmentation – Coulombic explosion.

Polymers: Forming and Characterizing polymers – Polymerisation – Sizes of polymers – Nano crystals – Condensed ring types – Poly diacetylene types – Polymers – Conductive polymers – Supra molecular structures – Transition-metal mediated types – Dendritic molecules – Supra molecular dendrimers – Micellers

UNIT - V

Instrumentation: Working principle, and applications of scanning electron microscope - transmission electron microscope - scanning tunneling microscope - atomic force microscope, and surface plasmon resonance – theories and principles of soft lithography, self assembled monolayers and multilayers

SUGGESTED BOOKS

1. Kittel. C. 2005, Introduction to Solid State Physics, 8th Edition, Willey Eastern Ltd., New Delhi.
2. Saxena.B.S., R.C.Gupta and P.N.Saxena, 2012, Fundamentals of Solid State Physics, 15th edition, PragatiPrakashan, Meeru.
3. Charles P. Poole Jr., Frank J.Owens, 2003, Introduction to Nano-technology, 1st edition, Wiley India, New Delhi
4. Dekkar. A.J., revised edition, 2000, Solid State Physics, Macmillan India Ltd., New Delhi.
5. Keer. H.V. 1st edition , 2002, Principles of Solid State, New age international., New Delhi.
6. Pillai S.O., 2005, Solid State Physics, 4th Edition, New Age International Publishers Ltd.
7. Mark Ratner, Daniel Ratner, 1st edition ; 2009, Nano-Technology, A gentle introduction to the new big idea, Pearson Education (Singapore) (P) Ltd., New Delhi.
8. Jean-Marie Lehn, 2006, Supramolecular Chemistry – Concepts and Perspectives, Wiley-VCH, Weinheim, Germany Volume 106
9. Jonathan Steed and Jerry Atwood, 2st edition; 2009, Supramolecular Chemistry, Wiley Interscience, London.
10. https://nptel.ac.in/courses/115106061/
11. https://nptel.ac.in/courses/115101009/

SEMESTER I

		L T P C
16PHP102	**ELECTRONIC DEVICES AND CIRCUITS**	**4 - - 4**

Course Objectives

- This paper contains details of basic electronic components, their characteristics and applications in the construction of different electronic instruments.
- Other than ordinary transistors and diodes special devices are also explained.
- To give an idea about the basics of electronics and electronic devices, this is very important for knowing the basics of any modern instrument.
- To study basic electronic componenets
- To observe characteristics of electronic devices
- To understand the high frequency application of diodes.

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Course Outcomes (COs)

After completing the course the students will /can

1. Able to build, design and analyze analog to digital converter.
2. Able to design digital and analog systems.
3. Ability to understand the basic operation and working of different diodes like FET, MOSFET, CMOS, etc.
4. Ability to analyze PN junctions in semiconductor devices under various conditions.
5. Ability to design and analyze simple rectifiers and voltage regulators using diodes.
6. To understand the high frequency application of diodes.

UNIT I

Electronic Devices and Applications - Transistor Biasing and Stabilization with design problems, h-parameters and their applications in transistor circuit analysis for CE, CB and CC configurations; FET and MOSFETs: Characteristics and Biasing, Design of biasing circuits, Design and analysis of amplifiers, Numerical problems.

UNIT ll

Frequency response of amplifiers General concepts; bode plot; low frequency response: BJT and FET amplifiers; miller effect capacitance; high frequency response of BIT amplifiers; hybrid pie model: short circuit current gain, cut off frequency, and current gain with resistive load; high frequency response of FET amplifiers; frequency response of multistage amplifiers; square wave testing, Numerical problems.

UNIT III

Analysis of compound configurations Cascade connection; Cascade connection; Darlington connection; Bootstrapping principle; Bootstrapped Emitter Follower; Bootstrapped Darlington Emitter Follower; Feedback pair; . CMOS circuits; Current source circuits; Current mirror circuits; Differential amplifier circuits; Numerical problems.

UNIT IV

Power amplifiers Introduction, Series-fed Class A amplifier, Transformer coupled class A amplifier, Class B amplifier operation, Class B amplifier distortion, Power transistor heat sinking, Class C and Class D amplifiers, Numerical problems.

UNIT V

Network theory, mesh and node analysis Kirchhoff's voltage and current law, Network Theorems- Thevein's theorem, Norton's theorem, Superposition Theorem, Maximum power transfer theorem, Problems based on network theorems

SUGGESTED BOOKS

1. Boyle L.stad and Louis Nashelsky,10th edition, 2013, Electronic devices and circuit theory, Prentice-Hall of India,Delhi.
2. Millman and Halkias, 48th reprint, 2008, Integrated electronics, Tata McGraw-Hill, New Delhi.
3. Malvino A.P., Electronics Principles, 10th edition, 2013, Tata McGraw Hill, New Delhi
4. Mottershed, 1st edition, 2002, Electronic devices and circuits : An introduction, Prentice-Halloflndia, New Delhi.
5. M. S. Ghausi1st edition, 2013, Electronic devices and circuits, CBS.
6. Donald L. Schilling, Charles Belove, 3rd edition, 2009, Electronic circuits discrete and integrated, Tata McGraw-Hill, New Delhi.
7. Millman and Grabel, 2nd edition, 2001, Microelectronics; Tata McGraw-Hill, New Delhi.
8. T.F. Bogart and J.S. beasely and G. Rico, 5th edition, 2000, Electronic devices and circuits, Prentice hall; New Delhi.Hall of India .
9. A.NagoorKani, 1st edition, 2014, Circuit theory, RBA publications.
10. https://nptel.ac.in/courses/122106025/
11. https://nptel.ac.in/courses/108108112/

SEMESTER I

		L T P C
16PHP103	**THERMODYNAMICS AND STATISTICAL MECHANICS**	**4 - - 4**

Course Objectives

- Thermodynamics is an important branch of physics, which helps us to understand the different phenomena in the evolution of the universe.
- To introduce the students to the concepts of statistical Thermodynamics. The statistical treatment permits to define the concepts of temperature, heat and entropy strictly from first principles without making use of empirical or axiomatic approach
- This paper gives a basic idea about the laws of thermodynamics and statistical processes.
- To Consolidate the understanding of the laws of thermodynamics and a systematic definition of thermodynamic potentials as the general formalism of thermodynamics.
- To know the foundations of equilibrium statistical physics as the microscopic theory of matter and fields.
- To apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems

Course Outcomes (COs)

After completing the course the students will /can able to

1. Identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, chemical potential, Free energies, partition functions.
2. To apply the knowledge of mathematics, science and engineering fundamentals to model the energy conversion phenomenon.
3. To identify and formulate power production based on the fundamentals laws of thermal engineering.
4. To instill upon to envisage appropriate experiments related to heat engines.
5. To investigate the effectiveness of energy conversion process in mechanical power generation for the benefit of mankind
6. Use the statistical physics methods, such as Boltzmann distribution, Fermi-Dirac and Bose-Einstein distributions to solve problems in physical systems.

UNIT I

Laws of Thermodynamics: Some consequences of the laws of thermodynamics − Entropy − Calculation of entropy changes in reversible processes. The principle of increase of entropy − Thermodynamic potentials − Ehthalpy, Helmholtz and the Gibbs functions − Phase transitions − The Clausius-Clayperon equation − Van der Waals equation of state.

UNIT II

Kinetic Theory: Distribution function and its evolution − Boltzmann transport equation and its validity − Boltzmann's H-theorem − Maxwell-Boltzmann distribution − Transport phenomena − Mean free path- Conservation laws − Hydrodynamics (No derivation).

UNIT III

Classical Statistical Mechanics: Maxwell Boltzmann distribution law: Evaluation of constants - Maxwell's law of distribution of velocities - Most probable speed, Average speed, Root mean square speed - Principle of equipartition of energy - Partition function - Condition for applicability of M.B statistics - Non degenerate and degenerate systems - Maxwell velocity distribution in a given direction - Total internal energy of an ideal gas - Molar heat capacity of a gas at constant volume – Entropy - Helmholtz free energy - Pressure and equation of state of an ideal gas - Limitation of M.B method.

UNIT IV

Quantum Statistical Mechanics: B.E energy distribution for energies in the range E to E + dE – Condition for B.E distribution to approach classical M.B distribution - Bose temperature - Bose Einstein condensation - Planck's law from B.E law - Fermi Dirac distribution law (no derivation) - FD law for the energies in the range E to E+dE – Fermi energy - Effect of temperature - Energy distribution curve - Free electron in a metal - Fermi temperature and Thermionic emission - Richardson Dushmann Equation - Comparison of MB,BE and FD statistics.

UNIT V

Applications of Quantum Statistical Mechanics: Ideal Bose gas : Photons − Black body and Planck radiation − Photons − Specific heat of solids − Liquid Helium.
Ideal Fermi gas : Properties − Degeneracy − Electron gas − Pauli paramagnetism
Ferromagnetism :Ising and Heisenberg models.

SUGGESTED BOOKS

1. Reif F., 2008, Fundamentals of Statistical and Thermal Physics, (Reprint), McGraw Hill International Edition, Singapore.
2. Gupta and Kumar, reprint, 2014, Elements of Statistical Mechanics, PragatiPrakashan, Meerut.
3. Huang K., 2nd edition, 2014, Statistical Mechanics, Wiley Eastern Limited, New Delhi
4. Agarwal B.K. and M. Eisner, 3rd edition, 2013, Statistical Mechanics, New age international Limited, New Delhi.
5. Sears N. and L. Salinger, 2013, Thermodynamics, 3rd Ed., Narosa Publishing House, New Delhi.

6. Greiner W., L. Neise and H. Stocker, 1st edition, 2007, Thermodynamics and Statistical Mechanics, Springer Verlag, New York.
7. Singh. K. and S.P. Singh reprint 2016, Elements of Statistical Mechanics, S. Chand & Company Ltd., New Delhi.
8. https://nptel.ac.in/courses/115103113/

SEMESTER – I

L T P C

16PHP104 MATHEMATICAL PHYSICS 4 - - 4

Course Objectives

- It is necessary for a physics student to be familiar with different methods in mathematics.
- Give a basic idea about different methods of mathematics, used in Physics.
- The purpose of the course is to introduce students to methods of mathematical physics
- To develop required mathematical skills to solve problems in quantum mechanics, electrodynamics and other fields of theoretical physics.
- This course provides the basic concepts in higher level mathematics application to physics
- To impart knowledge about various mathematical tools employed to study physics problems.

Course Outcomes (COs)

After completing the course the students will / can able to

1. Students will be able to apply integral transform (Fourier and Laplace) to solve mathematical problems of interest in physics, use Fourier transforms as an aid for analyzing experimental data.
2. Manipulating vectors as “atomic” entities without recourse to underlying coordinates
3. Ability to link this idea to descriptions various physical phenomena
4. Intuition of the physical meaning of the various vector calculus operators (div, grad, curl)
5. Students can formulate and express a physical law in terms of tensors, and simplify it by use of coordinate transforms (example: principal axes of inertia).
6. Students will be able to solve some simple classical variation problems.

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UNIT - I

Definition of vector space – Linear dependence – Linear independence – Basis – Dimension of a vector space – Representation of Vectors and linear operators with respect to basis – Schmidt orthogonalization process – Inner product.

Tensors : Transformation of coordinates – Summation convention – Contravariant Tensor – Covariant Tensor – Mixed Tensor – Rank of a Tensor – Kronecker delta symbol – symmetric and antisymmetric tensors – Invariant tensors.

UNIT - II

Functions of a complex variable – single and multivalued functions – Cauchy-Riemann differential equation – analytical – line integrals of complex function – Cauchy's integral theorem and integral formula – derivatives of an analytic function – Liouville's theorem - Taylor's series – Laurent's series - Residues and their evaluation - Cauchy's residue theorem – application to the evaluation of definite integrals.

UNIT - III

Fourier Transform – Properties of Fourier transform – Fourier transform of derivatives – Fourier sine and cosine transforms of derivatives – Fourier transform of functions of two or three variables – Finite Fourier transforms – Simple Applications of FT

Laplace transform – Properties of Laplace transforms – Laplace Transform of derivative of a function – Laplace transform of integral – Laplace transform of periodic functions - Inverse Laplace Transform – Fourier Mellin Theorem - Properties of inverse Laplace Transform – Convolution theorem – Evaluation of Laplace Transform using Convolution theorem.

UNIT - IV

Fourier series – Dirichlet's theorem – change of interval – complex form – Fourier series in the interval (0, T) – Uses of Fourier series - Legendre's polynomials and functions – Differential equations and solutions – Rodrigues formula – Orthogonality – relation between Legendre polynomial and their derivatives – recurrence relations – Lagurae Polynomials – recurrence relations

UNIT - V

Bessel's functions – differential equation and solution – generating functions – recurrence relations – Bessel function of second order – Spherical Bessel function -

Hermite differential equation and Hermite polynomials – Generating function of Hermite polynomials – Recurrence formulae for Hermite polynomials – Rodrigue's formula for Hermite Polynomials – Orthogonality of Hermite Polynomials – Dirac's Delta Function.

SUGGESTED BOOK

1. Satya Prakash.,2002. Mathematical Physics , 4th edition, S.Chand& Co, New Delhi.
2. Gupta.B.D., 2002, .Mathematical Physics, 2nd edition, Vikas publishing company, New Delhi.
3. Singaravelu.V., 2008. Numerical methods, 2nd edition, Meenakshi publications, Sirkali.
4. Rajput.B.S., 2003. Mathematical Physics, 16th edition, PragatiPrakashan, Meerut.
5. Gupta. P.P., Yadav., and Malik.,2012. Mathematical Physics, KedarNath& Ram Nath, Meerut.

6. Venkataraman.M.K., 2003. Numerical methods in Science & Engineering, 5th edition, The National Publishing Company, Chennai.
7. Butkov, 2007, Mathematical Physics, Addison Wesley, New York
8. A.W. Joshi, 2008, Tensors and Matrices, reprint, Wiley Interscience, New York.
9. https://nptel.ac.in/courses/115103036/
10. https://nptel.ac.in/courses/115105097/

SEMESTER – I

		L T P C
16PHP105A	**MATERIAL SCIENCE**	**4 - - 4**

Course Objectives

- To Study materials is always important, for any application, satellites.
- To introduce various methods available for characterization of materials specifically addresses that and educators must have working familiarity.
- To provide an introduction to materials characterization and
- To discuss different types of characterization techniques
- To introduce the students to the principles of optical diffraction and various spectroscopic techniques Introduction
- To understand the materials characterization and available

Course Outcomes (COs)

After completing the course the students will/can able to

1. The students are exposed with X-ray, thermal, microscopic, and electrical methods of characterization.
2. Understand and describe the fundamental principles behind the methods of characterization which are included in the curriculum
3. Analyze, interpret and present observations from the different methods.
4. Evaluate the uncertainty of observations and results from the different methods.
5. A thorough understanding of the history of materials science with basic understanding of metals, binary alloys, magnetic materials, dielectric materials and polymers
6. Concept of phase, phase diagram, phase boundaries, Invariant points and reactions leading to the understanding of the material synthesis and dependence of properties on thermodynamic parameters
7. Understanding nucleation, growth and phase transformation kinetics

UNIT - I

Nature of thin films: Deposition technology – Distribution of deposits – Resistance heating – Thermal evaporation – Flash evaporation.

Electron beam method – Cathodic sputtering – Glow discharge sputtering – Low pressure sputtering – Reactive sputtering – R. F. sputtering – Chemical and Physics vapour deposition – Chemical deposition.

Thickness Measurement Methods: Mass methods – Optical method – Photometric – Ellipsometry – Interferometry – Other methods – Substrate cleaning.

UNIT- II

Electron Diffraction Technique: Electron diffraction technique – High energy electron diffraction – Low energy electron diffraction – Electron microscopy – Scanning electron microscopy – X-ray photoelectron spectroscopy – Mass spectroscopy – Thermodynamics of nucleation – Nucleation theories – Film growth – Incorporation of defects, impurities etc. in film – Deposition parameters and grain size.

UNIT – III

Single Crystals: Significance of single crystals – Crystal growth techniques – The chemical physics of crystal growth – crystal growth phenomena – Nucleation – Gibbs Thomson equation – for vapour – for solution – Spherical nucleus – Heterogeneous nucleation – Cap shaped nucleus – Disc shaped nucleus –Characterisation techniques – XRD spectra and Analysis.

UNIT IV

Singular and rough faces: Models on surface roughness – The Kossel, Stranski, Volmer (KSV) theory – The Burton, Cabrera and Frank (BCF) theory – BCF theory of solution growth – Periodic Bond chain theory – the Muller – Krumbhaar Model.

The Bridgman and related techniques – Crystal pulling techniques – Convection in melts – Modeling and simulation of bulk crystal growth considering melt dynamics – Melt growth of oxide crystals for saw, piezo electric and non linear optical applications – Liquid encapsulated and Czochralski technique – Zone melting technique – Skull melting process – Heat exchanger method.

UNIT V

Nanotechnology: An introduction – Nanodevices – Carbon nanotubes – Types of Carbon Nanotubes: Single walled, Multiwalled, Torus – Properties: Hardness – Strength – Electrical – Thermal – Optical – Synthesis – Arc discharge – Laser Ablation.

SUGGESTED BOOK

1. Goswami. A., , 1st edition 2014, Thin film fundamentals, New Age International Pvt Ltd, New Delhi.
2. Meissel. L.T and R. Glang., 2006, Hand book of thin film technology, Tata McGraw Hill, New Delhi.
3. ShaliniSuri, , 1st edition 2006, Nano Technology: Basic Science to Emerging Technology, Aph Publishing Corporation.
4. Brice. J.C., , 1st edition, 2003, Crystal growth processes, John Wiley and Sons, New York.
5. https://nptel.ac.in/courses/115103030/
6. https://nptel.ac.in/courses/113106034/

SEMESTER – I **L T P C**

16PHP105B ASTRONOMY AND ASTROPHHYSICS 4 - - 4

Course Objectives

- Astronomy and Astrophysics is a very fundamental subject in Physics.
- Includes study of the solar system, evolution of stars, different physical processes going on stellar bodies, life cycle of stars etc.
- Is to apply basic physical principles from a broad range of topics in physics to astronomical situations
- Be able to formulate scientific problems in mathematical terms and apply analytical and numerical methods towards its solution
- Develop skills to design observing projects with research telescopes and projects drawing upon data in the literature and in archives
- Establish competence in focused areas of astrophysical theory and experiment
- Generate fluency in the scientific enterprise and awareness of possible career paths available to the undergraduate astronomy and astrophysics major

Course Outcomes (COs)

After completing the course the students will/can able to:

1. Plan and engage in an independent and sustained critical investigation of a chosen research topic to generate new knowledge in an area of astronomy and astrophysics.
2. Systematically evaluate the relevant theory and concepts in astronomy and astrophysics,
3. Relate the theory to appropriate methodologies and evidence and draw appropriate conclusions.
4. Demonstrate capacity for astronomy and astrophysics reasoning through analyzing, proving and explaining concepts from the chosen research area.
5. Identify important constellations – orient in space.
6. Describe the planets of the solar system and their properties.

UNIT - I

Astrophysics:

Introduction - Astrophysics and Astronomy - Celestial coordinate systems (Sun-Earth system, Galactic Coordinate system)

UNIT - II

Stellar Structure and Evolution:

Star formation - Stellar Magnitudes - Classification of stars - H-D classification - Saha Equation of ionization - Hertzsprung-Russel (H-R) diagram - Gravitational energy - Virial theorem - Equations of stellar structure and evolution - Pre-main sequence evolution - Jeans criteria for star formation - fragmentation and adiabatic contraction - Evolution on the main sequence - Post main sequence evolution

UNIT - III

Nuclear Astrophysics:

Thermonuclear reactions in stars - pp chains and CNO cycle - Solar Neutrino problem - subsequent thermonuclear reactions - Helium burning and onwards - nucleosynthesis beyond iron - r- and s-processes

Stellar Objects & Stellar Explosions:

Qualitative discussions on: Galaxies – Nabulae – Quasars - Brown dwarfs - Red Giant Stars – Nova - Supernova.

UNIT - IV

Gravitational Collapse and relativistic Astrophysics:

Newtonian theory of stellar equilibrium - White Dwarfs - Electron degeneracy and equation of States - Chandrasekhar Limit - Mass-Radius relation of WD - Neutron Stars - Spherically symmetric distribution of perfect fluid in equilibrium - Tolman-Oppenheimer-Volkoff (TOF) equation – Mass - Radius relations of NS – Pulsars - Magnetars - Gamma ray bursts - Black holes - Collapse to a black hole (Oppenheimer and Snyder) - event horizon - singularity.

UNIT - V

Accretion disks:

Formation of Accretion Disks - Differentially rotation systems in Astrophysics - Disk dynamics - Steady Disks - Disk formation in close binary systems through mass transfer - Accretion onto compact objects.

SUGGESTED BOOKS

1. V.B.Bhatia, , 1st edition, 2001; Textbook of astronomy and astrophysics with elements of cosmology,Alpha science international.
2. K. D. Abhyankar, , 1st edition Astrophysics – Stars and Galaxies,University Press, 2001.
3. S.L.Shapiro and S.A.Teukolsky, , 1st edition Black Holes, White Dwarfs and Neutron Stars (John Wiley, 2002)
4. E.W.Kolb and M.S.Turner, , 1st edition, 2007, The Early Universe Sarth book house and distributers
5. J.V.Narlikar, , 3rd edition 2012 Introduction to Cosmology, Cambridge University Press.
6. A.K.Raychaudhuri, S.Banerji and A.Banerjee, General Relativity, Astrophysics and Cosmology – , 1st edition (Springer-Verla, 2001)
7. S. Banerji and A. Banerjee , General Relativity and Cosmology – , 1st edition (Elsevier, 2007)
8. https://nptel.ac.in/courses/115105046/
9. http://www.nptelvideos.in/2012/12/astrophysics-cosmology.html

SEMESTER – I

		L T P C
16PHP105C	**CRYSTAL GROWTH TECHNIQUES**	**4 - - 4**

Course Objectives

- To strengthen the students with crystallographic and crystal growth techniques
- To provide the general characteristics of crystals, methods of preparation etc.
- Various thin films deposition techniques and thin film characterization techniques are also covered in the course.
- To give an idea about historical importance of crystals, methods of preparation and characterization of crystals etc.
- To explore the knowledge in fundamentals of materials syntheses, crystal growth techniques, zone refining, properties etc.,
- To provide the basic knowledge on crystal structure.

Course Outcomes (COs)

After completing the course the students will / can able to

1. The student will learn about the crystal growth mechanisms and techniques.
2. Various thin films deposition techniques and thin film characterization techniques are also covered in the course.
3. Gain the knowledge about phonons and its importance in thermal physics
4. Acquire the theoretical concept behind electrical and thermal properties of metals
5. Understand the fundamental theories to describe the energy bands in metals
6. Gain the knowledge about Semiconductor Crystals and their properties

UNIT- I

Crystal Growth phenomena

The historical development of crystal growth – significance of single crystals - crystal growth techniques - the chemical physics of crystal growth - Theories of nucleation - Gibb's Thompson equation for vapour, melt and solution- energy of formation of spherical nucleus- heterogeneous nucleation - kinetics of crystal growth, singular and rough faces, KSV theory, BCF theory - periodic bond chain theory- The Muller- Krumbhaar model.

UNIT- II

Crystal Growth from Melt and Solution Growth

Growth from the melt - the Bridgmann technique – crystal pulling - Czochralski method-experimental set up - controlling parameters advantages and disadvantages.- convection in melts – liquid solid interface shape - crystal growth by zone melting - Verneuil flame fusion technique.

UNIT - III

Low temperature crystal growth

Low temperature solution growth - methods of crystallization - slow cooling - solvent evaporation, temperature gradient methods - crystal growth system - growth of KDP, ADP and KTP crystals - high temperature solution growth - gel growth.

UNIT - IV

Vapour Growth and Epitaxial Growth

Physical vapour deposition - chemical vapour transport – definition - fundamentals, criteria for transport, Specifications, STP, LTVTP & OTP - advantages and limitations of the technique, hydrothermal growth – design aspect of autoclave – growth of quartz, sapphire and garnet.

Advantages of epitaxial growth - epitaxial techniques - liquid phase epitaxy - vapour phase epitaxy - molecular beam epitaxy - chemical beam epitaxy and atomic layer epitaxy

UNIT - V

Materials for Semiconductor Devices

Semiconductor optoelectronic properties - band structure - absorption and recombination, semiconductor alloys - group III-V materials selection - binary compounds, ternary alloys - lattice mismatch - lattice mismatched ternary alloy structures - compositional grading, heteroepitaxial ternary alloy structure - Quaternary alloys - Semiconductor Devices - Laser diodes, light emitting diodes (LED) – photocathodes - microwave Field-Effect Transistors (FET).

SUGGESTED BOOKS:

1. R.A. Laudise, 2006, illustrated edition, The Growth of Single Crystal, Prentice Hall, NJ.
2. A.W. Vere,2012 edition, Crystal Growth: Principles and Progres, Springer press.
3. P.S. Raghavan and P.Ramasamy, 2000 Hard cover edition. Crystal Growth Processes and methods, KRU Publications.
4. F.C. Auluck, A Short course in Solid State Physics, Vol. I, Thomson Press India Ltd.
5. B.R. Pamplin, 2nd edition Crystal Growth, Pergamon, (2012)
6. Heinz K Henish, , 1st edition 2005, Crystal Growth in Gel, Dover Publication
7. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/113105025/lec12.pdf
8. http://mgcl.iitr.ac.in/49200-nptel-video-lecture-topics.pdf

SEMESTER – I

16PHP111	GENERAL PHYSICS PRACTICALS - I	L T P C - - 4 2

Course Objective

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To learn the usage of optical systems for various measurements.
- Apply the analytical techniques and graphical analysis to the experimental data.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.
- To enable the students to understand the basic concepts of mechanics
- In order to get real time experience on experiment, which measures the physical properties.

Course Outcomes (COs)

After completing the course the students will/cab able to

1. The course is designed to train the students so that they can efficiently handle various instruments.
2. Students will verify laws studied in the different theory course.
3. Students will measure different properties of materials.
4. Capable to classify the materials with the properties
5. Will overcome the fear of experimental skill
6. Capable to built his own equipments for measuring the properties of materials

ANY TEN EXPERIMENTS

1. Young's Modulus – Elliptical Fringes (Cornu's method).
2. Viscosity of liquid – Mayer's oscillating disc method.
3. Michelson Interferometer – Determination of λ and $d\lambda$.
4. 'e/m' by Thomson's method and Magnetron method.
5. Young's Modulus – Hyperbolic Fringes (Cornu's method).
6. Fresnel's biprism - Determination of Wavelength of monochromatic source.
7. Determination of Plank's constant using Photo cell.
8. Forbe's method – Thermal conductivity.
9. 'e' by Millikan's method.

10. Ferguson’s method - Specific heat of a liquid.
11. Faraday effect – Determination of Verdet constant using He-Ne laser.
12. Young’s Double slit – Determination of Wavelength of monochromatic source.

SUGGESTED BOOKS:

1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
2. Singh S.P., 2003, Advanced Practical Physics – 1, 13th Edition, PragathiPrakashan, Meerut
3. Singh S.P., 2000, Advanced Practical Physics – 2, 12th Edition, PragathiPrakashan, Meerut
4. Gupta S.L. and V.Kumar, 2002, Practical Physics, 25th Edition, PragathiPrakashan, Meerut
5. https://nptel.ac.in/courses/115105110/

SEMESTER – I

16PHP112	ELECTRONICS PRACTICALS – I	L T P C - - 4 2

Course Objective

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To learn the usage of optical systems for various measurements.
- Apply the analytical techniques and graphical analysis to the experimental data.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.

Course Outcomes (COs)

1. The course is designed to train the students so that they can efficiently handle various
2. instruments.
3. Students will verify laws studied in the different theory course.
4. Students will measure different properties of materials.
5. Gain the knowledge in quantization of electromagnetic fields.
6. Analyze the characteristics of oscillators and wave shaping circuits
7. Understand the basic concepts of amplifiers and operational amplifier

ANY TEN EXPERIMENTS

1. Study of characteristics of junction diode, Zener diode and transistor. Fixing the Q-point of a transistor.
2. Construction of Half-wave, Full-wave and Bridge Rectifiers and Regulated power supplies.
3. Construction and comparative study of CE, CB and CC amplifiers, using discrete components.
4. Hartley and Colpit's oscillators using discrete components.
5. Wave form generators (Square wave and Triangular wave) – Op amp.
6. Phase shift oscillator and Wein's bridge oscillator – Op amp.
7. Parameters of Op amp, Active filters – Op amp.
8. Astable, monostable and bistable multi-vibrators, using discrete components.
9. Analog computer setup – Solving simultaneous equations.
10. UJT characteristics and relaxation oscillator.

11. CRO – Differentiating, Integrating, clipping and clamping circuits.
12. FET characteristics and Source follower
13. Virtual Lab (IC 741, IC 555)

SUGGESTED BOOKS:

1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
2. Singh S.P., 2003, Advanced Practical Physics – 1, 13th Edition, PragathiPrakashan, Meerut
3. Singh S.P., 2000, Advanced Practical Physics – 2, 12th Edition, PragathiPrakashan, Meerut

SEMESTER – II

		L T P C
16PHP201	**CLASSICAL MECHANICS AND RELATIVITY**	**4 - - 4**

Course objectives

- Study of Classical Mechanics gives an idea about how classical physics deal with matter and energy.
- It cannot explain many observed phenomena in the case of microparticles and relativistic velocities, it is still valid in the case of macro objects at non-relativistic velocities.
- To give an insight into the classical methods of physics.
- To understand the basic principles of classical mechanics.
- This course will demonstrate the ability to apply basic methods of classical mechanics towards solutions of variousproblems, including the problems of 1) complicated oscillatory systems, 2) the motion of rigid bodies, 3) mechanics of continuous media.
- Is to demonstrate the equations of motion for complicated nonlinear mechanical systems and their solutions.

Course Outcomes (Cos)

After completing the course the students will/can able to

1. Students can understand the classical laws of motion.
2. Competency in using the essential mathematical skills needed for describing mechanics and special relativity
3. Understanding of significance of conservation of various physical quantities to discuss the motion of dynamical system.
4. Understanding of constraints and their significance to solve the equations of motion of the dynamical system.
5. Understanding of necessity of Lagrangian and Hamiltonian formulations for simplified treatments of many complex problems in classical mechanics.
6. They can develop problem solving skills.

UNIT - I

Conservation laws: Mechanics of a system of particles – Conservation laws: linear momentum, angular momentum, energy – Constraints, Degrees of freedom – Generalised co-ordinates – Generalized notations – Brachistocrone problems – Atwood's machine.

Hamilton's variational principle – Lagrange's equation of motion from Hamilton's principle, D'Alembert's principle – Applications of Lagrange's equation of motion – Linear harmonic oscillator – Simple pendulum – particle moving under a central force – particle moving on the surface of earth, cylinder rolling on inclined plane, electric circuit – Superiority of Langrange's approach over Newtonian's approach.

UNIT – II

Phase space: Hamiltonian – Hamilton's canonical equations of motion – Physical significance of H – Advantage of Hamiltonian approach – Hamilton's canonical equation of motion in different coordinate systems – Hamilton-Jacobi method – Kepler's problem solution by Hamilton-Jacobi method – Action and angle variables – Solution of Harmonic oscillator by action angle variable method – canonical or contact transformation – Condition for a transformation to be canonical.

Poisson brackets – Invariance of Poisson brackets with respect to canonical transformation – Equations of motion in Poisson bracket form – Lagrange's bracket – Relation between Lagrange and Poisson brackets

UNIT – III

General features of central force motion – General features of orbits – Centre of mass and laboratory coordinates – Virial theorem – Stable and unstable equilibrium – Properties of T, V and ω for small oscillations – Normal coordinates and normal frequencies of vibrations – Parallel pendula – Double, Triple pendula – Linear triatomic molecule.

Generalized coordinates for rigid body motion – Euler's angles – Angular velocity, momentum of rigid body – moment and products of inertia – Principal axis transformation – rotational kinetic energy of a rigid body – Moment of inertia of a rigid body – motion of a symmetric top under action of gravity.

UNIT - IV

Special Theory of Relativity: Introduction – Galilean transformation and invariance of Newton's laws of motion – Non variance of Maxwell's equations – Michelson Morley experiment and explanation of the null result.

Concept of inertial frame – Postulates of special theory – simultaneity – Lorentz transformation along one of the axes – length contraction – time dilatation and velocity addition theorem – Fizeau's experiment – Four vectors – Relativistic dynamics – Variation of mass with velocity – Energy momentum relationship.

UNIT - V

General theory of Relativity: Introduction – Limitation of special theory of relativity and need for a relativity theory in non-inertial frames of reference. Concept of gravitational and inertial mass and the basic postulate of GTR, gravitation & acceleration and their relation to non-inertial frames of reference – principle of equivalence of principle of general co-variance – Minkowski space and Lorentz transformation.

SUGGESTED BOOKS:

1. Goldstein.H.A. 2000, Classical Mechanics, 2nd Edition, Wesley Publishing Company, London.

2. Gupta. S. L., V.Kumar and H.V.Sharma, 2008, Classical Mechanics, 19th Edition, PragatiPrakashan, Meerut.
3. BanerjiSriranjan and Asit Banerjee, 2nd Edition 2013, The Special Theory of Relativity, Printice-Hall of India, New Delhi
4. Aruldhas G.,1st edition, 2008, Classical Mechanics, Printice Hall of India, New Delhi
5. Sardesai D.L., 1st edition, 2004, A Primer of Special Relativity, New Age International Publishers, New Delhi
6. Hartle B. James, 1st edition ,2009, Gravity, An Introduction to Einstein's General Relativity, Dorling Kindersley (India) Pvt. Ltd., Delhi.
7. https://nptel.ac.in/courses/115105098/
8. https://nptel.ac.in/courses/115106059/

SEMESTER – II

		L T P C
16PHP202	**QUANTUM MECHANICS - I**	**4 - - 4**

Course Objectives

- This course is aimed to introduce basic concepts and ideas on Quantum Mechanics
- To acquire working knowledge of the Quantum Mechanics postulate on the physical systems.
- To impart knowledge of advanced quantum mechanics for solving relevant physical problems
- It has revolutionized the whole science, important for any physics student to know the basics of quantum mechanics.
- Explain Quantum Mechanics to understand wave particle dualism. Necessity of quantum mechanics to explore the behavior of sub atomic particles. Evaluate the Eigen values and Eigen functions of a particle
- This paper gives an idea about the development of quantum mechanics.

Course Outcomes (COs)

1. After the completion of course, students should be able to understand and grasp the basic concepts of quantum mechanics including the solution of wave equation, interpretation of dynamical variables and applying wave mechanics to various situations in terms of boundary value problems so as to understand the quantum well, barriers and particle motion in different types of force field (potentials).
2. Applying special functions as the solutions of differential equation as the wave function/state functions and understanding the physical situations where these can be applied.
3. Calculating states of electrons in hydrogen atom and harmonic oscillators and the interpretation of quantum states.
4. Applying the stationary perturbation problems to various problems including particle states splitting in electric and magnetic field.
5. interpret the wave function and apply operators to it, to obtain information about a particle's physical properties such as position, momentum and energy
6. Be able to solve the Schroedinger equation to obtain wave functions for some basic, physically important types of potential in one dimension, and estimate the shape of the wavefunction based on the shape of the potential
7. Be able to understand the role of uncertainty in quantum physics, and use the commutation relations of operators to determine whether or not two physical properties can be simultaneously measured

UNIT - I

Quantum Theory: Introduction – Limitation of classical physics – Origin of quantum theory – Planck's quantum hypothesis – Einstein's theory of Photoelectric effect –Bohr model of hydrogen atom – Inadequacy of quantum theory.

Wave Mechanics Matter waves – Uncertainty principle –Wave packet – Group and phase velocity – Time-dependent and Time-independent Schrodinger equations for a free particle and particle in a potential – Linear vector space – Hilbert's space – Orthogonal and orthonormal functions – Linear operator – Eigen functions and Eigen values – Hermitian operator – Dirac's notation – Equations of motion – Schrodinger, Heisenberg and Interaction representation.

UNIT - II

One dimensional potential well: Square-well potential with rigid walls – Square-well potential with finite walls – Square-well potential barrier – Alpha emission – Bloch waves in a periodic potential – Linear harmonic oscillator (Schrodinger method and operator method) – Free particle.

UNIT - III

Three dimensional potential Well: Particle moving in a spherically symmetric potential – System of two interacting particles – Rigid rotator – Hydrogen atom – Hydrogenic orbitals – The free particle – Three-dimensional square-well potential - Deutron

Matrix mechanics: Matrix representation of wave function – Matrix representation of operator – Properties of matrix elements – Schroedinger equation in matrix form – Eigen value problem – Unitary Transformations – Linear harmonic oscillator, Matrix method

UNIT - IV

Time-independent Perturbation theory: Basic concepts – Non-degenerate energy levels – First and Second order corrections for energy and wave functions – Ground state of Helium atom – Effect of electric field on the ground state of hydrogen atom (Stark effect) – Degenerate energy levels – Effect of electric field on the n=2 state of hydrogen atom

UNIT - V

Variational method&WKB Approximation: Variational principle – Variation method for excited states – Application of variation method to ground state of helium – The WKB method

Time dependent perturbation theory: Introduction – First-order perturbation – Harmonic perturbation – Transition to continuum states (Fermi's Golden rule) – Absorption and emission of radiation – Transition probability – Selection rules

SUGGESTED BOOKS:

1. Aruldhas. G, 2009, Quantum Mechanics, 2nd Edition, Prentice-Hall of India, New Delhi.
2. Schiff Leonard, 2000, Quantum Mechanics, 3rd Edition, McGraw Hill International, Auckland

3. Gupta, Kumar and Sharma, 2002 – 2003, Quantum Mechanics, 22^{nd} Edition, Jai PrakashNath& Co, Meerut.
4. SatyaPrakash, New Edition, 2003, Quantum Mechanics, KedarNath& Ram Nath& Co, Meerut.
5. Engen Merzbacher, 2013, Quantum Mechanics, 3^{rd} Edition, Wiley, Weinheim
6. Mathews. P.M. and K. Venkatesan, 2^{nd} Edition, 2013, Textbooks of Quantum Mechanics, McGraw Hill International, Weinheim.
7. Chatwal R.G. and Sk. Anand, 4^{th} edition, 2004, Quantum Mechanics, Himalaya Publishing House, New Delhi
8. Thangappan. V. K., 2^{nd} Edition,2013, Quantum Mechanics, Tata McGraw Hill, New Delhi
9. https://nptel.ac.in/courses/115101107/
10. https://nptel.ac.in/courses/122106034/

SEMESTER – II

		L T P C
16PHP203	**NUCLEAR PHYSICS**	**4 - - 4**

Course Objectives

- Nuclear physics is one of the fundamental subjects of physics. It is important to know about the physics of nuclei and the different energies involved in the nuclear processes.
- Nuclear energy is one of the major sources of energy, which, with proper careful usage, can solve the energy crisis to a large extent.
- To impart knowledge about basic nuclear physics properties and nuclear models for understanding of related reaction dynamics
- To introduce students the fundamental concepts of nuclear and sub-nuclear physics
- This paper is intended to give an insight into the different nuclear processes and the fundamental particles, which are the real building blocks of the universe.
- To introduce students to the fundamental concepts of nuclear and sub-nuclear physics

Course Outcomes (COs)

After completion of the course the students will /can

1. Students who have completed this course should Understand the relation between the standard model and QCD
2. Understand the importance of models in describing the properties of nuclei and nuclear collisions
3. Be able to make quantitative estimates of phenomena involving nuclei.
4. Students understand the basic principle, type of accelerators, working and operation of Accelerators.
5. Students learn the basic of ion sources, beam transport and application of accelerator in different branches of science.
6. Training given to students and researchers of the Universities to handle such complicated machine.

UNIT - I

Nuclear mass and charge: Distribution of nuclear charge - Nuclear mass and binding energy of a nucleus – semi-empirical mass formula – Nature of nuclear force – form of nucleon-nucleon potential – charge independence and charge symmetry of nuclear forces - Bound states of two nucleons-Ground state of Deuterium - Wave mechanics of ground state of Deuterium-Spin states – Pauli's exclusion principle -Tensor force - Exchange force - Low energy Nucleon - Nucleon scattering

UNIT - II

Radioactivity:

Alpha decay: Properties of α particles - Velocity and energy of α particles - Gamow's theory of α particles- Geiger - Nuttall law- α ray energies and fine structure of α rays - α disintegration energy-Low range α particles

Beta decay: Properties of β particles - General features of β ray spectrum – Pauli's hypothesis - Fermi's theory of β particles - Forms of interaction and selection rules - Fermi's and Gamow teller transition

Gamma decay: The absorption of γ rays by matter - Interaction of γ rays with matter - Measurement of γ ray energies - Dumont bent crystal spectrometer method-internal conversion – Applications.

UNIT -III

Nuclear models: Liquid drop model - Bhor Wheeler theory of fission - Condition for spontaneous fission - Activation energy-Seaborg's expression - Shell model: Explanation for magic numbers - Prediction of shell model -Prediction of spin and parity - Nuclear statistics - Magnetic moment of nuclei - Schmidt lines-Nuclear isomerism - Collective model: Explanation of Quadrupole moments - Prediction of sign of electric quadrupole moments. Optical model: Nilsson model - Elementary ideas

UNIT - IV

Nuclear reactions: Nuclear fission and fusion - Kinds of reaction and conservation laws - energetics of nuclear reaction – Applications of Nuclear Energy – Nuclear Reactors - Isospin - Reaction cross section-Continuum theory of nuclear reaction - Resonance - Briet Wigner Dispersion formula - Stages of nuclear reaction - Statistical theory of nuclear reaction - Evaporation probability and cross section – Kinematics of stopping and pickup reaction - Surface reaction

UNIT -V

High energy physics : Types of interaction in nature-typical strengths and time-scales, conservation laws, charge-conjugation, Parity and Time reversal, CPT theorem, GellMann-Nishijima formula, intrinsic parity of pions, resonances, symmetry classification of elementary particles, quark hypothesis, charm, beauty and truth, gluons, quarkconfinement, asymptotic freedom.

SUGGESTED BOOKS:

1. Pandya. M.L. and R. P. S. Yadav, 2004, Elements of Nuclear Physics, 1st edition KedarNath Ram Nath, Meerut.
2. Dayal. D.C., 4th edition 2011, Nuclear Physics, Himalaya Publishing House, New Delhi.

3. Kenneth S.Karne, , 1st edition, 2008, Introducing Nuclear Physics, John Wiley and Sons, New York.
4. Sharma. D.C 2004, Nuclear Physics, - K. Nath& Co, Meerut.
5. Bernard L. Cohen, , 1st edition, 2011, Concept of Nuclear Physics, Tata McGraw Hill, New Delhi.
6. Devanathan V.,2ndedition, 2008, Nuclear Physics, Narosa Book Distributers Pvt. Ltd., New Delhi.
7. Kaplan Irving, 2002, Nuclear Physics, 2nd Edition, Narosa Book Distributers Pvt. Ltd., New Delhi.
8. https://nptel.ac.in/courses/115103101/
9. https://nptel.ac.in/courses/115104043/

SEMESTER II

		L T P C
16PHP204	**SPECTROSCOPY**	**4 - - 4**

Course Objectives

- This paper gives an insight into the theoretical and practical aspects of spectroscopy. it is used as a tool for non-destructive testing of samples. It is important to know the physical aspects of spectroscopy.
- The major objectives of this course are to integrate theory and practice and to bring together different branches of both Academic studies and Industrial Research through the presentation of critical aspects of modern Spectroscopy.
- The course will provide a valuable theoretical introduction and an overview of modern topics in spectroscopy, which are of current interest and importance in Semiconductor Industry and Biomedicine.
- To give an understanding of wide range of techniques including optical Nearfield spectroscopy, X-ray, Raman, and FTIR spectroscopy.
- To introduce optical spectroscopy methods that are widely used in physics, chemistry and biological sciences
- To teach the basic aspects of nuclear magnetic resonance (NMR) spectroscopy.

Course Outcomes

After successfully completed course, student will be able to

1. Student shows interest in the phenomenon of the interaction of light with matter in terms of the relationship with the molecular structure
2. Understand quantum chemical principles
3. Student will know the basic physical chemistry law that govern molecular spectroscopy
4. Student will know basic information on molecular methods (IR, Raman, UV-VIS, NMR, EPR)
5. Student will be able to select molecular spectroscopy methods suitable for solving given scientific problem
6. Student will be able to analyze results of measurements using molecular spectroscopy

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UNIT- I

Atomic spectra: Hydrogen spectra – Angular momentum – Larmor precession – Spin-orbit interactions - Spectra of alkali metals – Energy level and spectral transitions of Helium - Normal Zeeman effect – Anomalous Zeeman effect – Paschen back effect – Inference of nuclear spin - Hyperfine structure of spectral lines – Stark effect – Characteristic X-ray spectra

Microwave spectra: Classification of molecules – Interaction of radiation with rotating molecule – Rotational spectra of rigid diatomic molecule – Isotopic effect – Non-rigid rotator – Linear, symmetric and asymmetric top molecules – Quadrapole hyperfine interaction – Microwave spectrometer

UNIT- II

I.R spectroscopy: Practical aspects – Theory of I.R rotation vibration spectra of gaseous diatomic molecules – applications of I.R spectroscopy – Basic principles of F.T.I.R spectroscopy

Raman spectroscopy: Classical and Quantum theory of Raman effect - Rotation vibration Raman spectra of diatomic and polyatomic molecules – Applications - Laser Raman spectroscopy - Surface Enhanced Raman Scattering.

UNIT -III

Electronic spectra: Electronic excitation of diatomic species - Vibrational analysis of diatomic molecules - Deslandre's table - Intensity distribution Frank Condon principle - Rotational structure of electronic bands - Resonance and Normal Fluorescence – Intensities of transitions - Phosphorescence population of triplet state and intensity- Experimental methods - Applications of Fluorescence and phosphorescence.

UNIT- IV

NMR Spectroscopy: Quantum mechanical and Classical description - The Bloch equation - Relaxation process - the experimental technique - Principle and working of high resolution NMR Spectrometer - Chemical shift – Applications of NMR

NQR Spectroscopy: Fundamental requirements - General principle - Experimental detection of NQR frequencies – Interpretation and chemical explanation of NQR spectroscopy – Applications of NQR

UNIT - V

ESR Spectroscopy: Basic principles of ESR - Experiments – ESR spectrometer reflection cavity and microwave bridge – ESR spectrum hyperfine structure - Study of free radicals – Applications of ESR

MOSSBAUER Spectroscopy: The Mossbauer effect- the recoilless emission and absorption of - Mossbauer spectrum – Experimental methods- Hyperfine interaction - Chemical Isomer Shift – Magnetic hyperfine and electric quadrupole interaction.

SUGGESTED BOOKS:

1. Aruldhas. G., 2008, Molecular Structure and Spectroscopy, 2nd Edition, Prentice Hall of India, New Delhi
2. Straughan.B.P. and S. Walker, 2000, Spectroscopy: Volume 1, Chapman and Hall Ltd, London. (for Unit I)
3. Straughan.B.P. and S. Walker, 2012, Spectroscopy: Volumes 2 & 3, Chapman and Hall Ltd, London.

4. CollenN.Banwell, 4th edition 2007, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill, New Delhi.
5. Chatwall and Anand, 2004, Atomic and Molecular Spectroscopy, 5th Edition, Himalaya Publishing House, New Delhi.
6. https://nptel.ac.in/courses/104101099/
7. https://nptel.ac.in/courses/104102113/

SEMESTER – II

16PHP205A	DIGITAL SIGNAL PROCESSING	L T P C 4 - - 4

Course Objectives

- Digital processing of signals has an extensive range of applications, from the military to the medical, from entertainment to mass production.
- The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis DSP systems.
- This course provides areas of application the advent of these specially designed DSP devices has started a revolution in engineering which will pervade most areas of modern life.
- To make students familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.
- To make students aware about the meaning and implications of the properties of systems and signals.
- To give idea about different classifications of signals, different methods of recording and processing.

.

Course Outcomes (COs)

After completing the course the students will/can able to

1. Determine the spectral coefficients and the Fourier series components of discrete-time signals.
2. Determine the frequency response and the z-transform of discrete-time systems.
3. Determine the discrete Fourier transform of discrete-time signals.
4. Calculate the outputs of discrete-time systems in response to inputs.
5. Understand the characteristics field effect transistors
6. Analyze the characteristics of oscillators and wave shaping circuits

UNIT - I

Introduction:

Signals and systems - Classification of signals - Concept of frequency in continuous time and discrete– time signals. Theory of A/D and D/A conversion - Sampling of analog signals -sampling theorem - Quantization of continuous amplitude signals - Quantization of sinusoidal signal - Coding of quantized – samples - Digital to analog conversion

UNIT - II

Discrete- time signals and systems:

Discrete - time linear time-invariant systems-Techniques of analysis of linear systems - Resolution of a discrete time signal into impulses - Response of LTI systems to arbitrary inputs :Convolution sum - Properties of convolution and the interconnection of LTI systems - Casual LTI systems Stability of LTI systems - Systems with finite duration and infinite duration impulse – response

UNIT - III

The Z-transform:

The Direct Z-Transform - The Inverse Z-Transform - Properties of Z-transform - Rational Z-transforms - Poles and zeros - Inversion of Z-transforms. The inverse Z-Transform by contour integration - Power series expansion - Partial fraction expansion – Decomposition of rational Z-transform – Analysis of linear time invariant systems in the Z-domain – one sided Z-Transform.

UNIT - IV

Frequency Analysis of Signals and Systems:

Frequency analysis of continuous - time signals. The Fourier Series for continuous Time Periodic Signals - Power Density Spectrum of Periodic Signals - The Fourier Transform of Continuous - Time Aperiodic Signals - Energy Density Spectrum of Aperiodic Signals - Frequency analysis of discrete time signals – The Fourier Series for discrete time Periodic Signals - Power Density Spectrum of Periodic Signals – Fourier transform for discrete time Aperiodic signal - Convergence of the Fourier Transform - Energy Density Spectrum of Aperiodic signals - Relationship of the Fourier Transform to the Z Transform.

UNIT - V

Discrete Fourier Transform:

Frequency domain sampling and reconstruction of discrete time signals – The Discrete Fourier transform – DFT as a linear transformation - Relationship of the DFT to the other transforms. Properties of DFT - Multiplication of two DFTs and Circular convolution - Linear filtering methods based on DFT - Frequency analysis of signals using the DFT – Discrete cosine transform - Computation of the Discrete Fourier Transform

SUGGESTED BOOKS:

1. Oppenheim & Schafer, , 1st edition, Digital Signal Processing, Prentice Hall India –1999
2. Paulo S.R. Piniz, Eduardo A.B. De Silva and Sergio Netto,2nd+ edition, 2010, Digital Signal Processing, Cambridge University Press
3. Rabiner& Gold, , 1st edition ,Theory and Applications of Digital Signal Processing, Prentice Hall India -2011.
4. Fundamentals of signals and systems, P.D. Cha and J.I. Molinder, 2007, Cambridge
5. University Press, Digital Signal Processing Principles Algorithm & Applications, J.G.

6. Proakis and D.G. Manolakis, 2007, 4th Edn., Prentice Hall.
7. Fundamentals of Digital Signal processing using MATLAB, R.J. Schilling and S.L.
8. Harris, 2011, Cengage Learning, Digital Signal Processing , J.G. Proakis and D.G. Manolakis, 2013., Prentice.
9. http://nptel.iitm.ac.in/video.php?subjectId=10810505520
10. https://nptel.ac.in/courses/104/106/104106122/
11. https://nptel.ac.in/courses/104101099/
12. http://nptel.iitm.ac.in/video.php?subjectId=10810505520.

SEMESTER – II

		L T P C
16PHP205B	**COMPUTATIONAL PHYSICS**	**4 - - 4**

Course Objectives

- Computational physics may be broadly defined as 'the science of using computers to assist in the solution of physical problems, and to further physics research.
- To equip the students of M.Sc. Physics with knowledge of programming in C, roots of equation, interpolation, curve fitting, numerical differentiation, numerical integration, solution of ordinary differential equations
- To introduce students to computational methods for simulating physical systems and solving problems arising in physics and astronomy, as well as in other related fields
- Computers now play a role in almost every branch of physics like large scale quantum mechanical calculations in nuclear, atomic, molecular and condensed matter physics, large scale calculations in such fields as hydrodynamics, astrophysics, plasma physics, meteorology and geophysics etc.
- The huge increase in the power of computers in recent years has made an impact on the role of computational physics.
- This paper gives idea about different types of computations involved in Physics, like curve fitting, interpolation, extrapolation, numerical calculations etc.

Course Outcomes (COs)

At the end of the course students should be able to:

1. The students programming tactics, numerical methods and their implementation like applying to problem in physics, including modeling of classical physics to quantum system as well as data analysis (Linear and non linear) will be improved.
2. Use analysis techniques for propagating error, representing data graphically. Create, solve and interpret basic mathematical tool.
3. independently program computers using leading-edge tools,
4. formulate and computationally solve a selection of problems in physics,
5. Use the tools, methodologies, language and conventions of physics to test and communicate ideas and explanations.
6. Identify and describe the characteristics of various numerical methods.

UNIT - I

Curve Fitting

The least squares method for fitting a straight line, parabola, power and exponential curves with the help of principle of least square fit.

UNIT - II

Interpolation

Introduction to finite difference operators - Newton's forward and backward difference interpolation formulae - Lagrange's interpolation formula - Newton's divided difference formula with error term - interpolation in two dimensions - Cubic spline interpolation end conditions. Statistical tests - Ψ^2- test and T-test.

UNIT - III

Numerical Differentiation and Integration

Numerical differentiation - errors in numerical differentiation - cubic spline method - finding maxima and minima of a tabulated function - Integration of a function with Trapezoidal Rule - Simpson's 1/3 and 3/8 Rule and error 55 associated with each - Romberg's integration - Gaussian integration method - Monte Carlo evaluation of integrals - numerical double integration

Unit IV

Numerical Solution of Ordinary Differential Equations

Euler method - modified Euler method and Runge - Kutta 4^{th} order methods - adaptive step size R-K method - predictor - corrector methods - Milne's method - Adam-Mouton method.

Numerical Solution of System of Equations

Gauss-Jordan elimination Method - Gauss-Seidel iteration method – Gauss elimination method and Gauss-Jordan method to find inverse of a matrix - Power method and Jacobi's method to solve eigenvalue problems.

Unit V

Numerical solutions of partial differential equations

Elementary ideas and basic concepts in finite difference method – Schmidt Method - Crank - Nicholson method - Weighted average implicit method - Concept of stability.

SUGGESTED BOOKS:

1. G. ShankerRao, K. Keshava Reddy, Mathematical Methods, I.K. , 1st edition 2009, International Publishing House, Pvt. Ltd.
2. S.S. Sastry,5th edition 2013, Introductory Methods of Numerical Analysis, PHI Pvt. Ltd.
3. Tao Pang, , 1st edition , 2006.An Introduction to Computational Physics, Cambridge University Press
4. https://nptel.ac.in/courses/115106118/
5. https://nptel.ac.in/courses/115104095/

SEMESTER – II

		L T P C
16PHP205C	**THIN FILM PHYSICS**	**4 - - 4**

Course Objectives

- The objectives of this course are:
- Introduce physical concepts and mathematical tools used to describe surfaces, interfaces and thin films.
- To develop an intuition for surface and thin film physical principles through plotting of functions using Maple
- To relate the mathematical results to practical applications and experiments in thin film techniques.
- Develop an appreciation of the mathematical basis for experimental techniques for deposition and analysis of thin films
- Understand physical phenomena that can be exploited for the deposition of thin films
- To demonstrate knowledge of different thin film deposition strategies

Course Outcomes (COs)

At the end of the course, the students will /can be able to

1. discuss the differences and similarities between different vacuum based deposition techniques,
2. evaluate and use models for nucleating and growth of thin films,
3. asses the relation between deposition technique, film structure, and film properties, discuss typical thin film applications,
4. Motivate selection of deposition techniques for various applications.
5. the basic concepts about the thin film technology
6. The importance of use of thin films in application and research.

UNIT - I: Preparation of Thin Films

Spray pyrolytic process – characteristic feature of the spray pyrolytic process – ion plating – Vacuum evaporation – Evaporation theory – The construction and use of vapour sources – sputtering Methods of sputtering – Reactive sputtering – RF sputtering - DC planar magnetron sputtering.

UNIT - II: Thickness measurement and Nucleation and Growth in Thin Film

Thickness measurement: electrical methods – optical interference methods – multiple beam interferometry – Fizeau – FECO methods – Quartz crystal thickness monitor.

Theories of thin film nucleation – Four stages of film growth incorporation of defects during growth.

UNIT - III: Electrical properties of metallic thin films

Sources of resistivity in metallic conductors – sheet resistance - Temperature coefficient of resistance (TCR) – influence of thickness on resistivity – Hall effect and magneto resistance – Annealing – Agglomeration and oxidation.

UNIT - IV: Transport properties of semiconducting and insulating Films

Semiconducting films; Theoretical considerations - Experimental results – Photoconduction – Field effect thin films – transistors, Insulation films Dielectric properties – dielectric losses – Ohmic contracts – Metal – Insulator and Metal – metal contacts – DC and AC conduction mechanism .

UNIT - V: Optical properties of thin films and thin films solar cells

Thin films optics –Theory – Optical constants of thin films – Experimental techniques – Multilayer optical system – interference filers – Antireflection coating, thin films solar cells: Role, Progress, and production of thin solar cells – Photovoltaic parameter, thin film silicon (Poly crystalline) solar cells : current status of bulk silicon solar cells – Fabrication technology – Photo voltaic performance: Emerging solar cells: GaAs and $CulnSe_2$.

SUGGESTED BOOKS:

1. Meissel. L.T and R. Glang., 2000, Hand book of thin film technology, Tata McGraw Hill, New Delhi.
2. Anderson, J.C.2011Ist edition The use of thin films in physical investigation, Academic press
3. Berry,Hall and Harris.2003,illustrated edition Thin films technology,VanNostrand Reinhold publishing
4. Chopra, K.L. Ist edition 2004, Thin film Phenomena, McGraw hill
5. Chopra, K.L. and Das, S.R Ist edition2013 Thin films solar cells.springer
6. George Hass and others (Ed). Physics of thin films, vol. 12.Academic press 2001
7. Holland, L Ist edition 2004, Vacuum deposition of thin films.Weily Publication
8. https://nptel.ac.in/content/storage2/courses/112108092/module2/lec08.pdf
9. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/113104075/lec41.pdf

SEMESTER – II

L T P C

16PHP211 GENERAL PHYSICS PRACTICALS – II - - 4 2

Course Objectives

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To learn the usage of optical systems for various measurements.
- Apply the analytical techniques and graphical analysis to the experimental data.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.
- To emphasize the importance of measurement, which, is central topic to physics.
- To empower the student to acquire engineering skills and practical knowledge, which help the student in their everyday life.

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Course Outcomes (COs)

- The course is designed to train the students so that they can efficiently handle various instruments.
- Students will verify laws studied in the different theory course.
- Students will measure different properties of materials.
- Capable to classify the materials with the properties
- Will overcome the fear of experimental skill
- Capable to built his own equipments for measuring the properties of materials

ANY TEN EXPERIMENTS

1. Fabry – Perot interferometer – Determination of wavelength.
2. Arc spectra – Copper and Iron
3. Determination of V-I characteristics of a solar cell.
4. Susceptibility – Quinke's method
5. Susceptibility – Gouy method
6. Hall Effect
7. Measurement of resistivity and conductivity of dielectric using Four-probe apparatus.
8. Compressibility of a liquid – Ultrasonic Interferometer, and verify with Ultrasonic Diffractometer

9. Determination of Stefan's constant.
10. Laser Diffraction at sharp edge – Determination of wavelength.
11. Series LCR circuit: (i) Determination of the resonance frequency using variable frequency source, (ii) To study the resonance of LCR using AC mains.
12. Kelvin's double bridge – To measure low resistance.

SUGGESTED BOOKS:

1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
2. Singh S.P., 2003, Advanced Practical Physics – 1, 13th Edition, PragathiPrakashan, Meerut
3. Singh S.P., 2000, Advanced Practical Physics – 2, 12th Edition, PragathiPrakashan, Meerut
4. Gupta S.L. and V.Kumar, 2002, Practical Physics, 25th Edition, PragathiPrakashan, Meerut
5. https://nptel.ac.in/courses/115/105/115105110/

SEMESTER – II

		L T P C
16PHP212	**ELECTRONICS PRACTICALS – II**	**- - 4 2**

Course Objectives

- The course is designed to train the students so that they can efficiently handle various Instruments
- To understand the Biasing network for BJT and FET, transient analysis and frequency response of BJT and FET in single stage and multistage amplifier
- To understand the frequency response feedback amplifier using BJT and FET and Tuned amplifier
- To understand the operation of Oscillators and waveform generators
- To learn the usage of digital electronics measurements.
- To develop intellectual communication skills and discuss the basic principles of Scientific concepts in a digital electronics

Course Outcomes (COs)

After completing the course the students will/can able to

1. The course is designed to train the students so that they can efficiently handle various instruments.
2. Students will verify laws studied in the different theory course.
3. Students will measure different properties of materials.
4. Gain the knowledge in quantization of electromagnetic fields.
5. Analyze the characteristics of oscillators and wave shaping circuits
6. Understand the basic concepts of amplifiers and operational amplifiers

ANY TEN EXPERIMENTS

1. Characteristics and an application of SCR
2. Study of various types of flip-flops (R-S, J-K, Master Slave J-K)
3. Shift register – Digital IC's
4. Schmidt trigger
5. Op-amp – Simultaneous Addition and Subtraction
6. Op-amp – V to I, I to V converter
7. V-I characteristics of a schotkky diode
8. V-I characteristics of photoconductive diode.

9. Op-amp Log and Antilog amplifier.
10. Op-amp –Analog computation second order differential equation
11. Op-amp comparator – Zero crossing detector, Window detector, time marker
12. 555 Timer application – monostable, linear, Astablemultivibrators.
13. Virtual Lab (Flip flop, Logic gates)

SUGGESTED BOOKS:

1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
2. Singh S.P., 2003, Advanced Practical Physics – 1, 13th Edition, PragathiPrakashan, Meerut
3. Singh S.P., 2000, Advanced Practical Physics – 2, 12th Edition, PragathiPrakashan, Meerut
4. Gupta S.L. and V.Kumar, 2002, Practical Physics, 25th Edition, PragathiPrakashan, Meerut
5. https://nptel.ac.in/courses/122/106/122106025/

SEMESTER III

L T P C

16PHP301 QUANTUM MECHANICS – II 4 - - 4

Course Objectives

- The aim of this course is to make the students to understand the concepts of quantum physics and their applications in microscopic systems
- This course develops concepts in quantum mechanics such that the behaviour of the physical universe can be understood from a fundamental point of view.
- To acquire working knowledge of the Quantum Mechanics postulate on the physical systems
- This is a continuation of Quantum Mechanics – I. More detailed study of problems like scattering problem, relativistic quantum mechanics, quantum electrodynamics etc, are added in this paper to enrich the theoritical knowledge.
- To make the students capable of analyzing theoretical problems like interaction of particles, scattering of particles etc.
- To impart knowledge of advanced quantum mechanics for solving relevant physical problems

Course Outcomes (COs)

After completing the course the students will/can able to

1. Students will get the knowledge of non-relativistic and relativistic quantum mechanics including time-dependent perturbation theory, scattering theory, relativistic wave equations, and second quantization.
2. Students will be able to understand concepts and to perform calculations of scattering of particles.
3. Students will be able to understand and evaluate modern research utilizing quantum theory in condensed matter, nuclear and particle physics.
4. Acquire the basic knowledge on eigen values and eigen functions
5. Apply the Schrodinger wave equation to get eigen values of bound systems
6. Understand the matrix formulation in quantum mechanics
7. Acquire the basic knowledge on angular momentum of quantum mechanical systems

UNIT - I

Angular momentum: Angular momentum operators – Angular momentum commutation relations – Eigen values and Eigen functions of L^2 and L_z– General angular momentum – Eigen values of J^2 and J_z – Ladder operators (J_+ and J_-) – Angular momentum matrices – Matrices for J^2, J_z, J_+, J_-, J_x and J_y – Spin angular momentum – Spin ½ systems – Spin vectors for spin ½ systems – Addition of angular momentum – Clebsh-Gordan coefficients.

UNIT -II

Scattering: Scattering cross-section – Scattering amplitude – Partial waves – Scattering by a central potential: partial wave analysis – Significant number of partial waves – Scattering by an attractive square-well potential – Briet-Wigner formula – Scattering length – Expression for phase shift – Integral equation – The Born approximation – Scattering by screened coulomb potential – Validity of Born approximation - Laboratory and center of mass co-ordinate systems.

UNIT - III

Many Electron Problem: Indistinguishable particles, Pauli principle – Inclusion of spin – Spin functions for two electrons – Spin functions for three electrons – The Helium atom – Central field approximation – Thomas-Fermi model of the atom – Hartree equation – Hartree-Fock equation – Molecular orbital theory: Hydrogen molecule ion H_2^+- Valence bond theory – Heitler-London theory of hydrogen molecule.

UNIT - IV

Relativistic quantum mechanics: Klein-Gordan equation – Interpretation of the Klein-Gordan equation – Particle in a coulomb field – Dirac's equation for a free particle – Dirac matrices – Covariant form of Dirac equation – Probability density – Negative energy states – Spin of the Dirac particle – Magnetic moment of the electron – Spin-orbit interaction – Radial equation for an electron in a central potential – Hydrogen atom – Lamb shift.

UNIT - V

Field theory: Introduction – Classical approach to field theory – Relativistic Lagrangian and Hamiltonian of a charged particle in an electromagnetic field – Field: Lagrangian and Hamiltonian formulations – Quantum equation for the field – Second quantisation – Quantisation of non-relativistic Schroedinger equation – Creation, annihilation and number operators.

SUGGESTED BOOKS:

1. Aruldhas. G, 2008, Quantum Mechanics, 2nd Edition, Prentice-Hall of India, NewDelhi.
2. Gupta, Kumar and Sharma, 2002, Quantum Mechanics, 22nd Edition, Jai PrakashNath& Co, Meerut.
3. SatyaPrakash, 2003, Quantum Mechanics, New Edition KedarNath& Ram Nath& Co, Meerut.
4. Leonard Schiff, 2006, Quantum Mechanics, 3rd Edition, McGraw Hill International, Auckland.
5. Engen Merzbacher, 2014, Quantum Mechanics, 3rd Edition, Wiley, Weinheim.
6. Mathews. P.M. and K. Venkatesan, 2nd edition 2013, Textbook of Quantum Mechanics, McGraw Hill International, Weinheim.
7. Chatwal R.G. and Sk. Anand, 4theditin 2004, Quantum Mechanics, Himalaya Publishing House, New Delhi
8. Thangappan. V. K., 2nd edition 2007, Quantum Mechanics, Tata McGraw Hill, New Delhi
9. https://nptel.ac.in/courses/115102023/
10. https://nptel.ac.in/courses/122/106/122106034/
11. https://nptel.ac.in/courses/115/101/115101107/

SEMESTER III

		L T P C
16PHP302	**LASER AND ITS APPLICATIONS**	**4 - - 4**

Course Objectives

- Laser is a versatile tool with applications in almost all fields from medical to astronomy, communications, welding, cutting etc.
- This paper explains the characteristics of lasers, different types of lasers and their construction to apply for industircal use. Applications of lasers in different fields are also explained.
- To give exposure to students about the characteristics of different lasers, their fabrication techniques, applications etc.
- To make the student understand the principles of Lasers
- To enable the student to explore the field of Nonlinear optics
- To be able to apply the fundamental concepts of optics in lasers, optical fiber communications and optoelectronics

Course Outcomes (COs)

After completing the course the students can understand/able to

1. Acquire fundamentals and principles of Laser action : Understand the basic concepts of different types of lasers
2. Built own laser system with the available components
3. The effects of homogeneous and inhomogeneous line broadening, and the conditions for laser amplification.
4. Operate and basic properties of the most common laser types, He-Ne, Argon-ion, and carbon-dioxide, ruby, titanium sapphire, neodymium YAG and glass, knowledge of other main laser types.
5. Classify fibers as single-mode, multimode step index and multi-mode graded index.
6. Describe modes in multimode fibers and mode field parameter in single-mode fibers.

Unit- I

Laser Characteristics: Spontaneous and stimulated emission, Einstein's quantum theory of radiation, theory of some optical processes, coherence and monochromacity, kinetics of optical absorption, line broadening mechanism, Basic principle of lasers, population inversion, laser pumping, two & three level laser systems, resonator, Q-factor, losses in cavity, threshold condition, quantum yield.

Unit – II

Laser Systems: Solid state lasers- the ruby laser, Nd:YAG laser, ND: Glass laser, semiconductor lasers – features of semiconductor lasers, intrinsic semiconductor lasers, Gas laser - neutral atom gas laser, He-Ne laser, molecular gas lasers, CO2 laser, Liquid lasers, dye lasers and chemical laser.

Unit-III

Advances in laser Physics : Production of giant pulse -Q-switching, giant pulse dynamics, laser amplifiers, mode locking and pulling, Non-linear optics, Harmonic generation, second harmonic generation, Phase matching, third harmonic generation, optical mixing, parametric generation and self-focusing of light.

Unit – IV

Multi-photon processes; multi-quantum photoelectric effect, Theory of two-photon process, three-photon process, second harmonic generation, parametric generation of light, Laser spectroscopy : Rayleigh and Raman scattering, Stimulated Raman effect, Hyper-Raman effect, Coherent anti-stokes Raman Scattering, Photo-acoustic Raman spectroscopy.

Unit – V

Laser Applications – ether drift and absolute rotation of the Earth, isotope separation, lasma, thermonuclear fusion, laser applications in chemistry, biology, astronomy, engineering and medicine. Communication by lasers: ranging, fiber Optics Communication, Optical fiber, numerical aperture, propagation of light in a medium with variable index, pulse dispersion.

SUGGESTED BOOKS:

1. AjoyGhatak&Thyagarajan 2nd edition,2013,Laser Fundementals and applications Laxmi Publications (P) Ltd
2. Laud, B.B.:1st Edition 2011 Lasers and nonlinear optics, New Age Int.Pub.
3. Thyagarajan, K and Ghatak, A.K 2009: Lasers theory and applications Plenum press,
4. Ghatak, A.K.andThyagarajan, K :2010 Optical electronics CambridgeUniv. Press
5. Seigman, A.E.: Lasers (Oxford Univ. 2008)
6. Maitland, A. and Dunn, M.H. 2013 : Laser Physics N.H.Amsterdam.
7. Hecht, 4thedition 2012 Laser Guide book McGraw Hill, NY.
8. Demtroder, W. : Laser Spectroscopy (Springe series in chemical physics vol.5,Springe verlag, Berlin, 2014).
9. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cy13/

SEMESTER III

		L T P C
16PHP303	**ELECTROMAGNETIC THEORY AND ELECTRODYNAMICS**	**4 - - 4**

Course Objectives

- The aim of this course is to provide the students with the fundamental principles of electrical energy (electro- magnetism).
- To understand the propagation of waves in different media, its transmission and reception.
- To understand, develop, and design various engineering applications involving electromagnetic fields.
- To expose the students to the ideas of electromagnetic waves and structure of transmission line
- To obtain an understanding of Maxwell's equations and be able to apply them to solving practical electromagnetic fields
- To provide the understanding to the propagation of EM wave in free space, conductors & dielectrics.

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Course Outcomes (COs)

After completing the course the students will/can able to

1. Formulate potential problems within electrostatics, magnetostatics and stationary current distributions in linear, isotropic media, and also solve such problems in simple geometries using separation of variables and the method of images. .
2. Define and derive expressions for the energy both for the electrostatic and magnetostatic fields, and derive Poyntings theorem from Maxwells equations and interpret the terms in the theorem physically.
3. Understand the theories and properties of electrostatics
4. Analyze the interaction of electrostatic properties with matter.
5. Acquire the fundamental knowledge in Magnetostatics
6. Understand the basic concepts of electrodynamics

UNIT- I

Electrostatics: Electric intensity – Electric potential – Gauss Law - Dielectric and its polarization - Electric displacement D – Dielectric constant ε_r – Polarisibiltiyα - Clausius-Mossotti relation (Non-polar molecules) – The Langevin equation (Polar molecules) – Electrostatic energy

Magnetostatics: Current density J – Ampere's law of force – Biot-Savart law – Ampere's circuital law – Magnetic scalar potential ϕ_m (no applications) – Magnetic vector potential A –

Magnetisation and magnetization current – Magnetic intensity – Magnetic susceptibility and Permeability.

UNIT- II

Field Equations and Conservation Laws: Equation of continuity - Displacement currents - The Maxwell's equations derivations - physical significance - Poynting vector - Electro magnetic potentials A and ϕ - Maxwell's equations in terms of Electro magnetic potentials - Concept of gauge -Lorentz gauge - Coulomb gauge

UNIT- III

Propagation of Electromagnetic Waves: Electromagnetic waves in Free space - Isotropic dielectric - Anisotropic dielectric – Conducting media - Ionized gases.

Radiating systems: Oscillating electric dipole – Radiation from an oscillating dipole – Radiation from small current element.

UNIT- IV

Interaction of E.M.Waves with matter (Macroscopic): Boundary conditions at interfaces - Reflection and refraction – Frenel's laws-Brewster's law and degree of polarization - Total internal reflection and critical angle.

Interaction of E.M.Waves with matter (Microscopic): Scattering and Scattering parameters - Scattering by a free electron (Thomson Scattering) - Scattering by a Bound electron (Rayleigh scattering) – Dispersion Normal and Anomalous – Dispersion in gases (Lorentz theory) – Dispersion in liquids and solids.

UNIT – V

Relativistic Electrodynamics: Purview of special theory of relativity – 4-vectors and Tensors - Transformation equations for charge and current densities J and ρ – For electromagnetic potentials A and ϕ - Electromagnetic field tensor $F_{\mu\nu}$ - Transformation equations for the field vectors E and B - Covariance of field equations in terms of 4-vectors - Covariance of Maxwell equations in 4-tensor forms – Covariance and transformation law of Lorentz force.

SUGGESTED BOOKS:

1. Chopra &Agarwal 2004, Electromagnetic theory, 6th Edition, Nath& Co, Meerut.
2. Griffiths D., 2013, Introduction to Electrodynamics, 4th Edition, Printice Hall of India, New Delhi.
3. Jacson. J.D., 2009, Classical Electro dynamics, 3rd Edition, Willey Eastern, New Delhi.
4. Schwaritz. M. 2008, Principles of Electro dynamics, McGraw Hill, Auckland.
5. Jordon and Balmain 2ndedition 2002, EMW radiating systems, Prentice Hall of India Pvt Ltd, New Delhi.

6. Gupta, Kumar and Singh, 2007, Electro dynamics, 19th Edition, PragatiPrakasan, Meerut, New Delhi.
7. SatyaPrakash 10th revised 2003, Electromagnetic theory and Electro dynamics, KedarNath Ram Nath& Co, Meerut.
8. https://nptel.ac.in/courses/115101008/
9. https://nptel.ac.in/content/syllabus_pdf/104104085.pdf

SEMESTER III

		L T P C
16PHP304	**DIGITAL ELECTRONICS AND MICROPROCESSOR**	**4 - - 4**

Course Objectives

- Digital electronics is very important in present day life due to its applications in almost all fields of life. Any signals stored in memory are first digitized. So it is important to have knowledge about digital electronics.
- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.
- This paper is intended to give an insight into the theory and applications of digital electronics, design of circuits with digital devices, details of microprocessor and its applications.
- To learn interfacing of real world input and output devices.
- To study various hardware & software tools for developing applications

Course Outcomes (Cos)

After completing the course the students can / will able to

1. Acquire the basic knowledge of digital logic levels and application of digital electronics circuits.
2. Perform the analysis and design of various digital electronic circuits.
3. Acquired knowledge about Microprocessors and its need.
4. Ability to identify basic architecture of different Microprocessors.
5. Foster ability to write the programming using 8085 microprocessor.
6. Foster ability to understand the internal architecture and interfacing of different peripheral devices with 8085 Microprocessor.

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UNIT I

Flip Flops : SR, JK, JK Master Slave, T Flip flop & D Flip Flop (Symbol and Truth table)Registers (Types, shift operations) - Counters (Types, Designing of MOD 5 synchronous Counter, Construction and truth table - verification of MOD 16 Asynchronous UP, Down counter) - Multiplexer And demultiplexer (16:1 and 1:16 description and truth table verification) - Decoders and encoders (Definitions, Seven segment decoder, decimal to BCD encoder)

UNIT ll

Special Function ICs: Timer IC 555 (Block diagram, pin description) , Application as Astable, monostable, bistablemultivibrator - VCO IC 566 (Block diagram and pin description) - PLL IC

565 (Block diagram and pin description) - Fixed voltage Regulator ICs 7800 and 7900 series - Voltage Regulator IC 723 (description, designing for low and high voltage)

UNIT III

Microprocessor: Microprocessor Architecture, Pin out configuration of 8085-bus organization and timings –address bus, data bus, multiplexing address/data bus and control and status signal, Interrupts: maskable and non-maskableinterrupt(concept),8085 interrupt.

UNIT IV

Programming Model of 8085 : Instruction set-Data transfer ,arithmetic, logical and branch instruction-Addressing modes -16 bit data transfer and memory related instructions-stack and subroutine instructions.

Simple Program: 8 bit addition-subtraction-multiplication- finding largest and smallest number, ascending and descending order, 16 bit addition,

UNIT V

Interfacing Peripherals and Applications: Interfacing concepts-peripheral I/O instructions-Interfacing programs- Data Converters, LED interfacing, stepper motor interfacing, Hex Keyboard Interfacing.

SUGGESTED BOOKS:

1. Floyd, 2003, Digital Fundamentals, 8th Edition, Pearson education, New Delhi.
2. Ramesh Gaonkar 6th edition 2013 Microprocessor Architecture, Programming and Applications with 8085, PENRAM International P Ltd
3. Malvino and Leach, 2006, Digital Principles and Applications, 3rd Edition, Tata McGrawHill, New Delhi.
4. Aditya P. Mathur, 24th reprint 2006, Introduction to Microprocessor, 3rd Edition, Tata McGrawHill, New Delhi.
5. Morris Mano. M, 1st 2002, Digital Logic and Computer Design, Prentice Hall, New Delhi.
6. https://nptel.ac.in/courses/117103064/
7. https://nptel.ac.in/courses/117106086/

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SEMESTER – III

		L T P C
16PHP305A	**NANOSTRUCTURE AND CHARACTERIZATION**	**4 - - 4**

Course Objectives

- This course introduces the fundamentals of nano-scale engineering and manufacturing.
- Current and future applications of nanostructured materials will be reviewed with respect to their impact in commercial products and technologies.
- The main physical forces controlling the nucleation and deposition of nanostructures will be presented allowing a better understanding of key design factors at the nano-scale.
- Well-established and novel synthesis/fabrication methods
- Nanostructures will be critically discussed giving a broad overview of the state-of-the-art nanomanufacturing processes.
- To foster the creation of new and relevant technologies and to transfer them to industry for effective utilization of nano materials
- To participate in the planning and solving of engineering and managerial problems of relevance to global industry and to society at large by conducting basic and applied research in the areas of nano technologies

Course Outcomes (COs)

At the end of the course, Students will understand and:

1. Explain the fundamental principles of nanotechnology and their application to biomedical engineering.
2. Apply engineering and physics concepts to the nano-scale and non-continuum domain.
3. Identify and compare state-of-the-art nanofabrication methods and perform a critical analysis of the research literature.
4. Design processing conditions to engineer functional nanomaterials.
5. Evaluate current constraints, such as regulatory, ethical, political, social and economical, encountered when solving problems in living systems.
6. Motivate selection of deposition techniques for various applications

UNIT - I

Low Dimensional Structures

Preparation of quantum nanostructures - size and dimensionality effects - size effects - potential wells - partial confinement - conduction electrons and dimensionality - Fermi gas and density of states - properties dependent on density of states - excitons - single-electron tunneling - Aplications - infrared detectors - quantum dot lasers - superconductivity. Microelectromechanical Systems (MEMS) - Nanoelectromechanical Systems (NEMS) –Fabrication of nanodevices and nanomachines - Molecular and Supramolecular Switches.

UNIT - II

Carbon Nanostructures

Carbon Molecules - Nature of the Carbon Bond - New Carbon Structures - Carbon Clusters -Small Carbon Clusters - Carbon Nano tubes - Fabrication - Structure – Electrical Properties - Vibrational Properties – Mechanical Properties - Applications of Carbon Nano Tubes - Computers - Fuel Cells - Chemical Sensors - Catalysis – Mechanical Reinforcement - Field Emission and Shielding. Solid Disordered Nanostructures - Methods of Synthesis - Failure Mechanisms of Conventional Grain sized Materials – Mechanical Properties – Nano structured Multi layers -Electrical Properties – Porous Silicon - Metal Nano cluster - Composite Glasses.

UNIT - III

Thermal, Microscopic and Infrared Analysis

Thermal analysis – DTA, DSC and TGA – methodology of DTA, DSC and TGA and Instrumentation.Microscopy – Electron microscopy – Principles and instrumentation – resolution limit – scanning tunnelling microscopy – principles – scanning tunnelling microscope - SEM & TEM. Atomic force microscope

UNIT - IV

Instrumentation

IR spectrophotometers – Theory and Instrumentation- Applications. Fourier transform techniques – FTIR principles and instrumentation. Raman spectroscopy – Principles, Instrumentation and Applications. Microwave Spectroscopy -Instrumentation and Applications

UNIT - V

Mass Spectrometry, Resonance Spectroscopy

Mass Spectrometry - Principle – Instrumentation – Types of ions produced in a Mass spectrometer - Interpretation of Mass spectra – Applications. NMR – Principles and Instrumentation – Chemical shift - Spin-spin coupling - Applications of NMR - Electron spin resonance spectrometry – Theory of ESR –Instrumentation - Interpretation of ESR spectra - Applications.

SUGGESTED BOOKS:

1. Charles P. Poole, Jr. and Frank J. Owens, Istedition 2003, Introduction to Nanotechnology,Wiley,
2. Cornelius T Leondes, MEMS/NEMS: micro electro mechanical systems/nano electromechanical systems Volume 1, Design Methods, Springer, (2006).
3. G. Chatwal& Sham Anand, 5th edition 2013, Instrumental methods of Chemical Analysis, Himalaya
4. Norman D Colthup, Lawrence H Daly and Stephen E Wiberley, 2001 Introduction to Infrared and Raman spectroscopy, Academic press, NY.

5. H.H. Willard, L.L. Merrit, J.A.Dean& F.A. Settle,7th Instrumental methods of analysis, CBS Pub.
6. https://nptel.ac.in/courses/118104008/
7. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/118104008/lec10.pdf

SEMESTER III

		L T P C
16PHP305B	**SOLAR ENERGY AND ITS UTILIZATION**	**4 - - 4**

Course Objectives

- Solar energy harvesting and utilizing for day to day purposes has become order of the day. The scarcity and increasing need of the fossil fuel has made man to think about alternate sources, the easiest and best being Solar energy. Hence the course introduced to get knowledge of solar energy and its utilization.
- To introduce the students to the world of solar energy, its different uses, the different methods of harvesting solar energy.
- To understand the basic concepts of energies produced from various energy sources, advantages and disadvantages
- To facilitate the students to achieve a clear conceptual understanding of technical and commercial aspects of Solar Power Development and Management.
- To enable the students to develop managerial skills to assess feasibility of alternative approaches and drive strategies regarding Solar Power Development and Management.
- To develop a comprehensive technological understanding in solar PV system components

Course Outcomes (COs)

After completing the course the students can / will be able to

1. Impart the knowledge of Storage technologies form the autonomous renewable energy sources.
2. Explain the principles that underlie the ability of various natural phenomena to deliver solar energy.
3. Discuss the positive and negative aspects of solar energy in relation to natural and human aspects of the environment.
4. Understand the basic principles in wind energy conversion and advantage and disadvantage of wind energy conversion systems.
5. Gain the knowledge about the energy produced from biomass and biogas.
6. Understand the concepts of solar cell and solar energy

Unit -1

Introduction to Energy Sources: World Energy Features, Indian Energy Scene, Conventional and non-conventional energy sources, Prospects of renewable energy sources.

Solar Energy Source: Introduction, Solar constant, radiation on Earth’s surface, Radiation geometry, Radiation measurements, Radiation data, Average solar radiation, radiation on tilted surfaces

Unit – II

Solar Energy collectors : Principle of conversion of energy, Flat plate collector, Transmissivity of cover system, Collector energy balance equation, Thermal Analysis of FPC, Useful heat gain, Focusing collectors, advantages and disadvantages, Factors affecting collector performance.

Application of Solar Energy: Solar Water Heating, Heating and Cooling of Buildings, Thermo electric conversion, Power generation, PV cells, Solar distillation, Pumping, Cooking, Hydrogen production.

Unit – III

Wind Energy: Principle of energy conversion, Power generation, Forces on blades, energy estimation, Wind data, Components of WECS, Classification of WECS, Advantages and Disadvantages, Types of Wind machines, Performance of Wind machines, Applications of wind energy.Problems

Energy from Biomass: Conversion technology, Factors affecting gas generation, classification of biogas plants, Advantages and disadvantages of different types of plants.

Unit – IV

Fuel Cells: Design and Principle of operation, Classification, Types, Advantages and disadvantages, Conversion efficiency, Types of electrodes, Work output and EMF of Fuel Cells, Applications of Fuel Cells.

Thermo Nuclear Fusion Energy: Fusion Reactions, Requirements, Plasma, Magnetic and Inertial Confinement fusion, Muon Catalyzed Fusion, Characteristics of D-T Reaction, Advantages of Nuclear Fusion, Fusion Hybrid, Cold Fusion.

Unit – V

Principles of working: Geothermal, OTEC, Tidal, Waves, and Hydrogen (Generation and Application)

SUGGESTED BOOKS:

1. G.D.Rai, 2011 ,Non conventional energy sources, Khanna Publishers
2. S.P.Sukhatme. 2008 , Solar Energy, Tata McGraw-Hill Publishing Co. Ltd.
3. G.D.Rai.,2002 , Solar Energy, Khanna Publishers.
4. D. Mukherjee and S. Chakrabarti, 2005 ,Fundamentals of Renewable Energy Systems, New Age International Publishers.
5. D.S. Chauhan and S.K.Srivastava. 2004,Non Conventional Energy Resources, New Age International Publishers.
6. https://nptel.ac.in/courses/112105050/
7. https://nptel.ac.in/courses/115107116/

SEMESTER – III

		L T P C
16PHP305C	**OPTOELECTRONICS**	**4 - - 4**

Course Objectives

- The aim of this course focuses to enable the students to understand optics and nonlinear optics concepts in physics
- Optoelectronics is the science that deals with designing devices that can detect or emit light in any part of the spectrum.
- This paper gives an introduction to semiconductors and light. The application of optics in electronics, usage of optical waves in communications, optical fibers are explained in this paper.
- This course builds on the basic knowledge of both fundamental physics and state-of-the art technologies for optoelectronic components and fibre optics, in order to understand their important applications in optical communications and energy conversions that influence our society and everyday life
- To focuse on the physics of the interaction of photons with semiconductor materials.
- To give adequate knowledge and clear understanding about the fundamentals of optical property.

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Course Outcomes (COs)

After completing the course / the students will/can able to

1. The students are conversant with the application of optical properties and processes in semiconductor optical sources.
2. The students understand the operation of LEDs and lasers.
3. The students are familiar with the structures and performance of LEDs and lasers.
4. Apply the knowledge of laser in holography
5. Gain the knowledge in Fourier optics and Fourier transforming properties of lenses
6. Understand the concepts of nonlinear optics and harmonic generations.

UNIT - I

Semiconductor Science and Light Emitting Diodes

Semiconductor energy bands - semiconductor statistics – extrinsic semiconductors – compensation doping – degenerate and non degenerate semiconductors – energy band diagrams in applied field - direct and indirect bandgap semiconductors, - p-n junction principles - open circuit- forward and reverse bias – depletion layer capacitance – recombination life time – p-n junction band diagram - open circuit - forward and reverse bias – light emitting diodes – principles - device structures - LED materials, heterojunction high intensity LEDs – double heterostructure – LED characteristics and LEDs for optical fiber communications - surface and edge emitting LEDs.

UNIT - II

Fiber Optics

Symmetric planar dielectric slab waveguide – waveguide condition – single and multimode waveguides – TE and TM modes – modal and waveguide dispersion in the planar waveguide – dispersion diagram – intermodal dispersion – intramodal dispersion – dispersion in single mode fibers – material dispersion – waveguide dispersion – chromatic dispersion – profile and polarization dispersion – dispersion flattened fibers - bit rate and dispersion – optical and electrical bandwidth – graded index optical fiber - light absorption and scattering – attenuation in optical fibers.

UNIT - III

Laser Principles

Laser oscillation conditions - diode laser principles - heterostructure laser diode – double heterostructure – stripe geometry – buried heterostructure – gain and index guiding - laser diode characteristics – laser diode equation - single frequency solid state lasers – distributed feedback – quantum well lasers - vertical cavity surface emitting laser - optical laser amplifiers.

UNIT - IV

Photodetectors and Photovoltaics

Principle of p-n junction photodiode - Ramo's theorem and external photocurrent - absorption coefficient and photodiode materials – quantum efficiency and responsivity - PIN-photodiode – avalanche photodiode – phototransistor - photoconductive detectors and photoconductive gain – noise in photo-detectors – noise in avalanche photodiode - solar energy spectrum - photovoltaic device principles – I-V characteristics - series resistance and equivalent circuit - temperature effects - solar cell materials, device and efficiencies

UNIT - V

Optoelectronic Modulators

Optical polarization, birefringence, retardation plates, electro-optic modulators – Pockels effect - longitudinal and transverse electro-optic modulators, Kerr effect, Magneto-optic effect, acousto-optic effect – Raman Nath and Bragg-types.

Non-linear optics

Wave propagation in an anisotropic crystal - polarization response of materials to light - second order non-linear optical processes – second harmonic generation - sum and frequency generation, optical parametric oscillation - third order non-linear optical processes - third harmonic generation - intensity dependent refractive index - self-focusing - non-linear optical materials, phase matching - angle tuning - saturable absorption - optical bistability - two photon absorption.

SUGGESTED BOOKS:

1. AjoyGhatak&Thyagarajan 2nd edition,2013,Laser Fundementals and applications Laxmi Publications (P) Ltd
2. William T. Silfvast, Laser fundamentals, CUP 2nd Edn. 2009.
3. Pallab Bhattacharya, 2nd edition Semiconductor optoelectronic devices: Pearson(2008)
4. Jasprit Singh,1st edition2014 Optoelectronics: An introduction to materials and devices, McGraw Hill International Edn.
5. A.Yariv and P. Yeh,1st edition 2003 Optical waves in crystals: Propagation and Control of Laser Radiation, John Wiley and Sons Pub.

SEMESTER – III

16PHP311	ADVANCED PHYSICS PRACTICALS	L T P C
		- - 4 2

Course Objectives

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- The course is designed to train the students so that they can efficiently handle various Instruments
- To learn the usage of optical systems for various measurements.
- Apply the analytical techniques and graphical analysis to the experimental data.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.
- To understand the programming knowledge in MATLAB for various physics problems and electronic circuits
  .

Course Outcomes (COs)

After completing the course the studend can / will able to

1. The course is designed to train the students so that they can efficiently handle various instruments.
2. Students will verify laws studied in the different theory course.
3. Students will measure different properties of materials.
4. Gain the knowledge in quantization of electromagnetic fields.
5. Analyze the characteristics of oscillators and wave shaping circuits
6. Understand the basic concepts of amplifiers and operational amplifiers

ANY TEN EXPERIMENTS

1. Arc spectra – Aluminium and Brass
2. (i) Determination of wavelength of He-Ne laser – Ruler method.

   (ii) Determination of thickness of a wire using He-Ne laser.
3. Determination of e/m using Zeeman effect.
4. Measurement of thickness of a thin film using MBI technique.
5. G.M.Counter – Characteristics.
6. Experiment on rotatory dispersion of quartz.
7. Matlab Programming-Radioactive Decay
8. Matlab Programming-Numerical Integration

9. Matlab Programming-Double Integration
10. Matlab Programming-Solution of Ordinary Differential Equations
11. Matlab Programming-Computer Simulation of Equations of Motion for a System of Particles
12. Matlab Programming-Computer Simulation of 1-D and 2-D Lattice Vibrations
13. Matlab Programming-Computer Simulation of Kronig-Penney Model

SUGGESTED BOOKS:

1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
2. Singh S.P., 2003, Advanced Practical Physics – 1, 13th Edition, PragathiPrakashan, Meerut
3. Singh S.P., 2000, Advanced Practical Physics – 2, 12th Edition, PragathiPrakashan, Meerut
4. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ge05/
5. https://nptel.ac.in/courses/111/102/111102137/

SEMESTER – III

16PHP312	ADVANCED ELECTRONICS PRACTICALS	L T P C - - 4 2

Course Objectives

- To introduce different integrated circuit for students to understand the application to electronics circuits
- To understand the Biasing network for BJT and FET, transient analysis and frequency response of BJT and FET in single stage and multistage amplifier
- To understand the frequency response feedback amplifier using BJT and FET and Tuned amplifier.
- This course introduces the assembly language programming of 8085 Microprocessor. It gives a practical training of interfacing the peripheral devices with the 8086 microprocessor.
- To design and construction of circuits using analog component and trouble shooting of the circuits.
- To provide the real time experience on microprocessor in traffic signal and industry

Course Outcomes (COs)

On completion of this lab course the students will be able to:

1. Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller.
2. Work with standard microprocessor real time interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters;
3. Troubleshoot interactions between software and hardware;
4. Analyze abstract problems and apply a combination of hardware and software to address the problem
5. Students will practically study the working of different electronic components circuits.
6. Learn to minimize contributing variables and recognize the limitations of the equipment.
7. Design and construction of circuits using analog component and trouble shooting of the circuits.

ANY TEN EXPERIMENTS

1. Microprocessor – LED interfacing, Musical tone generator interface
2. Microprocessor – Stepper motor interfacing, ADC interface wave form generation
3. Microprocessor –Traffic control simulation
4. Microprocessor –Hex Key board interfacing

5. Multiplexer and de-multiplexer
6. Ring counter using IC's
7. 4-bit binary adder
8. 4-bit binary subtracter
9. Half adder and Half subtractor
10. Full adder and full subtractor
11. BCD counter, using IC 7490 and 7473.
12. A/D Converters any one method, D/A converter – Binary weighted, Ladder methods

SUGGESTED BOOKS:

1. Ouseph C.C., U.J. Rao and V.Vijayendran, 2007, Practical Physics and Electronics, S. Viswanathan (Printers & Publishers), Pvt. Ltd., Chennai.
2. https://nptel.ac.in/courses/108/105/108105102/
3. https://nptel.ac.in/courses/115/102/115102014/

SEMESTER IV

		L T P C
16PHP491	**PROJECT**	**- - - 15**

Course Objectives

- The aim of the M.Sc. Research project work is to expose the students to preliminaries and methodology of research in Theoretical Physics and Experimental Physics.
- To provides the students to get opportunity and participate in some ongoing research activity and development of a laboratory experiment.
- To provide the student with a broad spectrum of physics projects courses
- To emphasize the role of physics in life and other discipline (chemistry ,mathematics and biology)
- To develop the ability of the students to conduct, observe, analyzes and report an experiment and deal with physical models and formulas mathematically.
- To provide the student with different practical, intellectual and transferable skills.
- To understand the objective of a physics laboratory experiment, properly carry out the experiments, and appropriately record and analyze the results.
- To think creatively about scientific problems and their solutions.
- To design experiments, and to constructively question results they are presented with, whether these results are in a newspaper, in a classroom, or elsewhere.

Course Outcomes (COs)

After successful completion of the course, the student is expected to

1. Complete an independent research project, resulting in research outputs in terms of publications in journals and conference proceedings.
2. Demonstrate a depth of knowledge of Physics.
3. Complete an independent research project, resulting in research outputs in terms of publications in journals and conference proceedings.
4. Demonstrate knowledge of contemporary issues in their chosen field of research.
5. Demonstrate an ability to present and defend their research work.
6. Demonstrate an ability to succeed in problem solving in electronics

7. Solve physics problems using qualitative and quantitative reasoning including sophisticated mathematical techniques
8. Conduct independent research or work successfully in a technical position.
9. Successfully pursue career objectives in graduate school or professional schools, in a scientific career in government or industry, in a teaching career, or in a related career.
10. Apply their knowledge to develop the instruments.
11. Verify the basic principles and laws experimentally as a project.

FACULTY OF ENGINEERING

B.E AUTOMOBILE ENGINEERING
SYLLABI 2016 (REGULARPROGRAMME)

Department of Automobile Engineering
Faculty of Engineering

KARPAGAM ACADEMY OF HIGHER EDUCATION
(Established Under Section 3 of UGC Act 1956)
Eachanari Post, COIMBATORE 641 021,INDIA

16BECC101 COMMUNICATIVEENGLISH 3 0 0 3 100

OBJECTIVES:

- To enable students to develop their basic communication skills.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.
- To ensure the students have their ability to speak without any grammatical error.

COURSE OUTCOMES:

Students undergoing this course will be able to

Upon successful completion of the course, the students should be able to:

- Use the English language for communication: verbal and non-verbal.
- Express comprehension and acquisition of speaking and writing ability.
- Demonstrate word power: lexical, grammatical and communication competence.
- Compose business letters and other forms of technical writing.
- Demonstrate oral communication in formal contexts.
- Do the writing practice.

Unit I

Listening– Types of listening - Listening to class reading - Video tapes/ Audio tapes. **Speaking** – Introduction on self - Introduction on one"s friend. **Reading** - Reading for comprehension – Reading different kind of passages like descriptive, narrative, objective, conversational and argumentative. **Writing** – Formal and Informal letters- Free writing on any topic –My favorite place, hobbies, dreams, goals, etc- - To fill in different application forms. **Grammar** – Articles- WH questions – Yes/No Question - Subject Verb agreement. **Vocabulary** - Word Formation – Word expansion (Root word) - Prefix and Suffix.

Unit II

Listening – Understanding the passage in English –Pronunciation practice. **Speaking** – Asking and answering questions - Telephone etiquette. **Reading** – Critical reading – Finding key information in a given text (Skimming - Scanning). **Writing**– Coherence and cohesion in writing – Short paragraph writing – Writing short messages. **Grammar**– Parts of speech – Noun – Verb – Adjectives - Adverbs. **Vocabulary**– Compound Nouns/Adjectives – Irregularverbs.

Unit III

Listening – Listening for specific task – Fill in the gaps. **Speaking** – Phonemes – Syllables – Role play – Conversation Practice. **Reading** – Reading and Comprehension. **Writing** - Autobiographical writing – Biographical writing - Instruction writing. **Grammar** – Preposition – Infinitive – Gerund – Tenses. **Vocabulary** – Foreign words used in English – British and American usage.

Unit IV

Listening – Responding to questions – Reading in class for complete understanding and for better pronunciation. **Speaking** – Debate- Presentations in seminars. **Reading** – Making inference from the reading passage – Predicting the content of reading passages. **Writing** - Interpreting visual materials (tables, graphs, charts, etc) Letters to the Editor. **Grammar** – Sentence pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

Unit V

Listening - Listening to different accents, speeches/presentations. **Speaking-** Extempore talk –Just-a-minute talk. **Reading-**Reading strategies–Intensive reading – Text analysis. **Writing** - Creative writing – Writing circulars and notices – Writing proposal. **Grammar** – Direct and Indirect speech – Conditional sentences - Auxiliary verbs. **Vocabulary** – Abbreviations & Acronyms.

Note: Students shall have hands on training in improving listening skill in the language laboratory@ 2 periods per each unit.

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	SangeetaS harma , Meenakshi Raman	TechnicalCommunication :Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lakshminarayanan, K.R. &Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2009
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES:

www.learnerstv.com – Listening/ Speaking/ Presentation

www.usingenglish.com – Writing/ Grammar

www.englishclub.com – Vocabulary Enrichment/ Speaking

www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking

www.teachertube.com – Writing Technically

www.Dictionary.com – Semantic /Grammar

16BECC102 ENGINEERING MATHEMATICS I 3 2 0 4 100

OBJECTIVES:

- To develop analytical skills for solving different engineering problems.
- To understand the concepts of Matrices, sequences and series.
- To solve problems by applying Differential Calculus and Differential equations.
- To use the concepts of Matrices in a real life situations.
- To use the concepts of Differential Calculus in a real life situations.
- To develop analytical skills.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Apply advanced matrix knowledge to Engineering problems.
- Improve their ability in solving geometrical applications of differential calculus problems.
- Solve engineering problems involving hyperbolic functions.
- Solve engineering problems involving Beta and Gamma functions.
- Apply tests of convergence.
- Expose the concept of sequences and series.

UNIT I MATRICES

Review of Matrix Algebra - Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction to canonical form through orthogonal reduction.

UNIT II DIFFERENTIAL CALCULUS

Overview of Derivatives - Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes- Evolutes as Envelope of normals – Maxima and Minima of functions of two or more Variables – Method of Lagrangian Multipliers

UNIT III DIFFERENTIAL EQUATIONS

Linear Differential equations of second and higher order with constant coefficients - Euler‟s form of Differential equations – Method of variation parameters.

UNIT IV FUNCTIONS OF SEVERALVARIABLES

Partial derivatives – Eule's theorem for homogeneous functions – Total derivatives – Differentiation of implicit functions – Jacobians –Maxima and Minima of functions of two or more Variables - Method of Lagrangian multipliers.

UNIT V SEQUENCES AND SERIES

Sequences: Definition and examples – **Series:** Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D‟Alembert‟s ratio test – Alternating series – Leibnitz‟s test – Series of positive and negative terms – Absolute and conditional convergence.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics	McGraw Hill Education (India) Private Limited, New Delhi.	2014
2	Sundaram, V. Lakhminarayan,K.A. & Balasubramanian,R.	Engineering Mathematics for first year.	Vikas Publishing Home, New Delhi.	2006

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Grewel .B. S.	Higher Engineering Mathematics	Khanna Publications, New Delhi.	2014
2	Bhaskar Rao. P. B, Sri Ramachary SKVS, Bhujanga Rao. M	Engineering Mathematics I	BS Publications, India.	2010
3	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
4	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and ComplexVariables)	PHI Publications, New Delhi.	2009
5	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES :

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.intmath.com/matrices-determinants
4. www. Intmath.com/calculus/calculus-intro.php

16BEPH103 **ENGINEERING PHYSICS** **3 0 0 3 100**

OBJECTIVE:

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology.
- To enhance the knowledge in Physics and its applications.
- To develop analytical skills in the concepts of Physics.
- To enhance the fundamental knowledge in Physics.
- To use Physics and its applications relevant to various branches of Engineering and Technology.
- To use Physics in various Technology.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Describe the basics of properties of matter and its applications.
- Express the concepts of sound, ultrasonic and their applications.
- Illustrate the thermal properties of materials and advanced physics concepts of quantum theory.
- Identify the basics of light, laser and their applications.
- Identify the basics of fibre optics and their applications.
- Explain the basics of crystals and their structures.

UNIT I PROPERTIES OF MATTER ANDTHERMODYNAMICS

Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniformbending.

Concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBEROPTICS

Introduction – emission and absorption process- Einstein‟s coefficients derivation. Types of LASER - CO_2, Semiconductor LASER- Applications of LASER in industry and medicine.

Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNIT III QUANTUM PHYSICS

Introduction to quantum theory – Black body radiation-Photo electric effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger‟s wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electronmicroscope.

UNIT IV CRYSTAL PHYSICS

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures- crystal defects – point, line and surface defects

UNIT V ULTRASONICS AND NUCLEARPHYSICS

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications –

Sonogram Introduction – basics about nuclear fission and fusion, nuclear composition –Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Serway and Jewett	Physics for Scientists and Engineers with Modern Physics	Thomson Brooks/Cole, Indian reprint, New Delhi	2010
2	Gaur, R.K. and Gupta, S.C	Engineering Physics	Dhanpat Rai Publications,New Delhi.	2011
3	M.N. Avadhanulu and PG Kshirsagar	A Text book of Engineering Physics	S.Chand and company, Ltd., New Delhi	2011
4	D.C. Ghosh, N.C. Ghosh, P.K. Haldar	Engineering Physics	University Science, New Delhi	2011
5	P. Khare, A. Swarup	EngineeringPhysics: Fundamentals and ModernApplications	Jones & Bartlett Learning	2009

WEBSITES:

- www.nptel.ac.in
- www.physicsclassroom.com
- www.oyc.yale.edu
- www.physics.org

16BECH103 ENGINEERING CHEMISTRY 3 0 0 3 100

OBJECTIVES:

- To understand about the water technology.
- To get the information on electrochemical cells, batteries, fuels and combustion.
- To study about the corrosion and protective coatings.
- To gain knowledge on adsorption phenomena.
- To understand microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces
- To study about the corrosion.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise periodic properties such as ionization potential, oxidation states and electronegativity.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- Rationalise bulk properties and processes using thermodynamic considerations.
- List major chemical reactions that are used in the synthesis of molecules.
- Explain the synthesis of a commonly used drug molecule

UNIT I WATER TECHNOLOGY

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverse osmosis.

UNIT II ELECTROCHEMISTRY AND STORAGEDEVICES

Electrochemical cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - Fe^{2+}vs dichromate) –Electrolytic conductance-application (conductometric titration)-Batteries- Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H_2-O_2 Fuel Cell.

UNIT III FUELS AND COMBUSTION

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method - Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, Combustion of fuel-Introduction-GCV-NCV-Flue gasanalysis.

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UNIT IV CORROSION SCIENCE

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings – Organic coatings-Paints - Constituents and functions –Inorganic coatings-Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating – Hotdipping.

UNIT V SURFACE CHEMISTRY AND PHASE RULE

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm- Role of adsorbents in industries (catalysis and water softening).

Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company (P) Ltd., Chennai.	2012

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3rd Reprint NewDelhi.	2013
2.	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5th edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010
3.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009
4.	Dara.S.S	Text book of Engineering Chemistry.	S.Chand&Co.Ltd., New Delhi	2008

5.	Sharma.B. K	Engineering Chemistry	Krishna Prakasam Media (P) Ltd., Meerut	2001

WEBSITES:

1.http://www.studynotes.ie/leaving-cert/chemistry/
2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html3.http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
4. http://ocw.mit.edu/courses/#chemistry
5. http://www.chem.qmul.ac.uk/surfaces/sec

16BEAE104 BASIC AUTOMOBILE ENGINEERING 3 0 0 3 100

OBJECTIVES:

- To learn the fundamental principles, construction of automotive petrol and diesel engines.
- To understand the basics of Steering System, Brakes and Suspension System.
- To enable the students to grasp latest developments in Automotive Electronics.
- To learn the fundamental principles petrol and diesel engines.
- To learn the construction of automotive petrol and diesel engines.

COURSE OUTCOMES:

UNIT I BASICS OF AUTOMOBILEENGINEERING

Introduction to an Automobile – Brief history of the automobile- Classification of automobile-Layout

- Demonstrate the operating principles and constructional details of various automobile components.
- Explain the function and working of components in transmission and drive lines.
- Identify and explain the types of steering system.
- Identify and explain the types of suspension system.
- Classify and describe the types of wheels, tyres and brakes of automobiles.
- Discuss the current and future trends in the automobiles.

of an automobile Chassis- Classification of vehicles -Major components and their functions- Manufacturers of motor vehicles

UNIT II AUTOMOTIVE ENGINES

Classification of Engines based on operation and construction-Constructional details of four stroke petrol engine and working principle- Constructional details of two stroke engine and operation, Comparison of four stroke and two stroke engine operation- Diesel Engine Construction and Operation

UNIT III POWER TRAIN UNIT

Requirements of transmission system. Different types of clutches, principle, Construction-Different types of gearboxes – operation- Differential and Propeller Shaft

UNIT IV STEERING AND SUSPENSIONSYSTEM

Types of chassis layout with reference to power plant locations and drive, Vehicle frames. Various types of frames. Constructional details, Materials. Different types of steering gear boxes. Steering linkages and layouts for conventional and independent suspension system- Drum Brakes and Disc Brakes-Construction and Operation

UNIT V ADVANCEMENTS IN AUTOMOTIVEELECTRONICS

Basics of MPFI system-CRDI system-ABS-Airbag-Electronic Stability Program- Traction Control System-Electronic Power Steering.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., New Delhi	2012
2	William Crouse, Donald Anglin	Automotive Mechanics	McGraw Hill Education (India) Private Limited	1993

REFERENCES:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Tim Gilles	Automotive Chassis-Brakes, Steering and Suspension	Thomson DelmarLearning	2005
2.	Ljubo Vlacic, Michael SarenandFumioHarashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001

16BEAE105A **BASICELECTRICAL ANDELECTRONICS ENGINEERING** **3 0 0 3 100**

OBJECTIVES

1. To impart the basic knowledge about the Electric circuits.
2. To understand the working of various Electrical Machines.
3. To know about various measuring instruments.
4. To understand the basic concepts in semiconductor devices and digital electronics.
5. To describe the working principle of DC generators.
6. To describe the working principle of DC motors.

COURSE OUTCOMES

- Explain the basic DC and AC circuits.
- Describe theworking principle of DC generators
- Describe the working principle of DC motors
- Explain the working principle of measuring instruments.
- Describe the semiconductor devices and applications
- Describe the digital electronics

UNIT I ELECTRIC CIRCUITS &MEASUREMENTS

Ohm"s Law – Kirchoff"s Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase balanced Circuits.

UNIT II ELECTRICAL MACHINES

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III MEASURINGINSTRUMENTS

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT IV SEMICONDUCTOR DEVICES AND APPLICATIONS

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics

UNIT V DIGITAL ELECTRONICS

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems- simplification of Boolean expression - implementation of Boolean expressionsusing logic gates - standard forms of Boolean expression.

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Mittle, V.M	Basic Electrical Engineering	Tata McGraw Hill Edition, New Delhi	2004
2	SedhaR.S	Applied Electronics	S. Chand & Co	2006

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Muthusubramanian R, and Muraleedharan K A	Basic Electrical, Electronics and Computer Engineering	Tata McGraw Hill, Second Edition	2006
2	Nagsarkar T K and Sukhija M S	Basics of Electrical Engineering	Oxford press	2005
3	Mahmood Nahvi and Joseph A. Edminister	Electric Circuits	Schaum‟ Outline Series, McGraw Hill	2002
4	Premkumar N	Basic Electrical Engineering	Anuradha Publishers	2003

16BEAE105B ELEMENTS OF MECHANICAL ENGINEERING 3 0 0 3 100

OBJECTIVES

- To expose the thrust areas in Mechanical Engineering and their relevance by covering fundamental concept.
- To familiarize with the basic machine elements
- To familiarize with the Sources of Energy and Power Generation
- To familiarize with the various manufacturing processes
- To familiarize with the Sources of Energy.
- To familiarize with the Power Generation.

COURSE OUTCOMES:

- To expose the thrust areas in Mechanical Engineering and their relevance by covering fundamental concept.
- To familiarize with the basic machine elements
- To familiarize with the Sources of Energy and Power Generation
- To familiarize with the various manufacturing processes
- To familiarize with the Power Generation.
- To familiarize with the Sources of Energy.

UNIT I MANUFACTURING PROCESS

Casting process – Operation of Cupola furnace. Patterns -Moulding tools - Types of moulding - Preparation of green sand mould

UNIT II METAL FORMING AND JOININGPROCESSES

Metal forming processes – Rolling, forging, drawing, extrusion and sheet metal operations-fundamentals only. Metal Joining processes – Welding - arc and gas welding, Soldering and Brazing.

UNIT III MACHININGOPERATIONS

Basics of metal cutting operations – Working of lathe parts of lathe-Operations performed on lathe. Milling machine – Horizontal and vertical milling machine - Milling operations. Drilling machine – Classification – Radial drilling machine - Twist drill nomenclature. Introduction to CNC and VMC

UNIT IV POWERPLANTS

Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric plants
Nuclear Power plants – Solar and Wind Power plants

UNIT V REFRIGERATION AND AIRCONDITIONING

Principle of vapour compression system- Layout of typical domestic refrigerator – Basic of Psychrometry - Window and Split type room Air conditioner.

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Venugopal K. and Prahu Raja V	Basic Mechanical Engineering	Anuradha Publishers, Kumbakonam	2000

2.	Shanmugam G and Palanichamy M S	Basic Civil and Mechanical Engineering	Tata McGraw Hill Publishing Co., New Delhi	1996

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Shantha Kumar S R J	Basic Mechanical Engineering	Hi-tech Publications, Mayiladuthurai	2000

16BEPH111 **ENGINEERING PHYSICS LABORATORY** **0042 100**

OBJECTIVES

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To have the knowledge on Physics practical experiments.
- To have the knowledge that will be used by them in different engineering.
- To develop basic laboratory skills.
- To develop basic laboratory skills on the application of physical principles.
- The students will have the knowledge on Physics practical experiments.

COURSE OUTCOMES:

- The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- To have the knowledge on Physics practical experiments.
- To have the knowledge that will be used by them in different engineering.
- To develop basic laboratory skills.
- To develop basic laboratory skills on the application of physical principles.
- The students will have the knowledge on Physics practical experiments

LIST OF EXPERIMENTS – PHYSICS

1. Determination of velocity of sound and compressibility of liquid – Ultrasonicinterferometer.
2. Determination of wavelength of mercury spectrum – spectrometergrating.
3. Determination of Young‟s modulus of the material – Non uniform bending (or) Uniform bending.
4. Determination of Viscosity of liquid – Poiseuille‟smethod.
5. Spectrometer Dispersive power of aprism.
6. Torsional pendulum – Determination of Rigiditymodulus.
7. Particle size determination using DiodeLaser
8. Determination of Laser parameters – Wavelength, and angle ofdivergence.
9. Determination of acceptance angle in an opticalfiber.
10. Determination of thickness of a thin wire – Air wedgemethod
11. Determination of Band Gap of a semiconductormaterial.
12. Determination of Specific resistance of a given coil of wire – WheatstoneBridge

16BECH111 ENGINEERING CHEMISTRY LABORATORY 0042 100

OBJECTIVES

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To provide students with practical knowledge of quantitative analysis of materials.
- The students will be outfitted with hands-on knowledge in quantitative chemical analysis.
- To develop basic laboratory skills.
- To develop basic laboratory skills on in quantitative chemical.
- To provide water quality parameters and corrosion measurement.students with practical knowledge water quality parameters and corrosion measurement.

COURSE OUTCOMES:

- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
- To provide students with practical knowledge of quantitative analysis of materials.
- The students will be outfitted with hands-on knowledge in quantitative chemical analysis.
- To develop basic laboratory skills.
- To develop basic laboratory skills on in quantitative chemical.
- To provide water quality parameters and corrosion measurement.students with practical knowledge water quality parameters and corrosion measurement.

LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of alkalinity of Watersample.
2. Estimation of hardness of Water byEDTA
3. Estimation of chloride in Water sample (Argentometricmethod)
4. Determination of corrosion rate by weight lossmethod.
5. Conductometric Titration (Simple acidbase).
6. Conductometric Titration (Mixture of weak and strongacids).
7. Conduct metric Titration using $BaCl_2$ vs Na_2SO_4.
8. pH Titration (acid &base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or$K_2Cr_2O_7$).
10. Estimation of Ferric ion bySpectrophotometry.
11. Determination of water of crystallization of a crystalline salt (Coppersulphate).
12. Determination of molecular weight and degree of polymerization usingViscometry.
13. Determination of chemical oxygendemand.

16BEAE112 ENGINEERING WORKSHOP PRACTICE 0042 100

OBJECTIVES

- To enable the students to have a hands on experience.
- To enable the students to have a hands on experience on various basic engineering practices.
- To enable the students to have a hands on experience on various basic engineering practices in Civil.
- To enable the students to have a hands on experience on various basic engineering practices in Mechanical.
- To enable the students to have a hands on experience on various basic engineering practices in Electrical.
- To enable the students to have a hands on experience Electrical and Electronics Engineering.

COURSE OUTCOMES:

- To enable the students to have a hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
- To enable the students to have a hands on experience on various basic engineering practices.
- To enable the students to have a hands on experience on various basic engineering practices in Civil.
- To enable the students to have a hands on experience on various basic engineering practices in Mechanical.
- To enable the students to have a hands on experience on various basic engineering practices in Electrical.
- To enable the students to have a hands on experience Electrical and Electronics Engineering

PART – A (CIVIL & MECHANICAL)

1. **WELDING**
   i. Preparation of arc welding of butt joints, lap joints and teejoints.

2. **BASICMACHINING**
   i. Simple Turning and Taperturning
   ii. Drilling andTapping

3. **SHEET METALWORK**
   i. Model making – Trays, funnels,etc.

4. **DEMONSTRATIONON**
   i. Smithyoperations
   ii. Foundryoperations
   iii. PlumbingWorks
   iv. CarpentaryWorks

PART –B (ELECTRICAL & ELECTRONICS)

5. **ELECTRICALENGINEERING**

   i. Study of electrical symbols and electricalequipments.
   ii. Construct the wiring diagram for Stair case wiring and Fluorescent lampwiring.

iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energymeter.
iv. Measurement of electrical quantities – voltage, current, power & power factor in Rload.
v. Measurement of energy using single phase energymeter.

6. ELECTRONICSENGINEERING

i. Study of Electronic components– Resistor (color coding), capacitors andinductors.
ii. Soldering practice – Components Devices and Circuits – Using general purposePCB.
iii. Study of logic gates AND, OR, NOT, NOR andNAND.
iv. Study of HWR andFWR.

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Jeyachandran, K. and Balasubramanian, S	A Premier on Engineering Practices Laboratory	Anuradha Publications, Kumbakonam	2007
2	Jeyapoovan, T., Saravanapandian, M	Engineering Practices Lab Manual	Vikas Publishing House Pvt. Ltd, Chennai	2006
3	Bawa, H.S	Workshop Practice	Tata McGraw – Hill Publishing Company Limited, New Delhi	2007

16BEAE113 **ENGINEERING GRAPHICS** **2023 100**

OBJECTIVES

- To develop students in graphic skills.
- To expose them to existing national standards.
- To develop students in graphic skills for communication of concepts.
- To develop students in graphic skills for ideas.
- To develop students in graphic skills fordesign of engineering products.
- To expose them to existing national standards related to technical drawings.

COURSE OUTCOMES

- Recognisethe conventions and apply dimensioning concepts while drafting simple objects.
- Draw freehand sketching of multiple views from pictorial views of objects.
- Draw the orthographic projection of points, line and plane surfaces.
- Draw the orthographic projection of solids.
- Draw the isometric projection of the given objects.
- Demonstrate knowledge of the CAD software

UNIT I INTRODUCTION

Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

UNIT II SCALES AND PLANECURVES

SCALES:Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

UNIT III FREE HANDSKETCHING

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT IV PROJECTION OF POINTS, LINES AND PLANESURFACES

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT V PROJECTION OFSOLIDS

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

Introduction to Drafting Software/Package (Not for Exam)

Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

TEXT BOOKS

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Venugopal K and Prabhu Raja V	Engineering Graphics	New Age International Publishers	2007
2	VTU	A Primer on Computer Aided Engineering Drawing	Belgaum	2006

REFERENCES:

S. N O.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kumar M S	Engineering Graphics	D D Publications, Chennai	2007
2	Bureau of Indian Standards	Engineering Drawing Practices for Schools and Colleges SP 46-2003	BIS, New Delhi	2003
3	Luzadder W J	Fundamentals of Engineering Drawing	Prentice Hall Book Co., New York	1998

16BECC151 **HUMAN VALUES** **10 0 - 100**

OBJECTIVE

- Explain the human values.
- Implement the importance of ethics and professionalism.
- Practice the process of management's four functions.
- Understand the stress management
- Understand the budgetary and non-budgetary control technique
- Understand the entrepreneurial characteristics.

COURSE OUTCOMES

- Explain the human values.
- Implement the importance of ethics and professionalism.
- Practice the process of management's four functions.
- Understand the stress management
- Understand the budgetary and non-budgetary control technique
- Understand the entrepreneurial characteristics.

UNIT I

Human life on Earth - Concept of Human Values - Value Education - Aim of education and value education - Types of values - Components of values – Attitudes – types of attitudes

UNIT II

Self Development :Self analysis – Goal Setting - Thought Analysis – Guarding against Anger - Respect to age, experience, maturity, family members, neighbors, co-workers

UNIT III

Individual Qualities – Truthfulness – Constructivity – Sacrifice – Sincerity - Self Control – Altruism – Tolerance - Scientific Vision – RegulatingDesire

UNIT IV

Mind Culture - Modern Challenges of Adolescent - Emotions and behavior - Sex and spirituality - Adolescent Emotions - Meditation

UNIT V

Body and Mind Fitness : (a)PhysicalExercises (b) Activities: (i) Moralization of Desires (ii)

Neutralization of Anger (iii) Eradication of Worries (iv) Benefits ofBlessings

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Subramanian. R	Professional Ethics	Oxford, New Delhi	2013
2	Govindarajan. M, Natarajan. S,	Engineering Ethics	Prentice Hall of India, New Delhi	2004
3	Tripathi. A.N	Human Values	New Age International	2009
4	Pope. G. U.	Thirukkural with English Translation	Uma Publication, Thanjavur.	2002

16BECC201A **BUSINESS COMMUNICATION** **3 0 0 3 100**

OBJECTIVES:

- To help students comprehend the role of listening skills in effective communication.
- To familiarize students with verbal and non-verbal communication.
- To expose students to neutral accent.
- To develop emotional intelligence skills in them for enhancing their self-esteem.
- To assist them in setting goals and developing positive attitude.
- To enable students to acquire decision making skills, problem solving skills and assertive skills.

COURSE OUTCOMES:

Students undergoing this course will be able to

- Design and deliver a persuasive presentation that convinces the audience of the topic"s relevance and overcomes resistance, using appropriate visual support and adhering to a specified time limit.
- Use a strategic communication model and critical thinking to identify objectives, analyze audiences, and choose the most effective structure and style for delivering strategically sound written and spoken messages.
- Practice principles of effective business writing and document design in all written documents.
- Build an understanding of different organizational cultures, business practices, and social norms to communicate more effectively in domestic and cross-cultural business contexts.
- Develop their soft skills skills which will make the transition from college to workplace smoother and help them excel in their job.
- Develop their inter personal skills

UNIT I

What is Business Communication? - Types of Communication – Formal and informal communication – Process of Communication- modes of Communication – Barriers to communication.

UNIT II

Written Business Communication – Style- word-usage- organisation of Ideas – mechanics of writing and fill up of forms - Cover Letter- Letter for Job Application- Letter of Complaint - Memos - Resumes - Email- Reports Revising and proofreading- Advertising slogans- jargons- Description of Graphics and visual aids - interpretation of graphs using expressions of comparison and contrast .

UNIT III

Reading and Understanding the news articles - Oral Business Communication - First Impressions - Attire – Effective Presentation strategies- Nuances of delivery – Controlling nervousness and stage fright- Visual aids Presentations- Capturing Audience - Tone - Behavior - Telephone Etiquette- Non - verbal communication - Eye contact - Facial expressions - Posture - Gestures - Body language – Etiquette- Organization of presentation – brain storming-Negotiations.

UNIT - IV

Difference between goals and dreams - SMART goal setting - 3 Ds of goal setting- Determination, Discipline and Direction - Developing the right attitude - Motivation - Intrinsic and Extrinsic motivation - Dealing with change - Dedication - Taking responsibilities - Decision making.

UNIT - V

Intrapersonal skills - Self-analysis - Thought process – Interpersonal skills - Confidence building - Resolving conflicts- Analytical skills - Team Building - Leadership skills - Planning/organizing - Ability to work independently - Professional ethics - Communicating via e-mail. Ethical perspectives and their implications for responsible communication - Proposal Presentation

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Meenakshi Raman, Prakash Singh	Business Communication	Oxford University Press	2012

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Murthy, G .R. K.	Soft Skills for Success**.**	The ICFAI University Press, Hyderabad.	2008
2	Jagadeesan, G &Santanakrishnan, R.	Soft Skills Development:Training and Evaluation.	The ICFAI University Press, Hyderabad.	2008
3	Sherfield, Robert M., Rhonda J. Montgomery, & Patricia G. Moody	Developing Soft Skills.	Pearson Education, New Delhi.	2005

WEBSITES:

http://tribehr.com/social-hr-software/talent-management/skills-trackingwww.ispeakyouspeak.blogspot.com https://alison.com/subjects/6/Personal-Development-Soft-Skills www.learning-development.hr.toolbox.comhttp://www.niit.com/solution/soft-skill-training http://mybcommlab.com to test your understanding of the concepts presented in each chapter and explore additional materials that will bring the ideas to life in videos, activities, and an online multimedia e-book.

16BECC201B **TECHNICALENGLISH** **3 0 0 3 100**

OBJECTIVES:

- To motivate learners to acquire listening & speaking skills in both formal and informal context.
- To focus on question forms & to make them understand the importance of using question tags and also the functional use of transformation of sentences.
- To improve their reading habit and to train them in critical and analytical reading.
- To equip them to write for academic as well as work place context.
- To enable students to face interviews.
- Develop reading, listening and writing skills.

COURSE OUTCOMES:

Students undergoing this course will be able to

- Acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- Enhance them reading texts critically and analytically.
- Develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Enrich the ability to face interviews with confidence.
- Develop reading, listening and writing skills
- Enrich Vocabulary

UNIT-1

Listening - Difference between Hearing & Listening –Listening to informal conversation. **Speaking** - Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., **Reading** – Extensive and Intensive reading. **Writing** – Report writing - Writing a covering letter. **Grammar** – Regular & Irregular verbs - Kinds of sentences - Question tags. **Vocabulary** – Homonyms andHomophones.

UNIT-II

Listening – Note Taking- Improving grasping ability. **Speaking** – Welcome address - Vote of thanks - Master of ceremony. **Reading** – Active and Passive reading - Reading for vocabulary- Reading for a purpose. **Writing** - Writing a review (Film review) - Summary of a story. **Grammar** - Modalverbs – Conjunction - Expression of cause and effect. **Vocabulary** - Phrasal verbs -Idioms.

UNIT – III

Listening - Barriers to listening (Physical, Psychological, Linguistic & Cultural). **Speaking** – Stress, Pause and Intonation. **Reading** – Rapid reading – Skimming, Scanning and Surveying. (SQ3R)**Writing**- Essay writing -Minutes of meeting - Agenda – **Grammar** - Active and Passive voice - Purpose expression. **Vocabulary** - Same words used as noun and verb - Often misspelt and confused words.

UNIT IV

Listening – Listening to telephone conversation - Viewing model interviews. **Speaking** – Group Discussion - Correlation between verbal & non - verbal communication. **Reading** – Reading comprehension (short & long text) - Reading job advertisements and profile of a company. **Writing** –

Job application - Resume writing - Checklist preparation. **Grammar** - Numerical expressions – Collocations - Vocabulary - Singular and Plural (Nouns)

UNIT- V

Listening – Types of listening- Improving listening comprehension**. Speaking** - Oral presentation - Vocal communication techniques - Voice, quality, volume, pitch etc., **Reading** -Note making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation writing – Short essays writing**- Grammar**- Transformation of sentences (Simple, Compound & Complex). **Vocabulary** - Collection of Technical Vocabularies with their meanings.

Note: Students shall have hands on training in improving listening skill in the language laboratory@ 2 periods per each unit.

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Sangeeta Sharma , Meenakshi Raman	Technical Communication: Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lakshminarayanan, K.R. &Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2008
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES:

www.learnerstv.com – Listening/ Speaking/ Presentation www.usingenglish.com – Writing/ Grammar www.englishclub.com – Vocabulary Enrichment/ Speaking www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking www.teachertube.com – Writing Technically www.Dictionary.com – Semantic /Grammar

16BECC202 **ENGINEERING MATHEMATICS II** **3 2 0 4 100**

OBJECTIVES:

- To understand the concepts and applications of partial differential equations
- To have knowledge in integral calculus and Vector calculus
- To expose to the concept of Analytical function and Complex integration.
- solve problems in heat and mass transfer etc.
- find the areas and volumes using multiple integrals
- improve their ability in Vector calculus

COURSE OUTCOMES:

The student will be able to

- solve problems in Fluid Dynamics, Theory of Elasticity
- solve problems in heat and mass transfer etc.
- find the areas and volumes using multiple integrals
- improve their ability in Vector calculus
- expose to the concept of Analytical function.
- apply Complex integration in their Engineering problems

UNIT-I MULTIPLEINTEGRALS

Double integral – Cartesian coordinates – Polar coordinates – Change of order of integration – Triple integration in Cartesian co-ordinates – Area as double integrals.

UNIT-II VECTORCALCULUS

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green"s theorem, Gauss divergence theorem and Stoke"s theorems (Statement Only)- Surfaces : hemisphere and rectangular parallelopipeds.

UNIT-III PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange"s linear equation – Linear partial differential equations of second and higher order withconstantcoefficients.

UNIT IV ANALYTIC FUNCTIONS

Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms – Sufficient condition for an analytic function (Statement Only) - Properties of analytic functions – Constructions of an analytic function - Conformal mapping: w = z+a, az, 1/z and bilinear transformation.

UNIT-V COMPLEXINTEGRATION

Complex Integration - Cauchy"s integral theorem and integral formula (Statement Only) – Taylor series and Laurent series - Residues – Cauchy"s residue theorem (Statement Only) - Applications of Residue theorem to evaluate real integrals around unit circle and semi circle (excluding poles on the real axis).

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO N
1	Hemamalini. P.T	Engineering Mathematics I & II	McGraw-Hill Education Pvt.Ltd, New Delhi	2014
2	Grewal.B.S	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2014

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Erwin Kreyszig	Advanced Engineering Mathematics.	John Wiley & Sons. Singapore	2011
2	Venkataraman, M. K.	Engineering Mathematics.	The National Publishing Company, Chennai	2005
3	Narayanan. S, Manicavachagampilla y.T.K and Ramaniah.G	Advanced Mathematics for Engineering Students.	Viswanathan S.(Printers and Publishers) Pvt. Ltd. Chennai.	2002
4	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES:

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.sosmath.com/diffeq/laplace/basic/basic.html
4. www.mathworld.wolframe.com

16BEPH203 **ENGINEERING PHYSICS** **3 0 0 3 100**

OBJECTIVE:

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology.
- To enhance the fundamental knowledge in Physics.
- To enhance the fundamental knowledge in Physicsand its applications.
- The students will have the knowledge on the basics of physics related to properties of matter.
- The students will have the knowledge that will be used by them in different engineering and technology applications
- The students will have the knowledge on the basics of physics related to properties of matter, fiber optics, quantum, crystal physics and that knowledge will be used by them in different engineering and technology applications.

COURSE OUTCOMES:

- Understand the elastic nature of materials.
- Infer the characteristics of laser for various engineering applications.
- Extend the knowledge on optical fiber for communication purposes.
- Illustrate the thermal properties of materials through various methods.
- Develop the idea of quantum mechanics through applications.
- Identify the different atomic arrangements of crystals and its defects.

UNIT I PROPERTIES OF MATTER ANDTHERMODYNAMICS

Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniformbending

Concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBEROPTICS

Introduction – emission and absorption process- Einstein‟s coefficients derivation. Types of LASER - CO_2, Semiconductor LASER- Applications of LASER in industry and medicine.

Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNIT III QUANTUM PHYSICS

Introduction to quantum theory – Black body radiation-Photo electric effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger‟s wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electronmicroscope.

UNIT IV CRYSTAL PHYSICS

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures- crystal defects – point, line and surface defects

UNIT V ULTRASONICS AND NUCLEARPHYSICS

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications – Sonogram Introduction – basics about nuclear fission and fusion, nuclear composition –Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Serway and Jewett	Physics for Scientists and Engineers with Modern Physics	Thomson Brooks/Cole, Indian reprint, New Delhi	2010
2	Gaur.R.K. and Gupta.S.C	Engineering Physics	Dhanpat Rai Publications,New Delhi.	2011
3	Avadhanulu.M.N and Kshirsagar.PG	A Text book of Engineering Physics	S.Chand and company, Ltd., New Delhi	2011
4	Ghosh.D.C, GhoshN.C, Haldar.P.K	Engineering Physics	University Science, New Delhi	2011
5	Khare.P, Swarup.A	EngineeringPhysics: Fundamentals and ModernApplications	Jones & Bartlett Learning	2009

WEBSITES:

- www.nptel.ac.in
- www.physicsclassroom.com
- www.oyc.yale.edu
- www.physics.org

16BECH203 **ENGINEERING CHEMISTRY** **3 0 0 3 100**

OBJECTIVES:

- To understand about the water technology.
- To get the information on electrochemical cells, batteries, fuels and combustion.
- To study about the corrosion and protective coatings.
- To gain knowledge on adsorption phenomena.
- This course will create an impact on the students and make them to realize themodern utility
- This course will create an impact on the students and make them to realize the modern utility on electrochemical cells, batteries, fuels and combustion process, corrosion and adsorption methods.

COURSE OUTCOMES:

- Analyse microscopic chemistry in terms of atomic and molecular orbital and intermolecular forces.
- Rationalise periodic properties such as ionization potential, oxidation states and electronegativity.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- Rationalise bulk properties and processes using thermodynamic considerations.
- List major chemical reactions that are used in the synthesis of molecules.
- Integrate the chemical principles in the projects undertaken in the field of engineering and technology.

UNIT I WATERTECHNOLOGY

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverse osmosis.

UNIT II ELECTROCHEMISTRY AND STORAGEDEVICES

Electrochemical cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - Fe^{2+}vs dichromate) –Electrolytic conductance-application (conductometric titration)-Batteries- Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H_2-O_2 Fuel Cell.

UNIT III FUELS AND COMBUSTION

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method - Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, Combustion of fuel-Introduction-GCV-NCV-Flue gasanalysis.

UNIT IV CORROSION SCIENCE

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings – Organic coatings-Paints - Constituents and functions –Inorganic coatings-Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating - Hotdipping.

UNIT V SURFACE CHEMISTRY AND PHASE RULE

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm- Role of adsorbents in industries (catalysis and water softening).

Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company (P) Ltd., Chennai.	2012

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3rd Reprint NewDelhi.	2013
2.	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5th edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010
3.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009
4.	Dara.S.S	Text book of Engineering Chemistry.	S.Chand&Co.Ltd., New Delhi	2008
5.	Sharma.B. K	Engineering Chemistry	Krishna Prakasam Media (P) Ltd., Meerut	2001

WEBSITES:

1.http://www.studynotes.ie/leaving-cert/chemistry/
2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html3.http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
4. http://ocw.mit.edu/courses/#chemistry
5. http://www.chem.qmul.ac.uk/surfaces/sec

16BECC204 ENVIRONMENTALSCIENCES 3 0 0 3 100

OBJECTIVES:

- To give a comprehensive insight into natural resources, ecosystem and biodiversity.
- To educate the ways and means of the environment
- To protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures.
- To give a comprehensive insight into natural resources
- Students will prepare themselves to go ecofriendly and help preserving the nature and environment.

COURSE OUTCOMES:

- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

Definition, Scope and Importance – Need for publicawareness-Forestresources: Useandover-exploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources- role of an individual in conservation of naturalresources.

UNIT II ECOSYSTEM

Chemistry and Environment- Environmental segments, Composition and Structure of atmosphere- Concept of an ecosystem- Structure, components and function of an ecosystemEnergy flow in the ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marineecosystem)

UNITIII BIODIVERSITY

Introduction to biodiversity,Definition-Genetic diversity, Species Ecosystem diversity, Biogeographical classification of India, Importance of biodiversity-Value of biodiversity - Hot Spots of biodiversity-Threats to biodiversity - Endangered and Endemic Species of India – Conservation of biodiversity- In-Situ and Ex-Situ conservation of biodiversity.

UNITIV ENVIRONMENTALPOLLUTION

Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control measures of urban and industrial wastes– Role of an individual in prevention of pollution–Disaster management-earthquake, tsunami, cyclone andlandslides.

UNITV SOCIAL ISSUES ANDENVIRONMENT

From Unsustainable to Sustainable development, Urban problems related to energy sources, Waterconservation, Rain water harvesting and Watershed management, Resettlement and rehabilitationofpeople,itsproblemsandconcerns,Environmentalethics-Issuesandpossiblesolutions-Climate change- Green house effect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation- Environment Protection Act- Human Rights- Value education, Role of Information Technology in Environment and Human health-Population growth, Variation of population among nations-Populationexplosion.

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Ravikrishnan, A	Environmental Science	Sri Krishna Hi tech Publishing Company Private Ltd., Chennai	2012
2.	Anubhakaushik C.P. Kaushik	Environmental Science and Engineering	New Age International (P) Ltd., New Delhi.	2010

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William P.Cunningham	Principles of Environmental Science	Tata Mc Graw -Hill Publishing Company, New Delhi.	2008
2.	Linda D. Williams	Environmental Science Demystified	Tata Mc Graw -Hill Publishing Company Ltd., New Delhi.	2005
3.	BharuchaErach	Environmental Science Demystified	Mapin Publishing (P) Ltd., Ahmedabad.	2005
4.	Tyler Miller G. Jr	Environmental Science	Thomson & Thomson Publishers, New Delhi.	2004

5.	Trivedi, R.K. and Goel, P.K	Introduction to Air Pollution	Techno-Science Publications, Jaipur.	2003

WEBSITES:

1. http://people.eku.edu/ritchisong/envscinotes1.html
2.http://nptel.ac.in/courses.php?disciplineId=120
3.www.newagepublishers.com/samplechapter/001281.
4.www.unesco.org/ext/field/beijing/scienceb.htm,www.infinitepower.org/education.htm
5. http://www.sciencedaily.com/news/top/environment/

16BEAE205A BASIC ELECTRICAL ANDELECTRONICS ENGINEERING 3 0 0 3 100

OBJECTIVES

1. To impart the basic knowledge about the Electric circuits.
2. To understand the working of various Electrical Machines.
3. To know about various measuring instruments.
4. To understand the basic concepts in semiconductor devices and digital electronics.
5. To know about various measuring instruments.
6. The students shall develop an intuitive understanding of the circuit analysis, basic concepts of electrical machines, basics of electronics and be able to apply them in practical situation

COURSE OUTCOMES

- Understand thebasicknowledgeabouttheElectriccircuits.
- Infer the characteristics of various Electrical Machines.
- Extend the knowledge on concepts of AC and DC currents.
- Understand the various measuringinstruments.
- Develop the idea of semiconductordevices.
- Understand thebasicknowledgeaboutdigitalelectronics

UNIT I ELECTRIC CIRCUITS &MEASUREMENTS

Ohm‟s Law – Kirchoff‟s Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase balanced Circuits.

UNIT II ELECTRICAL MACHINES

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III MEASURINGINSTRUMENTS

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT IV SEMICONDUCTOR DEVICES AND APPLICATIONS

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics

UNIT V DIGITAL ELECTRONICS

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems- simplification of Boolean expression - implementation of Boolean expressionsusing logic gates - standard forms of Boolean expression.

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Mittle, V.M	Basic Electrical Engineering	Tata McGraw Hill Edition, New Delhi	2004
2	SedhaR.S	Applied Electronics	S. Chand & Co	2006

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Muthusubramanian R, and Muraleedharan K A	Basic Electrical, Electronics and Computer Engineering	Tata McGraw Hill, Second Edition	2006
2	Nagsarkar T K and Sukhija M S	Basics of Electrical Engineering	Oxford press	2005
3	Mahmood Nahvi and Joseph A. Edminister	Electric Circuits	Schaum‟ Outline Series, McGraw Hill	2002
4	Premkumar N	Basic Electrical Engineering	Anuradha Publishers	2003

16BEAE205B ELEMENTS OFMECHANICALENGINEERING 3 0 0 3 100

OBJECTIVES:

- To expose the thrust areas in Mechanical Engineering and their relevance by covering fundamental concept.
- To familiarize with the basic machine elements
- To familiarize with the Sources of Energy and Power Generation
- To familiarize with the various manufacturing processes
- To expose the thrust areas in Mechanical Engineering
- To familiarize with the Power Generation

COURSE OUTCOMES:

- To expose the thrust areas in Mechanical Engineering and their relevance by covering fundamental concept.
- To familiarize with the basic machine elements
- To familiarize with the Sources of Energy and Power Generation
- To familiarize with the various manufacturing processes
- To expose the thrust areas in Mechanical Engineering
- To familiarize with the Power Generation

UNIT I MANUFACTURING PROCESS

Casting process – Operation of Cupola furnace. Patterns -Moulding tools - Types of moulding - Preparation of green sand mould

UNIT II METAL FORMING AND JOININGPROCESSES

Metal forming processes – Rolling, forging, drawing, extrusion and sheet metal operations- fundamentals only. Metal Joining processes – Welding - arc and gas welding, Soldering and Brazing.

UNIT III MACHININGOPERATIONS

Basics of metal cutting operations – Working of lathe parts of lathe-Operations performed on lathe. Milling machine – Horizontal and vertical milling machine - Milling operations. Drilling machine – Classification – Radial drilling machine - Twist drill nomenclature. Introduction to CNC and VMC

UNIT IV POWERPLANTS

Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric plants Nuclear Power plants – Solar and Wind Power plants

UNIT V REFRIGERATION AND AIRCONDITIONING

Principle of vapour compression system- Layout of typical domestic refrigerator – Basic of Psychrometry - Window and Split type room Air conditioner.

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Venugopal K. and Prahu Raja V	Basic Mechanical Engineering	Anuradha Publishers, Kumbakonam	2000
2.	Shanmugam G and Palanichamy M S	Basic Civil and Mechanical Engineering	Tata McGraw Hill Publishing Co., New Delhi	1996

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Shantha Kumar S R J	Basic Mechanical Engineering	Hi-tech Publications, Mayiladuthurai	2000

16BEPH211 **ENGINEERING PHYSICS LABORATORY** **0042 100**

OBJECTIVES:

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To develop basic laboratory skills
- To demonstrating the application of physical principles.
- The students will have the knowledge on Physics practical experiments
- The students will have the knowledge that will be used by them in different engineering and technology applications
- The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications

COURSE OUTCOMES:

- Familiarize the properties of material and basic concepts in physics.
- Get experience in laser wavelngthexperimenattion
- Get practical exposure to analyse the velocity of sound
- Get knowledge in bandgap and wavelengh determination
- Acquire knowledge about different bendings
- Practical knowledge in therml conductivity of wire and its thickness

LIST OF EXPERIMENTS – PHYSICS

1. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
2. Determination of wavelength of mercury spectrum – spectrometergrating.
3. Determination of Young‟s modulus of the material – Non uniform bending (or) Uniform bending.
4. Determination of Viscosity of liquid – Poiseuille‟smethod.
5. Spectrometer Dispersive power of aprism.
6. Torsional pendulum – Determination of Rigiditymodulus.
7. Particle size determination using DiodeLaser
8. Determination of Laser parameters – Wavelength, and angle ofdivergence.
9. Determination of acceptance angle in an opticalfiber.
10. Determination of thickness of a thin wire – Air wedgemethod
11. Determination of Band Gap of a semiconductormaterial.
12. Determination of Specific resistance of a given coil of wire – WheatstoneBridge

16BECH211 ENGINEERING CHEMISTRY LABORATORY 0042 100

OBJECTIVES:

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To provide students with practical knowledge of quantitative analysis of materials by classical.
- To provide students with practical knowledge of instrumental methods for developing experimental skills in building technical ompetence.
- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters.
- The students will be outfitted with hands-on knowledge in corrosion measurement.
- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.

COURSE OUTCOMES:

1.Familiarize the properties of material and basic concepts in chemistry
2.Get experience in argentometric method experimentation
3.Get practical exposure to analyse the water sample
4.Get knowledge in spectrophotometry
5.Acquire knowledge about different crystal formation in water
6.Practical knowledge in determine the chemical oxygen demand

LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of alkalinity of Watersample.
2. Estimation of hardness of Water byEDTA
3. Estimation of chloride in Water sample (Argentometricmethod)
4. Determination of corrosion rate by weight lossmethod.
5. Conductometric Titration (Simple acidbase).
6. Conductometric Titration (Mixture of weak and strongacids).
7. Conduct metric Titration using $BaCl_2$ vs Na_2SO_4.
8. pH Titration (acid &base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or$K_2Cr_2O_7$).
10. Estimation of Ferric ion bySpectrophotometry.
11. Determination of water of crystallization of a crystalline salt (Coppersulphate).
12. Determination of molecular weight and degree of polymerization usingViscometry.
13. Determination of chemical oxygendemand.

16BEAE212 **COMPUTER PRACTICE AND PROGRAMMING LABORATORY** **1043 100**

OBJECTIVES:

- To familiarize with open source office packages
- To understand the basic concept of C Programming write programs to, and its different modules that includes conditional and looping expressions, Arrays, Strings and Functions.
- To understand the basic concept of C Programming write programs.
- To understand the basic concept of different modules that includes conditional and looping expressions
- To understand the basic concept of, Arrays, Strings and Functions.
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in „C‟ language

COURSE OUTCOMES:

- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in „C‟ language
- To familiarize with open source office packages
- To understand the basic concept of C Programming write programs to, and its different modules that includes conditional and looping expressions, Arrays, Strings and Functions.
- To understand the basic concept of C Programming write programs.
- To understand the basic concept of different modules that includes conditional and looping expressions
- To understand the basic concept of, Arrays, Strings and Functions.

THEORY:

What is computer- Computer Components- What is C- C Character set- Constants, Variables and Keywords-General form of C Program - Relational and Logical Operators - Selection Structures- If and nested if - Switch Case - Loops-Definition and types- Functions- Arrays- Introduction to Strings- Pointers.

PRACTICALS:

1. Working with word Processing, Spreadsheet and presentation software inLinux

2. Programming inScratch:
   Practicing fundamental concepts of programming like sequence, selection decision statements, working of loops and event driven programming

3. CProgramming:
   Practicing programs to get exposure to basic data types, algebraic expressions, Conditional statements, Input and Output Formatting, Decision Statements, Switch Case, Control structures, arrays, Strings and function, implementation of pointers.

REFERENCES:

1. E. Balagurusamy, " Computing Fundamentals and C Programming", TMH Education,5th Edition, 2014
2. YashavantKanetkar, " Let us C", BPB Publications, 13th Edition,2013

16BEAE213 **MACHINE DRAWING** **1022 100**

OBJECTIVES:

- Students will have an ability to apply knowledge of Modeling, science & engineering.
- Students will understand the conventions and assembly concepts and drawing Practices.
- Students will be able to convert sketches to engineered drawings
- Students will have an ability to apply knowledge of Modeling, science & engineering.
- Students will understand the conventions and assembly concepts and drawing Practices.
- Students will be able to convert sketches to engineered drawings

COURSE OUTCOMES:

- Draw the surfaces for sheet metal working applications.
- Understand the representation of details in machine drawing.
- Represent tolerances and fits of machine elements.
- Construct an assembly drawing using part drawings of machine components.
- Construct an assembly drawing of machine components using 2D drafting
- Understand the various Cam Profile

UNIT I CONVENTIONS

Importance of sectional views, Code of practice for engineering drawing, drilled and tapped holes, countersunk and counter bored holes, internal and external threads, undercuts, grooves, chamfers, fillet radii and keyways. Conventions to represent standard components-bolts, nuts, washers, screws, cotters, pins, circlips, bearings, gears, springs and flanges.

UNIT II ASSEMBLY CONCEPTS AND DRAWING PRACTICE

Methods and concepts of assemblies-assembly requirements, Bill of materials. Methods of assembly-bolts, nuts, studs, screws and pins. Methods of arresting motion of a member in anassembly. Drawing Practice of flange coupling, universal coupling, oldhams coupling, swivel bearing, stuffing box, knuckle joint, C clamp, plummer block, screw jack, simple drilljig.

UNIT III FITS AND TOLERANCES

Limits, fits and tolerances-need, types, representation of tolerances on drawing, calculation of minimum and maximum clearances and allowances. Geometric tolerance-uses, types of form and position tolerances, symbols, method of indicating geometric tolerances on part drawings. Surface finish symbols- methods of indicating the surface roughness.

UNIT IV SOLID MODELING

Modelling of flange coupling, universal coupling, oldhams coupling, swivel bearing, stuffing box, knuckle joint, C clamp, plummer block, screw jack, simple drill jig.

UNIT V CAMPROFILE

Classifications, displacement diagrams-parabolic, uniform velocity, simple harmonic paths. Layout of plate cam profiles for different types of followers - knife - edged, roller, mushroom, flat type, derivatives of follower motion, pressure angle and undercutting.

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Gopalakrishna K R	Machine Drawing Seventeenth Edition	Subhas Stores, Bangalore	2003
2.	Narayana K L, Kannaiah P, Venkata Reddy K	Machine Drawing	New Age International	2006

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Varghese P I and John K C	Machine Drawing	Jovast Publishers, Thrissur	2007
2.	BIS	SP:46-2003	Engineering Drawing Practice for Schools and Colleges, New Delhi	2003
3.	ASME Y 14.5M-1994	Dimensioning and Tolerancing	ASME, New York	1995

16BEAE251 **APTITUDE TRAINING** **10 0 - 100**

OBJECTIVE

- To achieve the competencies in Analytical ability, Decision making
- Introduction, Speed Math‟s, Problems on Numbers, Averages, Ratios and Proportions, Problems on ages.
- Percentage, Data Interpretation, Profit and loss, Simple and Compound Interest
- Time Speed and Distance, Time and Work, Pipes and Cistern, Geometry, Probability, Permutation and Combination
- Percentage, Data Interpretation, Profit and loss, Simple and Compound Interest
- Time Speed and Distance, Time and Work, Pipes and Cistern, Geometry, Probability, Permutation and Combination

COURSE OUTCOMES

- To achieve the competencies in Analytical ability, Decision making
- Introduction, Speed Math‟s, Problems on Numbers, Averages, Ratios and Proportions, Problems on ages.
- Percentage, Data Interpretation, Profit and loss, Simple and Compound Interest
- Time Speed and Distance, Time and Work, Pipes and Cistern, Geometry, Probability, Permutation and Combination
- Percentage, Data Interpretation, Profit and loss, Simple and Compound Interest
- Time Speed and Distance, Time and Work, Pipes and Cistern, Geometry, Probability, Permutation and Combination

UNIT I
Introduction, Speed Math‟s, Problems on Numbers, Averages, Ratios and Proportions, Problems on Ages

UNIT II
Percentage, Data Interpretation, Profit and loss, Simple and Compound Interest

UNIT III
Time Speed and Distance, Time and Work, Pipes and Cistern, Geometry, Probability, Permutation andCombination

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Agarwal.R.S	Quantitative Aptitude for Competitive Examinations	S.Chand Limited	2011

2	Abhijit Guha	Quantitative Aptitude for Competitive Examinations	Tata McGraw Hill	2011
3	Edgar Thrope	Test Of Reasoning for Competitive Examinations	Tata McGraw Hill, 4th Edition	2012

16BEAE301 METHODS OF APPLIED MATHEMATICS 3 2 0 4 100

OBJECTIVES:

- To hone the analytical skills in the minds of Engineers.
- To provide sound foundation in the mathematical fundamentals necessary to formulate, solve and analyze Engineering problems.
- To study the basic principles of different transforms and Partial Differential Equations.
- The students will have a lucid idea about Laplace, Fourier and Z-transforms.
- The Learners can equip themselves in the transform techniques.
- Better understanding in problems related to Heat conduction, communication systems, electro optics and electromagnetic theory, using the techniques will be learnt

COURSE OUTCOMES:

- The students will have a lucid idea about Laplace, Fourier and Z-transforms.
- The Learners can equip themselves in the transform techniques.
- Better understanding in problems related to Heat conduction, communication systems, electro optics and electromagnetic theory, using the techniques will be learnt in this course.
- To hone the analytical skills in the minds of Engineers.
- To provide sound foundation in the mathematical fundamentals necessary to formulate, solve and analyze Engineering problems.
- To study the basic principles of different transforms and Partial Differential Equations.

UNIT-I LAPLACETRANSFORM

Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals – Initial and final value theorems. Inverse Laplace transforms – Convolution theorem (statement only) – Solution of Ordinary Differential Equations with constant coefficients using Laplace transforms – Transform of periodicfunctions.

UNIT-II FOURIER SERIES

Dirichlet‟s conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval‟s identity – Harmonic Analysis.

UNIT-III FOURIER TRANSFORM

Fourier integral theorem (Statement Only) – Fourier transform pair –Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval‟s identity – Relation between Fourier and Laplace transforms

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIALEQUATIONS

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded)

UNIT-V Z -TRANSFORM AND DIFFERENCE EQUATIONS

Z-transform - Elementary properties – Inverse Z- transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2013
2	Erwin Kreyszig	Advanced Engineering Mathematics.	Wiley India (P) Ltd, New Delhi.	2014

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Venkateswarlu S	Engineering Mathematics, Vol I	Anuratha Agencies and Publishers, Kumbakonam.	2007
2	Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G	Advanced Mathematics for Engineering Students. Volumes II and III,	Viswanathan S Printers and Publishers Pvt. Ltd. Chennai.	2002
3	Bali N P., Manish Goyal	A text book of Engineering Mathematics	Laxmi Publications Pvt. Ltd., New Delhi	2006
4	Ramana B V	Higher Engineering Mathematics	Tata Mc Graw Hill Publishing Co. Ltd. New Delhi.	2008

WEBSITES:

1. www.sosmath.com
2. http://mathworld.wolfram.com/FourierSeries.html
3. www.nptel.ac.in

16BEAE302 **ENGINEERING MECHANICS** **3 2 0 4 100**

OBJECTIVES:

- To study the principles involved in Engineering Mechanics.
- To understand the Statics of particles and rigid bodies
- To study the principles involved in Friction and kinematics of particles
- Determine the resultant force and moment for a given system of forces.
- Analyse the plane trusses having different types of supports and determine the forces in each member.
- Identify the location of centroid, centre of gravity and calculate the moment of inertia for different sections.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Determine the resultant force and moment for a given system of forces.
- Analyse the plane trusses having different types of supports and determine the forces in each member.
- Identify the location of centroid, centre of gravity and calculate the moment of inertia for different sections.
- Apply the equations of motion of particles to calculate displacement, velocity and acceleration.
- calculate dynamic forces exerted in rigid body
- Determine the friction and its effects by using the laws of friction.

UNIT I STATICS OFPARTICLES

Forces – system of forces - concurrent forces in plane and space- resultant - problems involving the equilibrium of a particle-free body diagram-equilibrium of particle in space.

UNIT II STATICS OF RIGID BODIES IN TWO DIMENSIONS

Rigid bodies-two dimensional structure-moment of force about an axis-moment of a couple-equivalent system of coplanar forces-Rigid body in equilibrium-problems involving equilibrium of rigid body-types of supports-reactions of beams and frames.

APPLICATION OF STATICS: Roof trusses-Method of joints, method of sections and Tension coefficient method.

UNIT III CENTROID, CENTRE OF GRAVITY AND MOMENT OFINERTIA

Centroids of areas, composite areas, determination of moment of inertia of plane figures, polar moment of inertia-radius of gyration – mass moment of inertia of simple solids.

UNIT IV KINEMATICS OFPARTICLES

Introduction-plane, rectilinear motion - time dependent motion-rectangular coordinates-projectile motion.

IMPULSE AND MOMENTUM: Concept of conservation of momentum- Impulse-Momentum principle- Impact-Direct central impact-oblique central impact.

UNIT V FRICTION

Laws of friction-coefficient of friction-problems involving dry friction- wedge and ladder friction.

KINETICS OF PARTICLES: Equation of motion-rectilinear motion-Newton‟s II law – D‟Alembert‟s principle- Energy - potential energy-kinetic energy-conservation of energy-work done by a force - work energy method.

TEXT BOOKS:

S.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Beer F P. and Johnson E R	Vector Mechanics for Engineers-Statics and Dynamics	Tata McGraw–Hill , New Delhi	2006
2.	Rajasekaran S and Sankarasubramanian G	Engineering Mechanics-Statics and Dynamics	Vikas Publishing House Pvt. Ltd., New Delhi	2006

REFERENCES:

S.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Bansal R K	Engineering Mechanics	Laxmi Publications Pvt. Ltd., New Delhi	2006
2.	Bhavikatti S S.	Engineering Mechanics	New Age International Pvt. Ltd., New Delhi	2003
3.	Young D H. and S Timashenko	Engineering Mechanics	Tata McGraw–Hill , New Delhi	1980
4.	JivanKhachane and Ruchi Shrivastava	Engineering Mechanics	ANE Books, New Delhi.	2006

WEB REFERENCE:

www.learnerstv.com/Free-Engineering-Video-lectures-ltv320
emweb.unl.edu/
www.nptel.iitm.ac.in/courses/...mechanics/ui/TableofContents.html
www.jncasr.ac.in/emumain.php
web.mit.edu/emech/dontindex-build/index.html

16BEAE303 **APPLIED THERMODYNAMICS** **3 0 0 3 100**

OBJECTIVES:

- Apply the first law of thermodynamics to closed and open systems.
- Solve the problems related to cycles and cyclic devices using the second law of thermodynamics.
- Determine the thermodynamic properties of pure substances and its phase change processes.
- Evaluate the air standard performance of heat engines.
- Solve the psychrometric problems in various applications.
- Calculate the performance of air compressors and refrigeration systems

COURSE OUTCOMES:

- Apply the first law of thermodynamics to closed and open systems.
- Solve the problems related to cycles and cyclic devices using the second law of thermodynamics.
- Determine the thermodynamic properties of pure substances and its phase change processes.
- Evaluate the air standard performance of heat engines.
- Solve the psychrometric problems in various applications.
- Calculate the performance of air compressors and refrigeration systems

UNIT I BASIC CONCEPTS AND LAWS OFTHERMODYNAMICS

Basic concepts - concept of continuum, macroscopic approach, thermodynamic systems - closed, open and isolated. Zeroth law of thermodynamics - First law of thermodynamics – application to closed and open systems, steady flow process with reference to various thermal equipments. Second law of thermodynamics-Reversibility and irreversibility. Carnot cycle, reversed carnot cycle, Thermodynamic temperature scale, Clausius inequality, concept of entropy, entropy of ideal gas, principle of increase of entropy – Carnot theorem, absolute entropy, availability.

UNIT II PROPERTIES OF PURE SUBSTANCE AND IDEAL & REALGASES

Properties of steam, Pure substance, phase, phase change process, property diagrams, PVT surface. Gas mixtures- properties of ideal and real gases, equation of state, Avagadro‟s law, Vander Waal‟s equation of states, compressibility and its chart. Dalton‟s law of partial pressure, exact differentials, T-D, relations, Maxwell relations, Clausius Clapeyroni equations, Joule Thomson Coefficient, Dryness fraction

UNIT III PSYCHROMETRY

Psychrometry and psychrometric charts, property calculations of air vapour mixtures. Psychrometric process- sensible and latent heat exchange processes.

UNIT IV GAS POWERCYCLES

Air standard cycles-Otto-Diesel-Dual-Work output, Efficiency and MEP calculations – Comparison of the cycles with respect to compression ratio, heat addition, heat rejection, peak pressure, temperature and work output , Simple Brayton cycle.

UNIT V RECIPROCATING AIR COMPRESSORS &REFRIGEREATIONCYCLES

Single acting and double acting air compressors, work required, effect of clearance volume, volumetric efficiency, isothermal efficiency, free air delivery, two stage compression, condition for minimum work.

Fundamentals of refrigeration, C.O.P., reversed carnot cycle, simple vapour compression refrigeration system, T-S, P-H diagrams, simple vapour absorption refrigeration system, desirable properties of an ideal refrigerant.Thermoelectric cooling and chip cooling

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Nag.P.K	Engineering Thermodynamics-5th Edition	McGraw-Hill Education (India) Private Limited	2013
2.	Rathakrishnan.E	Fundamentals of Engineering Thermodynamics	Prentice-Hall of India, New Delhi	2005
3.	Rajput.R.K	Applied Thermodynamics	Laxmi Publishing Co., New Delhi	2009

REFERENCES:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Arora.C.P	Thermodynamics	Tata McGraw-Hill, New Delhi.	2003
2.	Nag.P.K	Basic and applied Thermodynamics	McGraw –Hill Education (India) Private Limited	2009

16BEAE304 **AUTOMOTIVEENGINES** **3 0 0 3 100**

- Differentiate the construction and operation of two-stroke and four-stroke engines.
- Name and explain various components of the fuel feed system.
- Discuss the combustion process and combustion chambers.
- List and describe the different methods of supercharging and turbocharging.
- Explain the importance of cooling system.
- Explain the importance of lubrication system.

OBJECTIVES:

COURSE OUTCOMES:

- Differentiate the construction and operation of two-stroke and four-stroke engines.
- Name and explain various components of the fuel feed system.
- Discuss the combustion process and combustion chambers.
- List and describe the different methods of supercharging and turbocharging.
- Explain the importance of cooling system.
- Explain the importance of lubrication system.

UNIT I ENGINE CONSTRUCTION AND OPERATION

Constructional details of four stroke petrol and diesel engine, working principle, air standard Otto cycle, Diesel and Dual Cycles actual indicator diagram, two stroke engine construction and operation, comparison of four stroke and two stroke engine, firing order and its significance. Port Timing, Valve Timing of petrol and diesel engines.

UNIT II FUEL FEEDSYSTEM

Carburettor working principle, requirements of an automotive carburettor, starting, idling, acceleration and normal circuits of carburettors. Compensation, maximum power devices, constant choke and constant vacuum carburettors, fuel feed systems; mechanical and electrical fuel feed pumps. Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)-Jerk pumps, distributor pumps, pintle and multihole nozzles, Unit injector and common rail injection systems. Injection pump calibration. Need for a governor for diesel engines. Description of a simple diesel engine governor.

UNIT III COOLING, LUBRICATION AND IGNITIONSYSTEM

Need for cooling system, Types of cooling system: air cooling system, liquid cooling system, forced circulation system, pressure cooling system. Lubrication system; Mist, Dry sump and wet sump lubrication system, properties of lubricants.
Types of ignition systems and its working battery coil, magneto and electronic ignition systems, relative merits and demerits, centrifugal and vacuum advance mechanisms. Types and construction of spark plugs. Dependence of ignition timing on load and speed

UNIT IV COMBUSTION AND COMBUSTION CHAMBERS

Combustion in SI engine; stages of combustion, flame propagation, Delay period, Uncontrolled combustion, Effect of Delay period, rate of pressure rise, abnormal combustion, detonation, effect of engine variables on knock, knock rating. Combustion chambers; different types, Combustion in CI Engines, Direct and indirect injection combustion chambers for CI engines. Importance of Swirl, squish and turbulence. Factors considering combustion chamber design.

UNIT V SUPERCHARGING, TURBOCHARGING AND ENGINE TESTING

Supercharging and Turbocharging, Different methods of turbocharging, Intercooling, Turbocharger controls - wastegate, variable geometry, variable nozzle types. Dynamometers, indicated thermal, brake thermal and volumetric efficiencies. Measurement of friction, Cylinder pressure measurement. Engine performance maps, Engine testing standards.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., New Delhi	2012
2.	Mathur .M.L and R.P.Sharma	A course ininternal Combustionengines	Dhanpat Raj & Sons Publications, New Delhi	2001
3.	Heinz Heisler	Advanced Engine Technology	Butterworth-Heinemann	1998

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	John B. Heywood	Internal Combustion Engine Fundamental	McGraw-Hill Education(India) Private Limited.	2011
2.	Heldt.P.M	High Speed Combustion Engines: Design, Production, Test	Oxford & IBH Publishing Company	1965
3.	Obert.E.F	Internal Combustion Engines Analysis and Practice	International Text Books Co., Scrantron, Pennsylvania	1988

4.	William H.Crouse	Automotive Engines	McGraw-Hill Publishers.	2006
5.	Ellinger.H.E	Automotive Engines	Prentice Hall Publishers.	1992
6.	Pulkrabek	Engineering Fundamentals of the Internal Combustion Engines	Practice Hall of India.	2003

16BEAE305 **AUTOMOTIVE CHASSIS** **3 0 0 3 100**

- Discuss the types of frame, front axle and steering system.
- Sketch and explain the different types of Power and power assisted steering.
- Describe the components in driveline, final drive and rear axle.
- Describe the suspension systems and wheels.
- Familiar with tyres – tyre construction – tyre designation
- Explain the construction and working principle of different types of brakes.

OBJECTIVES:

COURSE OUTCOMES:

- Students will be able to explain the construction and Working principle of Front Axle, Rear Axle, Wheels, Tyres, Final Drive, Steering System, Brakes and Suspension System.
- Discuss the types of frame, front axle and steering system.
- Sketch and explain the different types of Power and power assisted steering.
- Describe the components in driveline, final drive and rear axle.
- Describe the suspension systems and wheels.
- Explain the construction and working principle of different types of brakes.

UNIT I INTRODUCTION

Types of chassis layout with reference to engine locations and drive, Vehicle frames. Various types of frames. Constructional details, Materials. Testing of vehicle frames. UNIT Ised frame body construction: Loads acting on vehicle frame.

UNIT II FRONT AXLEAND STEERINGSYSTEM

Types of front axles. Construction details. Materials. Front wheel geometry viz. Castor, Camber, King pin inclination, Toe-in - Conditions for true rolling motion of wheels during steering, turning radius, Wheel wobble and shimmy. Ackerman and Davis steering system. Slip angle-Oversteer and Understeer- Constructional details of steering linkages. Different types of steering gear boxes. Steering linkages and layouts for conventional and independent suspension system. Power and power assisted steering.

UNIT III DRIVE LINE, REAR AXLE, FINAL DRIVE, ANDDIFFERENTIAL

Effect of driving thrust and torque reactions. Hotch-kiss drive, torque tube drive and radius rods. Propeller shaft. Universal joints. Constant velocity joints. Front wheel drive. Construction of rear axles. Types of loads acting on rear axles. Fully floating Three quarter floating and Semi floating rear axles. Rear axle housing. Construction of different types of axle housings. Multi axled vehicles. Construction details of multi drive axle vehicles. Different types of final drive. Double reduction. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock - Differential housing.

UNIT IV SUSPENSION SYSTEM

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension – Pneumatic suspension – Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

UNIT V BRAKING SYSTEM, WHEELS ANDTYRES

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theory. Determination of braking torque. Brake actuating systems - Mechanical, Hydraulic and Pneumatic – Detailed study of components. Parking and engine exhaust brakes. Factors influencing brake performance. Power and power assisted brakes.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Tim Gilles	Automotive Chassis-Brakes,Steering and Suspension	Cengage Learning	2005
2.	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
3.	Reimpell.J, Stoll.H and Betzler.J.W	The Automotive Chassis: Engineering Principles	Elsevier India Pvt Ltd	2013

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Tom Birch	Automotive Braking Systems	Cengage Learning	1999
2.	Tom Birch	Automotive Chassis Systems	Cengage Learning	1999
3.	Tom Birch	Automotive Suspension and Steering Systems	Delmar Cengage Learning	1998

4.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAE Inc	2001
6.	John Peter Whitehead, Donald Bastow and Geoffrey Howard	Car Suspension and Handling	SAE Inc	2014

16BEAE306A **ENGINEERING MATERIALS AND METALLURGY** **3 0 0 3 100**

OBJECTIVES:

- Explain the phase diagrams of different engineering materials.
- Recognize the properties and applications of various metals and alloys.
- Identify the appropriate heat treatment processes for the given applications.
- Test the mechanical properties of the given materials for real-time applications.
- Understand the fundamentals of composites
- Identify the appropriate composites for applications in the automotive industry.

COURSE OUTCOMES:

- Explain the phase diagrams of different engineering materials.
- Recognize the properties and applications of various metals and alloys.
- Identify the appropriate heat treatment processes for the given applications.
- Test the mechanical properties of the given materials for real-time applications.
- Understand the fundamentals of composites
- Identify the appropriate composites for applications in the automotive industry.

Review (Not for Examination):

Crystal structure – BCC, FCC and HCP structure – unit cell – crystallographic planes and directions, miller indices – crystal imperfections, point, line, planar and volume defects – Grain size, ASTM grain size number.

UNIT I CONSITITUION OF ALLOYS AND PHASEDIAGRAMS

Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, peritectic, eutectoid and peritectroid reactions, Iron – Iron carbide equilibrium diagram. Classification of steel and cast Iron microstructure, properties andapplication.

UNIT II FERROUS AND NON FERROUSMETALS

Effect of alloying additions on steel (Mn, Si, Cr, Mo, V Ti& W) - stainless and tool steels – HSLA - maraging steels – Gray, White malleable, spheroidal -Graphite - alloy cast irons.

Copper and Copper alloys – Brass, Bronze and Cupronickel – Aluminium and Al-Cu – precipitation strengthening treatment – Bearing alloys.

UNIT III INTRODUCTION TO COMPOSITES

Fundamentals of composites - need for composites – Enhancement of properties - classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) – Reinforcement – Particle reinforced composites, Fibre reinforced composites. Applications of various types of composites.

UNIT IV HEAT TREATMENT

Definition – Full annealing, stress relief, recrystallisation and spheroidizing – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR - Hardenability, Jominy end quench test – Austempering, martempering – case hardening, carburising, nitriding, cyaniding, carbonitriding – Flame and Inductionhardening.

UNIT V MECHANICAL PROPERTIES ANDTESTING

Mechanism of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell) Impact test Izod and charpy, fatigue and creeptest.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Kenneth G.Budinski and Michael K.Budinski	Engineering Materials:Properties and Selection	Prentice-Hall of India Private Limited.	2010
2.	Raghavan.V	Materials Science and Engineering	Phi Learning	2013

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William D.Callister and David G.Rethwisch	Materials Science and Engineering: An Introduction	John Wiley and Sons Inc, New York	2010
2.	Sydney H.Avner	Introduction to Physical Metallurgy	McGraw- Hill Education (India) Private Limited.	1997

16BEAE306B **COMPOSITE MATERIALS** **3 0 0 3 100**

OBJECTIVES:

- Identify suitable reinforcement and matrix materials for different applications.
- Select appropriate fabrication technique for the specific application of polymer matrix composite.
- Selectsuitable processing method for the fabrication of metal matrix composites.
- Select suitable fabrication method for the specific application of ceramic matrix composite.'
- Describes the sol-gel technique
- Identify the advanced composites for appropriate applications

COURSE OUTCOMES:

- To enable the students to gain knowledge on the different types of composite materials, their properties and applications.
- Identify suitable reinforcement and matrix materials for different applications.
- Select appropriate fabrication technique for the specific application of polymer matrix composite.
- Selectsuitable processing method for the fabrication of metal matrix composites.
- Select suitable fabrication method for the specific application of ceramic matrix composite.'
- Describes the sol-gel technique.

UNIT I INTRODUCTION TO COMPOSITES

Fundamentals of composites - need for composites – Enhancement of properties - classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) – Reinforcement – Particle reinforced composites, Fibre reinforced composites. Applications of various types of composites.

UNIT II POLYMER MATRIXCOMPOSITES

Polymer matrix resins – Thermosetting resins, thermoplastic resins – Reinforcement fibres – Rovings – Woven fabrics – Non woven random mats – various types of fibres. PMC processes - Hand lay up processes – Spray up processes – Compression moulding – Reinforced reaction injection moulding - Resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass fibre reinforced plastics (GRP).

UNIT III METAL MATRIXCOMPOSITES

Characteristics of MMC, Various types of Metal matrix composites Alloy vs. MMC, Advantages of MMC, Limitations of MMC, Metal Matrix, Reinforcements – particles – fibres. Effect of reinforcement - Volume fraction – Rule of mixtures. Processing of MMC – Powder metallurgy process - diffusion bonding – stir casting – squeeze casting.

UNIT IV CERAMIC MATRIXCOMPOSITES

Engineering ceramic materials – properties – advantages – limitations – Monolithic ceramics - Need for

CMC – Ceramic matrix - Various types of Ceramic Matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres- whiskers. Sintering - Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing).

UNIT V ADVANCES IN COMPOSITES

Carbon /carbon composites – Advantages of carbon matrix – limitations of carbon matrix Carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Sol gel technique. Composites for aerospace applications.

TEXT BOOKS

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Mathews.F.L, and Rawlings.R.D	Composite materials: Engineering and Science, 1st edition	Chapman and Hall, London, England.	1994.
2.	Chawla.K.K	Composite materials Science & Engineering	Springer – Verlag.	2012

REFERENCES

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Clyne.T.W and Withers.P.J	Introduction to Metal Matrix Composites	Cambridge University Press.	1995
2.	Strong.A.B	Fundamentals of Composite Manufacturing	SME	1989
3.	Sharma.S.C	Composite materials	Narosa Publications, New Delhi.	2000

16BEAE311 AUTOMOTIVE ENGINE COMPONENTS LABORATORY 0032 100

OBJECTIVES:

- Identify and assemble the components of an engine.
- Explain the function of various components of an engine.
- Practice the appropriate linear and angular dimensions using precision measuring instruments.
- Examine the major terminologies for the gear and screw thread.
- Explain the suitable type of instrument used to measure the mechanical parameters.
- Understand the calibration of vernier / micrometer / dial gauge

COURSE OUTCOMES:

- To enable the students to have a practical knowledge on dismantling and assembling of engines.
- To give a practical knowledge on all components related to engine.
- Identify and assemble the components of an engine.
- Explain the function of various components of an engine.
- Practice the appropriate linear and angular dimensions using precision measuring instruments.

1. Dismantling and Assembling of 4 cylinder petrolengine.
2. Dismantling and Assembling of 6 cylinder petrolengine.
3. Study of oil filter, fuel filter, fuel injection system, carburetor, MPFI &CRDI
4. Study of ignition system components – coil, magneto and electronic ignitionsystems.
5. Study of engine cooling systemcomponents
6. Study of engine lubrication systemcomponents
7. Ovality and taper measurement of cylinder bore and comparison with standardspecifications
8. Ovality and taper measurement of engine crank shaft and comparison with standard specification
9. Study of 4 cylinder dieselengine

16BEAE312 COMPUTER AIDED MACHINE DRAWING LABORATORY 0 0 3 2 100

- To understand and interpret drawings of machine components.
- To acquire the ability in designing and making the assembly drawing of various components.
- To expose students todrawing of sleeve and cotter joint.
- To expose students toknuckle joint,gib and cotter joint
- To provide an overview ofdrawing of universal coupling,screw jack.
- To make the student acquire sound knowledge ofpiston and connecting rod

OBJECTIVES:

COURSE OUTCOMES:

- To make the students to gain knowledge on how to model and assemble automobile components using a software.
- Sketch the detailed drawing of solid blocks
- Sketch the detailed drawing of knuckle joint
- Sketch the detailed drawing of valves
- Sketch the detailed drawing of universal coupling.
- Sketch the detailed drawing of screw jack.

1. Create the assembly drawing of piston and connecting rod
2. Modeling of solidblocks
3. Modeling of V- Block , L- Block withrib
4. Modeling of blocks withholes
5. Modeling with square cut and Ucut
6. Modeling of pistons and connectingrods
7. Assembly drawing of screwjack
8. Assembly drawing of Universalcoupling
9. Assembly drawing of flangedcoupling
10. Assembly drawing of knucklejoint
11. Modeling ofvalves
12. Modeling of crankshaft

13. Modeling ofbumper
14. Modeling of frameassembly

16BEAE313 COURSEORIENTEDPROJECT-I 1 0 0 1 100

OBJECTIVES:

- The objective of this project is to provide opportunity for the students to implement their skills acquired and design projects based on courses in the third semester
- The students in convenient groups of not more than 3 members have to take up a project work in any subject of their choice in the third semester. Every project work shall have a guide who is the member of the faculty of the institution.

- Identify a problemand develop the solutions.
- Identify, formulate and analyseproblems and justify solutions using scientific knowledge.
- Apply technical ideas, strategies and methodologies.
- Design and conduct experiments, as well as analyseand interpret data.

- Identify a problemand develop the solutions.
- Identify, formulate and analyseproblems and justify solutions using scientific knowledge.
- Apply technical ideas, strategies and methodologies.
- Design and conduct experiments, as well as analyseand interpret data.

- Familiar with cost-effectiveness analysis.
- Prepare technical report and oral presentations.

COURSE OUTCOMES:

16BEAE351 **SOFT SKILLS** **100- 100**

OBJECTIVE

- Demonstrate the adequate soft skills required for the workplace.
- Express the presentation skills
- Express the views in group discussions with confidence.
- Demonstrate the appropriate interview skills.
- Manage time effectively.
- Explain the stress management

COURSE OUTCOMES

- Demonstrate the adequate soft skills required for the workplace.
- Express the presentation skills
- Express the views in group discussions with confidence.
- Demonstrate the appropriate interview skills.
- Manage time effectively.
- Explain the stress management

UNIT I

Overview to communication, self Introduction, Presentation on their own topic, Extempore,Group Activity

UNIT II

Group Discussion, Do's and Don"ts of Group Discussion, Body language, Grooming and Resume, Resume correction

UNIT III

Introduction to HRM – Questions - Do's and Don"t's - Interview - Mock GD - Stress Management

UNIT IV

Personality Development - Presentation skills, Interpersonal skills, Critical thinking, Confidence building and Stress management.

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Barun K Mitra	Personality Development and Soft Skills	Oxford University Press-New Delhi	2012

2	Rajiv K. Mishra	Personality Development	Rupa & Co.	2012

16BEAE401 **THEORY OF MACHINES** **3003 100**

OBJECTIVES:

- To impart knowledge on the concept and kinematic analysis of simple mechanisms.
- To introduce the concept of friction drives in kinematic of machines.
- To calculate the speed ratio of various types of the gear train and construct the cam profile for the various types of follower motion.
- To provide knowledge on balancing of rotating and reciprocating masses.
- To learn the concept of free, forced and damped vibrations.
- To provide knowledge on torsional vibration of shaft

COURSE OUTCOMES:

- Identify the simple mechanisms based on a given application, and find velocity and acceleration of simple mechanisms.
- Estimate the amount of power transmitted by drive.
- Calculate the speed ratio of various types of the gear train and construct the cam profile for the various types of follower motion.
- Estimate the balancing mass for rotating and reciprocating masses by using the force and couple polygon.
- Evaluate the natural frequency of a single degrees of freedom system subjected to free and forced vibrations.
- Compute the torsional vibration of shaft

UNIT I MECHANISMS

Machine Structure – Kinematic link, pair and chain – Grueblers criteria – Constrained motion – Degrees of freedom - Slider crank and crank rocker mechanisms – Inversions – Applications – Kinematic analysis of simple mechanisms – Determination of velocity andacceleration.

UNIT II FRICTION

Types of friction -Friction in screw and nut – Screw jack - Pivot and collar – Thrust bearing – Plate and disc clutches – Belt (flat and V) and rope drives. Ratio of tensions – Effect of centrifugal and initial tension – Condition for maximum power transmission – Open and crossed belt drive.

UNIT III GEARING ANDCAMS

Gear profile and geometry – Nomenclature of spur and helical gears – Gear trains: Simple, compound gear trains and epicylic gear trains - Determination of speed and torque- Cams – Types of cams – Design of profiles – Knife edged, flat faced and roller ended followers with and without offsets for various types of follower motions.

UNIT IV BALANCING

Static and dynamic balancing – Single and several masses in different planes –Balancing of reciprocating masses- primary balancing and concepts of secondary balancing – Single and multi cylinder engines (Inline) – Balancing of radial V engine – direct and reverse crank method. Governors and Gyroscopic effects.

UNIT V VIBRATION

Free, forced and damped vibrations of single degree of freedom systems – Force transmitted to supports – Vibration isolation – Vibration absorption – Torsional vibration of shaft – Single and multi rotor systems – Geared shafts – Critical speed of shaft.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Rattan.S.S	Theory of Machines	TataMcGraw–Hill Publishing Co, NewDelhi.	2004
2.	Ballaney.P.L	Theory of Machines	Khanna Publishers, New Delhi.	2002
3.	Bansal.R.K.	Theory of Machines	Laxmi Publications(P) Ltd., NewDelhi	2012

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Rao, V and Dukkipati, R.V	Mechanism and Machine Theory	Wiley Eastern Ltd, Second Edition	1992
2.	Malhotra, D.R and Gupta, H.C.	The Theory of Machines	Satya Prakasam, Tech. India Publications.	1989
3.	Gosh, A. and Mallick, A.K.	Theory of Machines and Mechanisms	Affiliated East West Press.	1989
4.	Shigley, J.E. and Uicker, J.J	Theory of Machines and Mechanisms	McGraw-Hill.	1986

16BEAE402 **FLUID MECHANICS AND HEAT TRANSFER** **3 2 0 4 100**

OBJECTIVES:

- To study the fluid laws
- To make the students conversant on properties and measurements.
- To expose the various fluid flow measuring devices and calculate the flow losses in pipes.
- To impart knowledge on various types of pumps and hydraulic turbines.
- To impart knowledge of the conduction heat transfer mechanisms.
- To learn the principles of convection and radiation.

COURSE OUTCOMES:

- Estimate the flow properties and pressure head using fundamental laws of fluid mechanics.
- Evaluate the discharge and loss of energy in flow through pipes.
- Analysethe performance of hydraulic pumps and turbines for a given application.
- Apply the heat conduction equation to compute the rate of heat transfer in simple and composite systems.
- Determine the rate of heat transfer in convection mode.
- Determine the rate of heat transfer in radiation mode.

UNIT I BASIC CONCEPTS AND PROPERTIESOFFLUIDS

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by U Tube Manometer manometers.

UNIT II FLIUD KINEMATICS ANDDYNAMICS

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- Equation of streamline - stream function - velocity potential function - circulation - flow net – Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube.

Incompressible Fluid Flow:

Viscous flow - Navier - Stoke's equation - flow through pipes - Darcy - weisback's equation - pipe roughness -friction factor - flow through pipes in series and in parallel - power transmission - Introduction to the concept of Boundary layer flows, boundary layer thickness, boundary layer separation ,drag and lift coefficients.

UNIT III HEATCONDUCTION

Basic Concepts – Mechanism of Heat Transfer – Conduction, Convection and Radiation – General Differential equation of Heat Conduction – Fourier Law of Conduction – Cartesian and Cylindrical

Coordinates – One Dimensional Steady State Heat Conduction – Conduction through Plane Wall, Cylinders and Spherical systems – Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis – Use of Heislers Chart.

UNIT IV HEAT CONVECTION

Basic Concepts – Convective Heat Transfer Coefficients – Boundary Layer Concept – Types of Convection – Forced Convection – Dimensional Analysis – External Flow – Flow over Plates, Cylinders and Spheres – Internal Flow – Laminar and Turbulent Flow – Combined Laminar and Turbulent – Flow over Bank of tubes – Free Convection – Dimensional Analysis – Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres.

UNIT V RADIATION

Basic Concepts, Laws of Radiation – Stefan Boltzman Law, Kirchoff Law –Black Body Radiation –Grey body radiation Shape Factor Algebra – Electrical Analogy – Radiation Shields – (Descriptive study -Gas Radiation).

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr.R.K.Bansal	A Textbook of Fluid Mechanics and Hydraulics Machines	Laxmi publications (P) Ltd, NewDelhi	2010
2.	YunusA.Cengel, John M.Cimbala	Fluid Mechanics – Fundamentals and Applications	McGraw Hill Education	2013
3.	Holman.J.P, Souvik Bhattacharyya	Heat Transfer	McGraw –Hill Education (India) Private Limited	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Victor Lyle Streeter, E. Benjamin Wylie and Keith W.Bedford	Fluid Mechanics	WCB/McGraw-Hill	1998
2.	Frank M.White	Fluid Mechanics	McGraw-Hill Higher Education	2011
3.	Nag.P.K	Heat and Mass Transfer	McGraw –Hill Education (India) Private Limited	2011

16BEAE403 **STRENGTH OF MATERIALS** **3 2 0 4 100**

OBJECTIVES:

- Evaluate the stresses and strains in simple and composite structures subjected to axial loads.
- Examine the shear force, bending moment and shear stress of various beams under different loading conditions.
- Examine the stresses induced in the shaft and closed coil helical springs subjected to torsion.
- Evaluate the slope and deflection of beams and buckling loads of columns with different boundary conditions.
- Examine the stresses in two-dimensional systems and thin cylinders.
- Familiar with construction of Mohr's circle

COURSE OUTCOMES:

- Evaluate the stresses and strains in simple and composite structures subjected to axial loads.
- Examine the shear force, bending moment and shear stress of various beams under different loading conditions.
- Examine the stresses induced in the shaft and closed coil helical springs subjected to torsion.
- Evaluate the slope and deflection of beams and buckling loads of columns with different boundary conditions.
- Examine the stresses in two-dimensional systems and thin cylinders.
- Familiar with construction of Mohr's circle

UNIT I STRESS STRAIN AND DEFORMATION OFSOLIDS

Rigid and Deformable bodies – Strength, Stiffness and Stability – Stresses; Tensile, Compressive and Shear – Deformation of simple and compound bars under axial load – Thermal stress – Elastic constants – Strain energy and unit strain energy – Strain energy in uniaxial loads-Volumetric strains and stresses on inclinedplanes

UNIT II BEAMS - LOADS AND STRESSES

Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever, Simply supported and Overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Effect of shape of beam section on stress induced – Shear stresses in beams – Shear flow

UNIT III TORSION

Analysis of torsion of circular bars – Shear stress distribution – Bars of Solid and hollow circular section – Stepped shaft – Twist and torsion stiffness – Compound shafts – Fixed and simply supported shafts – Application to close-coiled helical springs – Maximum shear stress in spring section including Wahl Factor – Deflection of helical coil springs under axial loads – Design of helical coil springs –

stresses in helical coil springs under torsionloads

UNIT IV BEAMDEFLECTION

Elastic curve of Neutral axis of the beam under normal loads – Evaluation of beam deflection and slope: Double integration method, Macaulay Method, and Moment-area Method –Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine formula for columns

UNIT V ANALYSIS OF STRESSES IN TWO DIMENSIONS

Biaxial state of stresses – Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells – Biaxial stresses at a point – Stresses on inclined plane – Principal planes and stresses – Mohr"s circle for biaxial stresses – Maximum shear stress - Strain energy in bending andtorsion.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Popov .E.P	Engineering Mechanics of Solids	Prentice-Hall of India,New Delhi	1998
2.	Punmia .B.C, Ashok Kumar Jain and Arun Kumar Jain	Strength of Materials and Theory of Structures-Vol.2	Laxmi Publications, New Delhi	2005
3.	Ferdinand Beer, E.RussellJohnston Jr., John DeWolf andDavid Mazurek	Mechanics of Materials,7th Edition	McGraw-Hill Book Co, New Delhi.	2014

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William Nash,Merle Potter	Theory and problems in Strength of Materials Schaum Outline Series	McGraw-Hill Book Co,New York.	2011
2.	Kazimi S.M.A	Solid Mechanics	Tata McGraw-Hill Publishing Co., New Delhi.	2001
3.	Ryder G.H	Strength of Materials	Macmillan India Ltd, New Delhi	2002
4	Timoshenko.S.P.	Elements of Strength of Materials",5th Edition	East West,India	2003

16BEAE404 AUTOMOTIVE TRANSMISSION 3 0 0 3 100

OBJECTIVES:

- To enrich the understanding of Clutch and Gear Box
- To introduce Hydrodynamic Drive
- To familiarize the students to understand Planetary Gear Boxes
- To introduce the concepts of Automatic Transmission Applications
- To provide knowledge on Hydrostatic Drive
- To provide knowledge on Electric Drive

COURSE OUTCOMES:

- Discuss the types of clutches
- Sketch and explain the different types of gearboxes.
- Describe the special type of gear boxes
- Describe the automatic transmission.
- Familiar with hydrostatic and electric drives
- Explain the Performance characteristics of electric drives

UNIT I CLUTCH AND GEAR BOX

Requirements of transmission system. Different types of clutches, principle, Construction, torque capacity and design aspects. Objective of the gearbox - Determination of gear ratios for vehicles. Performance characteristics at different speeds. Different types of gearboxes - operation. Typical problems involving the above principles.

UNIT II HYDRODYNAMIC DRIVE

Fluid coupling - principle of operation, constructional details, torque capacity, performance characteristics, reduction of drag torque. Torque converter - Principle of operation, constructional details, performance characteristics, converter coupling, multistage and poly phase torque converters.

UNIT III SPECIAL TYPES OFGEARBOXES

Ford –T model gearbox, Wilson gearbox, Cotal electromagnetic transmission, Automatic over drive,

UNIT IV AUTOMATIC TRANSMISSION APPLICATIONS

Chevrolet Turbo glide transmission, Toyota "ECT-i" Power glides Transmission (Automatic Transmission with Intelligent Electronic control system), Mercedes Benz Automatic transmission, Hydraulic actuation system for automatic transmission system.

UNIT V HYDROSTATIC AND ELECTRICDRIVES

Hydrostatic drive – principle, types, advantage and limitations. Comparison of hydrostatic drive with hydrodynamic drive. Construction and working of typical Janny hydrostatic drive.

Electric drive - Principle of early and modified Ward Leonard Control system. Advantage & limitations. Performancecharacteristics.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	N.Newton, W. Steeds and Garrett.T.K	The Motor vehicle, 13th edition	SAE Inc	2001
2.	Heinz Heisler	Advanced Vehicle Technology	Butterworth Heinemann Publishers	2002
3	P.M Heldt	Automotive Chassis	P. M. Heldt 1945(45) Nyack, NY	1945

REFERENCES:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Arthur William Judge	Modern Transmission systems	Massachusetts Robert Bentley Inc	1969
2.	Wlliam H. Crouse, Donald L.Anglin	Automotive Transmission and Power Trains construction	McGraw Hill.	1976

16BEAE405 **AUTOMOTIVE POLLUTION AND NVH CONTROL** **3 0 0 3 100**

OBJECTIVES:

- Explain the mechanism of pollutant formation in engines.
- Apply the knowledge of post-combustion treatments to control pollution.
- Discuss the control techniques and instrumentation for pollution measurements.
- State the laws and regulations related to automotive emission levels.
- Discuss the properties of tyres affecting vibration and noise
- Design the systems to reduce noise andvibration.

COURSE OUTCOMES:

- Explain the mechanism of pollutant formation in engines.
- Apply the knowledge of post-combustion treatments to control pollution.
- Discuss the control techniques and instrumentation for pollution measurements.
- State the laws and regulations related to automotive emission levels.
- Discuss the properties of tyres affecting vibration and noise
- Design the systems to reduce noise andvibration.

UNIT I MECHANISM OF POLLUTANT FORMATION AND POST COMBUSTION TREATMENTS

Introduction, Pollutants, sources, formation of HC and CO in SI engines, NOx formation in SI and CI engines, Particulate emission from SI and CI engines, Smoke Emission in CI engines. Effect of operating variables on emission formation.

Post combustion treatments**:** physical conditions and exhaust gas compositions before treatment, catalytic mechanism. Thermal reactions, installation of catalyst in exhaust lines, NOx treatment in diesel engines. Diesel trapoxidizers

UNIT II CONTROL TECHNIQUES AND INSTRUMENTATION FOR POLLUTION MEASUREMENTS

Crank case emission control, fuel evaporation & control, EGR, intake temp control, air injected exhaust, thermal reactors, SCR, catalytic converters – types, catalytic mechanism, tuning of mechanical systems - A/F ratio control. NDIR analyzer, flame ionization detectors, chemiliuminescent analyzer, smoke meters, gas chromatograph, On-board Diagonosticsystem.

UNIT III LAWS AND REGULATIONS

Historical background, regulatory test procedures (European cycles), exhaust gas pollutants (European railroad limits), particulate pollutants, European statutory values, inspection of vehicles in circulation (influence of actual traffic conditions and influence of vehicle maintenance) Indian Emission Standards.

UNIT IV NOISE CONTROL

Identification of noise sources, quantification, control of air borne noise - use of noise absorber, barrier, different materials, criteria for the selection of materials, control of structure borne noise - treatments for vibration damping materials for hood liner and head liner, resonance and ill effects of resonance. Characteristics of vehicle noise, sources of vehicle noise, engine noise, techniques for locating and measuring engine noise, engine noise control techniques, inlet and exhaust noise mechanism and control, noise from cooling system, transmission noise and tyre noise. Anechoichamber.

UNIT V VIBRATION CONTROL

Introduction, vibration analysis, sources of vibration, damping of vibration, rubber mountings, vibration isolation and absorption. Constrained and extensive layer dampings. Engine and drivetrain vibrations, vehicle and chassis vibration. Application of plastics and composites in automobiles. Properties of tyres affecting vibration andnoise.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Springer and Patterson	Engine Emission	Plenum Press.	1990
2.	Crouse.W.M and Anglin.A.L	Automotive emission control	McGraw Hill Co., New York	1993
3.	John B. Heywood	Internal Combustion Engine Fundamentals	McGraw Hill International Editions	2011
4.	Matthew Harrison	Vehicle Refinement – Controlling Noise and Vibration in Road Vehicles	Elsevier Butterworth-Heinemann, Burlington	2004

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Ganesan.V	Internal Combustion Engines, 4th Edition	Tata McGraw Hill Co, New Delhi	2012
2.	Obert.E.F	Internal Combustion Engines	Harper and Row, New York	1982
3.	Heinz Heisler	Advanced Engine Technology	SAE	1995
4.	Robert Hickling and Mounir M. Kamal	Engine Noise – Excitation, Vibration and Radiation	Plenum press, New York	1982
5.	White.R.G and Walker.J.G	Noise and Vibration	Ellis Horwood Ltd, England	2000

16BEAE411 AUTOMOTIVE CHASSIS AND TRANSMISSION LABORATORY 0 0 3 2 100

OBJECTIVES

- To expose the different types of Clutch, Gear Box, Brake system.
- To provide knowledge on Differential Unit
- To provide knowledge onPropeller Shaft Unit.
- To learn the Clutch, Gear Box, Brake system, Differential Unit
- To study the suspensionsystem.
- To impart knowledge on different Frames.

COURSE OUTCOMES:

- Sketch and explain the working clutch assembly
- Discuss gear boxassembly
- Illustrate the different types of rear axlefloating
- Sketch and explain the propeller shaft and universal jointassembly
- Sketch and explain the different types of rear axlefloating
- Explain the air braking system

LIST OF EXPERIMENTS

1. Dismantling and assembling of clutch assembly with playadjustment
2. Dismantling and assembling of
3. Dismantling and assembling of propeller shaft and universal jointassembly
4. Dismantling and assembling of drive shaftassembly
5. Dismantling and assembling of differentialassembly
6. Dismantling and assembling of different types of rear axlefloating
7. Dismantling and assembling of steering boxassembly
8. Dismantling and assembling of suspensionsystem
9. Dismantling and assembling of air-brakingsystem
10. Dismantling, bleeding, play adjustment and assembling of hydraulic brakingsystem.
11. Study of Frames used for HMV, LMV, Car and TwoWheelers

16BEAE412 SCIENTIFIC COMPUTING LABORATORY 2023 100

OBJECTIVES:

- To introduce the scientific computing, covering some important aspects of solving algebraic equations, IVP,BVP.
- To implement the methods using the spread sheet in Excel
- To develop analytical skills for solving different engineering problems.
- To understand the concepts of Matrices, sequences and series.
- To solve problems by applying Differential Calculus
- To solve problems by applying Differential equations.

COURSE OUTCOMES:

- To develop analytical skills for solving different engineering problems.
- To understand the concepts of Matrices, sequences and series.
- To solve problems by applying Differential Calculus
- To solve problems by applying Differential equations.
- To introduce the scientific computing, covering some important aspects of solving algebraic equations, IVP,BVP.
- To implement the methods using the spread sheet in Excel
- To solve Solution of initial value problems governed by ODE
    - Solution of BVP governed byPDE

LIST OF EXPERIMENTS

1. Solution of Transcendentalequation
    i) Newton – RaphsonMethod
    ii) Bisectionmethod
    iii) Iterative method by reducing the equation to the form x=f(x)
2. Solution of algebraic simultaneousequations
    i) Gauss Jacobimethod
    ii) Gauss Seidelmethod
3. Numericalintegration
    i) Gauss 2 point and 3 pointformulae
    ii) Trapezoidalmethod
    iii) Simpson‟s 1/3rule
4. Solution of initial value problems governed byODE
    i) Runge - Kutta 4th order method
    ii) Modified Euler‟smethod
    iii) Milne‟smethod
    iv) Adam – Bashforthmethod
5. Solution of BVP governed byPDE
    i) Laplace Equation
    ii) One – dimensional heatequation
        a) Explicit method : Bender – Schmidt‟smethod
        b) Implicit method : Crank - Nicolson‟smethod
    iii) One dimensional wave equation
    Implicitmethod

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Steven C. Chapra, Raymond P. Canale	Numerical Methods for Engineers	McGraw - Hill Pub. Co. Ltd	2014
2	Curtis F. Gerald and Patrick O. Wheatley	Applied Numerical Analysis	Pearson Education, South Asia	2009

0 0 3 2 100

16BEAE413 **FLUID MECHANICS AND STRENGTH OF MATERIALS LABORATORY** 0032 100

OBJECTIVES:

- Calculate the rate of fluid flow and coefficient of discharge in fluid flow devices.
- Measure the losses associated in a pipe flow.
- Evaluate the performance of non-positive and positive displacement pumps.
- Measure the tensile and shear strength of materials.
- Evaluate the hardness and impact strength of materials.
- Evaluate the compression strength of helical springs

COURSE OUTCOMES:

- Calculate the rate of fluid flow and coefficient of discharge in fluid flow devices.
- Measure the losses associated in a pipe flow.
- Evaluate the performance of non-positive and positive displacement pumps.
- Measure the tensile and shear strength of materials.
- Evaluate the hardness and impact strength of materials.
- Evaluate the compression strength of helical springs

LIST OF EXPERIMENTS

1. Determination of the Coefficient of discharge of given Venturi and Orificemeter.
2. Calculation of the rate of flow using Rotometer.
4. Determination of friction factor of given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/ submersible pump
6. Conducting experiments and drawing the characteristic curves of reciprocatingpump.
7. Conducting experiments and drawing the characteristic curves of Gearpump.
8. Tensile test on metals-stress strain characteristics, ductility, resilience,toughness.
9. Hardness test on metals-Brinell, Vicker and Rockwell Hardnesstests.
10. Impact test on metals-Charpy, Izod impacttests.
11. Shear test on metals-direct shear strength, single shear, doubleshear.
12. Tests on helical springs-compression, tension springs-load deformation characteristics, stiffness, shear stress , modulus of rigidity,energy.
13. Torsion test on beams-torque and angle of twist characteristics, shear stress,modulusof rigidity, energy.
14. Microscopic examination of i) Hardened samples ii) Temperedsamples

16BEAE414 COURSEORIENTEDPROJECT-II 1 0 0 1 100

The objective of this project is to provide opportunity for the students to implement their skills acquired and design projects based on courses in the fourth semester.

The students in convenient groups of not more than 3 members have to take up a project work in any subject of their choice in the third semester. Every project work shall have a guide who is the member of the faculty of the institution.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Identify a problem and develop the solutions.
- Identify, formulate and analyse problems and justify solutions using scientific knowledge.
- Apply technical ideas, strategies and methodologies.
- Design and conduct experiments, as well as analyse and interpret data.
- Familiar with cost-effectiveness analysis.
- Prepare technical report and oral presentations.

16BEAE451 AUTOMOTIVE ERGONOMICS AND SAFETY 10 0 - 100

OBJECTIVES:

- To enable the students to gain knowledge on the ergonomic effect of a vehicle.
- To understand the use of safety systems that can be included in a vehicle
- Illumination, heat ventilation and air conditioning, noise
- Human error, accidents, human factors and the automobile, organizational and social aspects,
- Steps according to ISO/DIS6385, OSHA‟s approach, virtual environments.
- Illumination, heat ventilation and air conditioning, noise

COURSE OUTCOMES:

- To enable the students to gain knowledge on the ergonomic effect of a vehicle.
- To understand the use of safety systems that can be included in a vehicle.
- Illumination, heat ventilation and air conditioning, noise
- Human error, accidents, human factors and the automobile, organizational and social aspects,
- Steps according to ISO/DIS6385, OSHA‟s approach, virtual environments.
- Illumination, heat ventilation and air conditioning, noise

PARTI VEHICLE ERGONOMICS:

Introduction, seating dimensions, interior ergonomics, ergonomics system design, seat comfort, suspension seats, split frame seating, back passion reducers, dash board instruments, electronicdisplays, commercial vehicle cabin ergonomics, mechanical package layout, goods vehiclelayout.

ENVIRONMENTAL CONDITIONS: Illumination, heat ventilation and air conditioning, noise, motion, speed and acceleration, sound, vibration.

PARTII HUMAN FACTORSAPPLICATIONS:

Human error, accidents, human factors and the automobile, organizational and social aspects, steps according to ISO/DIS6385, OSHA‟s approach, virtual environments.

SAFETY: Seat belt, air bag, collapsible steering, warning systems, ABS braking system, collision safety systems, global safety standards in automotiveapplications

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Nikolaos Gkikas	Automotive Ergonomics: Driver-Vehicle Interaction	CRC Press	2012
2	Ljubo Vlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001

16BEAE501 **DESIGN OF MACHINE ELEMENTS** **3204 100**

OBJECTIVES:

- Design machine elements subjected to simple loads.
- Design shaft for various engineering applications.
- Design couplings for various engineering applications.
- Design bolted and welded joints subjected to static and eccentric loading conditions.
- Design helical spring and flywheel for various engineering applications.
- Design and select journal bearings and rolling contact bearings for various machines.

COURSE OUTCOMES:

- Design machine elements subjected to simple loads.
- Design shaft for various engineering applications.
- Design couplings for various engineering applications.
- Design bolted and welded joints subjected to static and eccentric loading conditions.
- Design helical spring and flywheel for various engineering applications.
- Design and select journal bearings and rolling contact bearings for various machines.

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINEMEMBERS

Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – Design of curved beams – Factor of safety - theories of failure – stress concentration.

UNIT II DESIGN OF SOLID AND HOLLOWSHAFTS

Design of solid and hollow shafts based on strength, rigidity and critical speed. Basic concepts of rigid and flexible couplings.–Introduction and concepts of keys, key ways, Knuckle joints.

UNIT III DESIGN OF BOLTED JOINTS AND WELDEDJOINTS

Design of bolted joints including eccentric loading –square threaded screws, Efficiency, Maximum efficiency.. Design of welded joints for structures -Purpose of Screw Jack, Introduction to fasteners.

UNIT IV DESIGN OF SPURGEARS.

Design of energy storing elements- springs and flywheels.

UNIT V DESIGN OFBEARINGS

Introduction to bearings – sliding contact and rolling contact types. – Cubic mean load – Design of Journal bearings – McKee‟s equation – Lubrication in journal bearings – calculation of bearing dimensions.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Juvinall.R.C and Marshek K.M	Fundamentals of Machine Component Design, 5th Edition	John Wiley &Sons.	2011
2.	Bhandari.V.B	Design of Machine Elements 3rd Edition	Tata McGraw-Hill Book Co.	2010
3.	Robert L.Mortt	Machine elements in Mechanical Design	Macmillan Publishing Co, London	1992
4.	Shigley and Mischke	Mechanical Engineering Design	McGraw Hill, New York.	2001

REFERENCES:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Norton.RL	Design of Machinery	Tata McGraw-Hill Book Co., New Delhi	2004
2.	Orthwein .W	Machine Component Design	Jaico Publishing Co., New Delhi.	2006
3.	Ugural .A.C	Mechanical Design – An Integrated Approach	McGraw-Hill Book Co, New York.	2004
4.	Spotts.T.E,Shoup.T.H.E	Design of Machine Elements 8th Edition	Pearson Education, New Delhi.	2003
5.	Maitra.G.M	Handbook of Gear design	Tata McGraw Hill, New Delhi	2004

16BEAE502 **IC ENGINE DESIGN** **3204 100**

OBJECTIVES:

- To learn the design procedure of cylinder and piston.
- To study the design procedure of connecting rod.
- To provide knowledge on the design of crankshaft.
- To impart knowledge on the design of valves and valve actuating components.
- To study the design procedure of timing belt and pulley
- To acquaint the student with the concepts of sprocket and chain.

COURSE OUTCOMES:

- Design cylinder and piston for the specified power and torque.
- Design connecting rod of an engine.
- Design crankshaft of an engine.
- Design valves and valve actuating components.
- Select suitable timing belt and pulley.
- Select suitable transmission chains and sprockets

UNIT I DESIGN OF CYLINDER AND PISTON

Choice of material for cylinder and piston, piston friction, piston slap, design of cylinder, piston, piston pin, piston rings, piston failures, lubrication of piston assembly.

UNIT II DESIGN OF CONNECTING ROD,CRANKSHAFT

Material for connecting rod, determining minimum length of connecting rod, small end and big end design, shank design, design of big end cap bolts, connecting rod failures, balancing of I.C. Engines, significance of firing order, material for crankshaft, design of crankshaft under bending and twisting, balancing weight calculations.

UNIT III DESIGN OF VALVES AND FLYWHEEL

Design aspects of intake and exhaust manifolds, inlet and Exhaust valves, valve springs, tappets, valve train. Materials and design of flywheel.

UNIT IV DESIGN OF VALVE ACTUATINGCOMPONENTS

Design of valve springs, tappet. Cam design, cam profile generation, cam shaft design, rocker and rocker shaft design considerations, materials.

UNIT V DESIGN OF BELT, PULLEY, TIMING CHAIN ANDSPROCKET

Selection of V belts and pulleys – selection of Flat belts and pulleys - Selection of Transmission chains and Sprockets. Design of pulleys and sprockets

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Jain.R.K	Machine Design	Khanna Publishers, New Delhi.	1997
2	Charles Fayette Taylor	The Internal Combustion engine in Theory and Practice	MIT Press Ltd	1985

REFERENCES:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Heldt.P.M	High Speed Combustion Engines	Oxford-IBH Publishing Co., Calcutta.	1965
2	Kolchin.A and Demidov.V	Design of Automotive Engines	MIR Publishers, Moscow.	1984
3	Sundararaja Murthy T.V.	Machine Design	Khanna Publishers, New Delhi.	1991

DESIGN DATA BOOK:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	PSG College of Technology	Design Data Book	Kalaikathir Achagam, Coimbatore.	1978

16BEAE503A **AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEMS** **3003 100**

OBJECTIVES:

- Sketch and explain the working principle of battery and ignition system.
- Discuss working of the starting system and charging system.
- Illustrate the automobile wiring system.
- Illustrate the automobile lighting system.
- Identify the sensors and actuators used in the automobile.
- Explain the electronic engine management system.

COURSE OUTCOMES:

- Sketch and explain the working principle of battery and ignition system.
- Discuss working of the starting system and charging system.
- Illustrate the automobile wiring system.
- Illustrate the automobile lighting system.
- Identify the sensors and actuators used in the automobile.
- Explain the electronic engine management system.

UNIT I BATTERIES ANDACCESSORIES

Principle and construction of lead acid battery, characteristics of battery, rating capacity and efficiency of batteries, various tests on batteries, maintenance and charging. Lighting system: insulated and earth return system, details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.

UNIT II CHARGINGSYSTEM

Generation of direct current, shunt generator characteristics, armature reaction, third brush regulation, cutout. Voltage and current regulators, compensated voltage regulator, alternators principle and constructional aspects and bridge rectifiers, new developments.

UNIT III STARTINGSYSTEM

Condition at starting, behavior of starter during starting, series motor and its characteristics, principle and construction of starter motor, working of different starter drive units, care and maintenances of starter motor, starter switches.

UNIT IV FUNDAMENTALS OF AUTOMOTIVEELECTRONICS

Current trends in automotive electronic engine management system, electromagnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system.

UNIT V SENSORS ANDACTUATORS

Types of sensors: sensor for speed, throttle position, exhaust oxygen level, manifold pressure, crankshaft position, coolant temperature, exhaust temperature, air mass flow for engine application. Solenoids, stepper motors,relay.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2.	William B.Riddens	Understanding Automotive Electronics, 5th Edition	Butterworth Heinemann Woburn	1988

REFERENCES:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Bechhold	Understanding Automotive Electronics	SAE.	1998
2.	Crouse.W.H	Automobile Electrical Equipment, 3rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	Judge.A.W	Modern Electrical Equipment of Automobiles	Chapman & Hall, London	1992
4.	Kholi.P.L	Automotive Electrical Equipment	Tata McGraw-Hill Co Ltd., New Delhi	1975
5.	Robert Bosch	Automotive Hand Book, 5th Edition	SAE.	2000
6.	Ganesan.V	Internal Combustion Engines 4th Edition	Tata McGraw-Hill Publishing Co., New Delhi	2012

16BEAE503B **AUTOMATION & MECHATRONICS** **3003 100**

OBJECTIVES:

- Select the different types of sensor for various mechatronics applications.
- Identify suitable actuator used in a mechatronic system.
- Design a feedback controller for mechatronic systems.
- Develop a controller using microcontroller for the mechatronic system.
- Describe the PLC
- Write a program for PLC used in the mechatronic systems.

COURSE OUTCOMES:

- Select the different types of sensor for various mechatronics applications.
- Identify suitable actuator used in a mechatronic system.
- Design a feedback controller for mechatronic systems.
- Develop a controller using microcontroller for the mechatronic system.
- Describe the PLC
- Write a program for PLC used in the mechatronic systems.

INTRODUCTION

Concept and scope of automation: Socio economic Consideration: Low cost automation. Necessity of Multidisciplinary study – Evolution of Mechatronics – Brief introduction to manufacturing – Principles of Mechatronics.

UNIT I PNEUMATIC AND HYDRAULIC SYSTEMS

Hydraulics and pneumatic power supplies, Direction control valves, Pressure control valve: pressure limiting, pressure relief and pressure sequencing valves, speed control valve, servo valves and servo systems, time delay valves, shuttle valve, Actuators: Single acting and double acting cylinders, Cushion assembly, Rotary actuators, Vane Motor, Pilot operation, Cylinders sequencing and process control.

UNIT II PROGRAMMABLE LOGIC CONTROLLER (PLC)

Function of PLC, Architecture, Components Of PLC, selection of PLC, Ladder Logic Diagram, and Logic Functions: latching, sequencing, counters, shift registers, jumpers, manipulation of data, arithmetic operations. Application of personal computer in control and automation: Data acquisition: ADC, DAC, digital input, digital output, control of DC motor, stepper motor. Solid State Switches, Solenoid, DC/AC Motors, and Stepper Motors.

UNIT III ROBOTICS

Introduction, classification based on geometry, devices, control and path movements, End effectors- types and application: Sensors- types and application, Concept of Robotics/Machine vision, Teach Pendant.

Application: Material transfer, machine loading /unloading, welding, assembly and spray painting operations.

UNIT IV TRANSDUCERS,SENSORS&ACTUATORS

Define Transducer and Sensor - Transduction Principle – Transducer types – Photo emissive, Photoconductive and Photovoltaic Transducers – Thermistors – Thermo devices – Thermocouple – Inductive Transducers – Piezo-electric Transducer- Hall-effect Transducer – Strain-gauge type Transducers.

Sensors: Types – Active or Self-generating and Passive or Modulating types – Pressure Sensing – Variable resister, Variable Inductance, Variable differential transformer, Strain gauge and Piezo-resistive types – Position and Level sensing – Magnetic-variable reluctance, d.c.excited inductive, hall-effect, Reed Switch, Optical &Fibre Optics and Capacitance types – Air Flow Sensing – Hot wire, Flap type and Aneroid Gas Sensing – Exhaust Gas Oxygen Sensor – Knock Sensing.

Actuators: Introduction – Types and application areas – Stepper Motor – Pneumatic actuators –Valves - Hydraulic actuators.

UNIT V MECHATRONIC SYSTEMS

Definition and approach of Mechatronics, Measurement and Control Systems and Mechatronics Approach. Traditional and Mechatronics design, possible Mechatronics design solutions, case studies.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Bolton.W	Mechatronics	Pearson Education Asia, New Delhi	2003
2.	Ramesh S. Gaonkar	Microprocessor Architecture, Programming, and Applications with the 8085 6th Edition	Penram International, India	2013

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Bradley D.A, Dawson.D, Buru.N.C and Loader.A.J,	Mechatronics	Chapman and Hall, New Delhi	1993
2.	Dan Necsulesu	Mechatronics	Pearson Education Asia, New Delhi.	2002
3.	Lawrence J. Kamm	Understanding Electro – Mechanical Engineering, An Introduction to Mechatronics	Prentice – Hall of India Pvt., Ltd., New Delhi.	2000

4.	NitaigourP remchand Mahadik	Mechatronics	Tata McGraw-Hill publishing Company Ltd, New Delhi.	2003
5.	Groover.M.P	Industrial Robotics – Technology, Programming and Applications	McGraw-Hill, New Delhi.	2001

16BEAE5E-- PROFESSIONAL ELECTIVE – I 3 0 0 3 100

16BEAE5E-- PROFESSIONAL ELECTIVE – II 3 0 0 3 100

16BEAE511 THERMALENGINEERINGLABORATORY 0 0 3 2 100

OBJECTIVES:

- To impart knowledge on the flash point, fire point and viscosity of the fuel.
- To learn the port timing and valve timing diagram of internal combustion engines.
- To study the performance of the internal combustion engine and refrigeration system.
- To understand the thermal conductivity, heat transfer and emissivity.
- To know the effectiveness of heat exchangers.

COURSE OUTCOMES:

- Measure the flash point, fire point and viscosity of given sample.
- Draw the port timing diagram of two-stroke and valve timing diagram of four-stroke internal combustion engines.
- Evaluate the performance of internal combustion engine and reciprocating air compressor.
- Calculate the coefficient of performance of a refrigeration system
- Estimate the thermal conductivity of material, heat transfer from surface and emissivity of a grey surface.
- Calculate the effectiveness of a heat exchanger

List of Experiments:

1. Determination of Viscosity of Oils – Red WoodViscometer.
2. Determination of Flash Point and Fire Point offuels
3. Valve timing and port timingdiagram
4. Performance test on automotive multi-cylinder CIengines
5. Morse test on multi-cylinder SIengine
6. Thermal conductivity measurement by guarded platemethod
7. Natural convection heat transfer from a verticalcylinder
8. Heat transfer from pin-fin (natural & forced convection modes)
9. Determination of emissivity of a greysurface
10. Effectiveness of Parallel/counter flow heatexchanger
11. Determination of COP of a refrigerationsystem
12. Performance test on single/two stage reciprocating aircompressor.

16BEAE512 AUTOMOTIVE ELECTRICAL AND ELECTRONICSLABORATORY

0 0 3 2 100

OBJECTIVES:

- Sketch and explain the working principle of battery and ignition system.
- Discuss working of the starting system and charging system.
- Illustrate the automobile wiring system.
- Illustrate the automobile lighting system.
- Identify the sensors and actuators used in the automobile.
- Explain the electronic engine management system.

COURSE OUTCOMES:

- Sketch and explain the working principle of battery and ignition system.
- Discuss working of the starting system and charging system.
- Illustrate the automobile wiring system.
- Illustrate the automobile lighting system.
- Identify the sensors and actuators used in the automobile.
- Explain the electronic engine management system.

List of Experiments:

A. ElectricalLaboratory

1. Testing of batteries and batterymaintenance
2. Testing of starting motors andgenerators
3. Testing ofalternators
4. Diagnosis of ignition systemfaults
5. Study of Automobile electricalwiring

B. ElectronicsLaboratory

6. Study of rectifiers, filters, logic gates, adder,flip-flops,SCR and ICtimer
7. Interfacing A/D converter and simple dataacquisition
8. Display and Keyboard interface usingmicrocontroller
9. Interfacing sensors usingmicrocontroller.
10. Stepper motor and DC motor interface usingmicrocontroller.
11. Simulation of automotive lightingsystem

16BEAE513 DYNAMICS ANDMECHATRONICSLABORATORY 0 0 3 2 100

- To study the working principle of governor and gyroscope.
- To familiarize the students to understandgyroscopic law and gyroscopic couple
- To provide knowledge on the balancing of rotating and reciprocating masses.
- To learn the concept of transverse and torsional vibration.
- To introduce the concept and working of sensors used in the mechatronic systems.

OBJECTIVES:

COURSE OUTCOMES:

- Select the suitable governor for various engineering applications.
- Familiar with gyroscopic law and determine the gyroscopic couple
- Estimate the balancing mass for rotating and reciprocating masses.
- Calculate the natural frequency of transverse and torsional vibration.
- Select the different types of sensor for various mechatronics applications.
- Develop a controller using the microcontroller for mechatronic system.

LIST OF EXPERIMENTS

1. Governors – Determination of sensitivity, effort, etc. for Watt, Porter, Proell, and spring controlledGovernors
2. Cam – Determination of jump speed and profile of thecam.
3. Motorized Gyroscope–Verification of laws –Determination of gyroscopiccouple.
4. Whirling of shaft–Determination of critical speed of shaft with concentratedloads.
5. Balancing of rotating and reciprocatingmasses.
6. Determination of moment of inertia by oscillation method for connecting rod andflywheel.
7. Vibrating system – spring mass system – Determination of damping co–efficient ofsingle degree of freedomsystem
8. Determination of torsional frequencies for compound pendulum and flywheel systemwith lumped moment ofinertia.
9. Transverse vibration –free– Beam. Determination of natural frequency and deflection ofbeam.

10. Design and testing of fluid power circuits to control
    (i) velocity (ii) direction and (iii) force of single and double actingactuators
11. Design of circuits with logic sequence using Electro pneumatic trainerkits.
12. Simulation of basic Hydraulic, Pneumatic and Electric circuits usingsoftware
13. Circuits with multiple cylinder sequences in Electro pneumatic usingPLC.
14. Modeling and analysis of basic electrical, hydraulic and pneumatic systems using LABVIEW

16BEAE514 COURSE ORIENTED PROJECT-III 1 0 0 1 100

The objective of this project is to provide opportunity for the students to implement their skills acquired and design projects based on courses in the fifth semester

The students in convenient groups of not more than 3 members have to take up a project work in any subject of their choice in the third semester. Every project work shall have a guide who is the member of the faculty of the institution.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Identify a problem and develop the solutions.
- Identify, formulate and analyse problems and justify solutions using scientific knowledge.
- Apply technical ideas, strategies and methodologies.
- Design and conduct experiments, as well as analyse and interpret data.
- Familiar with cost-effectiveness analysis.
- Prepare technical report and oral presentations.

16BEAE551 IN-PLANTTRAINING 0 0 0 0100

Students will undergo industrial training for three weeks during the vacation at the end of IV semester and a report with the training completion certificate from the industry will be subsequently submitted to the department within a week after completion. Viva – Voce exam will be conducted at the end of V semester and 100 marks will be awarded.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Apply theoretical knowledge to practical work situations.
- Become updated with all the modern changes in technological world.
- Learn, practice and acquire the skills necessary
- Acquire knowledge through interaction with professionals
- Prepare report and presentation with effective visual aids
- To deliver effective presentation with clarity

16BEAE552 TECHNICAL PRESENTATION&SEMINAR 1 0 0 -100

COURSE OBJECTIVES:

- To develop self-learning skills of utilizing various technical resources to make a technical presentation.
- To promote technical presentation and communication skills.
- To understand the guidelines to prepare the slides and effectively use it for presentation.
- To promote the ability for interacting and sharing attitude.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Refer and utilise various technical resources available from multiple fields.
- Demonstrate sound technical knowledge on a given topic.
- Learn, practice and acquire the skills necessary
- Use a structured presentation methodology to prepare presentation material and effective visual aids
- Determine and develop personal presentation style
- To deliver effective presentation with clarity

16BEAE601 **AUTOMOTIVE CHASSIS DESIGN** **3204 100**

OBJECTIVES:

- To learn the design procedure of frame and springs.
- To study the design procedure of front axle and steering linkages.
- To provide knowledge on the design of clutches.
- To impart knowledge on the design of three speed and four speed gearboxes.
- To study the design of driveline components.
- To facilitate the understanding ofshafts

COURSE OUTCOMES:

- Design the frame and springs for automotive.
- Analyse the loads, moments and stresses at different sections of front axle.
- Design a suitable clutch for various engineering applications.
- Design the gearbox for various engineering applications.
- Design the propeller shaft to transmit required torque.
- Design the rear axle shafts

UNIT I INTRODUCTION

Assumptions to be made in designing a vehicle, Range of values for Gross Vehicle Weight, Frontal Area, maximum speed, maximum acceleration, gradability in different gears, Basics of Automobile Design.

UNIT II VEHICLE MOTION & PERFORMANCE CURVES

Calculation and Plotting of Driving force, Power requirement for different loads and acceleration, Maximum Power calculation. Calculation, Tabulation and Plotting of Torque and Mechanical Efficiency for different\vehicle speeds, Interpolation of Pressure – Volume diagram, Calculation of frictional Mean Effective Pressure, Calculation of Engine Cubic Capacity, Bore and StrokeLength.

UNIT– III VEHICLE FRAME AND SUSPENSION

Study of loads, moments and stresses on frame members, computer aided design of frame for passenger and commercial vehicles, computer aided design of leaf springs, coil springs and torsion bar springs.

UNIT– IV FRONT AXLEAND STEERINGSYSTEMS

Analysis of loads, moments and stresses at different sections of front axle, determination of loads at kingpin bearings, wheel spindle bearings, choice of bearings, determination of optimum dimensions and proportions for steering linkages ensuring minimum error in steering.

UNIT– V FINAL DRIVE AND REARAXLE

Design of propeller shaft, design details of final drive gearing, design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Giri.N.K	Automobile Mechanics 8th Edition	Khanna Publishers, New Delhi.	2008
2.	Prabhu.T.J	Design of Transmission Elements	P R Lithographers	2003
3.	Lichty	IC Engines	KogakushaCo., Limited,Tokyo.	1986
4.	Julien Happian-Smith	An Introduction to Modern Vehicle Design	Butterworth Heinemann Publishers	2000

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Giles.J.G	Engine Design	lliffe Books Ltd., London	1968
2.	John Fenton	Gasoline Engine analysis for CAD	MEP, London.	1986
3.	Fred Schaefer and Richard Van Basshuysen	Internal Combustion Engine Handbook-Basic Components, Systems and Perspectives	SAE.	2004
4.	Heldt P M	High Speed Combustion Engines	Oxford IBH Publishing Co., Calcutta	1986

16BEAE602 **VEHICLE DYNAMICS** **3003 100**

OBJECTIVES:

- To study the fundamental concept of vibration of a single degree of freedom system.
- To acquire knowledge on the road vehicle dynamics, stability and handling.
- To develop an understanding of the relationships between vehicle design variables and vehicle dynamic behaviour.
- To apply modelling techniques to predict the dynamic behaviour of road vehicles.
- To introduce the concepts ofgradeability, tractive force, braking force and stopping distance
- To provide knowledge onsteady state cornering model to design the steering system.

COURSE OUTCOMES:

- Explain the basic elements of vibration of single degree of freedom system.
- Analyse the cornering and tractive property of a tyre.
- Understand the sources of vibration
- Design and analyse the suspension system of a vehicle.
- Analyse the gradeability, tractive force, braking force and stopping distance of a vehicle.
- Apply steady state cornering model to design the steering system of a vehicle.

UNIT I INTRODUCTION

Fundamental of vibration, Mechanical vibrating systems. Modelling and Simulation - Model of an automobile - Single, two, multi degrees of freedom systems – Free, forced and damped vibrations. Magnification factor - Transmissibility - Vibration absorber.

UNIT II MULTI DEGREE OF FREEDOMSYSTEMS

Closed coupled system - Eigen value problems - Far coupled Systems - Orthogonality of mode shapes – Modal analysis - Forced vibration by matrix inversion. Approximate methods for fundamental frequency - Dunkerley's lower bound - Rayleigh's upper bound - Hozler method for close coupled and branchedsystems.

UNIT III SUSPENSION ANDTYRES

Requirements. Sprung mass frequency. Wheel hop, wheel wobble, wheel shimmy. Choice of suspension spring rate. Calculation of effective spring rate. Vehicle suspension in fore and apt directions. Ride characteristics of tyre - Effect of driving and braking torque - Gough's tyre characteristics.

UNIT IV VEHICLE HANDLING

Over steer, under steer, steady state cornering. Effect of braking, driving torques on steering. Effect of camber, transient effects in cornering. Directional stability of vehicles.

UNIT V STABILITY OFVEHICLES

Load distribution, Calculation of Tractive effort and reactions for different drives - Stability of a vehicle on a slope, on a curve and a banked road.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Giri .N.K,	Automobile Mechanics 8th Edition	Khanna Publishers,New Delhi.	2008
2.	Rao.J.S and Gupta.K	Theory and Practice of Mechanical Vibrations	Wiley Eastern Ltd. Delhi.	1999
3	Rao Srinivas.V,Dukkipati.J	Textbook of Mechanical Vibrations	PHI	2012
4	Wong.J.Y	Theory of Ground Vehicles	John Wiley & Sons; 4th Edition edition	2008

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt.P.M	Automotive Chassis	Chilton Co., New York	1992
2.	Ellis.J.R	Vehicle Dynamics	Business Books Ltd., London	1991
3.	Giles.J.G	Steering, Suspension and Tyres	lllliffe Books Ltd, London	1998
4.	Gillespie.T.D	Fundamental of Vehicle Dynamics	Society of Automotive Engineers,USA	1992

16BEAE603 VEHICLE BODY ENGINEERING AND SAFETY 3003 100

OBJECTIVES:

- Distinguish the various aerodynamic forces and moments.
- Explain different aspects of the car body, bus body and commercial vehicle.
- Describe the safety aspect of bus body
- Describe the commercial vehicle bodies
- Explain the regulations.
- Describe the material used in bodybuilding, tools used and body repairs.

COURSE OUTCOMES:

- Distinguish the various aerodynamic forces and moments.
- Explain different aspects of the car body, bus body and commercial vehicle.
- Describe the safety aspect of bus body
- Describe the commercial vehicle bodies
- Explain the regulations.
- Describe the material used in bodybuilding, tools used and body repairs.

UNIT I CAR BODY

Types: Saloon, Convertibles, Limousine, Estate Van, racing and sports car - Driver's seat, Body Mechanisms - window winding, Door lock, seat adjustment. Driver's visibility and tests for visibility. Minimum space requirements and methods of improving space in cars. Safety - safety design, safety equipments. Car body construction.

UNIT II BUS BODY

Types: Mini bus, single and double decker, two level, split level and articulated bus. Bus body layout – Floor height - Engine location - Entrance and exit location - Seating dimensions.
Constructional details: Frame construction, Double skin construction -Types of metal section used - Regulations -Conventional and integral type construction.

UNIT III COMMERCIALVEHICLE

Types: Flat platform, drop side, fixed side, tipper body, tanker body. LCV body types: pickup, van. Dimensions of driver's seat in relation to controls and steering angle -Driver cab design.

UNIT IV VEHICLE AERODYNAMICS ANDERGONOMICS

Objectives -Vehicle drag and types - various types of forces and moments -Effects of forces and moments – Side wind effects -Various body optimization techniques for minimum drag –Wind tunnel testing: Flow visualization techniques, Scale model testing, Component balance to measure forces and moments. Simple problems.

ERGONOMICS: Introduction, seating dimensions, interior ergonomics, ergonomics system design, seat comfort, suspension seats, split frame seating, back passion reducers, dash board instruments, electronic displays, commercial vehicle cabin ergonomics, mechanical package layout, goods vehicle layout.

UNIT V BODY MATERIALS, TRIM ANDMECHANISMS

Aluminium alloy sheet, extrusion and casting, stainless steels, alloy steels, Metal Matrix Composites. Structural timbers -properties. Designing in GRP and high strength composites, Thermo plastics, Load bearing plastics, semi-rigid PUR foams and sandwich panel construction. Corrosion, Anticorrosion methods. Selection of paint and painting process -Body trim items. Prototype making and crash test analysis on full scale model

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Powloski.J	Vehicle Body Engineering	Business Boob Ltd.	1989

REFERENCE BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Giles.J.C	Body construction and design	IliffeBoob Butterworth & Co	1971
2.	John Fenton	Vehicle Body layout and analysis	Mechanical EnggPublication Ltd,London	1982
3.	Braithwaite.J.B	Vehicle Body building and drafting	Heinemann Educational Book-I Ltd., London.	1977
4.	Dieter Anselm	The Passenger Car Body	ISBN Number: 0-7680-0708-9, SAE International	2000

16BEAE604A **MANUFACTURING TECHNOLOGY** **3003 100**

OBJECTIVES:

- To impart knowledge on the basic principle and manufacturing methods of components.
- To study the steps involved in the casting process.
- To learn the theory of metal cutting and calculate the forces involved in it.
- To introduce the basic concepts of integrated manufacturing.
- To introduce the basic concepts of grinding process
- To provide an exhaustive knowledge on various generic process and benefits of rapid prototyping techniques.

COURSE OUTCOMES:

- List and explain the steps involved in the casting process.
- Understand the theory of metal cutting.
- Select the suitable type of machine for machining operations.
- Describe the types of grinding process.
- Select the suitable material handling and storage system for flexible manufacturing systems.
- Select appropriate rapid prototyping process for engineering applications

UNIT I FOUNDRY AND CASTING

Patterns. Moulds-types of moulds, moulding sand characteristics. Core making, melting, Processes-shell moulding, investment castings, centrifugal castings, die casting, Fettling and cleaning of casting. Casting defects andremedies.

UNIT II THEORY OF METAL CUTTING AND MACHINETOOLS

Introduction, mechanics of metal cutting, orthogonal and oblique cutting, merchants equation, chip formation, heat generation, cutting fluids, cutting tool life - recent developments and applications (Dry machining and high speed machining).

Cutting tool materials, cutting tool nomenclature, introduction to machine tools, lathe, shaper, planning, milling, drilling and boring machines, working principle, operations, work holding devices,machining time calculation and cost estimation.

UNIT III MANUFACTURE OF COMPONENTS AND SURFACE FINISHING PROCESSES

Production of axis-symmetrical components- shafts, hubs, pins. Production of prismatic components-housings, lathe beds, gearboxes, machine columns. Hole production in components using drilling and boring.

Gear manufacturing processes-Gear form machining-generation process and gear hobbing, shaping machines, manufacture of spur, helical, bevel, worm and worm wheel. Gear finishing.

Surface finishing processes- Grinding machines, grinding wheel specification, honing, lapping, burnishing, super finishing surface integrity concepts.

UNIT IV INTEGRATED MANUFACTURINGSYSTEM

Definition – application – features – types of manufacturing systems – machine tools – computer control system – DNC systems manufacturing cell Flexible manufacturing systems (FMS) – The FMS concept – transfer systems – head changing FMS, GroupTechnology.

UNIT V RAPIDPROTOTYPING

Introduction, FDM- Principle, process parameters, applications, SLS- Types of machines, principles of operation, process parameters, applications. Rapid Tooling- Indirect rapid tooling - silicone rubber tooling, aluminum filled epoxy tooling, spray metal tooling, direct rapid tooling - direct AIM, quick cast process, copper polyamide, rapid tool.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Bhattacharya.A	New Technology	IN Publishing, New Delhi	1984
2.	Milton C. Shaw	Metal Cutting Principles	Clarendon Press, Oxford	1999
3.	Singh.D.K	Manufacturing Technology	Pearson Education	2008
4.	Kalpakjian	Manufacturing Engineering and Technology, 3rd Edition	Addison Wesley Publishing Company Inc	1995
5.	Khanna .O.P	Welding Technology	Dhanpat Rai and Sons, New Delhi.	1994
6.	Duc Pham and Dimov S S	Rapid manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling	Springer	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	HMT	Production Technology	Tata McGraw-Hill Co, New Delhi	2004
2.	James Brown	Advanced Machining Technology Handbook	McGraw Hill Book Company, New York	1998

3.	Pandey.P.C	Modern Machining Processes	Tata McGraw Hill Publications Co. Ltd, New Delhi	2013

16BEAE604B **PRODUCTION PROCESS FOR AUTOMOTIVE COMPONENTS** **3003 100**

OBJECTIVES:

- To impart knowledge on basic principle and production methods of automotive components.
- To learn the surface coating technologies used in the automotive industry.
- To understand the importance of suitable process for the manufacturing automotive components.
- To enrich the understanding of casted and forged engine components
- To know the application of the emission control system
- To expose students to the stretch forming of auto body panels

COURSE OUTCOMES:

- List and explain the steps involved in the forging process.
- Explain the steps involved in the casting process
- Describe the powder metallurgy process.
- explain the steps involved in the machining and gear manufacturing.
- Describe the welding processes
- Describe the un conventional machining processes

UNIT I FORMINGPROCESS

Forging - process flow chart, forging of valves, connecting rod, crank shaft, cam shaft ,propeller shaft, transmission gear blanks, foot brake linkage, steering knuckles, Extrusions: Basic process steps, extrusion of transmission shaft, steering worm blanks, brake anchor pins, rear axle drive shaft, axle housing spindles, piston pin and valve tappets. Hydro forming: Process, hydro forming of manifold and comparison with conventional methods- Hydro forming of tail lamp housing. Stretch forming - Process, stretch forming of auto body panels -Super plastic alloys for auto bodypanels.

UNIT II CASTING, MACHINING AND GEARMANUFACTURING

Sand casting of cylinder block and liners - Centrifugal casting of flywheel, piston rings, bearing bushes, and liners, permanent mould casting of piston, pressure die casting of carburettor other small auto parts. Machining of connecting rods - crank shafts - cam shafts - pistons - piston pins - piston rings - valves - front and rear axle housings - fly wheel - Honing of cylinder bores - Copy turning and profile grinding machines. Hobbing and shaping - Gear finishing and inspection.

UNIT III POWDER METALLURGY AND RECENT TRENDS IN MANUFACTURING OF AUTOCOMPONENTS

Process flow chart - Production of metal powders and their raw materials – Manufacture of friction lining materials for clutches and brakes - Testing and inspection of PM parts.

Powder injection moulding – Shot peen hardening of gears - Production of aluminum MMC liners for engine blocks - Plasma spray coated engine blocks and valves - Recent developments in auto body panel forming -Squeeze casting of pistons - aluminum composite brakerotors

UNIT IV WELDING & ALLIED PROCESSES

Classification of Welding Processes; Arc Welding- Principle of Arc, Metal Transfer, Arc Characteristics; Working and applications of Carbon Arc Welding, Flux Shielded Metal Arc Welding (SMAW), TIG (GTAW), MIG (GMAW), SAW and ESW; Resistance Welding- Spot, Seam, Projection and Flash Butt; Gas Welding- Oxy Acetylene and Oxy Hydrogen; Thermit Welding; Solid State Welding Processes; Fusion Welding Pool and Welding Defects, Allied Processes- Brazing and Soldering.

UNIT V UN CONVENTIONAL MACHININGPROCESSES

Abrasive Jet Machining – Water Jet Machining – Ultrasonic Machining. Electric Discharge Machining (EDM) - Wire cut EDM - Chemical machining and Electro-Chemical machining (CHM and ECM) Laser Beam machining (LBM), plasma Arc machining (PAM) and Electron Beam Machining - Working Principles – equipment used – Process parameters – MRR-Variation in techniques used – Applications

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt.P.M	High Speed Combustion Engines	Oxford Publishing Co., New York	1990
2.	Philip F.Ostwald and Jairo Munoz	Manufacturing Processes and Systems	John Wiley & Sons, New York	Reprint 2008

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Haslehurst.S.E	Manufacturing Technology	ELBS, London	1990
2.	Rusinoff	Forging and forming of metals	D.B.Taraporevala Sons & Co. Pvt Ltd., Mumbai	1995
3.	Sabroff.A.M	Forging Materials & Processes	Reinhold Book Corporation, New York.	1988
4.	ASTME	High Velocity Forming of Metals	Prentice Hall of India (P) Ltd., New Delhi	1990

16BEAE6E--	**PROFESSIONAL ELECTIVE – III**	**3 0 0 3 100**
16BEAE6E--	**PROFESSIONAL ELECTIVE – IV**	**3 0 0 3 100**

16BEAE611	AUTOMOBILE VEHICLE MAINTENANCE AND RE-CONDITIONING LABORATORY	0032 100

OBJECTIVES:

- To study the garage layout and general procedure for servicing.
- To learn the tuning of gasolineengine.
- To expose students to tuning of diesel engines
- To impart knowledge on fault diagnosis in electrical and electronic ignition systems.
- To provide knowledge on troubleshooting of fuel feed system, charging system, starting system and lighting system.
- To familiarisewith adjustment of the headlight beam.

COURSE OUTCOMES:

- List the procedure for servicing of an automobile.
- Demonstrate the tuning of gasoline engines.
- Demonstrate the tuning of diesel engines.
- Identify the fault in electrical and electronic ignition systems.
- Analyse and troubleshoot the faults of fuel feed system, charging system, starting system and lighting system.
- Demonstrate the adjustment of the headlight beam.

List of Experiments:

<u>I AUTOMOBILE VEHICLEMAINTENANCE</u>

1. Study and layout of an automobile repair, service and maintenanceshop.
2. Study and preparation of different types of tools and instruments, different statements/records required for the repair and maintenanceworks
3. Minor and major tune up of gasoline and dieselengines
4. Fault diagnosis in electrical and electronic ignitionsystems
5. Gasoline fuel system, diesel fuel system and rectification
6. Study of faults in the electrical systems such as Head lights, Side of Parking lights, Trafficator lights, Electric horn system, Windscreen wiper system, Starter system and chargingsystem.
7. Study of fuel filters (both gasoline and diesel engines) and air cleaners (dry andwet)
8. Simple tinkering, soldering works of body panels, study of door lock and window glass rising mechanisms.
9. Adjustment of pedal play in clutch, brake, hand brake lever and steering wheelplay
10. Air bleeding from hydraulic brakes, air bleeding of diesel fuelsystem.
11. Adjustment of head lightsbeam.

II AUTOMOBILE RE-CONDITIONING

12. Removal and fitting of tire andtube.
14. Cylinder reboring – checking the cylinder bore.
14. Setting the tool andreboring.
15. Valve grinding, valve lapping, setting the valve angle and checking for valveleakage
16. Calibration of fuel injectionpump
17. Chassis alignmenttesting

16BEAE612 MANUFACTURING PROCESSES LABORATORY 0032 100

OBJECTIVES:

- To facilitate the understanding of lathe machine and its operations.
- To provide practical knowledge on Preparing a flat and contour surface using milling machine.
- To provide practical knowledge on Preparing holes with higher finish by Drilling / Tapping / Reaming.
- To facilitate the understanding of surface and cylindrical grinding operations for surface finish.
- To introduce Surface preparation and etching techniques, heat treatment and metallographic studies.
- To impart knowledge on Forging processes.

COURSE OUTCOMES:

- Perform various operations on of lathe machine.
- Prepare a flat and contour surface using milling machine.
- Prepare holes with higher finish by Drilling / Tapping / Reaming.
- Perform surface and cylindrical grinding operations for surface finish.
- Prepare Surface preparation and etching techniques, heat treatment and metallographic studies..
- Perform various Forging processes.

List of Experiments:

1. Introduction- lathe machine, plain turning, Step turning & grooving (Including lathe mechanisms, simpleproblems).
2. Taper turning-compound rest/offset method & Drilling using lathe (Including Drilling feed mechanism, Twist drill nomenclature, and Different types of taper turningoperations).
3. External threading-Single start (Including Thread cutting mechanism-simpleproblems)
4. Eccentric turning-Singleaxis
5. Shaping-V-Block (Including Shaper quick returnmechanism)
6. Grinding-Cylindrical /Surface/Tool &cutter
7. Slotting-Keyways (Including Broaching tool nomenclature and Slottermechanism)
8. Milling-Polygon /Spur gear (Including Milling mechanism, simpleproblems)
9. Gear hobbing-Helicalgear
10. Drilling, reaming, counterboring
11. Planning/Capstan lathe/Burnishing process (Planner Mechanism, Description of capstan and turret lathe)
12. Surface preparation and etching techniques, heat treatment and metallographicstudies.
13. Laboratory experiments in fabrication processes: Spot, MIG, ARC and Gas Welding, Testing of Joints.
14. Basic Forging processes like upsetting, drawing down and forgewelding

16BEAE651 **MINIPROJECT** **1 0 0 2 100**

The objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to practical problems.

The students in convenient groups of not more than 4 members have to take one small item for design and fabrication. Every project work shall have a guide who is the member of the faculty of the institution.

The students are required to design and fabricate the chosen item in the college and demonstrate its working apart from submitting the project report. The report should contain assembly drawing, parts drawings, process charts relating to fabrication.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Demonstrate sound technical knowledge of a selected project topic.
- Apply the knowledge of mathematics, science and engineering to solve complex engineering problems.
- Identify, formulate and analyse problems and justify solutions using scientific knowledge.
- Design and conduct experiments
- Analyse and interpret data.
- Prepare technical report and oral presentations.

The mini-project involves the following:

- Preparing a project brief proposalincluding
- Problemidentification
-A statement of system / process specification proposed to be developed (Block diagram / concept tree)
-List of possible solutions including alternative and constraints
-Cost benefit analysis
-Time Line of activities
-A report highlighting the design finalization (based on functional requirements & standards)
- Fabrication
- Testing & Validation of the developedsystem
- Learning in theProject
- Consolidated report preparation

16BECC701 PROFESSIONAL ETHICS & PRINCIPLES OF MANAGEMENT 3 0 0 3100 AND ENTREPRENEURSHIPDEVELOPMENT

OBJECTIVE

- To enable the students to create an awareness on Engineering Ethics, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

- Explain the human values.
- Implement the importance of ethics and professionalism.
- Practice the process of management's four functions.
- Understand the stress management
- Understand the budgetary and non-budgetary control technique

COURSE OUTCOMES:

- Explain the human values.
- Implement the importance of ethics and professionalism.
- Practice the process of management's four functions.
- Understand the stress management
- Understand the budgetary and non-budgetary control technique
- Understand the entrepreneurial characteristics.

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IT I ENGINEERINGETHICS**

Senses of 'Engineering Ethics' – variety of moral issued – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – Models of Professional Roles – theories about right action – Self–interest – customs and religion – uses of ethical theories.

UNIT II FACTORS OFCHANGES

Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws. Social changes – Meaning and nature – Theories.

UNIT III HISTORICAL DEVELOPMENT, PLANNING,ORGANISING

Definition of Management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies and Planning Premises– Forecasting – Decision–making – Formal and informal organization – Organization Chart.

UNIT IV DIRECTING ANDCONTROLLING

Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment –Process of Communication – System and process of Controlling – Requirements for effective control – Control of Overall Performance – Direct and Preventive Control – Reporting

UNIT V ENTREPRENEURSHIP ANDMOTIVATION

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Harold Kooritz and Heinz Weihrich	Essentials of Management	Tata McGraw Hill, New Delhi	2010
2	Khanka S.S	Entrepreneurial Development	S.Chand and Co. Ltd., NewDelhi	2006
3	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw–Hill, NewYork	2005

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Tripathy P.C and Reddy P.N	Principles of Management	Tata McGraw Hill, New Delhi	2008
2	Rabindra N Kanungo	Entrepreneurship and innovation	Sage Publications, New Delhi	1998
3	Charles E Harris, and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, New Delhi	2013

WEB REFERENCES

1. http://www.managementstudyguide.com/taylor_fayol.htm
2. http://tutor2u.net/business/gcse/people_motivation_theories.htm
3. http://lfkkb.tripod.com/eng24/gilligansthеory.html
4. http://www.developingeyes.com/five–types–of–entrepreneurs/

16BEAE702 **FINITE ELEMENT ANALYSIS** **3204 100**

OBJECTIVE:

- To impart basic knowledge on the finite element method.
- To provide knowledge on one- and two-dimensional elements.
- To study heat conduction problems using finite element method.
- To present knowledge on the higher order and isoparametric elements.
- To Study and acquire knowledge on numerical methods
- To provide knowledge on Gaussian quadrature method

COURSE OUTCOMES:

- Apply the numerical methods to formulate the simple finite element problems.
- Apply the one-dimensional finite element method to solve bar, beam and truss type problems.
- Apply the finite element method for plane stress, plane strain and axisymmetric conditions.
- Determine the temperature distribution of one and two dimensional heat transfer problems using one and two dimensional finite elements.
- Apply the numerical methods to formulate the higher order and isoperimetric problems.
- Apply Gaussian quadrature method.

UNIT I INTRODUCTION

Historical background – Matrix approach – Application to the continuum – Discretization – Matrix algebra – Gaussian elimination – Governing equations for continuum – Classical Techniques in FEM – Weighted residual method – Ritz method

UNIT II ONE DIMENSIONAL PROBLEMS

Finite element modeling – Coordinates and shape functions– Potential energy approach – Galerkin approach – Assembly of stiffness matrix and load vector – Finite element equations – Quadratic shape functions – Applications to plane trusses

UNIT III TWO DIMENSIONALCONTINUUM

Introduction – Finite element modeling – Scalar valued problem – Poisson equation –Laplace equation – Triangular elements – Element stiffness matrix – Force vector – Galerkin approach – Stress calculation – Temperature effects

UNIT IV AXISYMMETRICCONTINUUM

Axisymmetric formulation – Element stiffness matrix and force vector – Galerkin approach – Body forces and temperature effects – Stress calculations – Boundary conditions – Applications to cylinders under internal or external pressures – Rotating discs

UNIT V ISOPARAMETRIC ELEMENTS FOR TWO DIMENSIONALCONTINUUM

The four node quadrilateral – Shape functions – Element stiffness matrix and force vector – Numerical integration – Stiffness integration – Stress calculations – Four node quadrilateral for axisymmetric problems.

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Rao S.S	The Finite Element Method in Engineering 5th Edition	Butter worth Heinemann imprint, USA	2010
2	Logan D.L	A First course in the Finite Element Method 5th Edition	Cengage Learning, Stamford, USA.	2012

REFERENCES

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Chandrupatla T.R., and BelegunduA.D	Introduction to Finite Elements in Engineering	Pearson Education, Delhi.	2002
2	David V Hutton	Fundamentals of Finite Element Analysis	McGraw–Hill Int. Ed, New York.	2005

16BEAE7E--	**PROFESSIONAL ELECTIVE–V**	**3 0 0 3 100**
	OPENELECTIVE-I	**3 0 0 3 100**
	OPENELECTIVE-II	**3 0 0 3 100**

16BEAE711 | **AUTO SCANNING AND VEHICLE TESTING LABORATORY** | **0032 100**

OBJECTIVES:

- To introduce knowledge ofComputerized engine analyzer.
- To provide knowledge on wheelbalancing.
- To impart knowledge on wheelalignment.
- To learn about Head light focusingtest.
- To impart knowledge on emission test
- To expose students toBrakingdistancetestandVisibilitytest

COURSE OUTCOMES:

- Analysis of engine using Computerized engine analyzer.
- Perform wheelbalancing.
- Perform wheelalignment.
- Understand Head light focusingtest
- Perform emission test.
- PerformBrakingdistancetestandVisibilitytest

List of Experiments:

1. Computerized engine analyzer study andpractice;
2. Computerized wheel balancing machine study andpractice:
3. Computerized wheel alignment machine study andpractice;
4. Head light focusingtest;
5. Exhaust emission test of petrol and diesel engine;
   Study of NDIR Gas AnalyserandFID.
   Study of Chemiluminescent NOx analyzer.
   Measurement of HC, CO, CO2, O2 using exhaust gas analyzer.
   Diesel smoke measurement.
6. Braking distance test and Visibilitytest.

16BEAE712 COMPUTER AIDED DESIGN ANALYSIS LABORATORY 0032 100

OBJECTIVES:

- To introduce knowledge of the FEA software as a tool for analysis.
- To provide knowledge on contact stress analysis using FEA software.
- To impart knowledge on transient analysis using FEA software.
- To learn about temperature distribution for heat conduction using FEA software.
- To impart knowledge on coupled field analysis using FEA software.
- To expose students to analysis of the simple structure using FEA software

COURSE OUTCOMES:

- Analysis of piston and connecting rod using FEA software.
- Analysis of bumper using FEA software.
- Analysis of leaf spring using FEA software.
- Analysis of composite structure using FEA software
- Find the temperature distribution for heat conduction using FEA software.
- Dynamic analysis of the simple structure using FEA software.

List of Experiments:

1. Transient analysis of connectingrod.
2. Crash analysis ofbumper.
3. Thermal analysis ofpiston.
4. Contact stress analysis of leafspring.
5. Coupled field analysis of brakeshoes.
6. Study of Combustionanalysis.
7. Study of Aerodynamicanalysis.
8. Contact stress analysis of gearpair.
9. Stress analysis of composite structure.
10. Vibration analysis of quarter carmodel.

16BEAE791 PROJECTWORKPHASE-I 0 0 8 4 100

- Identification of a real life problem in thrustareas
- Developing a mathematical model for solving the aboveproblem
- Finalization of system requirements andspecification
- Proposing different solutions for the problems based on literaturesurvey

- Future trends in providing alternatesolutions
- Consolidated report preparation of theabove

16BEAE751 **INDUSTRIALROBOTICS** **1 0 0 -100**

OBJECTIVES:

- To learn the construction and fundamentals of robots.
- To expose students to the various sensors
- To provide knowledge on types of drives and end effectors in robots.
- To impart knowledge on sensors and machine vision system.
- To provide knowledge on the applications of robots in industries.
- To provide knowledge on economic analysis of robots

COURSE OUTCOMES:

- Identify the components and construction of robot manipulator.
- Understand the sensors.
- Select a suitable drive and an end effectfor industrial robots.
- Choose sensors and machine vision system for industrial robots.
- Discuss the usage and applications of robots in industries.
- Understand the economic analysis of robots.

PART– I FUNDAMENTALS OFROBOT

Robot – Definition – Robot Anatomy – Co-ordinate Systems, Work Envelope, types and classification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and Their Functions – Need for Robots – Different Applications. Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features. End Effectors – Grippers. Requirements of a sensor, Principles and Applications of sensors – Position of sensors, Proximity Sensors, Touch Sensors - Camera, Frame Grabber, Sensing and Digitizing Image.

PART– II ROBOT CELLDESIGN

Robot cell design – simulation software (Robo Wave). Robot cell layouts – Multiple robots and machine interference – robot cell planning – robot cycle time analysis for assembly, welding and painting shop. Safety Considerations for Robot Operations, Economic Analysis of Robots – Pay back Method, EUAC Method, Rate of ReturnMethod.

TEXT BOOK

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Groover.M.P	Industrial Robotics – Technology, Programming and Applications	McGraw-Hill	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Richard D Klafter, Thomas Achmielewski and Mickael Negin	Robotic Engineering – An integrated Approach	Prentice Hall India, New Delhi	2001

16BEAE801 **TOTALQUALITYMANAGEMENT** **3 0 0 3 100**

- To learn concepts, dimension quality and philosophies of TQM.
- To study the TQM principles and its strategies.
- To expose the seven statistical quality and management tools.
- To impart knowledge on TQM tools for continuous improvement.
- To introduce the quality systems and procedures adopted.
- To acquaint the student with the concepts of quality management system

OBJECTIVES:

COURSE OUTCOMES:

- Use the concepts, dimension of quality and philosophies of TQM.
- Apply the principles of TQM and its strategies in industries.
- Apply the statistical quality tools and seven management tools.
- Choose suitable TQM tools for continuous improvement.
- Understand the Failure Modes and Effects Analysis.
- Use the concepts of quality management system in industries.

UNIT I INTRODUCTION

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT II TQM PRINCIPLES

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT III STATISTICAL PROCESS CONTROL (SPC)

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT IV TQM TOOLS

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT V QUALITY SYSTEMS

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

TEXT BOOK

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dale H.Besterfiled	Total Quality Management	Pearson Education, Inc.	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	James R.Evans and William M.Lindsay	The Management and Control of Quality	South Western College	2010
2.	Feigenbaum.A.V,	Total Quality Control	McGraw-Hill Professional	2004
3.	Oakland.J.S	Total Quality Management and Operational Excellence	Routledge	2014
4.	Narayana.V and Sreenivasan.N.S	Quality Management – Concepts and Tasks	New Age International Ltd., NewDelhi.	1996

16BEAE8E-- PROFESSIONAL ELECTIVE–VI 3 0 0 3 100

16BEAE891 PROJECT WORK PHASE-II AND VIVA- VOCE --3216300

OBJECTIVE

The objective of the project work is to enable the students in convenient groups of not more than 3 members on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Demonstrate sound technical knowledge of the project topic.
- Apply the knowledge of mathematics, science and engineering to solve complex engineering problems.
- Identify, formulate and analyseproblems and justifysolutions using scientific knowledge.
- Design and conduct experiments, as well as analyseand interpret data.
- Execute the project based on the design developed during phase - I.
- Prepare technical report and oral presentations.

16BEAE5E01 DESIGN FOR MANUFACTURE AND ASSEMBLY 3003 100

OBJECTIVES:

- To introduce the way of specifying dimension and tolerance in engineering drawing by using geometric dimensioning and tolerancing.
- To indicate the design considerations while casting, welding and forming of components.
- To familiarisewith the concept and design guidelines for manufacturing parts by different machining processes.
- To study the factors affecting the easy assembly of parts into a final product.
- To impart knowledge on the environmental impact of products manufactured and engineering ways to minimise it
- To Study and acquire knowledge on disassembly, recyclability, remanufacture

COURSE OUTCOMES:

- Apply geometric dimensioning and tolerancing techniques in engineering drawing.
- Apply design considerations to minimise the difficulty in fabrication of components by casting, welding and forming processes.
- Apply design for manufacturing concept to reduce the machining time and manufacturing cost.
- Perform the parts assembly of the given component using design for assembly guidelines.
- Design components taking into consideration the environmental impact.
- Describe disassembly, recyclability, remanufacture.

UNIT I DFM APPROACH, SELECTION AND SUBSTITUTION OF MATERIALS IN INDUSTRY

DFM approach, DFM guidelines, standardization, group technology, value engineering, comparison of materials on cost basis, design for assembly, DFA index, Poka - Yoke principle; 6σ concept; design creativity.

Tolerance Analysis: Process capability, process capability metrics, Cp, Cpk¸cost aspects, feature tolerances, geometric tolerances, surface finish, review of relationship between attainable tolerance grades and different machining process, cumulative effect of tolerances, sure fit law, normal law and truncated normal law.

UNIT II SELECTIVE ASSEMBLY

Interchangeable and selective assembly, deciding the number of groups, Model-I: group tolerances of mating parts equal; Model-II: total and group tolerances of shaft, control of axial play-introducing secondary machining operations, laminated shims, examples.

Datum Systems: Degrees of freedom, grouped datum systems-different types, two and three mutually perpendicular grouped datum planes, grouped datum system with spigot and recess, pin and hole, grouped datum system with spigot and recess pair and tongue-slot pair, computation of translational and rotational accuracy, geometric analysis and applications.

UNIT III TRUE POSITION TOLERANCINGTHEORY

Comparison between co-ordinate and convention method of feature location, tolerancing and true position tolerancing, virtual size concept, floating and fixed fasteners, projected tolerance zone, assembly with gasket, zero true position tolerance, functional gauges, paper layout gauging, compound assembly, examples.

UNIT IV FORM DESIGN OF CASTINGS ANDWELDMENTS

Redesign of castings based on parting line considerations, minimising core requirements, redesigning cast members using weldments, use of welding symbols – design considerations for plastic component manufacturing.

Tolerance Charting Technique: Operation sequence for typical shaft type of components, preparation of process drawings for different operations, tolerance worksheets and centrality analysis, examples, design features to facilitate machining, datum features - functional and manufacturing, component design-machining considerations, redesign for manufacture,examples.

UNIT V LEAN MANUFACTURING

Need for lean concepts, different types of waste, metrics of manufacturing, an overview of value stream mapping- present state map, future state map, evaluation of benefits – Process FMEA, Design FMEA

TEXT BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Harry Peck,	Designing for Manufacture	Pitman Publications, London	1983
2	Robert Matousek D C Johnson	Engineering Design a Systematic Approach	Blackie and Son Ltd., London.	1974

REFERENCES

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Spotts.M.F	Dimensioning and Tolerance for Quantity Production	Prentice Hall Inc., New Jersey, USA.	1983

2	Oliver R Wade	Tolerance Control in Design and Manufacturing	Industrial Press Inc., NewYork.	1967
3	James G.Bralla	HandBook of Product Design for Manufacturing	McGraw Hill Publications, New Delhi.	1983

16BEAE5E02 AUTOMOTIVE AERODYNAMICS 3003 100

OBJECTIVES:

- To provide knowledge on the fundamentals of aerodynamics and vehicle body optimisation.
- To introduce the use of wind tunnels in testing the vehicles.
- various aerodynamic shapes of car
- To introduceaerodynamics for design of the vehicle body
- To study the features ofcharacteristics of forces and moments
- To understand the importance computational fluid dynamics analysis

COURSE OUTCOMES:

- Explain the importance of aerodynamics for automobiles.
- Apply principles of aerodynamics for design of the vehicle body.
- Analyse the various aerodynamic shapes of car.
- Discuss the characteristics of forces and moments.
- Apply the concept of wind tunnel for the aerodynamic design of automobiles.
- Apply the computational fluid dynamics analysis.

UNIT I INTRODUCTION

Scope - historical development trends - Fundamental of fluid mechanics - Flow phenomenon related to vehicles - External & Internal flow problem - Resistance to vehicle motion - Performance - Fuel consumption and performance - Potential of vehicle aerodynamics.

UNIT II AERODYNAMIC DRAG OFCARS

Cars as a bluff body - Flow field around car - drag force - types of drag force - analysis of aerodynamic drag - drag coefficient of cars - strategies for aerodynamic development - low drag profiles.

UNIT III SHAPE OPTIMIZATION OFCARS

Front end modification - front and rear wind shield angle - Boat tailing - Hatch back, fast back and square back - Dust flow patterns at the rear - Effects of gap configuration - effect of fasteners.

UNIT IV VEHICLE HANDLING

The origin of forces and moments on vehicle - side wind problems - methods to calculate forces and moments- vehicle dynamics under side winds - the effects of forces and moments - Characteristics of forces and moments - Dirt accumulation on the vehicle - wind noise - drag reduction in commercial vehicles.

UNIT V WIND TUNNELS FOR AUTOMOTIVEAERODYNAMIC

Introduction - Principle of wind tunnel technology - Limitation of simulation - Stress with scale models – fullscalewindtunnels-measurementtechniques-Equipmentandtransducers-roadtestingmethods – Numericalmethods.

TEXT BOOK

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hucho .W.H	Aerodynamic of Roadvehicles	Butterworth‟s Co. Ltd, London.	1997

REFERENCES

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Alan Pope William H. RaeJewel B. Barlow	Low-Speed WindTunnel Testing,3rd Ed	John Wiley & Sons, New York.	1999
2	SAE	Automotive Aerodynamic	Update SP-706, SAE	1987
3	SAE	Vehicle Aerodynamic	SP-1145, SAE.	1996

16BEAE5E03 **CONTROL SYSTEM** **3003 100**

OBJECTIVES:

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
- To introduce stability analysis
- To introduce Driveline Control System
- To introduce Anti - Lock Braking Control Systems.

COURSE OUTCOMES:

- Describe elements in control systems
- Explain the transfer function.
- Apply the frequency model analysis.
- Describe the driveline control system
- Describe the drive line speed control modeling
- Explain the antilock braking system

UNIT1 INTRODUCTION

Control system - Basic elements in control systems - Open and closed Loop - Effect of feedback - System representations - Transfer functions of single input & single output and multivariable systems – Block diagram reduction techniques – Signal flow graphs – Gain formula – Modeling of control components – Mechanical and electrical systems

UNIT-II TRANSFER FUNCTION MODEL ANDANALYSIS

Test signals– Time response of second order system- Time response – Damping ratio - Natural frequency – Effects of adding poles and zeros – Dominant poles - Stability – Routh Hurwitz criterion – Root locus plots of typical systems – Root locus analysis

UNIT-III FREQUENCY DOMAIN ANALYSIS

Polar plots - Magnitude and phase angle curves - Straight line approximation - Corner frequencies - Bode plots - Assessment of stability - Gain margin and phase margin Assessment- Bode plots for automotivesuspension.

UNIT IV DRIVELINE CONTROLSYSTEM

Drive line modeling - Basic drive line equations- Modeling of neutral gear- Stationary and dynamic gear shift equation- Drive line speed control modeling – Transmission torque control criterion – Torque control design. Signal flow graph model for transmission system.

UNIT V ANTI – LOCK BRAKING CONTROLSYSTEMS

Anti-lock braking control systems, control cycles of ABS system - Control of the yaw dynamics-PID for ABS system - Mathematical model for ABS model- vehicle controllability – Vehicle motion characteristics and controllability-Possibility of handling quality evaluation based on driver model – Stability analysis for ABS model.

TEXT BOOK

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Nagrath.J and Gopal.M	Control Systems Engineering	New Age International Publishers Reprint	2008
2	Kiencke and Nielsen	Automotive control systems	Springer /SAE – Verlag Berlin Heidelberg	2007
3	Ogata K	Modern Control Engineering	Pearson/Prentice-Hall of India Pvt Ltd., New Delhi	2008

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Richard C. Dorf and Robert H. Bishop	Modern Control Systems	Pearson Education	2009
2	GalipUlsoy, Huei Peng	Automotive Control Systems	Cambridge University Press, London	2012
3	Wong J.Y	Theory of Ground Vehicles	John Wiley & Sons, New York	2008

16BEAE5E04 TWO AND THREE WHEELER TECHNOLOGY 3003 100

OBJECTIVES:

- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
- Explain the servicing of two and three wheelers.

COURSE OUTCOMES:

- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
- Explain the servicing of two and three wheelers.

UNIT I INTRODUCTION

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICALSYSTEMS

2 stroke and 4 stroke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburetor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHES AND TRANSMISSION

Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS ANDTYRES

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, Types of wheels - construction. Function of tyres - Solid and pneumatic Tyres. Constructional details of pneumatictyres.

UNIT V THREE WHEELERS

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992
2.	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century bookhouse.	1988

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Griffin.M.M	Motor cycles from inside and outside.	Prentice Hall Inc, NewJersey.	1978
2.	Bruce A. Johns, David D.Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAE5E05 OPTIMIZATION FOR ENGINEERING DESIGN 3003 100

OBJECTIVES:

- To formulate design optimization problems for engineering applications.
- To provide knowledge on single variable unconstrained problems.
- To learn multi-objective unconstrained optimization problems.
- To introduce concepts of constrained non-linear optimization problems.
- To interpret non-traditional optimization techniques for engineering problems.
- To study the features ofneural network-based optimization

COURSE OUTCOMES:

- Describe single variable optimization algorithm.
- Explain the multi variable optimization algorithm
- Apply the constrained optimization algorithms
- Describe the sensitivity analysis
- Describe the specialized algorithms
- Explain the nontraditional optimization algorithms

UNIT I SINGLE VARIABLE OPTIMIZATION ALGORITHM

Introduction - Engineering optimization problems - Optimality criteria - Bracketing methods – Region elimination methods - Point estimation methods - Gradient based methods - Root finding using optimization techniques - Computer Programmes.

UNIT II MULTI VARIABLE OPTIMIZATION ALGORITHM

Optimality criteria - Unidirectional search - Direct search methods - gradient based methods – Computer programmes.

UNIT III CONSTRAINED OPTIMIZATION ALGORITHMS

Kuhn-Tucker conditions - Transformation methods - sensitivity analysis - Direct search for constrained minimization - Unrearized search techniques method - Gradient projection method - Computer programmes

UNIT IV SPECIALIZED ALGORITHMS

Integer programming - Geometric programming

UNIT V NON TRADITIONAL OPTIMIZATION ALGORITHMS

Genetic algorithms - Simulated annealing - Global optimization - Computer programmes.

TEXT BOOK

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Kalyanmoy Deb	Optimization for Engineering Design, 5th print	Prentice Hall of India, New Delhi.	2003

REFERENCES

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Taha.H.A	Operations Research	Macmillan, New York.	1986
2.	Rao.S.S	Engineering Optimization: Theory and Practice, 4thEd	Wiley Eastern, NewDelhi.	2009
3.	Murthy.K.G	Linear Programming	Wiley New York.	1987
4.	Reklaitis.G.V, Ravindran.A and Regedit K.M	Engineering optimization methods andapplications	Wiley, New York.	2006

16BEAE5E06 **MODERN VEHICLE TECHNOLOGY** **3003 100**

OBJECTIVES:

- Distinguish and describe the various modern vehicle power plant systems.
- List and explain the various driver assistant mechanisms.
- Identify and describe the working of advanced suspension and braking systems.
- Apply the knowledge of motor vehicle emission and noise pollution control.
- Describe the noise control techniques
- Describe the vehicle telematics and its applications

COURSE OUTCOMES:

- Distinguish and describe the various modern vehicle power plant systems.
- List and explain the various driver assistant mechanisms.
- Identify and describe the working of advanced suspension and braking systems.
- Apply the knowledge of motor vehicle emission and noise pollution control.
- Describe the noise control techniques
- Describe the vehicle telematics and its applications.

UNIT I TRENDS IN POWERPLANTS

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNIT II SUSPENSION BRAKES AND SAFETY

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT III NOISE &POLLUTION

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT IV VEHICLE OPERATION AND CONTROL

Computer Control for pollution and noise control and for fuel economy - Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.

UNIT V VEHICLE AUTOMATED TRACKS

Preparation and maintenance of proper road network - National highway network with automated roads and vehicles - Satellite control of vehicle operation for safe and fast travel.

REFERENCE BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Beranek.L.L	.Noise Reduction	McGraw-Hill Book Co., Inc, NewYork	1993
2	SAE	Bosch Hand book	3rd Edition, SAE	1993

16BEAE5E07 AUTOMOTIVE EMBEDDED SYSTEM 3003 100

OBJECTIVES:

- To provide a clear understanding of Embedded system terminologies and its devices.
- To introduce Electronics in Automobile
- To introduce the concepts of Drive-By-Wire
- To understand the concept of Hardware Modules
- To Study and acquire knowledge Software Development Tools
- To understand Integration of Hardware And Software

COURSE OUTCOMES:

- Discuss aboutelectronics in automobile.
- Explaindrive by wire.
- Discuss about hardware modules.
- Explainsoftware development tools
- Describe automatic code generation.
- Explain integration of hardware and software

UNIT I ELECTRONICS IN AUTOMOBILE

Power train Management – MPFI, GDI & CRDI, ignition systems, body and convenience electronics, vehicle power supply controllers, lighting modules, door control modules, safety anti-lock braking system, electronic stability program, supplementary restraint system, traction control system – 42 V technology.

UNIT II DRIVE-BY-WIRE

Challenges and opportUNITIes of X-by-wire system & design requirements, steer-by-wire, brake-by-wire, electronic throttle including adaptive cruise control, shift-by-wire. Semiconductor concepts for X-by-wire systems, Future of automotive electronics.

UNIT III HARDWARE MODULES

16-bit Infineon microcontrollers-architectural overview of C166 family-memory organization, fundamental CPU concepts and optimization measures, on-chip system resources, peripheral event controller (PEC) ad interrupt control, external bus interface, parallel ports, general purpose timers(GPT), watchdog timer, serial channels, capture/compare units, pulse width modulation unit, analog to digital converter, real time clock, on-chip I^2C bus module, on-chip CAN module, universal serial bus (USB) interface, SDLM interface, power management monitoring features, special features of XC166family.

UNIT IV SOFTWARE DEVELOPMENTTOOLS

Introduction to KEIL integrated development environment (IDE), creating new project, creating new file, adding files to project, options for target, compile and building project, simulation and debugging, set breakpoints, monitor on-chip peripherals using simulators, study of example programs. Introduction to digital application virtual engineer (DAVE) software, configuring the on-chip resources using DAVE software, automatic code generation using DAVE software.

UNIT V INTEGRATION OF HARDWARE ANDSOFTWARE

Introduction to Infineon microcontroller development kit (easy kit), developing project using KEIL software, downloading embedded software into target system, introduction to on-chip debugging resources (JTAG), debugging target system using on-chip debugging support (OCDS).

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ronald K Jurgen	Automotive Electronics Handbook	McGraw Hill	1999
2	Werner Klingenstein & Team	Semiconductors: Technical Information, Technologies and Characteristic Data	Publicis Corporate Publishing	2004
3	LjuboVlacic, Michel Parent & Furnio Harshima	Intelligent Vehicle Technologies: Theory and Applications	Butterworth-Heinemann Publications	2001

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Arnold Berger	Embedded System Design: An Introduction to Processes, Tools, and Techniques	CMP Books	2001
2	David E Simon	An Embedded Software Primer	Pearson Education	2001
3	Wayne Wolf	Computers as Components	Morgan Kaufmann Publishers	2001

16BEAE5E08 FUEL CELL TECHNOLOGY 3003 100

OBJECTIVES:

- To address the need and promise of alternative clean energy.
- To introduce the concept of fuel cells for use in automobiles.
- To learn the fuel cell components and their impact on performance.
- To impart knowledge on Alkaline Fuel Cells & Phosphoric Acid Fuel Cells
- To impart knowledge on Solid Oxide Fuel Cells & Molten Carbonate Fuel Cells
- To impart knowledge on Direct Methanol and Proton Exchange Membrane Fuel Cells

COURSE OUTCOMES:

- List the types of fuel cells.
- Explain the thermodynamics and electrochemical kinetics of fuel cells.
- Describe the fuel cell performance characteristics
- Explain the various components of the fuel cell.
- Analyse the performance characteristics of the fuel cell.
- Analyse the impact of the fuel cell system in automobiles.

UNIT I INTRODUCTION AND THERMODYNAMICS

Introduction: Basic operating principles – Historical highlights – Classification. Thermodynamics: Electrochemical energy conversion – Theoretical efficiency – Electrochemical energy conversion – Factors affecting electrochemical energy conversion

UNIT II ELECTRODE KINETICS

Electrode double layer – Electrolyte double layer – Double layer models (Helmoltz model, Gouy-Chapman Model, Stern model, Grahame model – Bockris, Devenathan and Muller model, and chemical models) – Solid metallic electrode – Semiconductor electrode – Specific adsorption – Zero potential.

UNIT III ALKALINE FUEL CELLS & PHOSPHORIC ACID FUELCELLS

Alkaline Fuel Cells: Working principle – Components – Modules and stacks – Performance characteristics (power density, space applications, atmospheric pressure cells) – Limitations and R&D challenges – System issues – Ammonia as fuel. Phosphoric Acid Fuel Cells: Cell reactions – Electrodes (stability of catalysts, electrode fabrication – fuel cell performance) – Stacks and systems.

UNIT IV SOLID OXIDE FUEL CELLS & MOLTEN CARBONATE FUELCELLS

Solid Oxide Fuel Cell: Principle of operation - Benefits and limitations – Cell components (electrolytes, zirconia systems, ceria based electrolytes, perovskite-based systems) – Cathode materials – Anode materials –Interconnects – Fuel reactions –Configurations and performance (tubular, monolithic, planar) – Environmental impact – Applications. Molten Carbonate Fuel Cell: General principle– Components (electrolyte and matrix, cathode and anode materials) – Electrode reactions – Lifetime

UNIT V DIRECT METHANOL AND PROTON EXCHANGE MEMBRANE FUEL CELLS

Direct Methanol Fuel Cells, Operating principle**:** – Noble metal issue – Electro-oxidation of methanol (catalysts, oxygen electro-reduction, electrolyte, non-catalytic aspects) - Methanol crossover – Catalyst optimization – Vapor feed versus liquid feed cells.

Proton Exchange Membrane Fuel Cells: Operating principle (membranes, electrodes and electrolysis, optimization of membrane and electrode assembly,
Impurities) – Technology development (single cell and stacks, composite plates) – Fuel processing – Modeling studies (membrane, electrode, membrane-electrode assembly, fuel cell, stack and system) – Technology development and applications.

TEXT BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Viswanathan.B and ScibiohM.Aulice	Fuel Cells Principles and Applications	Universities Press (India) Pvt. Ltd., Hyderabad.	2006
2.	Hoogers.G	Fuel Cell Technology Handbook	CRC Press, Washington D.C	2003

REFERENCE BOOK

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Larminie. J and Dicks. A,	Fuel Cell Systems Explained, 2nd Edition	John Wiley & Sons, Ltd.,New York.	2003

16BEAE5E09 HYBRIDVEHICLETECHNOLOGY 3 0 0 3 100

OBJECTIVES:

- Explain the working of different configurations of electric vehicles.
- Analysethe performance characteristics of the battery.
- State the basic principle of operation of the fuel cell.
- Design series and parallel hybrid electric drive trains.
- Discuss the various charging methods for the battery.
- Discuss the energy storage design.

COURSE OUTCOMES:

- Explain the working of different configurations of electric vehicles.
- Analysethe performance characteristics of the battery.
- State the basic principle of operation of the fuel cell.
- Design series and parallel hybrid electric drive trains.
- Discuss the various charging methods for the battery.
- Discuss the energy storage design.

UNIT I ELECTRIC AND HYBRID ELECTRICVEHICLES

Configuration of Electric Vehicles, Performance of Electric Vehicles, Traction motor characteristics, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains

UNIT II ENERGY STORAGE FOR EV ANDHEV

Energy storage requirements, Battery parameters, Types of Batteries, Modelling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modelling of PEMFC, Super Capacitors.

UNIT III ELECTRIC PROPULSION

EV consideration, DC motor drives and speed control, Induction motor drives, Permanent Magnet Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Configuration and control of Drives

UNIT IV DESIGN OF ELECTRIC AND HYBRID ELECTRIC VEHICLES

Series Hybrid Electric Drive Train Design: Operating patterns, control strategies, Sizing of major components, power rating of traction motor, power rating of engine/generator, design of PPS

Parallel Hybrid Electric Drive Train Design: Control strategies of parallel hybrid drive train, design of engine power capacity, design of electric motor drive capacity, transmission design, energy storage design

UNIT V POWER ELECTRONIC CONVERTER FOR BATTERY CHARGING

Charging methods for battery, Termination methods, charging from grid, The Z-converter, Isolated bidirectional DC-DC converter, Design of Z-converter for battery charging, High-frequency transformer based isolated charger topology, Transformer lesstopology.

TEXTBOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M. Ehsani, Y. Gao, S. Gay and Ali Emadi,	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design	CRC Press	2009
2.	Iqbal Husain	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press	2010

REFERENCE BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Sheldon S. Williamson	Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles	Springer	2013
2.	Ron Hodkinson and John Fenton	Light Weight Electric/Hybrid Vehicle Design	Butterworth-Heinemann	2001
3.	Chan.C.Cand. Chau.K.T	Modern Electric Vehicle Technology	OXFORD University Press	2001
4.	Chris Mi, M. Abul Masrur, David Wenzhong Gao	Hybrid Electric Vehicles Principles And Applications With Practical Perspectives	Wiley Publication	2011

16BEAE6E01 ALTERNATE FUELS ANDENERGYSYSTEMS 3 0 0 3 100

OBJECTIVES:

- To acquire knowledge of alternative fuels and changes in the engine design for handling them.
- To learn the various energy systems for use in the automobiles.
- To equip them with skills to modify the engines
- To make the students conversant of bio fuels
- To make the students conversant of synthetic fuels
- To give exposure to combustion, performance and emission characteristics of engines

COURSE OUTCOMES:

- Analyse the thermodynamics of combustion characteristics of alternative fuels.
- Distinguish the various types of alternative fuels based on need and scope.
- Modify the engines according to the type of alternative fuel.
- Explain the bio fuels
- Explain the synthetic fuels
- Analyse the combustion, performance and emission characteristics of engines

UNIT I INTRODUCTION

Estimation of petroleum reserve - Need for alternate fuel - Availability and properties of alternate fuels – general use of alcohols - LPG - Hydrogen - Ammonia, CNG, and LNG - Vegetable oils and Biogas - Merits and demerits of various alternatefuels.

UNIT II ALCOHOLS

Properties as engine fuel, alcohols and gasoline blends, performance in SI engine. Methanol and gasoline blends - Combustion characteristics in engines - emission characteristics.

UNIT III NATURAL GAS, LPG, HYDROGEN ANDBIOGAS

Availability of CNG, properties, modification required to use in engines - performance and emission characteristics of CNG using LPG in SI & CI engines. Performance and emission for LPG - Hydrogen – Storage and handling, performance and safety aspects.

UNIT IV VEGETABLE OILS

Various vegetable oils for engines - Esterification - Performance in engines - Performance and emission Characteristics

UNIT V ELECTRIC AND SOLAR POWERED VEHICLES

Layout of an electric vehicle - Advantage and limitations - Specifications - System component. Electronic control system - High energy and power density batteries - Hybrid vehicle - Solar powered vehicles.

REFERENCE BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	MaheswarDayal	Energy today & tomorrow	I & B Harish India.	1982
2.	Nagpal.G.K	Power Plant Engineering	Khanna Publishers, New Delhi.	2002
3.	Bechtold.R.L	Alternative Fuels Guide Book	SAE	1997

16BEAE6E02 ADVANCED THEORY OFICENGINES 3 0 0 3 100

OBJECTIVES:

- To impart knowledge on advancement in IC engine construction and combustion process.
- To familiarise the combustion modelling.
- To enrich the understanding of advances in IC Engines
- To expose students to performance of the IC engines
- To facilitate the understanding ofcomputer control of engine parameters
- To impart knowledge onperformance maps

COURSE OUTCOMES:

- Explain the operating cycles of SI engines, CI engines and gas turbines.
- Understand the IC engine combustion processes.
- Analysethe causes of knocking in combustion.
- Apply new techniques to improve the performance of the IC engines.
- Explain the computer control of engine parameters for pollution control
- Explain the performance maps.

UNIT I CYCLE ANALYSIS

Operating cycles of S.I. and C.I. engines and Gas turbines - Comparison of Air standard cycle - Fuel air cycle and actual cycle.

UNIT II COMBUSTION OFFUELS

Combustion stoichiometry of petrol, diesel, alcohol and hydrogen fuels - Chemical energy and heating values - Chemical equilibrium and maximum temperature - SI engine combustion - Flame velocity and area of flame front - CI engine combustion. Fuel spray characteristics - droplet size, penetration and atomization.

UNIT III COMBUSTIONMODELLING

Basic concepts of engine simulation - Governing equation - Flow models, thermodynamic models - SI engine and CI engine models.

UNIT IV ADVANCES IN IC ENGINES

Adiabatic and L.H.R. engines - MAN combustion chamber and multifuel engines - HCCI, VCR Engines and GDI Engines Stratified charged and lean burn engines - Locomotive and marineengines.

UNIT V OPERATION ANDPERFORMANCE

Computer control of engine parameters for pollution control and better efficiency - Closed loop control of engine parameters - Hybrid operation - performance maps.

TEXT BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Ganesan.V	Internal combustion engines, 4th Edition	Tata McGraw Hill Publishing Co.	2012

REFERENCE BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Ganesan.V	Computer Simulation of Spark Ignition engine process	Universities Press (India) Ltd, Hyderabad.	1996
2.	John.B.Heywood	Internal Combustion Engine Fundamentals	McGraw Hill Publishing Co., New York.	2011

16BEAE6E03 VIBRATION AND NOISE CONTROL 3003 100

OBJECTIVES:

- To impart knowledge on the basics of vibration and noise.
- To understand the importance of single degree and two degrees of freedom vibration systems.
- To equip them with skills to Calculate the total sound pressure level
- To enrich the understanding of frequency analysis
- To understand the sources of vibration and noise.
- To learn the vibration and noise control techniques.

COURSE OUTCOMES:

- List and explain the types of vibrations
- Analyse a single degree and two degrees of freedom vibration systems.
- Calculate the total sound pressure levelproduced by two sounds of different levels.
- Apply frequency analysis
- Identify the sources of vibrationin automobiles.
- Design the systemsto reduce vibration and noise.

UNIT I SIMPLIFICATION OF VIBRATION PROBLEMS TO ONE DEGREE OF FREEEDOM

Basic equation of motion for various vibration problems – Torsional, Free, Damped and Forced vibration problems, critical speed, nature of exciting forces, vibration isolation, vibration instruments.

UNIT II TWO AND MULTI-DEGREE OF FREEDOMSYSTEMS

Two degree – Formulation of solution - Coupling between rotating and translation - Applications. Multi degree – Governing equation for closed coupled systems - Lateral vibration, Geared systems - Effect of gyroscopic acceleration.

UNIT III SOLUTION OF VIBRATIONPROBLEMS

Approximate methods (or) Numerical methods – Holzer‟s method, Myklestadt‟s method, Sturn sequence Energy methods – Rayleigh‟s Approach – Closed coupled systems. For coupled systems – Dunkerley‟s method, Rayleigh Ritz method.

UNIT IV DIAGNOSTICS AND FIELDMEASUREMENT

Diagnostic tools - Condition monitoring in real time - Balancing of rotors - Field measurements on various compressors, fans, machine foundation.

UNIT V MACHINERY NOISE ANDCONTROL

Basics of noise - Introduction, amplitude, frequency, wavelength and sound - Pressure level, noise dose level - Measurement and analysis of noise. Methods for control of noise - Mechanical noise - Predictive analysis, Sound in enclosures - Sound energy absorption - Sound transmission through barriers.

TEXT BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ramamurthy .V,	Mechanical Vibration Practice with Basic Theory	Narosa Publishing House, Chennai	2000
2	KewelPujara	Vibration and noise for engineers	Dhanpatrai& Sons	1992

REFERENCE BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Rao .J.S and Gupta. K	Introductory course on theory and practice of mechanical vibrations	Wiley Eastern, New Delhi.	1984
2	Rao.S.S	Mechanical vibrations,3rd Edition	Wesley publishing company, New York	1995
3	Thomson.W.T	Theory of Vibration andits Applications	Prentice Hall, NewDelhi	1982

16BEAE6E04 **FAILURE ANALYSIS AND DESIGN** **3003 100**

OBJECTIVES:

- To impart knowledge on significance of failure analysis in engineering design.
- To understand failure mechanism.
- To equip them with skills to handle the specific failure component
- To enrich the understanding of detailed root-cause analysis
- To understand the material factors that cause the failure
- To learn the corrective and preventive guidelines.

COURSE OUTCOMES:

- Describe the materials and design process
- Explain the fracture mechanics.
- Explain the linear elastic fracture mechanics
- Describe the elastic plastic fracture mechanics
- Determine the fracture toughness values
- Use the failure analysis tools.

UNIT I MATERIALS AND DESIGN PROCESS

Factors affecting the behavior of materials in components, effect of component geometry and shape factors, design for static strength, stiffness, designing with high strength and low toughness materials, designing for hostile environments, material processing and design, processes and their influence on design, process attributes, systematic process selection, screening, process selection diagrams, ranking, process cost.

UNIT II FRACTURE MECHANICS

Ductile fracture, brittle fracture, Cleavage-fractography, ductile-brittle transition-Fracture mechanics approach to design-energy criterion, stress intensity approach, time dependent crack growth and damage

LINEAR ELASTIC FRACTURE MECHANICS: Griffith theory, Energy release rate, instability and R-curve, stress analysis of cracks-stress intensity factor, K-threshold, crack growth instability analysis, crack tip stress analysis.

UNIT III ELASTIC PLASTIC FRACTURE MECHANICS

Crack tip opening displacement (CTOD), J integral, relationship between J and CTOD,dynamic and time-dependent fracture: Dynamic fracture, rapid loading of a stationary crack, rapid crack propagation, dynamic contour integral, Creep crack growth-C Integral, Visco elastic fracture mechanics, visco elastic J integral

UNIT IV DETERMINATION OF FRACTURE TOUGHNESSVALUES

Experimental determination of plane strain fracture toughness, K- R curve testing, J measurement, CTOD testing, effect of temperature, strain rate on fracture toughness.

UNIT V FAILURE ANALYSISTOOLS

Reliability concept and hazard function, life prediction, life extension, application of poisson, exponential and Weibull distribution for reliability, bath tub curve, parallel and series system, MTBF,MTTR, FMEA definition-Design FMEA, Process FMEA , analysis causes of failure,modes , ranks of failure modes, fault tree analysis, industrial case studies/projects on FMEA.

TEXT BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	John M. Barsom and Stanley TRolte	Fracture and Fatigue Control inStructures	Prentice Hall, New Delhi.	1987
2.	ASM Metals Handbook	Failure Analysis and Prevention,10thedition,Vol.10	ASM Metals Park, Ohio, USA.	1995
3.	Michael F. Ashby	Material Selection in Mechanical Design	Butterworth Heinemann.	1999

REFERENCES

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Shigley and Mischke	Mechanical Engineering Design	McGraw Hill.	1992
2.	Mahmoud M.Farag	Material Selection for EngineeringDesign	Prentice Hall, New Delhi.	1997

Faculty of Mechanical Engineering, PSG College of Technology “Design Data Book”, DPV Printers,1993

16BEAE6E05 COMPUTER AIDED VEHICLE DESIGN 3003 100

OBJECTIVES:

- To impart knowledge on significance of CAD.
- To impart knowledge on Vehicle Frame and Suspension
- To acquire the ability in designing of Front Axle and Steering Systems
- To acquire the ability in designing of Clutch
- To provide an overview of drawing of Gear Box
- To provide an overview of Drive Line and Read Axle

COURSE OUTCOMES:

- Design the vehicle frame and suspension.
- Design the front axle
- Design the steering systems
- Design the clutch components
- Designthe gearboxes
- Designthe driveline and rear axles

UNIT I VEHICLE FRAME AND SUSPENSION

Study of loads - moments and stresses on frame members. Computer aided design of frame for passenger and commercial vehicle - Computer aided design of leaf springs - Coil springs and torsion barsprings.

UNIT II FRONT AXLEAND STEERINGSYSTEMS

Analysis of loads - moments and stresses at different sections of front axle. Determination of bearing loads at Kingpin bearings. Wheel spindle bearings. Choice of bearings. Determination of optimum dimensions and proportions for steering linkages ensuring minimum error in steering.

UNIT III CLUTCH

Torque capacity of clutch. Computer aided design of clutch components, Design details of roller and sprag type of clutches.

UNIT IV GEARBOX

Computer aided design of three speed and four speed gear boxes.

UNIT V DRIVE LINEAND REARAXLE

Computer aided design of propeller shaft. Design details of final drive gearing. Design details of full floating. semi-floating and three quarter floating rear shafts and rear axle housings.

TEXT BOOK

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dan Evans	Automobile Chassis Design	iliffe Books Ltd	1992

REFERENCES

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Heldt.P.M,	Automotive Chassis	Chilton Co., New York	1992
2	Steeds.W	Mechanics of Road vehicles	iliffe Books Ltd, London.	1990
3	Newton, Steeds & Garrett	Motor vehicle	iliffe Books Ltd., London.	2001
4	Giri.N.K	Automobile Mechanics 8th Edition	Khanna Publisher, New Delhi.	2008

16BEAE6E06 **INDUSTRIAL ENGINEERING AND OPERATIONSRESEARCH** **3003 100**

OBJECTIVES:

- Select suitable production planning methodologies, production system and plant layout for the industry.
- Execute an effective work study and ergonomics for better productivity.
- Formulate and select a suitable method to solve the linear programming problem.
- Solve different transportation and assignment based models.
- Solve the inventory decision-making problem usingmathematical modelling.
- Describe the economicorderquantity

COURSE OUTCOMES:

- Select suitable production planning methodologies, production system and plant layout for the industry.
- Execute an effective work study and ergonomics for better productivity.
- Formulate and select a suitable method to solve the linear programming problem.
- Solve different transportation and assignmentbased models.
- Solve the inventory decision-making problem usingmathematical modelling.
- Describe the economic order quantity

UNIT I INTRODUCTION

Evolution of industrial engineering, fields and functions of industrial engineering. Methods engineering process charts, motion study, work sampling and work measurement.

UNIT II PRODUCTION PLANNING ANDCONTROL

Introduction, objectives, components of PPC, manufacturing systems, plant layout, types of layouts, forecasting, product planning, loading and scheduling, dispatching, production control, material handling principles, case studies.

Human engineering- Ergonomics, design of controls and displays, heating, ventilation, glare, airflow, influence of factory environment on productivity, industrial safety.

Cost analysis - Cost structure of a product-labor, material, overhead. Overhead absorption, machine hour rate, cost computation for simple machined components, learning curve, „Make-or-Buy" decision.

UNIT III LINEAR PROGRAMMINGTECHNIQUES

Operations research and decision-making, types of mathematical models and constructing the model. Role of computers in operations research, formulation of linear programming problem, applications and limitations, simplex method, variants in simplex method (analytical andgraphical).

UNIT IV DISTRIBUTION METHODS AND ASSIGNMENTMODELS

Vogel"s approximation method, modified distribution method, optimization models, unbalance and degeneracy in transportation model. Hungarian algorithm, traveling salesman problem, routing problems, processing „n" jobs through two machines and three machines, processing two jobs through „m"machines.

UNIT V INVENTORYCONTROL

Variables in inventory problems, inventory models with penalty, storage and quantity discount, safety stock, inventory models with probability, lead time, demand, multi item deterministic model.

TEXT BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Frederick S.Hillier and Gerald J.Lieberman	Introduction to Operations Research	Tata McGraw Hill Publishing Company Ltd., New Delhi	2006
2.	Chase R.B, Jacob F.R.E.D and AquilanoN.J	Operations Management for Competitive Advantage, 10th Edition	Tata McGraw Hill, New Delhi	2004
3.	Elwood S. Buffa	Modern Production /Operations Management 8th Edition	Wiley Eastern, New Delhi.	2007
4.	Kanti Swarup Gupta P.K and Manmohan	Operations Research	Sultan Chand and Sons, New Delhi.	1995

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Srinath.C	PERT and CPM – Principles and Applications 3rd Edition	East West Press, New Delhi	2001
2.	Dharani Venkatakrishnan.S	Operations Research	Keerthi Publication House, Coimbatore	1991
3.	Kannappan.D, Paranthaman.D, Augu stine.A.G	Mechanical Estimating and Costing	Tata mcGraw Hill, (New Delhi:)	2003
4.	Saravanan.R	Manufacturing optimization through intelligent techniques	CRC Press, Florida.	2006
5.	Gupta.P.K and Hira.D.S	Operations Research	S. Chand & Co, New Delhi.	2012
6.	Panneerselvam.R	Production and Operations Management, 2nd Edition	Prentice Hall of India (P) Ltd.	2007

16BEAE6E07 **QUALITY CONTROL AND RELIABILITY ENGINEERING** **3003 100**

OBJECTIVES:

- Summarize the concept of quality and process control for variables.
- Apply the process control for attributes.
- Explain the importance of sampling methods and their characteristics.
- Explain the concept of life testing.
- Evaluate the reliability concept with their models.
- Explain the product life cycles

COURSE OUTCOMES:

- Summarize the concept of quality and process control for variables.
- Apply the process control for attributes.
- Explain the importance of sampling methods and their characteristics.
- Explain the concept of life testing.
- Evaluate the reliability concept with their models.
- Explain the product life cycles.

UNIT I INTRODUCTION AND PROCESS CONTROL FOR VARIABLES

Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality cost-Variation in process- factors – process capability – process capability studies and simple problems – Theory of control chart- uses of control chart – Control chart for variables – X chart, R chart and σ chart.

UNIT II PROCESS CONTROL FOR ATTRIBUTES

Control chart for attributes –control chart for proportion or fraction defectives – p chart and np chart – control chart for defects – C and U charts, State of control and process out of control identification in charts.

UNIT III ACCEPTANCESAMPLING

Lot by lot sampling – types – probability of acceptance in single, double, multiple sampling techniques – O.C.curves–producer‟sRiskandconsumer‟sRisk.AQL,LTPD,AOQLconcepts-standardsampling plans for AQL and LTPD- uses of standard samplingplans.

UNIT IV LIFE TESTING -RELIABILITY

Life testing – Objective – failure data analysis, Mean failure rate, mean time to failure, mean time between failure, hazard rate, system reliability, series, parallel and mixed configuration – simple problems. Maintainability and availability – simple problems. Acceptance sampling based on reliability test – O.C Curves.

UNIT V QUALITY ANDRELIABLITY

Reliability improvements – techniques- use of Pareto analysis – design for reliability – redundancy unit and standby redundancy – Optimization in reliability – Product design – Product analysis – Product development – Product life cycles.

Note: Use of approved statistical table permitted in the examination.

TEXT BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Grant, Eugene .L	Statistical Quality Control	McGraw-Hill, New Delhi.	1996
2.	Srinath. L.S	Reliability Engineering	Affiliated East westpress.	1991

REFERENCES

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Monohar Mahajan	Statistical Quality Control	Dhanpat Rai &Sons, NewDelhi.	2001
2.	Besterfield.D.H,	Quality Control	Prentice Hall, New Delhi.	1993
3.	Sharma.S.C	Inspection Quality Control andReliability	Khanna Publishers, New Delhi.	1998
4.	Connor. P.D.T.O	Practical Reliability Engineering, 4th Edition	John Wiley, London.	2002

16BEAE6E08 **COMPUTATIONAL FLUID DYNAMICS** **3003 100**

OBJECTIVES:

- To introduce governing equations of viscous fluid flows.
- To acquaint the student with the concepts of finite difference and finite volume methods for diffusion.
- To familiarize the students to understand the finite volume method for convective diffusion
- To introduce numerical modelling and its role in the field of fluid flow and heat transfer.
- To provide knowledge on the various discretization methods, solution procedures and turbulence modelling.
- To impart knowledge on use of software tools.

COURSE OUTCOMES:

- Derive the governing equations and boundary conditions for fluid dynamics.
- Analyse finite difference and finite volume methods for diffusion.
- Analyse finite volume method for convective diffusion.
- Analyse the flow field problems.
- Explain and solve the turbulence models and mesh generation techniques.
- Use software tools.

UNIT I GOVERNING EQUATIONS AND BOUNDARYCONDITIONS

Basics of computational fluid dynamics – Governing equations of fluid dynamics – Continuity, Momentum and Energy equations – Chemical species transport – Physical boundary conditions – Time-averaged equations for Turbulent flow - Turbulence -Kinetic -Energy Equations – mathematical behavior of PDEs on CFD: Elliptic, Parabolic and Hyperbolic equations.

UNIT II DISCRETIZATION AND SOLUTIONMETHODOLOGIES

Methods of Deriving the Discretization Equations - Taylor Series formulation – Finite difference method – Control volume Formulation – Spectral method.

Solution methodologies: Direct and iterative methods, Thomas algorithm, Relaxation method, Alternating Direction Implicit method.

UNIT III HEATCONDUCTION

Finite difference and finite volume formulation of steady/transient one-dimensional conduction equation, Source term linearization, Incorporating boundary conditions, Finite volume formulations for two and three dimensional conduction problems

UNIT IV CONVECTION ANDDIFFUSION

Finite volume formulation of steady one-dimensional convection and Diffusion problems, Central, upwind, hybrid and power-law schemes - Discretization equations for two dimensional convection and diffusion.

UNIT V CALCULATION OF FLOWFIELD

Representation of the pressure - Gradient term and continuity equation - Staggered grid - Momentum equations - Pressure and velocity corrections - Pressure - Correction equation, SIMPLE algorithm and its variants. Turbulence models: mixing length model, Two equation (k-ε)models.

TEXT BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Versteeg. H.K and Malalasekera.W	An Introduction to Computational Fluid Dynamics: The Finite VolumeMethod	Longman	1998
2.	Ghosh dastidar. P. S	Computer Simulation of flow and heat transfer	Tata McGraw-Hill Publishing Company Ltd., New Delhi.	1998

REFERENCES

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Patankar. S.V	Numerical Heat Transfer and Fluid Flow	And- Books2004 Indian Edition, McGraw-Hill, NewDelhi.	1980
2.	Muralidhar.K and Sundararajan.T	Computational Fluid Flow and Heat Transfer	Narosa Publishing House, New Delhi.	1995
3.	Bose.D.K,	Numerical Fluid Dynamics	Narosa publishing House,New Delhi.	1997
4.	Muralidhar.K and Biswas	Advanced Engineering Fluid Mechanics	Narosa Publishing House, New Delhi.	1996

16BEAE6E09 INTELLIGENT VEHICLE TECHNOLOGY 3003 100

OBJECTIVES:

- List and explain the various driver assistant systems.
- Discuss the global positioning systems
- Describe the vehicle telematics and its applications.
- Explain the safety and security systems for automotive.
- Discuss the various comfort systems.
- Explain the adaptive control systems.

COURSE OUTCOMES:

- List and explain the various driver assistant systems.
- Discuss the global positioning systems
- Describe the vehicle telematics and its applications.
- Explain the safety and security systems for automotive.
- Discuss the various comfort systems.
- Explain the adaptive control systems.

UNIT I DRIVER ASSISTANCE SYSTEMS

Introduction, driver support systems – driver information, driver perception, driver convenience, driver monitoring. Vehicle support systems – general vehicle control, collision avoidance, vehiclestatus monitoring-Night visionsystem

UNIT II TELEMATICS

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition, driver assistance systems.

UNIT III SAFETY AND SECURITYSYSTEMS

Airbags, seat belt tightening system, collision warning systems, child lock, anti lock braking systems. Anti theft technologies, smart card system, number plate coding.

UNIT IV COMFORT SYSTEMS

Active suspension systems, requirement and characteristics, different types, power steering, collapsible and tiltable steering column, power windows-Adaptive lighting system

UNIT V ADAPTIVE CONTROL SYSTEMS

Adaptive cruise control, adaptive noise control, anti spin regulation, traction control systems, cylinder cut- off technology.-Autonomous vehicles

TEXT BOOKS

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	LjuboVlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001
2.	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems –Progress in Technology	Automotive Electronics Series,SAE, USA.	1998

REFERENCES

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William B Riddens	Understanding Automotive Electronics, 5th Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold	Understanding Automotive Electronics	SAE	1998
3.	Robert Bosch	Automotive HandBook, 5th Edition	SAE	2000

16BEAE7E01 VEHICLE TRANSPORT MANAGEMENT 3003 100

OBJECTIVES:

- To study Transport Management
- To understand the concept of Organisation
- To learn about Vehicle Maintenance
- To be aware of the Supply Management and Budget
- To provide knowledge on Scheduling and Fare Structure
- To introduce Motor Vehicle Act

COURSE OUTCOMES:

- Acquire in-depth knowledge of Transport Management.
- Analyse concept of Organisation.
- Describe Vehicle Maintenance.
- Knowledge on Supply Management and Budget.
- Knowledge on Scheduling and Fare Structure.
- Awareness on Motor Vehicle Act

UNIT I ORGANISATION AND MANAGEMENT

Forms of Ownership – principle of Transport Management – Staff administration – Recruitment and Training – welfare – health and safety. Basic principles of supervising. Organizing time and people. Driver and mechanic hiring - Driver checklist - Lists for driver and mechanic - Trip leasing - Vehicle operation and types of operations.

UNIT II VEHICLE MAINTENACE

Scheduled and unscheduled maintenance - Planning and scope - Evaluation of PMI programme – Work scheduling - Overtime - Breakdown analysis - Control of repair backlogs - Cost of options.

UNIT III VEHICLE PARTS, SUPPLY MANAGEMENT ANDBUDGET

Cost of inventory - Balancing inventory cost against downtime - Parts control - Bin tag systems – Time management - Time record keeping - Budget activity - Capital expenditures - Classification of vehicle expenses - Fleet management and data processing - Data processing systems - Software. Model - Computer controlling of fleet activity - Energy management.

UNIT IV SCHEDULING AND FARESTRUCTURE

Route planning - Scheduling of transport vehicles - Preparation of timetable – preparation of vehicle and crew schedule - Costs, fare structure – Fare concessions - Methods of fare collection - Preparation of faretable.

UNIT V MOTOR VEHICLE ACT

Schedules and sections - Registration of motor vehicles

- Licensing of drivers and conductors - Control of permits - Limits of speed - traffic signs - Constructional regulations - Description of goods carrier, delivery van, tanker, tipper, municipal, fire fighting and break down service vehicle.

REFERENCE BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	John Dolu	Fleet Management	McGraw-Hill Co.	1984
2.	Rex W. Faulks	Bus and Coach Operation	Butterworth.	1987
3.	Kitchin L.T.D	Bus operation, 3rd Edition	iliffe and Sons Ltd.,London.	1992

16BEAE7E02 **LEAN MANUFACTURING** **3003 100**

OBJECTIVES:

- To acquire the general knowledge to deliver consistently high quality and value added products and services to the customer in a lean environment.
- To understand the terminology relating to lean operations in both service and manufacturing organizations.
- To impart knowledge on principles of lean manufacturing on the shop floor
- To enrich the understanding of just in time concept
- To expose students to concepts of visual management, 5Sand total productive maintenance
- To expose students to Jidoka principle

COURSE OUTCOMES:

- Summarise the quality requirements to provide products and services in a lean environment.
- Apply the principles of lean manufacturing on the shop floor.
- Explain the just in time
- Explain the concepts of visual management, 5Sand total productive maintenance.
- Examine the Jidoka principle.
- Illustrate the culture of lean management.

UNIT I INTRODUCTION

Objectives of lean manufacturing-key principles and implications of lean manufacturing- Traditional Vs lean manufacturing – Lean benefits. Lean Manufacturing Concepts: Value creation and waste elimination- Major kinds of waste- pull production-different models of pull production-continuous flow-continuous improvement / Kaizen- Worker involvement.

UNIT II GROUPTECHNOLOGY

Part family- Production flow analysis – Composite part concept – Machine cell design-Case studies.

UNIT III LEAN MANUFACTURING TOOLS &METHODOLOGIES

Standard work -communication of standard work to employees -standard work and flexibility -visual controls-quality at the source- 5S principles -preventive maintenance-total quality management-total productive maintenance-changeover/setup time -batch size reduction.

UNIT IV VALUE STREAMMAPPING

The as-is diagram-the future state map-application to the factory simulation scenario-line balancing -poke yoka-Kanban – overall equipment effectiveness.

UNIT V JITAND LEANMANUFACTURING

Just InTime Manufacturing: Introduction - elements of JIT - Kanban system. Implementing Lean - Road map-senior management Involvement-best practices. Reconciling Lean With Other Systems: Toyota production system-lean six sigma-lean and ERP-lean with ISO9001:2000

TEXT BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Michael L. George, David T. Rowlandsand Bill Kastle	What is Lean Six Sigma	McGraw-Hill, New York.	2004
2.	Askin R.G and GoldbergJ.B	Design and Analysis of Lean Production Systems	John Wiley and SonsInc.	2001
3.	Michael Wader	Lean Tools: A Pocket guide to Implementing Lean Practices	Productivity and Quality Publishing Pvt Ltd., New Delhi.	2002

REFERENCES

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Joseph D.E. Feo, William WBarnard	JuranInstitute‟s Six Sigma Break Through and Beyond	Tata McGraw-Hill Edition, NewDelhi	2004
2.	Richard B. Chase,Robert Jacobs F and Nicholas J Aquilano	Operation Management for Competitive Advantage, Tenth Edition.	McGraw- Hill.	2003
3.	Poka - Yoke	Improving Product Qualit Preventing Defects	Productivity Press.	1992
4.	Alan Robinson	Continuous Improvement Operations	Productivity Press, Portland, Oregon.	1991

16BEAE7E03 **SUPPLY CHAIN MANAGEMENT** **3003 100**

- To know the principle methods, areas of usage, possibilities and limitations as well as environmental effects of the Additive Manufacturing technologies
- To be familiar with the characteristics of the different materials those are used in Additive Manufacturing.
- To explain basics of SCM and logistics
- To impart knowledge, need for inventory management
- To expose students to value of information in SCM
- To understand the concept of information technology involved in SCM

OBJECTIVES:

COURSE OUTCOMES:

- Basics of SCM .
- Understand the need for inventory management
- Apply the need for value of information in SCM
- Describe about the various strategic alliances
- Explain about the various issues in the international SCM
- Get knowledge in information technology involved in SCM

UNIT I INTRODUCTION TO SUPPLY CHAINMANAGEMENT

Definition, global optimization, objectives of SCM. Logistics networks- data collection, model and data elevation, solution techniques.

UNIT II INVENTORYMANAGEMENT

Introduction, single warehouse, Inventory examples, economic lot size model, effect of demand uncertainty. Risk pooling, centralized and decentralized system, managing inventory in the supply chain,forecasting.

UNIT III VALUE OFINFORMATION

Bullwhip effect, information and supply chain technology. Supply chain integration- push, pull and push-pull system. Demand driven strategies, impact of internet on SCM, distribution strategies.

UNIT IV STRATEGIC ALLIANCES

Framework for strategic alliance, third party logistics, retailer, supplies partnership, distributor-integration, procurement and out servicing strategies.

UNIT V INTERNATIONAL ISSUES IN SCM

Introduction, risks and advantages- design for logistics, supplies integration into to new product development, mass customization. Issues in customer value. Information Technology for SCM: Goals, standardization, infrastructure, DSS for supply chain management.

TEXT BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Simchi – Levi David, Kaminsky Philip and Simchi-Levi Edith,	Designing and Managing the SupplyChain, 3rd Edition	Tata McGraw- Hill Publishing Company Ltd,New Delhi.	2007
2.	Sunil Chopra and Peter Meindl,	Supply Chain Management – Strategy, Planning andOperation, 3rdEdition	Prentice Hall, New Delhi	2006

16BEAE7E04 PROCESS PLANNING AND COST ESTIMATION 3003 100

OBJECTIVES:

- To introduce the process planning concepts.
- To impart importance of the cost estimation process and procedures.
- To study the procedure to calculate direct, indirect and overhead expenses.
- To facilitate the understanding of the production cost of forging, welding, and foundry.
- To learn the procedure to estimate the various machining costs.
- To acquire the procedure to estimate the machining time for lathe, drilling, boring, shaping, milling and grinding operations.

COURSE OUTCOMES:

- Explain the concepts of process planning and cost estimation.
- Assess the importance of cost estimation process and its procedures.
- Compute direct, indirect and overhead expenses.
- Determine the production cost of forging, welding, and foundry.
- Calculate the machining time for lathe, drilling, boring and shaping operations.
- Calculate the machining time for milling and grinding operations.

UNIT I PROCESS PLANNING

Process Planning, selection and analysis – Manual, Experience based planning – CAPP, Variant, Generative - Processes analysis – Types of Production.

UNIT II COSTING, ESTIMATION, COSTS AND EXPENSES

Aims of costing and Estimation – Functions and Procedure – Introduction to Costs, Computing Material cost, Direct Labor cost, Analysis of Overhead costs, Factory expenses, Administrative expenses, Selling and Distributing expenses – Cost Ladder - Cost of Product - Depreciation – Analysis of Depreciation.

UNIT III ESITMATION OF COSTS IN DIFFERENTSHOPS

Estimation in Foundry shop – Pattern cost, Casting cost - Illustrative examples. Estimation in Forging Shop – Losses in forging – Forging cost - Illustrative examples

UNIT IV ESTIMATION OF COSTS IN FABRICATIONSHOPS

Estimation in welding shop – Gas cutting – Electric Welding - Illustrative examples. Estimation in sheet metal shop – Shearing and Forming - Illustrative examples

UNIT V ESITMATION OF MACHINING TIMES ANDCOSTS

Estimation of machining time for lathe operations - Estimation of machining time for drilling, boring, shaping, planning, milling and grinding operations - Illustrative examples

TEXT BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Adithan.M.S and Pabla	Estimating and Costing	Konark Publishers vt., Ltd, New Delhi	1989
2	Chitale.A.K and Gupta.R.C	Product Design and Manufacturing	Prentice Hall of India, New Delhi	1997

REFERENCES

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Nanua Singh	System Approach to Computer Integrated Design and Manufacturing	John Wiley Inc.	1996
2	Joseph G. Monks	Operations Management Theory and Problems	McGraw Hill Book Company.	1982
3	Narang.G.B.S and Kumar.V	Production and Planning	Khanna Publishers ,New Delhi.	1995
4	Banga.T.R and Sharma.S.C	Estimating and Costing	Khanna publishers,New Delhi.	1986

16BEAE7E05 **AUTOMOTIVE AIR CONDITIONING** **3003 100**

OBJECTIVES:

- To gain knowledge of fundamentals of the automotive air conditioning.
- To study the working of automotive cooling and heating systems.
- To provide knowledge on air conditioning controls, delivery system and refrigerants.
- To impart knowledge on working of automatic temperature control.
- To learn the system servicing and testing.
- To impart knowledge on special tools for servicing

COURSE OUTCOMES:

- Apply the psychrometry principles.
- Explain the components of vehicle air conditioning systems.
- Describe the air conditioning controls.
- Select the suitable sensors and actuators for automatic temperature control.
- Discover and troubleshoot the fault in vehicle air conditioning systems.
- Describe the special tools for servicing vehicle air conditioning

UNIT I AIRCONDITIONING FUNDAMENTALS

Basic air conditioning system - Location of air conditioning components in a car - Schematic layout of a refrigeration system. Compressor components - Condenser and high pressure service ports. Thermostatic expansion value - Expansion value calibration - Controlling evaporator temperature - Evaporator pressure regulator - Evaporator temperatureregulator.

UNIT II AIR CONDITIONER - HEATINGSYSTEM

Automotive heaters - Manually controlled air conditioner - Heater system - Ford automatically controlled air conditioner and heater systems - Automatic temperature control - Air conditioning protection – Engine protection.

UNIT III REFRIGERANTS

Containers - Handling refrigerants - Tapping into the refrigerant container - Refrigeration system diagnosis -Diagnostic procedure - Ambient conditions affecting system pressures.

UNIT IV AIR ROUTING & TEMPERATURECONTROL

Objectives - Evaporator care air flow through the Dash recirculating unit - Automatic temperature control – Duct system - Controlling flow - Vacuum reserve - Testing the air control and handling systems.

UNIT V AIR CONDITIONINGSERVICE

Air conditioner maintenance and service - Servicing heater system Removing and replacing components. Trouble shooting of air controlling system - Compressor service.

TEXT BOOK

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	William H. Crouse and Donald LAnglin	Automotive Air conditioning	McGraw-Hill Inc.	1990

REFERENCES

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Mitchell	Mitchell Automatic Heating and Air Conditioning Systems	Prentice Hall India	1989
2	Paul Weller	Automotive Air Conditioning	Reston Publishing Co Inc.	1990
3	MacDonald.K.L,	Automotive Air Conditioning	Theodore Audel series	1978
4	Goings.L.F	Automotive Air Conditioning	American Technical services	1978

16BEAE8E01 **SPECIAL VEHICLES** **3003 100**

OBJECTIVES:

- To impart knowledge of the construction layout and applications of the off-road vehicles.
- To learn the various earth moving constructional machines.
- To study the construction and working details of industrial vehicles.
- To acquire knowledge on the working of tractor attachments and military vehicles.
- To provide knowledge on the mechanism of brake, suspension and steering in off-road vehicles.
- To impart knowledge on earth moving machines

COURSE OUTCOMES:

- Explain the construction layout and features of off-road vehicles.
- Select earth moving constructional machine for a particular application.
- Describe the construction details and working of industrial vehicles.
- State the special features of tractor attachments and military vehicles.
- Illustrate the mechanism of brake
- Illustrate the mechanism of suspension and steering

UNIT I EARTH MOVING AND CONSTRUCTIONALEQUIPMENTS

Construction layout, capacity and applications of earthmovers for dumpers, front-end loaders, bulldozers, excavators, backhoe loaders, scrappers, motor graders etc. criteria for selection of prime mover fro dumpers and front end loaders based on vehicle performance characteristics.

UNIT II POWER TRAIN CONCEPTS

Engine – converter match curves. Epicyclic type transmissions. Selection criteria for universal joints. Constructional details of steerable and drive axles of dumper.

UNIT III VEHICLE SYSTEMS,FEATURES

Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics. Hydro-pneumatic suspension cylinders. Power steering system. Kinematics for loader and bulldozer operational linkages. Safety features, safe warning system for dumper. Design aspects on dumper body, loader bucket and water tank of sprinkler. Articulated vehicles, double decker. Fire fighting equipment.

UNIT IV SPECIAL PURPOSE VEHICLES FOR INDUSTRIAL APPLICATIONS

Constructional features, capacity and stability of jib cranes. Vibratory compactors. Stackers, borewell machines, concrete mixtures.

UNIT V FARM EQUIPMENTS, MILITARY AND COMBATVEHICLES

Ride and stability characteristics, power take off, special implementations. Special features and constructional details of tankers, gun carriers and transport vehicles. Harvesting vehicles.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Pipenger.	Industrial Hydraulics.	Mcgraw Hill, Tokoyo.	1979
2.	Astakhov.A	Truck cranes.	MIR Publishers, Moscow.	1971
3.	Bart H Vanderveen.	Tanks and Transport Vehicles.	Frederic Warne and co.Ltd., London.	1974
4.	Abrosimov.K, Bromberg.A and Katayer.F	Road making machineries.	MIR Publisher, Moscow.	1975
5.	SAE Handbook – Vol III, 1995.			

16BEAE8E02 TRACTOR AND FARM EQUIPMENTS 3003 100

OBJECTIVES:

- To familiarise the components of a tractor and its controls.
- To impart knowledge on the various farm equipment.
- To expose students to the types of tractors.
- To familiarize the students to understand the performance characteristics of a tractor engine.
- To facilitate the understanding of cooling and lubrication system for troubleshooting.

COURSE OUTCOMES:

- Classify the types of tractors.
- Explain the performance characteristics of a tractor engine.
- Discuss the construction and operation of the valve mechanism.
- Analyse the cooling and lubrication system for troubleshooting.
- Discuss the tractorattachments
- List and explain the various farm equipment.

UNIT I GENERAL DESIGN OFTRACTORS

Classification of tractors - Main components of tractor - Safety rules.

UNIT II CONTROL OF THE TRACTOR AND FUNDAMENTALS OFENGINE OPERATION

Tractor controls and the starting of the tractor engines - Basic notions and definition - Engine cycles – Operation of multi cylinder engines - General engine design - Basic engine performance characteristics.

UNIT III ENGINE FRAME WORK AND VALVE MECHANISM OFTRACTOR

Cylinder and pistons - Connecting rods and crankshafts - Engine balancing - Construction and operation of the valve mechanism - Valve mechanism components - Valve mechanism troubles.

UNIT IV COOLING SYSTEM, LUBRICATION SYSTEM ANDFUELSYSTEM

Cooling system - Classification - Liquid cooling system - Components, Lubricating system servicing and troubles -Fuel tanks and filters - Fuel pumps- Air cleaner and turbo charger

UNIT V FARMEQUIPMENTS

Working attachment of tractors - Farm equipment - Classification - Auxiliary equipment - Trailers and body tippingmechanism.

REFERENCEBOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Rodichev and Rodicheva.G	Tractor and Automobiles	MIR Publishers.	1987
2.	Kolchin.A and Demidov.V	Design of Automotive engines for tractor	MIR Publishers.	1984

16BEAE8E03 **OFFROADVEHICLES** **3 0 0 3 100**

- To impart knowledge of the construction layout and applications of the off-road vehicles.
- To learn the various earth moving constructional machines.
- To study the construction and working details of industrial vehicles.
- To acquire knowledge on the working of tractor attachments and military vehicles.
- To provide knowledge on the mechanism of brake, suspension and steering in off-road vehicles.
- To impart knowledge on earth moving machines

OBJECTIVES:

COURSE OUTCOMES:

- Explain the construction layout and features of off-road vehicles.
- Select earth moving constructional machine for a particular application.
- Describe the construction details and working of industrial vehicles.
- State the special features of tractor attachments and military vehicles.
- Illustrate the mechanism of brake
- Illustrate the mechanism of suspension and steering

UNIT I CLASSIFICATION AND REQUIREMENTS OF OFF ROADVEHICLES

Power plants, chassis and transmission, Multi axle vehicles.

UNIT II LAND CLEARING MACHINES

Bush cutter, Stampers, Tree dozer, Rippers.

UNIT III EARTH MOVINGMACHINES

Bulldozers, cable and hydraulic dozers. Crawler track, running and steering gears, scrapers, drag and self powered types - Dump trucks and dumpers - Loaders, single bucket, multi bucket and rotary types - Power and capacity of earth movingmachines.

UNIT IV SCRAPERS ANDGRADERS

Scrapers, elevating graders, self powered scrapers and graders.

UNIT V SHOVELS AND DITCHERS

Power shovel, revolving and stripper shovels - drag lines - ditchers - Capacity of shovels.

REFERENCE BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Abrosimov.K, Bryan berg.AandKatayer.K	Road making Machinary	MIR Publishers, Moscow.	1971
2.	Wong.J.Y	Theory of Ground vehicles	John Wiley &Sons, NewYork	2008

16BEAE8E04 **VEHICLE MAINTENANCE** **3003 100**

OBJECTIVES:

- To understand the need for vehicle maintenance and its importance.
- To familiarise the maintenance procedure for various components of an automobile.
- To familiarize the students to understand servicing of transmission and driveline components.
- To make the students conversant on the procedure for steering and suspension
- To make the students conversant on the procedure for wheel and brake maintenance.
- To Study and acquire knowledge on the fault diagnosis in the electrical and air conditioner systems.

COURSE OUTCOMES:

- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.
- Explain the fault diagnosis in theelectrical and air conditioner systems

UNIT I MAINTENANCE TOOL, SHOP, SCHEDULE,RECORDS

Standard tool set, torque wrenches, compression and vacuum gauges, engine analyzer and scanner, computerized wheel alignment and balancing, gauges for engine tune up and pollution measurement, spark plug cleaner, cylinder re boring machine, fuel injection calibration machine. Importance of maintenance. Schedule and unscheduled maintenance. Scope of maintenance. Equipment downtime. Vehicle inspection. Reports. Log books. Trip sheet. Lay out and requirements of maintenance shop.

UNIT II POWER PLANT REPAIR AND OVERHAULING

Dismantling of power plant and its components. Cleaning methods. Inspection and checking. Repair and reconditioning methods for all engine components. Maintenance of ignition system, fuel injection system, cooling system,- lubrication system. Power plant trouble shootingchart.

UNIT III MAINTENANCE, REPAIR AND OVERHAULING OF THECHASSIS

Maintenance, servicing and repair of clutch, fluid coupling, gearbox, torque converter, propeller shaft. Maintenance of front axle, rear axle, brakes, steering systems. Tyre maintenance.

UNIT IV MAINTENANCE AND REPAIR OF VEHICLEBODY

Body panel tools for repairing. Tinkering and painting. Use of soldering, metalloid paste.

UNIT V MAINTENANCE AND REPAIR OF ELECTRICALSYSTEMS

Care, maintenance, testing and troubleshooting of battery, starter motor, dynamo, alternator and regulator. Transistorized regulator problems.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Judge.A.W	Motor Vehicle Servicing.	3rd Edition, Pitman Paperpack, London .	1969
2.	W.Crouse.	Everyday Automobile repair.	Intl.student edition, TMH, New Delhi.	1986
3.	Ernest Venk., Edward spicer.	Automotive maintenance and trouble shooting.	D.B. Taraporevala Sons,Bombay.	1963

REFERENCE BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Stator Abbey.	Automotive steering, braking and suspension overhaul.	Pitman publishing, London.	1971
2.	Frazee, fledell, Spicer.	Automobile collision Work.	American technical publications, Chicago.	1953
3.	John Dolce.	Fleet maintenance.	Mcgraw Hill, Newyork.	1984
4.	A,W.Judge.	Maintenance of high speed diesel engines.	Chapman Hall Ltd., London.	1956
5.	V.L.Maleev.	Diesel Engine operation and maintenance.	McGraw Hill Book Co., Newyork..	1995

16BEAE8E05 INTELLECTUAL PROPERTY RIGHTS (IPR) 3003 100

OBJECTIVES:

- To introduce the basic concepts of Intellectual Property Rights (IPR).
- To compare and contrast the different forms of intellectual property protection in terms of their key differences and similarities.
- To study the various agreements and legislation related to IPR.
- To learn digital products and law.
- To provide knowledge on enforcement of IPRs.
- To provide knowledge on the Infringement of IPRs

COURSE OUTCOMES:

- Outline the basic concepts of intellectual property rights.
- Explain the registration of copyrights, trademarks, patents, geographical indications, trade secrets and industrial design registration.
- State the various agreements and legislation related to IPR.
- Describe digital products and law.
- Explain the enforcement measures of IPRs.
- Explain the Infringement of IPRs

UNIT I

Introduction - Invention and Creativity - Intellectual Property (IP) - Importance - Protection of IPR - Basic types of property i. Movable Property ii. Immovable Property and iii. Intellectual Property).

UNIT II

IP - Patents - Copyrights and related rights - Trade Marks and rights arising from Trademark registration - Definitions - Industrial Designs and Integrated circuits - Protection of Geographical Indications at national and International levels – ApplicationProcedures.

UNIT III

International convention relating to Intellectual Property - Establishment of WIPO - Mission and Activities - History - General Agreement on Trade and Tariff (GATT).

UNIT IV

Indian Position Vs WTO and Strategies - Indian IPR legislations - commitments to WTO-Patent Ordinance and the Bill - Draft of a national Intellectual Property Policy - Present against unfair competition.

UNIT V

Case Studies on Patents - Copyright and related rights - Trade Marks - Industrial design and Integrated circuits - Geographic indications - Protection against unfair competition.

TEXT BOOK

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Subbaram.N.R	Handbook of Indian Patent Law and Practice	S. Viswanathan (Printers and Publishers) Pvt. Ltd.	1998

REFERENCE BOOKS

SL.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Eli Whitney	United States Patent Number	72X, Cotton Gin	March 14, 1794.

16BESHOE01 **PROBABILITY AND RANDOM PROCESS** **3003 100**

OBJECTIVES:

- To gain knowledge in measures of central tendency.
- To provide necessary basic concepts in probability and random processes.
- Mean, Median, Mode
- Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
- The students will have an exposure of various distribution functions, correlation and spectral densities.
- Learners acquire skills in handling situations involving more than one random variable and functions of randomvariables.

COURSE OUTCOMES:

- Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
- The students will have an exposure of various distribution functions, correlation and spectral densities.
- To gain knowledge in measures of central tendency.
- To provide necessary basic concepts in probability and random processes.
- Mean, Median, Mode
- Learners acquire skills in handling situations involving more than one random variable and functions of random variables.

UNIT I MEASURES OF CENTRAL TENDENCY ANDPROBABILITY

Measures of central tendency – Mean, Median, Mode - Standard Deviation ,Probability - Random variable - Axioms of probability - Conditional probability - Total probability – Baye‟s theorem.

UNIT II STANDARDDISTRIBUTIONS

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma(one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – Chebyshev's inequality**.**

UNIT III TWO DIMENSIONAL RANDOMVARIABLES

Joint distributions - Marginal and conditional distributions - Probability mass function - Probability density functions – Covariance - Correlation and regression

UNIT IV CLASSIFICATION OF RANDOMPROCESS

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT V CORRELATION AND SPECTRALDENSITIES

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peebles Jr, P.Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Pubishers, NewDelhi.	2002

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ross, S	A first Course in Probability	Pearson Education, New Delhi (Chap 2 to 8)	2012
2	Gupta, S.C. and Kapoor, V.K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2014
3	Veerarajan,T.	Probabilitiy, Statistics and Random process	Tata McGraw-Hill Education pvt. Ltd., New Delhi	2008
4	Henry Stark and John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002

WEBSITES:

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld. Wolfram.com

16BESHOE02 **FUZZY MATHEMATICS** **3003 100**

OBJECTIVES:

- To understand basic knowledge of fuzzy sets and fuzzy logic.
- To apply the basic knowledge of fuzzy operations.
- To know the basic definitions of fuzzy relations.
- To apply basic fuzzy inference and approximate reasoning.
- To know the applications of fuzzy technology.
- Describe the methods of fuzzy logic.

COURSE OUTCOMES:

- Explain the main subject of fuzzy sets.
- Discuss the concept of fuzziness involved in various systems and fuzzy set theory.
- Describe the methods of fuzzy logic.
- Comprehend the concepts of fuzzy relations.
- Analyse the application of fuzzy logic control to real-time systems.
- Understand the fuzzy relational inference

UNIT I FUZZY SETS

Fuzzy Sets : Basics Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations – Level Sets – Fuzzy functions - Zadeh‟s Extension Principle

UNIT II OPERATIONS ON FUZZY SETS

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III FUZZY RELATIONS

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNIT IV FUZZY MEASURES

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures vs Possibility Measures

UNIT V FUZZY INFERENCE

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	George J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic : Theory and Applications	Prentice Hall of India, New Delhi.	2003

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Zimmermann H.J.	Fuzzy Set Theory and its Applications	Kluwer Academic publishers, USA.	2001
2	Michal Baczynski and Balasubramaniam Jayaram	Fuzzy Implications	Springer-Verlag publishers, Heidelberg	2008
3	Kevin M Passino and Stephen Yurkovich	Fuzzy Control	Addison Wesley Longman publishers, USA	1998

WEBSITES:

1. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

16BESHOE03 **LINEAR ALGEBRA** **3003 100**

OBJECTIVES:

- To introduce the basic concepts of vector space.
- To know the fundamentals of linear algebra.
- To solve the system of linear equations.
- To study the linear transformations.
- To introduce the concepts of inner product spaces.
- Express linear transformations as a matrix form.

COURSE OUTCOMES:

The student will be able to

- Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- Apply the fundamental concepts in their respective engineering fields.
- Express linear transformations as a matrix form.
- Explain the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers.
- Discuss the importance of linear algebra
- Discuss the applications of linear algebra in branches of mathematics.

UNIT I VECTOR SPACES

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space

UNIT II EIGEN VALUES AND EIGENVECTORS

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

UNIT III SYSTEM OF LINEAREQUATIONS

Direct methods, Gauss elimination method, Gauss Jordan method, Crout‟s method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNIT IV LINEAR TRANSFORMATIONS

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNIT V INNER PRODUCT SPACES

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and ComplexVariables)	PHI Publications, New Delhi.	2009

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES:

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com

16BESHOE04 **ENGINEERING ACOUSTICS** **3003 100**

OBJECTIVES:

- To disseminate the fundamentals of acoustic waves.
- To inculcate the characteristics of radiation and reception of acoustic waves.
- To divulge knowledge on the basics of pipe resonators and filters.
- To introduce the features of architectural acoustics.
- To impart the basic knowledge of transducers and receivers.
- Explain the basic ideas of pipe resonators and filters.

COURSE OUTCOMES:

- Develop the idea of the fundamentals of acoustic waves.
- Apply the concepts of radiation and reception of acoustic waves.
- Explain the basic ideas of pipe resonators and filters.
- Illustrate the basics of architectural acoustics.
- Illustrate the transducers and receivers and its applications in various electronic devices.
- Apply the knowledge inputs of the course for engineering applications.

UNIT I INTRODUCTION

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves - Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales. Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence –method of images.

UNIT II RADIATION AND RECEPTION OF ACOUSTICWAVES

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers. Absorption and attenuation of sound. Absorption fromviscosity – complex sound speed and absorption – classical absorptioncoefficient

UNIT III PIPES RESONATORS ANDFILTERS

Resonanceinpipes-standingwavepatternabsorptionofsoundinpipes–longwavelengthlimit–
Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe – acousticfilters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – fundamental properties of hearing – loudness level and loudness – pitch and frequency –voice.

UNIT IV ARCHITECTURAL ACOUSTICS

Sound in enclosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design. Environmental Acoustics: Highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

UNIT V TRANSDUCTION

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	LawerenceE. Kinsler, Austin R.Frey	Fundamentals of Acoustics	John Wiley & Sons	2000

REFERENCE:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	AltonEverest.F& KenPohlmann	Master Handbook of Acoustics	McGraw Hill Professional	2014

WEBSITES:

1. www.acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www.ocw.mit.edu

16BESHOE05 **SOLID WASTE MANAGEMENT** **3003 100**

OBJECTIVES:

- To make the students conversant with the basics of solid wastes and its classification.
- To make the student acquire sound knowledge of different treatments of solid wastes.
- To acquaint the student with concepts of waste disposals.
- To develop an understanding of the basic concepts of hazardous waste management.
- To acquaint the students with the basics of energy generation from waste materials.
- Identify the methods of wastes disposals.

COURSE OUTCOMES:

- Outline the basic principles of solid waste and separation of wastes.
- Identify the concepts of treatment of solid wastes.
- Identify the methods of wastes disposals.
- Examine the level of hazardousness and its management.
- Examine the possible of energy production using waste materials.
- Integrate the chemical principles in the projects undertaken in the field of engineering and technology.

UNIT I SOLID WASTE

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

UNIT II WASTE TREATMENT

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNIT III WASTE DISPOSAL

Sanitary Land Fill Method of Solid Waste Disposal – Land Fill Classficaition, Types, Methods &Siting Consideration – Layout & Preliminary Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfill Remediation

UNIT IV HAZARDOUS WASTE MANAGEMENT

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure, Remediaiton, risk assessment.

UNIT V ENERGY GENERATION FROM WASTE

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, Energy recovery systems. Biological & Chemical conversion technologies – Aerobic composting, low solids. Anaerobic digestion, high solids anaerobic digestion, Energy production from biological conversion products, other biological transformation processes. Chemical transformationprocesses.

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dara.S.S,Mishra.D.D	A Text book of Environmental Chemistry and Pollution Control	S.Chand and Company Ltd., New Delhi.	2011

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Naomi B. Klinghoffer and Marco J. Castaldi	Waste to Energy Conversion Technology (Woodhead Publishing Series inEnergy)	Woodhead Publishing Ltd., Cambridge, UK	2013
2.	Frank Kreith,George Tchobanoglous	Hand Book of Solid Waste Management- 2nd edition	McGraw Hill Publishing Ltd., New York	2002
3.	Shah, Kanti.L	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall (P) Ltd., New Delhi.	1999

WEBSITES:

1. www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.
2. http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/
3. www.alternative-energy-news.info/technology/garbage-energy/
4. nzic.org.nz/ChemProcesses/environment/

16BESHOE06 **GREEN CHEMISTRY** **3003 100**

OBJECTIVES:

- To make the students conversant about green chemistry.
- To make the student acquire sound knowledge of the atom efficient process and synthesis elaborately.
- To acquaint the student with concepts of green technology.
- To develop an understanding of the basic concepts of renewable energy resources.
- To acquaint the students with the basics information on catalysis.
- Apply the concepts combustion of green technology.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Outline the basic principles of green chemistry.
- Examine the different atom efficient process and synthesis elaborately.
- Apply the concepts combustion of green technology.
- Identify and apply the concepts of renewable energy.
- Apply the concepts of green catalysts in the synthesis.
- Integrate the chemical principles in the projects undertaken in the field of engineering and technology.

UNIT I INTRODUCTION TO GREEN CHEMICALPRINCIPLES

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

UNIT II ATOM EFFICIENTPROCESSES

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

UNIT III BIOTECHNOLOGY AND GREENCHEMISTRY

Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

UNIT IV RENEWABLE RESOURCES

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

UNIT V CATALYSIS IN GREEN CHEMISTRY

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Sanjay K. Sharma, AckmezMudhoo	Green Chemistry for Environmental Sustainability	CRC Press , London	2010
2.	Ahluwalia V. K. and M.Kidwai	New Trends in Green Chemistry 2nd edition	Anamaya publishers., New Delhi.	2007

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons., New Delhi.	2012
2.	Mukesh Doble. Ken Rollins, Anil Kumar	Green Chemistry and Engineering, 1st edition	Academic Press, Elesevier., New Delhi.	2007
3.	Desai K. R.	Green Chemistry	Himalaya Publishing House, Mumbai.	2005
4.	Matlack A. S.	Introduction to Green Chemistry	Marcel Dekker: New York	2001

WEBSITES:

1. http://www.organic-chemistry.org/topics/green-chemistry.shtm
2. http://www.essentialchemicalindustry.org/processes/green-chemistry.html
3. http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm
4. http://www.epa.gov/research/greenchemistry/
5. http://www.amazon.in/Green-Chemistry-Catalysis

16BESHOE07 **APPLIED ELECTROCHEMISTRY** **3003 100**

OBJECTIVES:

- To get the information on electro chemical material.
- To study about the conducting polymers
- To understand about the fuel
- To gain knowledge on the batteries and power sources.
- Apply the concepts of electrochemistry in storage devices.
- Identify the concepts of storage devices and their applications.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Outline the basic principles of chemistry in electrochemical material.
- Examine the properties of conducting polymers.
- Apply the concepts of electrochemistry in storage devices.
- Identify the concepts of storage devices and their applications.
- Apply suitable materials for the manufacturing of storage devices.
- Integrate the chemical principles in the projects undertaken in the field of engineering and technology.

UNIT I METALFINISHING

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electroplating for electronic industry- Alloy plating, brass plating- Electro less plating of nickel- anodizing – Electroforming – Electro winning.

UNIT II CONDUCTING POLYMERS ANDELECTROCHEMICALS

Lectropolymerisation- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene- Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNIT III BATTERIES AND POWERSOURCES-I

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNIT IV BATTERIES AND POWERSOURCES-II

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells,advantages.

UNIT V ELECTROCHEMICAL MATERIAL SCIENCE

Solar cells- Preparation of CdS/Cu_2S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Cynthia G. Zoski	Hand Book of Electrochemistry	Academic Press, Elesevier., UK	2007
2.	D.Pletcher and F.C.Walsh	Industrial Electrochemistry	Chapman and Hall, London	1990

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M. Barak	Electrochemical Power Sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
2.	Bruno Scrosati	Applications of Electroactive Polymers	Chapman & Hall, London	1993
3.	K.L. Chopra and I. Kaur	Thin Film Devices and their Application	Plenum Press, New York.	1983
4.	M.M.Baizer	Organic Electrochemistry	Dekker Inc. New York	1983

WEBSITES:

1. http://www.anoplate.com/finishes/
2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html
3. http://inventors.about.com/od/sstartinventions/a/solar_cell.htm

16BESHOE08 **INDUSTRIAL CHEMISTRY** **3003 100**

OBJECTIVES:

- To understand about the fuel
- To study about the abrasives and lubricants.
- To gain knowledge on inorganic chemicals and explosive materials.
- To get the information on agriculture chemicals.
- Identify the concepts of explosives and smoke screens.
- Identify the usage of agriculture chemicals.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Outline the basic chemistry of cement and lime.
- Examine the uses of abrasives and refractories.
- Identify the usage of inorganic chemicals.
- Identify the concepts of explosives and smoke screens.
- Identify the usage of agriculture chemicals.
- Integrate the chemical principles in the projects undertaken in the field of engineering and technology.

UNIT I CEMENT ANDLIME

Manufacture of Portland cement – settling of hardening of portland cement – regauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials- manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – magnesian lime – dolomitic lime – hydrauliclime.

UNIT II ABRASIVES ANDREFRACTORIES

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories – definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

UNIT III INORGANIC CHEMICALS

Common salt and soda ash – manufacture – different grades – products – alkalis – Na_2CO_3, caustic soda and chlor-alkali industry – manufacture principles of electrolytic process – chlorine – storage. Hydrochloric acid – manufacture – absorption – uses, sulphur and sulphuric acid – extraction ofsulphur – manufacture of H_2SO_4 – chamber – contact processes – industrialuses.

UNIT IV EXPLOSIVES

Explosives – uses – properties and tests – explosives for war – nitrocellulose – picric acid and T.N.T. – industrial explosives – nitroglycerin and dynamites – black powder – smoke screens – incendiaries – gasmask.

UNIT V AGRICULTURE CHEMICALS

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Harikrishan	Industrial Chemistry	Goel Publishing House, Meerut.	2014
2.	Sharma.B.K	Industrial Chemistry	Goel Publishing House, Meerut.	2000

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Chakrabarty.B.N	Industrial Chemistry	Oxford and IBH Publishing CO. New Delhi.	1998
2.	James A. Kent	Hand Book of Industrial Chemistry, 9th edition	Van Nostrand Reinhold, New York.	1992
3.	Sherve.R.N	Chemical Process Industries	McGraw-Hill, Kugakuisha Ltd., Tokyo.	1984
4.	Shukla.S.D and Pandy.G.N	A Text book of Chemical Technology	Vikas Publishing House (P) Ltd, New Delhi.	1979

WEBSITES:

1. http://en.wikipedia.org/wiki/Cement
2. http://www.hon.ch/HONselect/Selection/D01.html
3. http://fas.org/man/dod-101/navy/docs/fun/part12.htm
4. http://toxics.usgs.gov/topics/agchemicals.html

16BECSOE01 **INTERNET PROGRAMMING** **3003 100**

OBJECTIVES:

- To introduce the Java programming language and explore its current strengths and weaknesses.
- To study the way that object-oriented concepts are implemented in the Java programming language.
- To write working Java code to demonstrate the use of applets for client side programming.
- Discuss the way that exceptions are detected and handled in the Java programming language.
- Create Java code that demonstrates multiple threads of execution.
- Describe internet telephony

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Explain the basic and advanced concepts and techniques of Java.
- Design an application based upon the concepts of Java and advance Java.
- Discuss the way that exceptions are detected and handled in the Java programming language.
- Create Java code that demonstrates multiple threads of execution.
- Describe internet telephony
- Explain multimedia applications

UNIT I INTRODUCTION

Introduction - Network of Networks, Intranet, Extranet and Internet. World Wide Web- Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. TCP/IP- Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing- Classful and Classless Addressing,Subnetting

UNIT II HTML

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue. Image Maps- map, area, attributes of image area- Extensible Markup Language (XML)- Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts- Introduction- Environment Variable, GET and POST Methods.

UNIT III PERL

Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling- JavaScript- Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies- Definition of cookies, Create and Store a cookie with example. Java Applets- Container Class, Components, Applet Life Cycle, Update method, Applications.

UNIT IV CLIENT-SERVER PROGRAMMING

Client-Server programming In Java - Java Socket, Java RMI. Threats - Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks- Network security techniques- Password and Authentication- VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH). Firewall- Introduction, Packet filtering, Stateful, Application layer, Proxy.

UNIT V INTERNET TELEPHONY

Introduction, VoIP- Multimedia Applications- Multimedia over IP: RSVP, RTP, RTCP and RTSP-Streaming media, Codec and Plugins, IPTV- Search Engine and Web Crawler- Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Paul Deitel, Harvey Deitel and Abby Deitel	Internet and World Wide Web-How to Program-5th Edition	Pearson	2011
2	Gopalan.N.P and. Akilandeswari.J	Web Technology: A Developer's Perspective	PHI Learning, Delhi	2013

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Rahul Banerjee	Internetworking Technologies, An Engineering Perspective	PHI Learning, Delhi	2011
2	Robert W. Sebesta	Programming the World Wide Web	Pearson Education	2016

16BECSOE02 **MULTIMEDIA AND ANIMATION** **3003 100**

OBJECTIVES:

- To study the graphics techniques and algorithms.
- To study the multimedia concepts and various I/O technologies.
- To enable the students to develop their creativity
- To impart the fundamental concepts of Computer Animation and Multimedia. To write working Java code that demonstrates multiple threads ofexecution
- Discuss the fundamental concepts of computer animation and multimedia.
- Explain the various latest interactive multimedia devices, the basic concepts about images

COURSE OUTCOMES:

- Discuss the fundamental concepts of computer animation and multimedia.
- Explain the various latest interactive multimedia devices, the basic concepts about images and image formats.
- Explain the data compression techniques, image compression techniques like JPEG
- Explain the video compression techniques like MPEG, and the basic concepts about animation
- Create an interactive multimedia presentation by using multimedia devices
- Identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.

Upon successful completion of the course, the students should be able to:

UNIT I INTRODUCTION

What is mean by Animation – Why we need Animation – History of Animation– Uses of Animation– Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects -Creating Animation.

UNIT II CREATING ANIMATION INFLASH

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers - Action script.

UNIT III 3D ANIMATION & ITSCONCEPTS

Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation.

UNIT IV MOTION CAPTION

Formats – Methods – Usages – Expression – Motion Capture Software‟s – Script Animation Usage

– Different Language of Script Animation Among the Software.

UNIT V CONCEPT DEVELOPMENT

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

TEXTBOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Malay K. Pakhira	Computer Graphics, Multimedia and Animation	PHI Learning PVT Ltd	2010

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ranjan Parekh	Principles of Multimedia (Unit I, Unit V)	TMH	2007
2	Ashok Banerji, Ananda Mohan Ghosh	Multimedia Technologies	McGraw Hill Publication.	
3	Pankaj Dhaka	Encyclopedia of Multimedia and Animations	Anmol Publications	2011

16BECSOE03 PC HARDWARE AND TROUBLESHOOTING 3003 100

COURSE OBJECTIVES:

- To assemble/setup and upgrade personal computer systems.
- To perform installation, configuration, and upgrading of microcomputer hardware and software.
- To install/connect associated peripherals.
- Define the terms that are directly related to processors such ascaching, multi-threading, dual-core technology, multi-processing, and pipelining.
- Explain the PC memories such as RAM and ROM devices.
- Discuss about motherboards and the various technologies connected to mainboards such as chipsets, buses, and various BIOS types.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Identify the main components of the PC.
- Use the skills to troubleshoot various power-related problems.
- Define the terms that are directly related to processors such ascaching, multi-threading, dual-core technology, multi-processing, and pipelining.
- Explain the PC memories such as RAM and ROM devices.
- Discuss about motherboards and the various technologies connected to mainboards such as chipsets, buses, and various BIOS types.
- Prepare a HDD for storing data; installWindows OS and various programs.

UNIT I INTRODUCTION

Introduction-ComputerOrganization–NumberSystemsandCodes–Memory–ALU–CU–
Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error DetectionTechniques – Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC and User.

UNIT II PERIPHERAL DEVICES

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices – FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNIT III PC HARDWARE OVERVIEW

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC.

UNIT IV INSTALLATION AND PREVENTIVEMAINTENANCE

Introduction – system configuration – pre installation planning – Installation practice – routine checks – PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery.

UNIT V TROUBLESHOOTING

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LSI‟s – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Govindarajalu.B	IBM PC Clones Hardware, Troubleshooting and Maintenance,2/E	TMH	2002

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peter Abel, Niyaz Nizamuddin	IMB PC Assembly Language and Programming	Pearson Education	2007
2	Scott Mueller	Repairing PC's	PHI	1992

16BECSOE04 **JAVA PROGRAMMING** **3003 100**

COURSE OBJECTIVES:

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Demonstrate the concepts of polymorphism and inheritance.
- List the important topics and explain the principles of software development.
- Create a computer program to solve specified problems.
- Use the Java SDK environment to create, debug and run simple Java programs

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Identify classes, objects, members of a class and relationships among them needed for a specific problem.
- Demonstrate the concepts of polymorphism and inheritance.
- List the important topics and explain the principles of software development.
- Create a computer program to solve specified problems.
- Use the Java SDK environment to create, debug and run simple Java programs.
- Describe the basics of event handling

UNIT I INTRODUCTION TO JAVA

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members –constructors – finalize method

UNIT II PACKAGES

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy –polymorphism – dynamic binding – final keyword – abstract classes

UNIT III I/O STREAMS

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes.

UNIT IV EXCEPTION HANDLING

Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions – Using exceptions fordebugging

UNIT V THREADS

Introduction, Creating Threads, The Life Cycle of a Thread, Thread Methods, Using Threads, Synchronization of Threads, Summary

TEXTBOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Cay S. Horstmann and Gary Cornell	Core Java: Volume I – Fundamentals	Sun Microsystems Press	2008

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Arnold.K and Gosling.J	The JAVA programming language Third edition	Pearson Education	2009
2	Timothy Budd	Understanding Object-oriented programming with Java Updated Edition	Pearson Education	2002
3	Thomas Wu.C	An introduction to Object-oriented programming with Java Fourth Edition	Tata McGraw-Hill Publishing company Ltd	2008

WEBSITES:
http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/http://www.winprog.org/tutorial/msvc.htmlhttp://www.tutorialized.com/tutorials/Visual-C/1http://www.freeprogrammingresources.com/visualcpp.html

16BEEEOE01 ELECTRIC HYBRID VEHICLE 3003 100

OBJECTIVES

- To understand the basic concepts of an electric hybrid vehicle.
- To gain knowledge about the electric propulsion unit.
- To understand and gain knowledge about various energy storage devices.
- Evaluate the different energy management strategies.
- Describe the concept of different energy storage devices.
- Analyse the different motor drives used in hybrid electric vehicles.

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

- Explain the concept of hybrid electric vehicles.
- Discuss the concept of hybrid electric drive-trains.
- Evaluate the different energy management strategies.
- Describe the concept of different energy storage devices.
- Analyse the different motor drives used in hybrid electric vehicles.
- Discuss the fuel cell based energy storage and its analysis

UNIT I INTRODUCTION

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II HYBRID ELECTRIC DRIVE-TRAINS

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV ENERGYSTORAGE

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENTSTRATEGIES

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

TEXT BOOK

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press – 2nd edition	2010

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	Standardsmedia – 2nd edition	2009
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley – 2nd edition	2012

16BEEEOE02 ENERGY MANAGEMENT AND ENERGY AUDITING 3003 100

OBJECTIVES

- To gain the knowledge about energy management.
- To understand the basic concepts in economic analysis in energy management.
- To understand the basic principles of energy audit.
- Analyse the different energy efficient motors.
- Describe the concept of energy conservation.
- Analyse the different methods to improve power factor.

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

- Explain the concept of energy management.
- Analyse the different methods for economic analysis.
- Discuss the basic concept of energy audit and types.
- Analyse the different energy efficient motors.
- Describe the concept of energy conservation.
- Analyse the different methods to improve power factor.

UNIT I ENERGY MANAGEMENT

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS

Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worthmethod.

UNIT III BASIC PRINCIPLES OF ENERGYAUDIT

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT IV ENERGY EFFICIENT MOTORS

Electric Motors: Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation –over motoring – motor energy audit-

Energy conservation: Importance-energy saving measures in DG set-fans and blowers pumps- air conditioning system- energy efficient transformers.

UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS

Power factor - methods of improvement, location of capacitors, p.f with non linear loads, effect of harmonics on p.f,- p.f motor controllers –Energy efficient lighting system design and practice- lighting control– Measuring Instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLCs.

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Murphy W.R. and Mckay Butter worth.G	Energy Management	Heinemann Publications	2007

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	John.C.Andreas	Energy Efficient Electric Motors	Marcel Dekker Inc Ltd – 3rd edition	2005
2	W.C.Turner Steve Doty	Energy Management Handbook	Lulu Enterprises, Inc. - 8th Edition Volume II	2013

16BEEEOE03 PROGRAMMABLE LOGIC CONTROLLER 3003 100

OBJECTIVES

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To understand the principles of PID.
- Describe programmable controller networking and supervisory control.
- Design logic circuits to perform industrial control functions of medium complexity.
- Demonstrate the correct operation of logic circuits by programming them into the programmable logic controller.

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

- Examine the typical PLC hardware structure.
- Interpret relay ladder diagrams.
- Examine the issues related to using PLCs for batch processes and sequential control.
- Describe programmable controller networking and supervisory control.
- Design logic circuits to perform industrial control functions of medium complexity.
- Demonstrate the correct operation of logic circuits by programming them into the programmable logic controller.

UNIT I INTRODUCTION

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLCPROGRAMMING

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray processsystem.

UNIT III REGISTERS AND PLCFUNCTIONS

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PIDPRINCIPLES

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hackworth.JR and Hackworth.F.D – Jr	Programmable Logic Controllers – Programming Method and Applications	Pearson	2006

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	2004
2	Bolton.W	Programmable Logic controller	Elsevier Newnes Publications, 5th Edition	2009

WEBSITE

http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logic controller

16BEEEOE04 RENEWABLE ENERGY SOURCES 3003 100

OBJECTIVES

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
- To understand the basic principles fuel cell, Geo thermal powerplants.
- To gain the knowledge about hydro energy.
- Explain the need of wind energy and the various components used in energy generation.
- Discuss the need of hydro energy and the various types of hydro energy.

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

- Explain the need of renewable energy resources, historical and latest developments.
- Describe the use of solar energy and the various components used in the energy production with respect to applications.
- Explain the need of wind energy and the various components used in energy generation.
- Discuss the need of hydro energy and the various types of hydro energy.
- Analyse the different energy sources for energy production.
- Explain the need of ocean thermal power plants

UNIT I INTRODUCTION

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

UNIT II SOLARENERGY

Introduction to solar energy: solar radiation, availability, measurement and estimation– Solar thermal conversion devices and storage – solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

UNIT III WINDENERGY

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNIT IV HYDRO ENERGY

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V OTHER SOURCES

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Rai.G.D	Non-conventional sources of energy	Khanna publishers	2011
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Rao.S. &Parulekar	Energy Technology	Khanna publishers, Eleventh Reprint	2013
2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis – 3rd edition	2015

WEBSITES:

1. www.energycentral.com
2. www.catelelectricpowerinfo.com

16BEECOE01 REAL TIME EMBEDDED SYSTEMS 3003 100

OBJECTIVES

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing to study about memory management
- Gain knowledge about task management
- Gain knowledge about semaphore management

COURSE OUTCOMES

- Ability to understand embedded systems, its hardware and software.
- Gain knowledge about devices and buses used for embedded networking.
- Gain knowledge about task management
- Gain knowledge about semaphore management
- Gain knowledge about message passing
- Gain knowledge about memory management

UNIT-I INTRODUCTION TO EMBEDDED SYSTEM

Introduction - Embedded systems description, definition, design considerations & requirements - Overview of Embedded system Architecture (CISC and RISC) - Categories of Embedded Systems - embedded processor selection &tradeoffs - Embedded design life cycle - Product specifications - hardware/software partitioning - iterations and implementation - hardware software integration - product testing techniques – ARM7

UNIT-II OPERATING SYSTEMOVERVIEW

Introduction –Advantage and Disadvantage of Using RTOS – Multitasking – Tasks - Real Time Kernels – Scheduler - Non-preemptive Kernels - Preemptive Kernels – Reentrancy- Reentrant Functions – Round Robin Scheduling - Task Priorities - Static Priorities – Mutual Exclusion – Deadlock – Intertask Communication – Message Mailboxes – Message Queues - Interrupts - Task Management – Memory Management - Time Management – ClockTicks.

UNIT-III TASKMANAGEMENT

Introduction - µ C/OS-II Features - Goals of µ C/OS-II - Hardware and Software Architecture – Kernel Structures: Tasks –Task States – Task Scheduling – Idle Task – Statistics Task – Interrupts Under µ C/OS-II – Clock Tick - µ C/OS-II Initialization. Task Management: Creating Tasks – Task Stacks – Stack Checking – Task‟s Priority – Suspending Task – Resuming Task. Time Management: Delaying a Task – Resuming a Delayed Task – System Time. Event Control Blocks- Placing a Task in the ECB Wait List – Removing a Task from an ECB waits List.

UNIT IV SEMAPHORE MANAGEMENT AND MESSAGEPASSING

Semaphore Management: Semaphore Management Overview – Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox – Deleting Mailbox – Waiting for a Message box – Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue – Deleting a Message Queue – Waiting for a Message at a Queue – Sending Message to a Queue – Flushing a Queue.

UNIT-V MEMORY MANAGEMENT

Memory Management: Memory Control Blocks – Creating Partition- Obtaining a Memor y Block – Returning a Memor y Block .Getting Started with µ C/OS-II – Installing µ C/OS-II – Porting µ C/OS-II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with µ C/OS-II - µ C/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Anal yze the Multichannel ADC with help of µ C/OS-II.

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Jean J. Labrosse	MicroC/OS – II The Real Time Kernel	CMP BOOKS	2009
2	David Seal	ARM Architecture Reference Manual	Addison-Wesley	2008
3	Steve Furbe	ARM System-on-Chip, Architecture	Addison-Wesley Professional California	2000

16BEECOE02 **CONSUMER ELECTRONICS** **3003 100**

OBJECTIVES

- To study about various speakers and microphone
- To learn the fundamental of television systems and standards
- To learn the process of audio recording and reproduction
- To study the various telephone networks
- Gain knowledge about various speakers and microphone
- Gain knowledge about the fundamental of television systems and standards

COURSE OUTCOMES

- Gain knowledge about various speakers and microphone
- Gain knowledge about the fundamental of television systems and standards
- Gain knowledge about the process of audio recording and reproduction
- Gain knowledge about the various telephone networks
- To study about various speakers and microphone
- To learn the fundamental of television systems and standards

UNIT I LOUDSPEAKERS AND MICROPHONES

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNIT II TELEVISION STANDARDS AND SYSTEMS

Components of a TV system – interlacing – composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL, SECAM - Components of a Remote Control.

UNIT III OPTICAL RECORDING ANDREPRODUCTION

Audio Disc – Processing of the Audio signal –read out from the Disc – Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems.

UNIT IV TELECOMMUNICATION SYSTEMS

Telephone services - telephone networks – switching system principles – PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellular modems

UNIT V HOME APPLIANCES

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Bali.S.P	Consumer Electronics	Pearson Education	2005

16BEECOE03 NEURAL NETWORKS AND ITS APPLICATIONS 3003 100

OBJECTIVES

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.
- Understand the basic concepts of neural networks and its applications in various domain
- Ability to develop the use of Soft Computing to solve real-world problems
- Understand the Basic Neural Network.

COURSE OUTCOMES

- Understand the basic concepts of neural networks and its applications in various domain
- Ability to develop the use of Soft Computing to solve real-world problems
- Understand the Basic Neural Network.
- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.

UNIT I INTRODUCTION TO NEURAL NETWORKS

Introduction - biological neurons and their artificial models - learning, adaptation and neural network's learning rules - types of neural networks- single layer, multiple layer- feed forward, feedback networks

UNIT II LEARNING PROCESS

Error – correction learning – memory based learning - hebbian learning-competitive learning-Boltzmann learning- supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT III PERCEPTION

Single layer perception-Adaptive filtering-unconstrained optimization-Least-mean square algorithm-Leaning curve-Annealing Technique-perception convergence theorem-Relationship between perception and Baye‟s classifier-Back propagation algorithm

UNIT IV ATTRACTOR NEURAL NETWORK ANDART

Hopfield model-BAM model- BAM stability-Adaptive BAM -Lyapunov function-effect of gain-Hopfield design-Application to TSP problem-ART- layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP

UNIT V SELFORGANIZATION

Self organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical vector Quantization. Applications of self-organizing maps: The Neural Phonetic Typewriter Learning Ballistic Arm Movements

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Simon Haykin	Neural Networks and Learning Machines-3/E	Pearson/ Prentice Hall	2009
2	Satish Kumar	Neural Networks : A Classroom Approach	TMH	2008
3	Freeman J.A., SkapuraD.M	Neural networks, algorithms, applications, and programmingtechniques	Addition Wesley	2005
4	Laurene Fausett	Fundamentals of Neural Networks: Architectures, Algorithms, and Applications	Pearson/ Prentice Hall	1993
5	Robert J Schalkoff	Artificial Neural Networks	McGraw Hill	1997

16BEECOE04 **FUZZY LOGIC AND ITS APPLICATIONS** **3003 100**

OBJECTIVES

- To introduce the basic concepts of Fuzz y logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.
- Understand the basic concepts of Fuzzy logic and its applications in various sdomain
- Ability to develop how to use Fuzzy computation to solve real-world problems
- Understand basic fuzzy models.

COURSE OUTCOMES

- Understand the basic concepts of Fuzzy logic and its applications in various domain
- Ability to develop how to use Fuzzy computation to solve real-world problems
- Understand basic fuzzy models.
- To introduce the basic concepts of Fuzz y logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.

UNIT - I

Basics of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT – II

Theory of Approximate Reasoning**:** Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference-fuzzy models

UNIT - III

Fuzz y Knowledge Based Controllers (Fkbc**):** Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures – Design of Fuzz y Logic Controller

UNIT - IV

Adaptive Fuzz y Control: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

UNIT V

Simple applications of FKBC -washing machines- traffic regulations -lift control-fuzz y in medical applications-Introduction to ANFIS.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Diankar.D, Hellendoom.H and Reinfrank.M	An Introduction to Fuzzy Control	Narosa Publishers India	1996
2	Klir.G.J and Folger.T.A	Fuzzy Sets Uncertainty and Information	PHI IEEE	1995

16BTBTOE01 **BIOREACTOR DESIGN** **3003 100**

OBJECTIVES

- To impart basic knowledge in bioprocess engineering.
- To design the bioreactors for various operations.
- To understand the principle and working of heat transfer equipments.
- To extendtheknowledge in principle of heat transfer inside a bioreactor.
- To construct the equipments used in mass transfer operations.
- To learn the equipments used in the separation process.

COURSE OUTCOMES

- Summarise the basic concepts in biotechnology
- Summarise the basic concepts in bioprocess engineering.
- Design the bioreactors for various operations.
- Develop the heat transfer equipments for bioprocess engineering.
- Construct the equipments used in mass transfer operations.
- Categorise the equipments used in separation process.

UNIT I ENGINEERING PROPERTIES AND STORAGETANK

Introduction to various mechanical properties of material to be used material of construction, design of cylindrical storage tank.

UNIT II REACTORDESIGN

Design of Airlift fermentor, Bubble column reactor and Continuous stirred tank reactor.

UNIT III HEAT TRANSFEREQUIPMENTS

Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulation evaporator.

UNIT IV MASS TRANSFEREQUIPMENTS

Design of Bollmann extractor, fractionating column, packed tower and spray tray absorber

UNIT V SEPARATIONEQUIPMENTS

Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rotart drum drier and Swenson –walker crystallizer.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	James Edwin Bailey, David F. Ollis	Biochemical Engineering	McGraw-Hill	2007
2	Don W. Green, Robert H. Perry	Chemical Engineer Hand book	The McGraw- Hill Companies,	2008

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Pauline. M. Doran	Bioprocess Engineering Principles	Academic Press	2013

16BTBTOE02 FOOD PROCESSING AND PRESERVATION 3003 100

OBJECTIVES

- To learn the scope and importance of food processing.
- To impart basic knowledge in different food processing methods carried out in the food tech companies.
- To extend the brief knowledge in food conservation operations.
- To study the methods of food preservation by cooling.
- To familiarise the students on the concepts of preservation methods for fruits.
- To create a deeper understanding of preservation methods for vegetables.

COURSE OUTCOMES

- Describe the scope and importance of food processing.
- Outline the various processing methods for foods.
- Extend the knowledge in food conservation operations.
- Describe the methods of food preservation by cooling.
- Summarise the preservation methods for fruits.
- Demonstrate the preservation methods for vegetables.

UNIT I SCOPE AND IMPORTANCE OF FOODPROCESSING

Properties of food- Physical, thermal, mechanical, sensory. Raw material Preparation - Cleaning, sorting, grading,peeling.

UNIT II PROCESSINGMETHODS

Heating- Blanching and Pasteurization. Freezing- Dehydration- canning- additives- fermentation- extrusion cooking- hydrostatic pressure cooking- dielectric heating- micro wave processing and aseptic processing – Infra red radiation processing- Concepts and equipmentused.

UNIT III FOOD CONVERSIONOPERATIONS

Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membrane separation- filtration- equipmentand application.

UNIT IV FOOD PRESERVATION BYCOOLING

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Water activity, methods to control wateractivity.

UNIT V PRESERVATION METHODS FOR FRUITS ANDVEGETABLES

Pre processing operations - preservation by reduction of water content: drying / dehydration and concentration – chemical preservation – preservation of vegetables byacidification, preservation with sugar - Heat preservation– Food irradiation- Combined preservationtechniques.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Paul Singh.R, Dennis R. Heldman	Introduction to food Engineering.	Academic Press	2001
2	Fellows.P	Food Processing Technology,Principles and practice.	Wood head Publishing Ltd	2000
3	Mircea EnachescuDauthy	Fruit and Vegetable Processing	FAO agricultural services bulletin no.119	1995

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Rao.M.A, Syed S.H. Rizvi, Ashim K. Datta	Engineeringproperties of foods	CRC Press	2005
2	Sivasankar.B	Food processing and preservation	PHI Learning Pvt. Ltd	2002

16BTBTOE03 **BASIC BIOINFORMATICS** **3003 100**

OBJECTIVES

- To understand the available tools and databases for performing research in bioinformatics.
- To expose students to sequence alignment tool in bioinformatics.
- To construct the phylogenetic trees for evolution.
- To get familiar with the 3D structure of protein and classification.
- To acquire basic knowledge in protein secondary structure prediction.
- To extend the brief knowledge in microarray data analysis.

COURSE OUTCOMES

At the end of the course,

- Summarise the basic concepts and importance of bioinformatics in various sectors.
- Demonstrate the sequence alignment tool in bioinformatics.
- Construct the phylogenetic trees for evolution.
- Analyse the three-dimensional protein structure and classification using various tools.
- Illustrate the protein secondary structure prediction by comparative modelling.
- Extend the knowledge in microarray technology and applications of bioinformatics in various sectors.

UNIT I OVERVIEW OFBIOINFORMATICS

The scope of bioinformatics; bioinformatics & the internet; useful bioinformatics sites. Data acquisition: sequencing DNA, RNA & proteins; determination of protein structure; gene & protein expression data; protein interaction data. Databases – contents, structure & annotation: file formats; annotated sequence databases; miscellaneous databases.

UNIT II RETRIEVAL OF BIOLOGICALDATA

Data retrieval with Entrez & DBGET/ LinkDB; data retrieval with SRS (sequence retrieval system).Searching sequence databases by sequence similarity criteria: sequence similarity searches; amino acid substitution matrices; database searches, FASTA & BLAST; sequence filters; iterative database searches & PSI-BLAST.Multiple-sequence alignment, gene & protein families: multiple-sequence alignment & family relationships; protein families & pattern databases; protein domain families.

UNIT III PHYLOGENETICS

Phylogenetics, cladistics& ontology; building phylogenetic trees; evolution of macromolecular sequences.Sequence annotation: principles of genome annotation; annotationtools & resources.

UNIT IV STRUCTURALBIOINFORMATICS

Conceptual models of protein structure; the relationship of protein three-dimensional structure to protein function; the evolution of protein structure & function; obtaining, viewing & analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure: CATH & SCOP; introduction to protein structure prediction; structure prediction by comparative modeling; secondary structure prediction; advanced protein structure prediction &predictionstrategies.

UNIT V MICROARRAY DATA ANALYSIS

Microarray data, analysis methods; microarray data, tools & resources; sequence sampling &SAGE.Bioinformatics in pharmaceutical industry: informatics & drug discovery; pharmainformaticsresources.Basic principles of computing in bioinformatics: running computer software; computer operating systems; software downloading & installation; databasemanagement.

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dan E. Krane, Michael L. Rayme	Fundamental Concepts of Bioinformatics	Pearson education	2004
2	Andreas D. Baxevanis, Francis Ouellette.B.F	Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins	Wiley-Interscience	2004
3	David W. Mount	Sequence and Genome Analysis	Cold Spring Harbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Michael J. Korenberg	Microarray Data Analysis: Methods and Applications	Springer Science & Business Media	2007

16BTBTOE04 FUNDAMENTALSOFNANOBIOTECHNOLOGY 3 0 0 3100

OBJECTIVES

- To impart the skills in the field of nanobiotechnology and its applications.
- To acquire knowledge in the nanoparticles and its significance in various fields.
- To extend the knowledge in types and application of nanoparticles in sensors.
- To define the concepts of biomaterials through the molecular self assembly.
- To equip students with clinical applications of nanodevices.
- To describe a deeper understanding of the socio-economic issues in nanobiotechnology.

COURSE OUTCOMES

At the end of the course,

- Develop skills in the field of nanobiotechnology and its applications.
- Summarise the nanoparticles and its significance in various fields.
- Extend the knowledge in types and application of nanoparticles in sensors.
- Define the concepts of biomaterials through the molecular self assembly.
- Outline the clinical applications of nanodevices.
- Describe the socio-economic issues in nanobiotechnology.

UNIT I INTRODUCTION

Introduction, Scope and Overview, Length scales , Importance of Nanoscale and Technology, History of Nanotechnology, Future of Nanotechnology: Nano Technology Revolution, Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concept, Controversies and confusions, Understanding advanced capabilities, Nanotechnology in Different, Fields: Nanobiotechnology, Materials, Medicine, Dentalcare.

UNIT II NANOPARTICLES

Introduction, Types of Nanoparticles, Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Applications, Toxic effects of Nanomaterials, Significance of Nanoparticles Nanofabrications- MEMS/NEMS, Atomic Force Microscopy, Self assembled monolayers/ Dip- pen Nanolithography, Soft Lithography, PDMS Molding, Nano Particles, Nano wires and Nanotubes.

UNIT III APPLICATIONS

Nanomedicine, Nanobiocensor and Nanofludics.Nanocrystals in biological detection, Electrochemical DNA sensors and Integrated Nanoliter systems.Nano-Biodevices and Systems.Fabrication of Novel Biomaterials through molecular self assembly- Small scale systems for in vivo drug delivery- Future nanomachine.

UNIT IV NANOBIOTECHNOLOGY

Clinical applications of nanodevices.Artificialneurons.Real-time nanosensors- Applications in cancer biology.Nanomedicine.Synthetic retinyl chips based on bacteriorhodopsins.High throughput DNA sequencing with nanocarbon tubules.Nanosurgical devices.

UNIT V ETHICAL ISSUES INNANOTECHNOLOGY

Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology: With Especial Reference to Nanomedicine, Nanomedicine Applied in Nonmedical Contexts, Social Issues Relating to

Nanomedicine. Social and Ethical Issues, Economic Impacts, Other Issues, Nanotechnology and Future Socio-economicchallenges.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Niemeyer,C.M. and Mirkin,C.A	Nanobiotechnology: Concepts, Applications and	Wiley-VCH	2004
2	Goodsell, D.S.	Bionanotechnology	John Wiley and Sons, Inc	2004

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Shoseyov, O. and Levy, I	Nanobiotechnology: Bioinspired Devices and	Humana Press	2007
2	Bhushan, B.	Springer Handbook of Nanotechnology	Springer-Verlag Berlin Heidelberg	2004
3	FreitasJrR.A	Nanomedicine	Landes	2004
4	Kohler, M. and Fritzsche, W.	Nanotechnology – An Introduction toNanostructurin	Wiley-VCH	2004

16BEMEOE01 **COMPUTER AIDED DESIGN** **3003 100**

OBJECTIVE

- To provide an overview of how computers are being used in mechanical component design.
- To study the various computer graphics concepts.
- To get basic knowledge of geometric modelling.
- To study the basics of parametric design and object representation.
- To get basic knowledge in product design and development.
- Explain the process involved in graphic transformations.

COURSE OUTCOMES

- Give an overview of the CAD systems and its importance.
- Explain the ideas and principles behind the computer graphics.
- Explain the process involved in graphic transformations.
- Understand the operations involved in geometric modelling.
- Describe the concepts of parametric design.
- Understand the basics of product design and development.

UNIT I OVERVIEW OF CAD SYSTEMS

Conventional and computer aided design processes-advantages and disadvantages. Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations. Networking of CAD systems.

UNIT II INTERACTIVE COMPUTER GRAPHICS ANDGRAPHICS TRANSFORMATIONS

Generative, cognitive and image processing graphics. Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Two- and Three – Dimensional graphics concepts, Graphical input technique, Geometric transformations, Visual Realism, Computer animation, customizing graphics software.

UNIT III GEOMETRIC MODELING

Wireframe, surface, NURBS and solid modeling-applications and advantages. Creating primitive solids, sweeping solids, boolean operations. Extracting entities from a solid. Filleting of edges of solids. Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

UNIT IV PARAMETRIC DESIGN AND OBJECT REPRESENTATION

Types of co-ordinate systems. Parametric design - definition and advantages. Parametric representation of analytic and synthetic curves. Parametric representation of surfaces and solids - manipulations.

UNIT V PRODUCT DESIGN AND DEVELOPMENT

Automated 2D drafting - basics, mechanical assembly - bill of materials generation. Mass property calculations.

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Vera B Anand	Computer Graphics and Geometric Modeling for Engineers	John Wiley & Sons, New York	2000
2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	Dhanpat Rai & Sons, New Delhi	2002
2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	William M Newman and Robert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994
5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998
6	Rao S S	Optimisaiton Techniques	Wiley Eastern, New Delhi	2003

16BEMEOE02 INDUSTRIAL SAFETYANDENVIRONMENT 3 0 0 3 100

OBJECTIVES

- To provide in-depth knowledge on industrial safety.
- Understand the various safety techniques involved in the industrial sector.
- Record and investigate the accident zone and prepare reports related to it.
- Conduct basic safety inspections using strategies that they have developed.
- Identify and demonstrate the working of safety monitoring.
- Train about education and training based on safety.

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

- Understand the need and awareness of safety concepts.
- Understand the various safety techniques involved in the industrial sector.
- Record and investigate the accident zone and prepare reports related to it.
- Conduct basic safety inspections using strategies that they have developed.
- Identify and demonstrate the working of safety monitoring.
- Train about education and training based on safety.

UNIT I INTRODUCTION TO LOGISTICS

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNIT II PHASES OF SUPPLYCHAIN

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAINMODELS

Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain withcustomer.

UNIT IV SUPPLY CHAINACTIVITIES

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNIT V SCM ORGANISATION AND INFORMATIONSYSTEM

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERP Software's

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Shari.P.B and Lassen.T.S	Managing the global supply chain	Viva books, New Delhi	2000
2	Ayers.J.B	Hand book of supply chain management	The St. Lencie press	2000

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Nicolas.J.N	Competitive manufacturing management - continuous improvement, Lean production, customer focused quality	McGrawHill, New York	1998
2	Steudel.H.J and Desruelle.P	Manufacturing in the nineteen - How to become a mean, lean and world class competitor	Van No strand Reinhold, New York	1992

16BEMEOE03 **TRANSPORT PHENOMENA** **3003 100**

OBJECTIVES

- To provide the basics of transport phenomena and its applications.
- To provide the knowledge over the properties of the systems and unit systems used.
- To understand the basics and mathematics involved in momentum transport.
- To provide the basics and applications of energy transport.
- To give basics and principles involved in the mass transport phenomena.
- Understand the basic concepts involved in momentum transport.

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

- Understand the basic concepts of transport phenomena.
- Understand the essentiality of properties of a system and unit systems used.
- Understand the basic concepts involved in momentum transport.
- Apply the mathematics involved in fluid flow problems.
- Explain the various energy transport phenomena.
- Understand the basics of mass transport phenomena.

UNIT I INTRODUCTION AND BASIC CONCEPTS

General overview of transport phenomena including various applications, Transport of momentum, heat and mass , Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II PROPERTIES, UNITS AND OTHER PHYSICALPARAMETERS

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III MOMENTUMTRANSPORT

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNIT IV ENERGY TRANSPORT

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heattransfer

UNIT V MASSTRANSPORT

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion- Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

REFERENCE

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

WEB REFERENCE

1. https://laulima.hawaii.edu/portal

16BEMEOE04 INTRODUCTION TO BIOMECHANICS 3003 100

OBJECTIVES

- Understand the basics and importance of biomechanics.
- Present the nine fundamentals of biomechanics and its need.
- Explain the nine principles used for the application of biomechanics.
- Describe the human anatomy.
- Explain the need for biomechanics in muscle actions.
- Understand the basics of the mechanics involved in the musculoskeletal system.

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

- Understand the basics and importance of biomechanics.
- Present the nine fundamentals of biomechanics and its need.
- Explain the nine principles used for the application of biomechanics.
- Describe the human anatomy.
- Explain the need for biomechanics in muscle actions.
- Understand the basics of the mechanics involved in the musculoskeletal system.

UNIT I INTRODUCTION

Biomechanics - Improving Performance – Applications - Preventing and Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNIT II KEY MECHANICAL CONCEPTS

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application ofBiomechanics

UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY

Gross (Whole-Body) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups - Anthropometric Data

UNIT IV ANATOMICAL DESCRIPTION

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNIT V MECHANICS OF THE MUSCULOSKELETALSYSTEM

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit - Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle - Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Duane Knudson	Fundamentals of Biomechanics	Springer Science+ Business Media, LLC	2007
2	Ross Ethier.C Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

16BECEOE01 HOUSING, PLANANDMANAGEMENT 3 0 0 3 100

OBJECTIVES:

- To examine the role and tasks of basic housing policies and building bye-laws.
- To understand the process of integrated service delivery in the context of economic, social, environmental and institutional factors.
- To analyse the innovative construction methods and materials.
- To analyse city management strategies and strengthen the urban governance through a problem solving approach.
- Use housing programmes and schemes.
- Plan and design housing projects.

COURSE OUTCOMES

- Explain the importance of basic housing policies and building bye-laws.
- Use housing programmes and schemes.
- Plan and design housing projects.
- Examine innovative construction methods
- Examine innovative construction materials.
- Describe housing finance and loan approval procedures.

UNIT I INTRODUCTION TO HOUSING

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II HOUSINGPROGRAMMES

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNIT III PLANNING AND DESIGN OF HOUSINGPROJECTS

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V HOUSING FINANCE AND PROJECTAPPRAISAL

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern(Problems).

TEXT BOOKS

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi,2002.
2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay,2001.

REFERENCES

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai,2002.
2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi,2000.

16BECEOE02 **BUILDING SERVICES** **3003 100**

OBJECTIVES:

- To provide knowledge on machineries involved in building construction.
- To impart knowledge onelectrical systems in buildings.
- To understand theprinciples of illumination and design.
- To learn therefrigeration principles and its applications.
- To study the importance of fire safety and its installation techniques.
- Use the principles of illumination and design.

COURSE OUTCOMES

- Explain the machineries involved in building construction.
- Discuss the electrical system and its selection criteria.
- Use the principles of illumination and design.
- Illustrate the principle of refrigeration.
- Explain the importance of fire safety and its installation techniques.
- Apply fire safety installation techniques.

UNIT I MACHINERIES

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION &DESIGN

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES &APPLICATIONS

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compressioncycle–Compressors–Evaporators–Refrigerantcontroldevices–Electricmotors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automaticsprinklers

TEXT BOOKS

1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc.,New York, 2002.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi,2005.

REFERENCES

1. Philips Lighting in Architectural Design, McGraw-Hill, New York,2000.

2 A.F.C.Sherratt,"Air-conditioningandEnergyConservation",TheArchitecturalPress, London, 2005.

3 National BuildingCode.

16BECEOE03 MANAGEMENT OF IRRIGATION SYSTEMS 3003 100

OBJECTIVES:

- At the end of this course the students should have learnt the irrigation system requirements, irrigation scheduling, strategies in water use management, canal operation places and involvement of stakeholder
- At the end of this course the students should have learnt the irrigation system requirements
- At the end of this course the students should have learnt the irrigation scheduling
- At the end of this course the students should have learnt the strategies in water use management
- At the end of this course the students should have learnt the canal operation places and involvement of stakeholder
- At the end of this course the students should have learnt the Frequency and interval of irrigation

COURSE OUTCOMES

- At the end of this course the students should have learnt the irrigation system requirements, irrigation scheduling, strategies in water use management, canal operation places and involvement of stakeholder
- At the end of this course the students should have learnt the irrigation system requirements
- At the end of this course the students should have learnt the irrigation scheduling
- At the end of this course the students should have learnt the strategies in water use management
- At the end of this course the students should have learnt the canal operation places and involvement of stakeholder
- At the end of this course the students should have learnt the Frequency and interval of irrigation

UNIT I IRRIGATION SYSTEMREQUIREMENTS

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigationefficiencies.

UNIT II IRRIGATION SCHEDULING

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III MANAGEMENT

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV OPERATION

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V INVOLVEMENT OF STAKEHOLDERS

Farmer"s participation in System operation – Water user"s associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TEXT BOOKS

1. DilipKumarMajumdar,"IrrigationWaterManagement–PrinciplesandPractice", Prentice Hall of India Pvt. Ltd., New Delhi, 2000
2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, NewDelhi

REFERENCES

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi,2000
2. Maloney,C.andRaju,K.V.,"ManagingIrrigationTogether",PracticeandPolicyin India, Stage Publication, New Delhi, India, 2000

16BECEOE04 ADVANCED CONSTRUCTION TECHNOLOGY 3003 100

OBJECTIVES:

- Explain the modern concrete construction.
- Explain the construction methods.
- Describe the construction Equipment used for Earth Moving
- Describe the Construction Equipment used for Conveying,
- Explain the principles and Practices of Temporary structures
- Explain the operation and maintenance of construction equipment

COURSE OUTCOMES

- Explain the modern concrete construction.
- Explain the construction methods.
- Describe the construction Equipment used for Earth Moving
- Describe the Construction Equipment used for Conveying,
- Explain the principles and Practices of Temporary structures
- Explain the operation and maintenance of construction

UNIT I MODERN CONSTRUCTIONMETHODS

Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT II CONSTRUCTION METHODS FOR SPECIALSTRUCTURES

Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines

UNIT III MODERN CONSTRUCTION EQUIPEMENTS-I

Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting,Tunneling and hoisting

UNIT IV MODERN CONSTRUCTION EQUIPEMENTS-II

Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant

UNIT V PRINCIPLES AND PRACTICES OF TEMPORARYSTRUCTURES

Principles and Practices of Temporary structures, Shoring, and Strutting,Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipments

TEXT BOOKS

1. Peurifoyu , R. L., , Ledbette, W.B., Construction Planning , Equipment andMethods, Mc Graw Hill Co., 2000.
2. Antill J.M., PWD, Civil Engineering Construction, Mc Graw Hill Book Co.,2005

REFERENCE

1.Varma, M Construction Equipment and its Planning & Applications, Metropoltian Book Co.,2000

2.Nunnaly, S.W., Construction Methods and Management , Prentice – Hall, 2000

3.Ataev, S.S., Construction Technology,MI

16BEAEOE01 **AUTOMOBILE ENGINEERING** **3003 100**

OBJECTIVES:

- To impart knowledge on the constructional details and principle of operation of various automobile components.
- To learn the function and working of various components in transmission and drive lines.
- To study the concept and working of steering and suspension systems in an automobile.
- To give knowledge on the wheels, tyres and brakes of automobiles.
- To provideinformation on thecurrent and future trends in automobiles.
- Explain the function and working of components in transmission and drive lines.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Demonstrate the operating principles and constructional details of various automobile components.
- Explain the function and working of components in transmission and drive lines.
- Identify and explain the types of steering system.
- Identify and explain the types of suspension system.
- Classify and describe the types of wheels, tyres and brakes of automobiles.
- Discuss the current and future trends in the automobiles.

UNIT I ENGINE AND FUEL FEEDSYSTEMS

Classification of Engine, construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburettor working principle, requirements of an automotive carburettor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNIT II TRANSMISSION SYSTEMS

Requirements of transmission system. Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. Objective of the gearbox - Determination of gear ratios for vehicles. Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propeller Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

UNIT III SUSPENSION SYSTEM

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension – Pneumatic suspension – Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

UNIT IV BRAKES

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theory, Brake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System (ABS).

UNIT V ELECTRICAL SYSTEM

Principle and construction of lead acid battery. Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.Starting System and chargingsystem.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2.	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., NewDelhi	2003
3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publisher	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
2.	Crouse.W.H	Automobile Electrical Equipment, 3rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAE Inc	2001

16BEAEOE02 BASICS OF TWO AND THREE WHEELERS 3003 100

OBJECTIVES:

- To impart technical knowledge on construction and working of the power train and drive train of two and three wheeler vehicles.
- To familiarise with maintenance procedures of the engine and subsystems of two and three wheelers.
- To impart knowledge on types of transmission systems
- To impart knowledge on types of steering and suspension systems
- To impart knowledge on types of wheels, tyres and brakes for two and three wheelers
- To make the students conversant on servicing of two and three wheelers.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
- Explain the servicing of two and three wheelers.

UNIT I INTRODUCTION

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS

2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHES AND TRANSMISSION

Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS ANDTYRES

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992
2.	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century bookhouse.	1988

REFERENCES:

SL. NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Griffin.M.M	Motor cycles from inside and outside.	Prentice Hall Inc, NewJersey.	1978
2.	Bruce A. Johns, David D. Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAEOE03 AUTOMOBILE MAINTENANCE 3003 100

OBJECTIVES:

- To understand the need for vehicle maintenance and its importance.
- To familiarise the maintenance procedure for various components of an automobile.
- To familiarize the students to understand servicing of transmission and driveline components.
- To make the students conversant on the procedure for steering and suspension
- To make the students conversant on the procedure for wheel and brake maintenance.
- To Study and acquire knowledge on the fault diagnosis in theelectrical and air conditioner systems.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.
- Explain the fault diagnosis in the electrical and air conditioner systems.

UNIT I MAINTENANCE OF RECORDS ANDSCHEDULES

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheelbalancing.

UNIT IV ELECTRICAL SYSTEMMAINTENANCE

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLEBODY

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating systemmaintenance.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	John Doke	Fleet Management	McGraw Hill Co	1984
2.	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011
3.	Service Manuals from Different Vehicle Manufacturers			

16BEAEOE04 **INTRODUCTION TO MODERN VEHICLE TECHNOLOGY** **3003 100**

COURSE OUTCOMES:

- To impart knowledge on trends in the vehicle power plants.
- To learn the various advanced driver assistance systems.
- To study the working of advanced suspension and braking systems in an automobile.
- To giveinformationaboutmotor vehicle emission and noise pollution control.
- To provide knowledge ofthe vehicle telematics.
- To give information about the noise control techniques

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Distinguish and describe the various modern vehicle power plant systems.
- List and explain the various driver assistant mechanisms.
- Identify and describe the working of advanced suspension and braking systems.
- Apply the knowledge of motor vehicle emission and noise pollution control.
- Describe the noise control techniques
- Describe the vehicle telematics and its applications.

UNIT I TRENDS IN POWERPLANTS

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNIT II DRIVER ASSISTANCE SYSTEMS

Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNIT III SUSPENSION BRAKES AND SAFETY

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT IV NOISE & POLLUTION

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT V TELEMATICS

Global positioning systems, geographical information systems, navigation systems, automotive vision system, roadrecognition

TEXT BOOKS

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	LjuboVlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001
2.	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems –Progress in Technology	Automotive Electronics Series,SAE, USA.	1998

REFERENCES:

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William B Riddens	Understanding Automotive Electronics, 5th Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold,	Understanding Automotive Electronics	SAE	1998
3.	Robert Bosch	Automotive HandBook, 5th Edition	SAE	2000

FACULTY OF ENGINEERING
DEGREE OF BACHELOR OF ENGINEERING IN BIOMEDICAL ENGINEERING

DEPARTMENT OF BIOMEDICAL ENGINEERING

(REGULAR PROGRAMME)

CURRICULUM & SYLLABI

(2016-2017)

KARPAGAM ACADEMY OF HIGHER EDUCATION
(Established Under Section 3 of UGC Act 1956)
COIMBATORE 641 021
INDIA.

SemesterI & II

16BECC101 COMMUNICATIVE ENGLISH 3 0 0 3 100

OBJECTIVES:

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To improve word power Receptive Skills
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence

OUTCOMES:

- Use English language for communication: verbal & non –verbal.
- Enrich comprehension and acquisition of speaking & writing ability.
- Gain confidence in using English language in real life situations.
- Improve word power: lexical, grammatical and communication competence.
- Acquire good vocabulary for easy communication.
- Be familiar with sentence structure and sentence formation.

Unit I (9)

Listening–Typesoflistening-Listeningtoclassreading-Videotapes/Audiotapes.**Speaking** –Introductiononself-Introductiononone's friend.**Reading**-Readingfor comprehension– Reading different kind ofpassages likedescriptive, narrative, objective, conversational and argumentative.**Writing**–FormalandInformalletters-Freewritingonany topic–My favorite place,hobbies,dreams,goals,etc--Tofillindifferentapplicationforms.**Grammar**–Articles-WHquestions–Yes/NoQuestion-SubjectVerbagreement.**Vocabulary**-WordFormation–Word expansion (Root word) -Prefix and Suffix.

Unit II (10)

Listening–UnderstandingthepassageinEnglish–Pronunciationpractice.**Speaking**–Asking and answeringquestions - Telephone etiquette. **Reading** –Critical reading – Finding key informationinagiventext(Skimming-Scanning).**Writing**–Coherence andcohesioninwriting –Shortparagraphwriting–Writingshortmessages.**Grammar**–Partsofspeech–Noun–Verb – Adjectives -Adverbs.**Vocabulary**– Compound Nouns/Adjectives–Irregularverbs.

Unit III(10) Listening–Listeningforspecifictask–Fillinthegaps.**Speaking**–Phonemes–Syllables–Role play– Conversation Practice. **Reading** –Reading and Comprehension. **Writing** -Autobiographicalwriting–Biographicalwriting-Instructionwriting.**Grammar**–Preposition–Infinitive–Gerund– Tenses.**Vocabulary**– Foreignwordsusedin English –Britishand American usage.

Unit IV (8)

Listening–Respondingtoquestions–Readinginclassforcompleteunderstandingandfor better pronunciation. **Speaking** –Debate- Presentations in seminars. **Reading** –Making inferencefromthereadingpassage–Predictingthecontentofreadingpassages.**Writing**-Interpretingvisualmaterials(tables,graphs,charts,etc) LetterstotheEditor. **Grammar**–Sentencepattern – Voice(active and passivevoice).**Vocabulary** – Oneword substitution.

Unit V **(8)**

Listening-Listeningtodifferentaccents,speeches/presentations.**Speaking**-Extemporetalk– Just-a-minutetalk.**Reading**-Readingstrategies–Intensivereading–Textanalysis.**Writing**- Creativewriting–Writingcircularsandnotices–Writingproposal.**Grammar**–Directand Indirect speech– Conditional sentences - Auxiliaryverbs. **Vocabulary** –Abbreviations & Acronyms.

Note: Students shall havehands on training in improving listening skill inthe language laboratory@ 2 periods per each unit.

Total-45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OFTHEBOOK	PUBLISHER	YEAROF PUBLICATION
1	Sangeeta Sharma, Meenakshi Raman	Technical Communication:Principles And Practice 2^{nd}Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OFTHE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Lakshminarayanan, K.R. &Murugavel, T.	Communication Skills forEngineers	SCITECH Publications, Chennai	2009
2	Rizvi Ashraf, M	EffectiveTechnical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES:

www.learnerstv.com –Listening/ Speaking/ Presentation
www.usingenglish.com–Writing/ Grammar
www.englishclub.com –VocabularyEnrichment/Speaking
www.ispeakyouspeak.blogspot.com– VocabularyEnrichment/ Speaking
www.teachertube.com–Writing Technically
www.Dictionary.com– Semantic/ Grammar

16BECC102 ENGINEERING MATHEMATICS I 3 2 0 4 100

Course Objectives

The goal of this course is for the students

- To develop the use of matrix algebra techniques that is needed by engineers forpractical applications.
- To understand geometrical aspects of curvature and elegant application of differential calculus which are needed in Engineeringapplications.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model Engineeringproblems.
- To familiarize the student with functions of several variables which is the foundation for many branches ofEngineering.
- To introduce sequence and series which is central to many applications in Engineering.
- To make the student to solve various engineering problems

Course Outcomes

Upon completion of this course the students will be able

- To solve the rank, Eigen values and eigenvectors, diagonalization of a matrix,Symmetric matrices and the students will be able to use matrix algebra techniques for practical applications.
- Toequipthestudentstohavebasicknowledgeandunderstandinginonefieldofm aterials, differentialcalculus
- To solve simple standard examples using the ideas of differential equations.
- To apply various techniques to solve Partial DifferentialEquations
- To develop the tool of power series for learning advanced EngineeringMathematics.
- To apply the knowledge acquired to solve various Engineeringproblems.

UNIT I MATRICES (12)

ReviewofMatrixAlgebra-Characteristicequation–EigenvaluesandEigenvectorsofareal matrix–Properties–Cayley-Hamiltontheorem(excludingproof)–Orthogonaltransformation ofasymmetricmatrixtodiagonalform–Quadraticforms–Reductiontocanonicalform through orthogonal reduction.

UNIT II DIFFERENTIAL CALCULUS (12)

Overview ofDerivatives-CurvatureinCartesianco-ordinates–Centreandradiusofcurvature–Circleofcurvature–Evolutes–Envelopes-EvolutesasEnvelopeofnormals–Maximaand Minima offunctions of two ormoreVariables–Method ofLagrangianMultipliers

UNIT III DIFFERENTIAL EQUATIONS (11)

LinearDifferentialequationsofsecondandhigherorderwithconstantcoefficients-Euler’s form of Differentialequations– Method of variation parameters.

UNIT-IV FUNCTIONSOF SEVERAL VARIABLES (12)

Partial derivatives– Euler’s theorem for homogeneous functions – Total derivatives – Differentiationofimplicitfunctions–Jacobians–MaximaandMinimaoffunctionsoftwoor moreVariables -MethodofLagrangian multipliers.

UNIT V SEQUENCESAND SERIES (13)

Sequences: Definitionandexamples–**Series:**TypesandConvergence–Seriesof positive terms–Testsofconvergence:Comparisiontest,IntegraltestandD’Alembert’sratiotest– Alternatingseries–Leibnitz’stest–Seriesofpositiveandnegativeterms–Absoluteand conditional convergence.

Total :60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OFTHE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics	McGraw Hill Education (India) Private Limited, New Delhi.	2014
2	Sundaram, V. Lakhminarayan,K.A. &Balasubramanian, R.	Engineering Mathematics forfirstyear.	Vikas Publishing Home, New Delhi.	2006

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OFTHE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Grewel .B. S.	Higher Engineering Mathematics	KhannaPublications, New Delhi.	2014
2	Bhaskar Rao. P. B, Sri RamacharySKV S, Bhujanga Rao. M	Engineering MathematicsI	BS Publications, India.	2010
3	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
4	ShahnazBathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009
5	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education,India	2009

WEBSITES:

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.intmath.com/matrices-determinants
4. www.Intmath.com/calculus/calculus-intro.php

16BEPH103
16BEPH203 **ENGINEERING PHYSICS** **3 0 0 3** **100**

Course Objectives

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology
- Understand the basics of laser and optical fiber with appropriate applications.
- Introduce the concepts of quantum mechanics for diverse applications.
- Impart the basic knowledge of crystal and its various crystal structures.
- Disseminate the fundamentals of nuclear physics and their applications.
- To understand about nuclear reactors for energy resources

Course Outcomes

- Identify the elastic nature of materials and its thermodynamic properties.
- Infer the characteristics of laser and optical fibers for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Identify the different atomic arrangements of crystals and its defects
- Make use of the concepts of sound waves for medical applications
- Illustrate the basic ideas for nuclear reactors for energy resources

UNITIPROPERTIESOFMATTERANDTHERMODYNAMICS (9)

Threetypesofmodulusofelasticity –basicdefinitions,relationconnectingthemodulii (Derivation), poison ratio- Torsionalpendulum- bendingof beams- bendingmoment–basic assumption ofmoment–uniform and non uniformbending
Concept of entropy-changeof entropyin reversible and irreversible processes– refrigeration.

UNITII LASER ANDFIBER OPTICS (9)

Introduction–emissionandabsorptionprocess-Einstein'scoefficientsderivation.Typesof LASER-CO_2, SemiconductorLASER-Applications ofLASERin industryand medicine.
Totalinternalreflection–modesofpropagationoflightinopticalfibers–numericalaperture andacceptance angle–derivations,typesof opticalfibers(Material,refractive indexandmode)– fiber optical communication system (block diagram)

UNITIII QUANTUMPHYSICS (9)

Introductiontoquantumtheory–Blackbodyradiation-Photoelectriceffect-dualnatureof matterandradiation–deBrogliewavelength,uncertainty principle–physicalsignificanceof wave function, Schrödinger'swave equation–time dependentandtime independentequations– particle in onedimensional box-scanning electronmicroscope.

UNITIV CRYSTAL PHYSICS (9)

Lattice–unitcell–Bravaislattice–lattice planes–Miller indices–calculationofnumber of atomsper unitcell,atomic radius,coordinationnumber,packingfactorfor SC,BCC,FCCand HCPstructures-crystal defects– point, line and surfacedefects

UNITV ULTRASONICS AND NUCLEARPHYSICS (9)

Productionofultrasonicsby piezoelectricmethod–NonDestructiveTesting–pulseecho system through transmission and reflection modes-A,Band C–scan displays,Medicalapplications–Sonogram Introduction – basics about nuclear fission and fusion, nuclear composition – Radiationdetectors–semiconductor detector.Reactors–essentialsofnuclear reactor- power reactor.

Total-45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Ganesan.Sand Baskar.T	Engineering PhysicsI	GEMS Publisher, Coimbatore-641	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OFTHE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Serwayand Jewett	Physics for Scientists and Engineerswith Modern Physics	Thomson Brooks/Cole,Indian reprint, NewDelhi	2010
2	Gaur, R.K. and Gupta, S.C	Engineering Physics	DhanpatRai Publications,New Delhi.	2011
3	M.N. Avadhanulu and PG Kshirsagar	A Text book of Engineering Physics	S.Chandand company,Ltd.,New Delhi	2011
4	D.C. Ghosh, N.C. Ghosh, P.K. Haldar	Engineering Physics	UniversityScience, New Delhi	2011
5	P. Khare, A. Swarup	Engineering Physics: Fundamentals and Modern Applications	Jones &Bartlett Learning	2009

WEBSITES:

- www.nptel.ac.in
- www.physicsclassroom.com
- www. oyc.yale.edu
- www.physics.org

16BECH103
16BECH203 **ENGINEERINGCHEMISTRY** **3 0 0 3** **100**

COURSE OBJECTIVES:

The goal of this course is for students:

- To analyze the basics of Periodic properties, Intermolecularforces
- To infer the terminologies of electrochemistry and to analyze aboutenergy storagedevices
- To build the concept of corrosion and itsprevention
- To summarize the basic water technology and itspurification.
- To analyze about spectroscopictechnique
- To analyze the chemical principles in the field of engineering

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Rationaliseperiodicpropertiessuchasionizationpotential,electronegativity,oxidation states and electronegativity.
- Analyse the mechanism of different energy storagedevices.
- Rationalise different types of corrosion and itsprevention.
- List the various methods in the purification ofwater.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopictechniques
- Integrate the chemical principles in the projects undertaken in field of engineeringand technology

UNITI WATER TECHNOLOGY **(9)**

Sources-Characteristics–Specificationfordrinkingwater,BIS&WHO-Alkalinity–Typesof alkalinity anddetermination–Hardness–Typesandestimationby EDTAmethod(problems)-Domesticwatertreatment–Disinfectionmethods (Chlorination,Ozonation.UVtreatment)– Boiler feedwater–Requirements–Disadvantagesofusinghardwater inboilers–Internal conditioning (Phosphate, Calgonand Carbonate conditioning methods)– Externalconditioning– Demineralization process–Desalination -Reverseosmosis.

UNITII LECTROCHEMISTRYAND STORAGE DEVICES **(9)**

Electrochemicalcells–EMF–Measurement ofemf–Single electrodepotential–Nernst equation – Reference electrodes –Standard Hydrogenelectrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement ofpH – Electrochemical series – Significance– Potentiometrictitrations(Redox-Fe^{2+}vsdichromate)–Electrolyticconductance- application (conductometric titration)-Batteries- Primary batteries-Leclanchecell- Secondary batteries-Lead acid battery.An introduction to Fuel Cell-H_2-O_2Fuel Cell.

UNITIII FUELSAND COMBUSTION **(9)**

Coal-ProximateandUltimateanalysis-Metallurgicalcoke-ManufacturebyOtto-Hoffman method- Petroleumprocessingand fractions-Synthetic petrol- Bergiusand Fischer-Tropsch method-Knocking-Octane number andCetanenumber-Gaseousfuels- Water gas, Producer gas, Combustion offuel-Introduction-GCV-NCV-Flue gas analysis.

UNITIV CORROSIONSCIENCE **(9)**

ChemicalandElectrochemicalcorrosion-Galvaniccorrosion-Differentialaerationcorrosion-Corrosioncontrol- SacrificialanodeandImpressed current cathodicmethods- Corrosion inhibitors -Protective coatings– Organiccoatings-Paints-Constituents and functions –Inorganic coatings-Metalliccoatings- Electroplating (Au) andElectroless plating (Ni)- Surface conversion coating -Hot dipping.

UNITV SURFACE CHEMISTRYAND PHASE RULE **(9)**

Introduction-Adsorption-Types, adsorptionof gases on solids, adsorption of solutes from solutions,Adsorption isotherms-Freundlich adsorption isotherm-Langmuiradsorptionisotherm- Role of adsorbents in industries (catalysisand water softening).
Phase Rule:Definition -Phase diagrams–onecomponentwater system,twocomponentAg-Pb system.

Total:45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OFTHEBOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	EngineeringChemistry I&II	Sri Krishna Hi tech PublishingCompany (P) Ltd., Chennai.	2012

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OFTHEBOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I&II	McGraw-Hill Publishing Co.Ltd., 3rdReprint NewDelhi.	2013
2.	Kuriakose. J.C. and Rajaram	ChemistryinEngineeringand Technology.	TataMcGrawHillPublishing Company, New Delhi.	2010
3.	Jain, P.C. and MonikaJain	Engineering Chemistry.	DhanpatRai PublishingCompany(P)Ltd., New Delhi.	2009
4.	Dara.S.S	Text book of Engineering	S.Chand&Co.Ltd., New Delhi	2008
5.	Sharma.B. K	Engineering Chemistry	Krishna PrakasamMedia (P) Ltd., Meerut	2001

WEBSITES:

1. http://www.studynotes.ie/leaving-cert/chemistry/
2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html
3. http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
4. http://ocw.mit.edu/courses/#chemistry
5. http://www.chem.qmul.ac.uk/surfaces/sec

16BEBME104 INTRODUCTION TO BIOMEDICAL ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students :

- To give exposure on the basics of Biomedical engineering to the students.
- To have a basic knowledge on medical devices and equipment
- To understand the evolution of modern health care system
- To induce medical Morality and Ethics in the students
- To understand the various diagnostic methods and therapeutic systems available
- To get to know the various biomedical signals and other parameters associated with the Human body

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- understand the basicsof Bioinstrumentation
- Apply the ethics in their field of work
- Explain basic functions of medical imaging equipment
- Illustrate the HaemodialysisMachines
- Understand the importance and functions of therapeuticeqipment
- Analyze various Ethicalissues

UNIT-I INTRODUCTION(9)

HistoricalPerspective-Evolutionofmodernhealthcare system,Rolesplayedby Biomedical engineers, Professionalstatusof biomedicalengineering, ProfessionalSocieties,Basicsof Anatomyand physiology-Electrical Signals and Conductivity, temperature.

UNIT-IIDIAGNOSTICDEVICES (9)

Sourcesof biomedicalsignals,Basicmedicalinstrumentation system-Generalblockdiagramof a medicalinstrumentationsystem,Diagnostic devices-ECG,EEG, bloodpressuremeasurement, Temperatureand Respiration ratemeasurement, Blood cell counters, General constraints in design of medical instrumentation systems.

UNIT-III DIAGNOSTIC IMAGING (9)

X-rays, Nuclear MedicalImaging-Positron Emission Tomography,MagneticResonanceImaging Scanners, DiagnosticUltrasound, Thermal imaging systems.

UNIT-IV THERAPEUTIC EQUIPMENT (9)

Cardiac Pacemakers,Cardiac Defibrillators,Artificialheart,Instrumentsfor Surgery, HaemodialysisMachines-ArtificialKidney,Dialyzers, Ventilators-Humidifiers, Nebulizers and Aspirators, AnaesthesiaMachine.

UNIT-V ETHICSFOR BIOMEDICAL ENGINEERS (9)

Morality andEthics-A Definitionofterms,HumanExperimentation,Ethicalissuesinfeasibility studies,Ethicalissuesinemergency use,Ethicalissuesintreatmentuse, Codesofethicsforbio engineers, Ethical issues in tissue engineering.

TOTAL: 45

TEXT BOOKS

S. No.	Author (s) Name	Title of the book	Publisher	Yearof Publication
1	Enderle,John D., Bronzino, JosephD., Blanchard, SusanM	Introductionto Biomedical Engineering	ElsevierInc	2ndedition, 2005
2.	R. S. Khandpur	HandbookofBiomedical Instrumetation	McGraw-Hill PublishingCompan y Limited	2ndedition, 2003
3.	DanielAVallero	Biomedicalethics forEngineers	Elsevierpublication	1stedition, 2007

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Yearof Publication
1	Leslie Cromwell, Fred J.Weibell,Erich A. Pfeiffer	BiomedicalInstrumentation and Measurement	Prentice Hallof India, New Delhi	2ndedition2002
2.	John GWebster	MedicalInstrumentation: Applicationand Design	John Wileyand sons, New York	4thedition,2010
3.	JosephJCarr, John M Brown	Introduction to Biomedical EquipmentTechnology	John Wiley& Sons, New York	4thedition, 2008

16BEBME105 BASIC ELECTRICALAND ELECTRONICS ENGINEERING 3 0 0 3 100

Course Objectives

- To impart the basic knowledge about the Electric circuits.
- To understand the concept of Electrical Machines and Transformers.
- To understand the basic concepts of star and delta connections
- To understand the operation of AC and DC circuits
- To understand the working of Semiconductor devices and Digital Circuits.
- To impart the basic knowledge of Measuring Instruments and Electrical Installation.

Course Outcomes

At the end of this course, students will be able to

- Attribute the electric circuits with DC and AC excitation by applying various circuit laws.
- Attribute the electrical machines and transformer.
- To understand the working principle of electronic devices and circuits
- Evaluate the various digital circuits in real time applications.
- Analysis various semiconductor devices in real time applications.
- Reproduce the Measuring Instruments and Electrical Installation.

UNITI ELECTRICCIRCUITS& MEASUREMENTS

Ohm's Law–Kirchoff'sLaws–SteadyStateSolutionofDCCircuits–IntroductiontoAC CircuitsWaveformsandRMSValue–PowerandPowerfactor–SinglePhaseandThreePhase balanced Circuits.

UNITII ELECTRICAL MACHINES 9

Construction,PrincipleofOperation,BasicEquationsandApplicationsofDCGenerators,DC Motors, Single PhaseTransformer, single phaseinduction Motor.

UNITIII MEASURING INSTRUMENTS 9

OperatingPrinciplesofMovingCoilandMovingIronInstruments(AmmetersandVoltmeters), DynamometertypeWattmeters and Energymeters.

UNITIV SEMICONDUCTOR DEVICESAND APPLICATIONS 9

Characteristics of PN Junction Diode– Zener Effect– ZenerDiode and itsCharacteristics– Half wave and Fullwave Rectifiers– VoltageRegulation. Bipolar Junction Transistor– CB, CE, CC Configurations and Characteristics

UNITIV-DIGITAL ELECTRONICS 9

Numbersystems–binarycodes-logicgates-Booleanalgebra,laws& theorems-simplification ofBooleanexpression-implementationofBooleanexpressionsusinglogicgates-standard forms of Boolean expression.

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title ofthe book	Publisher	Yearof Publication
1	Mittle,V.M	Basic ElectricalEngineering	Tata McGrawHillEdition,New Delhi	2004
2	SedhaR.S	AppliedElectronics	S.Chand&Co	2006

REFERENCES

S. No	Author(s) Name	Title ofthe book	Publisher	Yearof Publication
1	Muthusubramanian R, andMuraleedharanK A	Basic Electrical,Electronics and Computer Engineering	Tata McGrawHill, SecondEdition	2006
2	NagsarkarTK and Sukhija MS	Basics ofElectricalEngineering	Oxford press	2005
3	MahmoodNahviand JosephA.Edminis	Electric Circuits	Schaum'Outline Series, McGraw Hill	2002
4	PremkumarN	Basic ElectricalEngineering	AnuradhaPublishers	2003

16BEPH111
16BEPH211 **ENGINEERING PHYSICS LABORATORY** **0 0 4 2 100**

OBJECTIVES:

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To prepare for the lab experiment and perform individually a wide spectrum of experiments.
- To present experimental data in various appropriate forms like tabulation, and plots.
- To analyze, Interpret and Summarize experimental results.
- To communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- To analyse the relevant problems in engineering stream.

OUTCOMES:

- The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- Prepare for the lab experiment and perform individually a wide spectrum of experiments.
- Present experimental data in various appropriate forms like tabulation, and plots.
- Analyze, Interpret and Summarize experimental results.
- Communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- Prepare to develop the skills for understanding basic electric circuits.

LIST OF EXPERIMENTS– PHYSICS

1. Determination ofv elocity of soundand compressibilityof liquid– Ultrasonic interferometer.
2. Determination of wavelength of mercuryspectrum– spectrometergrating.
3. Determination of Young'smodulusofthematerial–Nonuniformbending(or)Uniform bending.
4. Determination ofViscosityof liquid– Poiseuille's method.
5. Spectrometer Dispersivepower of aprism.
6. Torsional pendulum– Determination of Rigidity modulus.
7. Particle sizedetermination using Diode Laser
8. Determination ofLaser parameters– Wavelength, and angle of divergence.
9. Determination ofacceptance angle inan optical fiber.
10. Determination of thickness of a thin wire– Air wedge method
11. Determination ofBand Gap of asemiconductor material.
12. Determination of Specific resistanceof a given coil of wire – Wheatstone Bridge

16BECH111
16BECH211 **ENGINEERING CHEMISTRY LABORATORY** **0 0 4 2 100**

COURSE OBJECTIVES

The goal of this course is for students :

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To estimate the amount of alkalinity ions, hardness, chloride in water sample
- To make the student acquire practical skills in the determination of conductance of solutions, EMF etc
- To acquaint the students with the determination of molecular weight of a polymer by viscometry
- To understand the use of Spectrophotometry
- To carried out different types of titrations for estimation of concerned in materials

COURSE OUTCOMES

Upon completion of the course the students will be able to

- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
- Estimate the amount of alkalinity ions, hardness, chloride in water sample
- Measure molecular/system properties of conductance of solutions, EMF etc
- Acquaint the students with the determination of molecular weight of a polymer by visocometry
- Determine the corrosion rate of steel by weight loss method.
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more qualities and quantities of materials involved for accurate results.

LIST OF EXPERIMENTS– CHEMISTRY

1. Estimation of alkalinity of Watersample.
2. Estimation of hardness of Water by EDTA
3. Estimation of chloride in Watersample (Argentometric method)
4. Determination of corrosion rate byweightlossmethod.
5. ConductometricTitration (Simple acid base).
6. ConductometricTitration (Mixtureof weak and strong acids).
7. Conduct metricTitration using $BaCl_2$vs Na_2SO_4.
8. pH Titration (acid&base).
9. PotentiometricTitration (Fe^{2+}/ $KMnO_4$or $K_2Cr_2O_7$).
10. Estimation of Ferricion bySpectrophotometry.
11. Determination of water of crystallization of a crystalline salt (Copper sulphate).

12. Determination of molecular weight and degree of polymerization using Viscometry.

13. Determination of chemical oxygen demand.

16BEBME112 COMPUTER PRACTICE AND PROGRAMMING LABORATORY 1 0 4 3 100

COURSE OBJECTIVES

- To familiarize with open source office packages
- To write programs for Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings and Functions.
- To discuss the fundamental principles of C Programming, as well as in-depth data and information processing techniques
- To solve problems, explore real-world software development challenges, and create practical and contemporary applications
- To learn about data structures
- To apply the string handling functions to solve the given problem

COURSE OUTCOMES

- Study logical structure of a computer program
- analyze logical structure of a computer program
- understand computer program, and different constructor to develop a program in 'C'language
- Utilize the basic data structures.
- Distinguish and use the fundamental data types.
- Utilize a simple programming environment, compile programs and interpret compiler errors.

THEORY:

Whatiscomputer- ComputerComponents- WhatisC- CCharacterset-Constants,Variablesand Keywords-Generalformof C Program- Relational andLogicalOperators- Selection Structures-If andnestedif-Switch Case-Loops-Definitionandtypes- Functions- Arrays-IntroductiontoStrings-Pointers.

PRACTICALS:

1. Working with word Processing, Spreadsheetandpresentation softwareinLinux

2. Programming in Scratch:

   Practicing fundamental concepts of programminglikesequence, selection decision statements, working of loops and eventdriven programming

3. C Programming:

   Practicingprogramstogetexposuretobasicdatatypes,algebraicexpressions,Conditional statements, Inputand Output Formatting, Decision Statements, Switch Case, Control structures, arrays, Stringsand function, implementation ofpointers.

REFERENCES: **TOTAL: 45**

S. No.	Author(s) Name	Title ofthe book	Publisher	Yearof Publication
1	E.Balagurusamy	ComputingFundamental sandCProgramming	TMH Education, 5th Edition	2014
2	YashavantKanetkar	Let us “C”	BPB Publications, 13th Edition	2013

16BEBME113 ENGINEERING GRAPHICS 0 0 4 2 100

COURSE OBJECTIVES:

The goal of this course is for students :

- To prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as manufacturability, andsustainability
- To Understand the application of industry standards and techniques applied in engineering graphics
- To Apply auxiliary or sectional views to most practically represent engineered parts
- To sketch freehand drawings and to efficiently communicate ideas graphically
- To understand Dimension and annotate two-dimensional engineering drawings
- To prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineeringpractice

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Understand the engineering drawing and its place insociety.
- gain the knowledge of usage of Drawing instruments
- Expose the visualization of engineering drawing and engineering graphicsstandards.
- Expose the engineeringcommunication.
- Apply dimensions in drawings
- Use various graphic tools

UNIT I INTRODUCTION 9

Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

UNIT II SCALES AND PLANE CURVES 8

SCALES:Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

UNIT III FREE HAND SKETCHING 9

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT IV PROJECTION OF POINTS, LINES AND PLANE SURFACES 8

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT V PROJECTION OF SOLIDS 8

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

Introduction to Drafting Software/Package (Not for Exam) 3

Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venugopal K and Prabhu Raja V	Engineering Graphics	New Age International Publishers	2007
2	VTU	A Primer on Computer Aided Engineering Drawing	Belgaum	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kumar M S	Engineering Graphics	D D Publications, Chennai	2007
2	Bureau of Indian Standards	Engineering Drawing Practices for Schools and Colleges SP 46-2003	BIS, New Delhi	2003
3	Luzadder W J	Fundamentals of Engineering Drawing	Prentice Hall Book Co., New York	1998

WEB REFERENCES

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

16BECC151 **HUMANVALUES** **1 0 0 -100**

OBJECTIVE

- To create an awareness on Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others.
- To create awareness on assessment of safety and risk
- To attain higher level of consciousness.
- To Develop the Self Discipline, and Self Control

OUTCOME

- Articulate what makes a particular course of action ethically defensible
- Assess their own ethical values and the social context of problems
- Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources and the objective presentation of data
- Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
- Possess emotional stability
- Develop good health. and fitness

UNIT I **3**

HumanlifeonEarth-ConceptofHumanValues-ValueEducation-Aimofeducationandvalueeducation-Typesofvalues-Components ofvalues– Attitudes–typesofattitudes

UNIT II **3**

SelfDevelopment:Selfanalysis–GoalSetting-ThoughtAnalysis–GuardingagainstAnger-Respectto age, experience, maturity, family members, neighbors,co-workers

UNIT III **3**

IndividualQualities –Truthfulness –Constructivity–Sacrifice–Sincerity-SelfControl –Altruism–

Tolerance-Scientific Vision– RegulatingDesire

UNIT IV **3**

MindCulture- ModernChallengesofAdolescent-Emotionsandbehavior-Sexandspirituality-Adolescent

Emotions-Meditation

UNIT V **3**

Bodyand Mind Fitness :(a)PhysicalExercises (b)Activities:(i)Moralization ofDesires(ii)Neutralizationof

Anger (iii)Eradication ofWorries (iv)Benefits ofBlessings

TOTAL 15

REFERENCES

S. No	Author(s) Name	Title ofthe book	Publi	Yearof Publication
1	Subramanian.R	ProfessionalEthics	Oxford,NewDelhi	2013
2	Govindarajan. M, Natarajan.	EngineeringEthics	Prentice Hall	2004
3	Tripathi.A.N	HumanValues	NewAge International	2009
4	Pope.G.U.	ThirukkuralwithEnglishTransla	Uma	2002

16BECC201A BUSINESSCOMMUNICATION 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students :

- To help students comprehend the role oflisteningskills in effective communication.
- To familiarizestudents with verbal andnon-verbalcommunication.
- To exposestudents to neutral accent.
- To develop emotional intelligenceskills in them for enhancing their self-esteem.
- To assist them in settinggoals and developing positive attitude.
- To enable students to acquiredecision making skills, problem solving skillsand assertiveskills.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Design and deliverapersuasive presentation that convinces the audienceofthe topic's relevanceand
- overcomes resistance,using appropriate visual support and adhering to a specified time limit.
- Useastrategic communication model and critical thinking to identifyobjectives, analyzeaudiences,and choosethe most effectivestructure and style for delivering strategicallysound written and spoken messages.
- Practiceprinciples of effectivebusiness writing and document design in allwritten documents.
- Build an understanding of different organizationalcultures, business practices, and social norms to communicate moreeffectivelyin domestic andcross-cultural business contexts.
- Develop their soft skills and inter personal skills, which willmakethe transition from collegeto
- workplacesmoother andhelp them excel in theirjob.

UNITI

What is Business Communication?-Types of Communication– Formal and informal communication– Process of Communication-modes ofCommunication– Barriers to communication.

UNITII

Written Business Communication– Style-word-usage-organisation ofIdeas– mechanics ofwriting and fill upof forms -CoverLetter-Letter for Job Application-Letter ofComplaint-Memos-Resumes- Email-Reports Revising and proofreading-Advertising slogans-jargons- Description of Graphicsand visual aids-interpretation of graphs using expressions ofcomparison and contrast .

UNITIII

ReadingandUnderstandingthenewsarticles-OralBusinessCommunication-FirstImpressions-Attire– EffectivePresentationstrategies-Nuancesofdelivery –Controllingnervousnessandstagefright-Visual aidsPresentations- CapturingAudience- Tone-Behavior-TelephoneEtiquette-Non-verbal communication -Eye contact - Facial expressions - Posture - Gestures - Bodylangage– Etiquette-Organization ofpresentation– brain storming-Negotiations.

UNIT-IV

Differencebetween goalsand dreams -SMART goal setting -3 Ds ofgoal setting-Determination, DisciplineandDirection-Developingtherightattitude-Motivation-IntrinsicandExtrinsicmotivation- Dealing with change -Dedication-Taking responsibilities-Decision making.

UNIT-V

Intrapersonal skills-Self-analysis-Thought process–Interpersonal skills- Confidencebuilding-Resolving conflicts-Analytical skills-Team Building-Leadership skills- Planning/organizing-Abilityto work independently-Professional ethics -Communicating via e-mail. Ethical perspectives and their implications forresponsible communication-Proposal Presentation

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THEBOOK	PUBLISHER	YEAROF PUBLICATION
1	Meenakshi Raman &Prakash Singh	Business Communication	Oxford University Press	2012

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THEBOOK	PUBLISHER	YEAROF PUBLICATION
1	Murthy, G .R. K.	Soft Skills for Success.	TheICFAI University Press, Hyderabad.	2008
2	Jagadeesan, G& Santanakrishnan,R.	Soft Skills Development: Training and Evaluation.	TheICFAI University Press, Hyderabad.	2008
3	Sherfield, Robert M., RhondaJ. Montgomery,&Patricia G. Moody	Developing Soft Skills.	Pearson Education, New Delhi.	2005

WEBSITES

http://tribehr.com/social-hr-software/talent-management/skills-trackingwww.ispeakyouspeak.blogspot.com
https://alison.com/subjects/6/Personal-Development-Soft-Skills
www.learning-development.hr.toolbox.comhttp://www.niit.com/solution/soft-skill-training
http://mybcommlab.comtotestyour understanding of the concepts presented in each chapter and explore additional materials that will bring theideas to lifein videos, activities, and an online multimediae-book.

16BECC201B TECHNICAL ENGLISH 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students :

- To motivate learners to acquire listening & speaking skills in both formal and informal context
- To focus on question forms & to make them understand the important of using question tags and also the functional use of transformation of sentences.
- To improve their reading habit and to train them in critical and analytical reading
- To equip them to write for academic as well as work place context
- To enable students to face interviews
- To improve business letter writing skill of the students

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- Enhance them reading texts critically and analytically
- Develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Enrich the ability to face interviews with confidence.
- Enable to write documents and formal written communication
- Admire and appreciate elegancy in communication.

UNIT-1 (10)

Listening-DifferencebetweenHearing&Listening–Listeningtoinformalconversation.**Speaking**-Spokenstructuresondifferentsituations-Introduction,Greeting,Commentsontopicslike Films,Games etc,Excuse,Request,Agreement,Disagreement,etc.,**Reading**–ExtensiveandIntensivereading.**Writing** –Reportwriting-Writinga coveringletter.**Grammar**–Regular&Irregular verbs-Kindsofsentences- Question tags. **Vocabulary**– Homonymsand Homophones.

UNIT-II (8)

Listening–NoteTaking-Improvinggraspingability.**Speaking**–Welcomeaddress-Voteofthanks-Masterofceremony.**Reading**–ActiveandPassivereading- Readingforvocabulary-Readingfora purpose.**Writing**-Writingareview(Filmreview)-Summary ofastory.**Grammar**-Modalverbs– Conjunction-Expression of causeand effect.**Vocabulary**-Phrasal verbs -Idioms.

UNIT– III (9)

Listening-Barrierstolistening(Physical,Psychological,Linguistic&Cultural).**Speaking**–Stress,Pause andIntonation.**Reading**–Rapidreading– Skimming, Scanningand Surveying.(SQ3R)**Writing**- Essay writing-Minutesofmeeting -Agenda–**Grammar**-ActiveandPassivevoice-Purposeexpression. **Vocabulary** -Same words used as noun and verb- Often misspeltand confused words.

UNIT-IV (8)

Listening –Listening to telephone conversation - Viewing model interviews. **Speaking** –Group Discussion - Correlation between verbal &non - verbal communication. **Reading** – Reading comprehension(short&longtext)-Readingjob advertisementsandprofileofacompany.**Writing**– Job application- Resume writing- Checklistpreparation.**Grammar** - Numericalexpressions– Collocations-**Vocabulary** -Singular and Plural (Nouns)

UNIT-V **(10)**

Listening–Typesoflistening-Improvinglisteningcomprehension.**Speaking**-Oralpresentation-Vocal communicationtechniques-Voice,quality,volume,pitchetc.,**Reading**-Notemaking-Makingnotes frombooks/anyformsofwritingmaterials.**Writing**-Describingprocess&products-Recommendation writing–Shortessayswriting-**Grammar**-Transformationofsentences(Simple,Compound&Complex). **Vocabulary** -Collection ofTechnical Vocabularies with their meanings.

Note: Students shall havehands on training in improving listening skill inthe languagelaboratory@ 2 periods per each unit.

Total-45

TEXT BOOK:

S.NO.	AUTHOR(S) NAME	TITLE OF THEBOOK	PUBLISHER	YEAROF PUBLICATION
1	Sangeeta Sharma, Meenakshi Raman	Technical Communication: Principles AndPractice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THEBOOK	PUBLISHER	YEAROF PUBLICATION
1	Lakshminarayanan, K.R. &Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2008
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES:

www.learnerstv.com –Listening/ Speaking/ Presentation
www.usingenglish.com– Writing/ Grammar
www.englishclub.com–VocabularyEnrichment/Speaking
www.ispeakyouspeak.blogspot.com– VocabularyEnrichment/ Speaking
www.teachertube.com–Writing Technically
www.Dictionary.com–Semantic / Grammar

16BECC202 ENGINEERING MATHEMATICS II 3 2 0 4 100

COURSE OBJECTIVES:

The goal of this course is for students :

- To have knowledge in integral calculus.
- Determine mathematical tools needed in evaluating multiple integrals and their usage.
- Utilize Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.
- Apply the knowledge of Mathematics in various Engineering fields by making them to identify the functions in engineering problems as analytic function and their analyze as a function of a complex variables.
- Develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence.
- To specify some difficult integration that appear in applications can be solved by complex integration in application areas such as fluid dynamics and flow of the electric current.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- solve problems in FluidDynamics, Theoryof Elasticity, heat and mass transfer etc.
- find the areas and volumes using multiple integrals
- improvetheir abilityinVector calculus
- exposeto the concept ofAnalytical function.
- applyComplex integration in their Engineering problems
- Apply various methods of solving differential equation which arise in many application problems.

UNIT-I MULTIPLE INTEGRALS (11)

Doubleintegral–Cartesiancoordinates–Polarcoordinates–Changeoforderofintegration–Triple integration in Cartesian co-ordinates – Areaas double integrals.

UNIT-II VECTOR CALCULUS (13)

Gradient,DivergenceandCurl–Directionalderivative–IrrotationalandSolenoidalvectorfields–Vector integration– Green's theorem, Gauss divergencetheoremand Stoke'stheorems (StatementOnly)- Surfaces
: hemisphereand rectangularparallelopipeds.

UNIT-III PARTIAL DIFFERENTIAL EQUATIONS (11)

Formationofpartialdifferentialequationsbyeliminationofarbitraryconstantsandarbitraryfunctions–Solutionofstandardtypesoffirstorderpartialdifferentialequations–Lagrange'slinearequation–Linear partial differential equations of second and higherorder with constantcoefficients.

UNIT-IVANALYTIC FUNCTIONS (12)

Analyticfunctions -Cauchy-RiemannequationsinCartesianandpolarforms– Sufficientconditionforan analyticfunction(StatementOnly)-Properties ofanalyticfunctions–Constructionsofananalytic function-Conformal mapping: w=z+a, az, 1/zand bilinear transformation.

UNIT-V COMPLEX INTEGRATION (13)

ComplexIntegration-Cauchy's integral theoremand integralformula(Statement Only)– Taylor series and Laurentseries-Residues–Cauchy'sresiduetheorem(StatementOnly)-ApplicationsofResiduetheorem to evaluatereal integralsaroundunitcircleand semicircle(excluding poles on the real axis).

Total :60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OFTHE BOOK	PUBLISHER	YEAROF PUBLICA TION
1	Hemamalini. P.T	Engineering MathematicsI&II	McGraw-Hill Education Pvt.Ltd, New Delhi	2014
2	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2014

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THEBOOK	PUBLISHER	YEAROF PUBLICATION
1	Erwin Kreyszig	Advanced Engineering Mathematics.	JohnWiley& Sons. Singapore	2011
2	Venkataraman, M. K.	Engineering Mathematics.	TheNational Publishing Company, Chennai	2005
3	Narayanan. S, Manicavachagam pillay.T.K and Ramaniah.G	Advanced Mathematics for Engineering Students.	Viswanathan S.(Printers and Publishers) Pvt.Ltd. Chennai.	2002
4	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES:

1.www.efunda.com
2. www.mathcentre.ac.uk
3. www.sosmath.com/diffeq/laplace/basic/basic.html
4. www.mathworld.wolframe.com

16BECC204 ENVIRONMENTAL SCIENCES 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students :

- To give a comprehensive insight into natural resources.
- To impart knowledge on ecosystem and biodiversity.
- To educate the ways and means of the environment.
- To protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Recognize the importance of natural resources (S)
- Associate themselves with the various ecosystems (S)
- Describe the importance of biodiversity (S)
- Identify and minimize the difference pollutions (S)
- Prioritize and analyses the social issues (S)
- Integrate the environmental principles in the projects undertaken in field of engineering and technology (A)

UNITIINTRODUCTIONTO ENVIRONMENTALSTUDIESANDNATURALRESOURCES (9)

Definition,Scope andImportance–Needfor publicawareness -Forest resources: Use and over-exploitation,deforestation-Waterresources-Use and over-utilization of surface and ground water, floods, drought,conflictsover water-Land resources-Landasa resource,land degradation,maninduced landslides,soilerosionanddesertification–Mineralresources:Use andexploitation,environmentaleffects of extractingandusingmineralresources-Foodresources-Worldfoodproblems,changescausedby agricultureandovergrazing,effectsofmodernagriculture-Energy resources-Growingenergyneeds, renewableandnonrenewableenergysources,useofalternateenergy sources-roleofanindividualin conservation ofnatural resources.

UNITII ECOSYSTEM (9)

Chemistry andEnvironment-Environmental segments, Composition and Structure of atmosphere- Conceptofan ecosystem- Structure,components andfunctionofan ecosystem Energy flow in the ecosystem–Foodchain,FoodwebandEcologicalpyramids,StructureandfunctionofTerrestrial ecosystem (Forest,Desert andGrasslandecosystem) andAquaticecosystem (FreshwaterandMarine ecosystem)

UNITIII BIODIVERSITY (9)

Introductionto biodiversity,Definition-Genetic diversity, Species diversityand Ecosystem diversity,BiogeographicalclassificationofIndia,Importance ofbiodiversity-Value of biodiversity - Hot Spotsofbiodiversity-Threats to biodiversity -Endangered and EndemicSpecies of India – Conservationofbiodiversity-In-SituandEx-Situconservationofbiodiversity.

UNITIV ENVIRONMENTALPOLLUTION **(9)**

Definition–causes,effectsandcontrolmeasuresofAir pollution, Water pollution, Soil pollution, Marinepollution,NoisepollutionandThermalpollution.Solidwastemanagement-causes,effects and controlmeasures of urban and industrial wastes– Role of an individual in preventionof pollution–Disastermanagement-earthquake,tsunami,cycloneandlandslides.

UNITV SOCIALISSUESANDENVIRONMENT **(9)**

From UnsustainabletoSustainabledevelopment,Urbanproblemsrelatedtoenergy sources, Water conservation,Rainwaterharvestingand Watershedmanagement,Resettlementandrehabilitationof people,itsproblemsandconcerns,Environmentalethics-Issuesandpossible solutions-Climate change- Green houseeffect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation- Environment Protection Act- HumanRights-Valueeducation, Role of Information Technology in EnvironmentandHumanhealth-Populationgrowth,Variationof populationamongnations-Population explosion.

TEXT BOOKS:

S.NO	**AUTHOR(S) NAME**	**TITLE OF**	**PUBLISHER**	**YEAROF PUBLICATIO**
1	Dr. Ravikrishnan, A	Environmental Science	Sri KrishnaHi tech Publishing CompanyPrivate Ltd., Chennai	2012
2	Anubhaka ushik C.P. Kaushik	Environmental Science and Engineering	New Age International (P) Ltd., New	2010

REFERENCES:

S.NO	**AUTHOR(S) NAME**	**TITLE OF THEBOOK**	**PUBLISHER**	**YEAROF PUBLICATION**
1.	William P.Cunningham	Principles of Environmental Science	Tata McGraw - Hill Publishing Company, New Delhi.	2008
2.	Linda D. Williams	Environmental Science Demystified	Tata McGraw - Hill Publishing Company Ltd., New Delhi.	2005
3.	Bharucha Erach	Environmental Science Demystified	MapinPublishing (P)Ltd., Ahmedabad.	2005
4.	Tyler Miller G. Jr	Environmental Science	Thomson & Thomson Publishers, New Delhi.	2004
5.	Trivedi, R.K. and Goel, P.K	Introduction to Air Pollution	Techno-Science Publications, Jaipur.	2003

WEBSITES:

1. http://people.eku.edu/ritchisong/envscinotes1.html
2. http://nptel.ac.in/courses.php?disciplineId=120
3.www.newagepublishers.com/samplechapter/001281.
4.www.unesco.org/ext/field/beijing/scienceb.htm,www.infinitepower.org/education.htm
5. http://www.sciencedaily.com/news/top/environment/

16BEBME205 MATERIALS SCIENCE 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students

- To inculcate the fundamental principles and concepts of magnetic materials for different engineering applications.
- To impart basic knowledge of superconductivity and associated applications.
- To serve the fundamental concepts of dielectric materials for diverse applications in energy engineering.
- To divulge the basics of crystals, their structures and different crystal growth techniques.
- To make the students familiar in the fundamentals of ceramics, composites and nanomaterials.
- To learn about advanced materials and characterization

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Explain the ideas of classical and quantum electron theories and energy band structures.
- Illustrate the basics of semiconductor physics and its related concepts.
- Compare the different magnetic materials, its properties and infer its role in various fields.
- Identify the properties of superconducting materials and its engineering applications.
- Extend the various polarization techniques and applications of dielectric materials.
- Summarize the basics of nano structures and synthesizing techniques

UNITI CONDUCTING MATERIALS (9)

Conductors–classicalfreeelectrontheory ofmetals–Electricalandthermalconductivity–Wiedemann–Franzlaw–Lorentznumber–Drawbacksofclassicaltheory–Quantumtheory –Fermidistribution function–EffectoftemperatureonFermiFunction–Density ofenergystates–carrierconcentrationin metals.

UNITII SEMICONDUCTINGMATERIALS (9)

Intrinsicsemiconductor–carrierconcentrationderivation–Fermilevel–VariationofFermilevelwith temperature–electricalconductivity– bandgapdetermination–extrinsic semiconductors–carrier concentrationderivationinn-type semiconductor–variationof Fermilevelwithtemperature andimpurity concentration– compound semiconductors– Halleffect–Determination ofHallcoefficient– Applications.

UNITIIIMAGNETIC ANDSUPERCONDUCTING MATERIALS (9)

Originofmagneticmoment–Diaandparamagnetism–Ferromagnetism–Domaintheory–Hysteresis–soft and hard magneticmaterials– anti– ferromagneticmaterials– Ferrites– applications. Superconductivity:properties-Typesofsuperconductors–BCStheoryofsuperconductivity(Qualitative) -High Temperaturesuperconductors– Applications of superconductors– Magneticlevitation.

UNITIVDIELECTRIC MATERIALS (9)

Electricalsusceptibility–dielectricconstant–electronic,ionic,orientationalandspacechargepolarization –frequency andtemperaturedependenceofpolarisation–internalfield–Claussius–Mosottirelation (derivation)–dielectric loss–dielectricbreakdown–Applications ofdielectricmaterials–ferroelectricity and applications.

UNIT V ADVANCED MATERIALS (9)

Metallic glasses: preparation, properties and applications.Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, applications. Composite materials, Aircraft materials and non-metallic materials. Nano materials: synthesis – Physical and chemical vapour deposition – ball milling - properties of nanoparticles and applications. Carbon nanotubes: structure – properties and applications.

Total-45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLEOF THE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering PhysicsII	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAROF PUBLICATION
1	William D Callister Jr	Material Science and Engineering-An	JohnWiley& SonsInc., New York.	2013
2	James F Shackelford	Introduction to Materials Sciencefor Engineers	Macmillan Publication Company, New York	2014
3	Charles Kittel	Introduction to Solid State	JohnWiley& sons, Singapore.	2005

WEBSITES:

1. www.nptel.ac.in
2. www.physicsclassroom.com
3. www. oyc.yale.edu
4. www.physics.org

16BEBME206 ELEMENTS OF MECHANICAL ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES:
The goal of this course is for students

- To impart the basic knowledge of various basic fields of mechanical engineering.
- To Study about basic manufacturing processes.
- To study about basic machining process.
- To study about power plants.
- To study about automobile engineering
- To understand the concept of energy engineering

COURSE OUTCOMES:
Upon completion of this course, students will be able to:

- Infer the basic knowledgeof various basic fields of mechanicalengineering.
- Demonstrate various manufacturing processes.
- Understand the machining process.
- Discuss about power plants.
- Understand simple problems in Powertransmission of automobile engineering
- Explain about energy engineering

INTRODUCTION(Not included for examination)
EngineeringandTechnology-HistoryofMechanicalEngineering-Mechanics-Staticsanddynamics- Broad areas in Mechanical Engineering.

UNITI MANUFACTURING PROCESSES

FOUNDRY- Principles- Patterns- Types,Molding Processes,Cupola andInduction Furnaces.METAL FORMING-Principles-Hotandcoldworking ofmetals-Forging,rolling,extrusionandwiredrawing, sheetmetaloperations. WELDING- Principles-Oxy-Acetylene WeldingandManualMetalArcWelding, Brazing and Soldering.

UNITII MACHINETOOLS
Machiningprinciples-Constructionandworkingprinciplesofbasicmachinetools -Lathe,Drilling, Shaper, Planerand Milling machine.Introduction to CNC machines.

UNIT III AUTOMOBILE ENGINEERING &POWER TRANSMISSION SYSTEMS
Workingprincipleofpetrolanddieselengines-Fourstrokeandtwostrokecycles-Comparisonbetween fourstrokeandtwostrokeengines-Workingprincipleofsimplecarburetor-Lubricationsystemand cooling system. Beltdrives-Flat,V-belts-Rope,Chaindrive.Gears-Spur,Helical,Bevel,WormandwormwheelandRackand Pinion– Simple problems in Powertransmission.

UNIT IV ENERGY ENGINEERING&HYDRAULICMACHINES
IntroductiontoBoilers-WorkingprincipleofThermal,Hydro-ElectricandNuclearPowerPlants-Meritsand demerits.Solar–Wind powerplants.

Turbines-Impulseturbine-Peltonwheel,Reactionturbines-KaplanandFrancisturbines-Pumps-Working principle ofReciprocatingpumps and Centrifugalpumps.

UNIT V REFRIGERATION AND AIR-CONDITIONING
TerminologyofRefrigerationandAirConditioning-BasicprinciplesofVapourCompressionandAbsorption Refrigeration System– Windowand SplitRoomAirConditioners.

TEXT BOOKS:

S.No	Titleofthe book	Author(s) Name	Publisher	Yearof Publication
1	Basic Mechanical	Shanmugam, G	TataMcGrawHill Publishing	2008
2	Basic	Rajput, R.K	Laxmi Publications (P)	2008

16BEBME212 ENGINEERING WORKSHOP PRACTICE 0 0 4 2 100

COURSE OBJECTIVES:

The goal of this course is for students

- To provide exposure to the students with hands on experience on various basic engineering practices in civil, mechanical, electrical and electronics engineering.
- To understand carpendry works
- To understand Plumbing works
- To understand smithy and foundry works
- To classify various tools used in carpendry ,plumbing and foundry works
- To understand basic concept of machining

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Ability to fabricate carpentry components and pipe connections including plumbing works.
- Ability to use welding equipments to join the structures.
- Demonstrate carpendry works
- Demonstrate Plumbing works
- Demonstrate smithy and foundry works
- Ability to fabricate electrical and electronics circuits

PART – A (MECHANICAL)

1. **WELDING**
   i. Preparation of arc welding of butt joints, lap joints and tee joints.
2. **BASIC MACHINING**
   i. Simple Turning and Taper turning
   ii. Drilling and Tapping
   iii. Sheet Metal Work
   iv. Model making – Trays, funnels, etc.
3. **DEMONSTRATION ON**
   i. Smithy operations
   ii. Foundry operations
   iii. Plumbing Works
   iv. Carpentary Works

PART –B (ELECTRICAL & ELECTRONICS)

4. **ELECTRICAL ENGINEERING**
   i. Study of electrical symbols and electrical equipments.
   ii. Construct the wiring diagram for Stair case wiring
   iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energy meter.
   iv. Measurement of electrical quantities – voltage, current, power & power factor in R load.
   v. Measurement of energy using single phase energy meter.
5. **ELECTRONICS ENGINEERING**
   i. Study of Electronic components– Resistor (color coding), capacitors and inductors.
   ii. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
   iii. Study of logic gates AND, OR, NOT, NOR and NAND.

TOTAL 45

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Jeyachandran, K. and Balasubramanian, S	A Premier on Engineering Practices Laboratory	Anuradha Publications, Kumbakonam	2007
2	Jeyapoovan, T., Saravanapandian, M	Engineering Practices Lab Manual	Vikas Puplishing House Pvt. Ltd, Chennai	2006
3	Bawa, H.S	Workshop Practice	Tata McGraw – Hill Publishing Company Limited, New Delhi	2007

16BEBME251 **APTITUDE TRAINING** **1 0 0 - 100**

OBJECTIVE:

- To achieve the competencies inAnalyticalability, Decisionmaking
- To enhance the employability skills among the students to meet out the corporate expectations.
- To improve the industry – institute selection ratio
- To enhance the students’ interest towards Industry expectations
- to enhance the students with reason, model, and draw conclusions or make decisions with mathematical, statistical, and quantitative information.
- To apply probabilistic reasoning to draw conclusions, to make decisions, and to evaluate outcomes of decisions.

OUTCOMES:

- Understand the basic concepts of quantitative ability
- Understand the basic concepts of logical reasoning skills
- Solve campus placements aptitude papers
- Compete in various competitive exams
- Acquire satisfactory competency in use of VERBAL REASONING
- Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability

UNIT I **5**
Introduction,SpeedMath’s,ProblemsonNumbers,Averages,RatiosandProportions,Problemson Ages

UNIT II **5**
Percentage, DataInterpretation, Profitand loss, Simple and CompoundInterest

UNIT III **5**
TimeSpeedandDistance,TimeandWork,PipesandCistern,Geometry,Probability,Permutationand Combinati

TOTAL: 15

S. No.	Author(s) Name	Title ofthe book	Publisher	Yearof Publication
1	Agarwal.R.S	Quantitative Aptitude forCompetitive Examinations	S.ChandLimited	2011
2	AbhijitGuha	Quantitative Aptitude forCompetitive Examinations	Tata McGrawHill	2011
3	EdgarThrope	Test OfReasoningforCompetitive Examinations	Tata McGrawHill, 4thEdition	2012

16BEBME301A OPTIMIZATION AND CALCULUS OF VARIABLES 3 2 0 4 100

COURSE OBJECTIVES:

- To develop analytical skills for solving engineering problems
- To teach the students the basic concepts of LPP, Transportation and Assignment problems
- To make the students to study about the Integer Programming and Network Analysis
- To teach the students the basic concepts PERT & CPM
- To teach the students the basic concepts of Hungarian Algorithm
- To make students understand the concept of Branch Bound Method

COURSE OUTCOMES:

- solve problems in different environments and develop critical thinking
- build and solve Transportation Models
- analyse Assignment Models,
- solve integer programming and Nonlinear programming
- understand Hungarian Algorithm
- Analyse and apply branch bound method in engineering problems

UNIT I LINEAR PROGRAMMING PROBLEM (12)

Formulation of LPP - Graphical Method - Simplex Method - Artificial variable technique and two phase simplex method. Duality - Dual and simplex method - Dual Simplex Method .

UNIT II TRANSPORTATION AND ASSIGNMENT PROBLEM (12)

Transportation Model- finding initial basic feasible solutions- moving towards optimality- Degeneracy. Solution of an Assignment problem - Hungarian Algorithm.

UNIT III INTEGER PROGRAMMING (11)

Integer Programming Problem – Gromory's fractional cut Method – Branch Bound Method

UNIT IV NETWORK ANALYSIS (11)

PERT & CPM- network diagram-probability of achieving completion date- crash time- cost analysis.

UNIT V CALCULUS OF VARIABLES (14)

Calculus of Variations covering, Basic definition, Simplest problem, Isoperimetric problem, Problems with Higher order derivatives, Euler Lagrange Equation, Weierstrass-Erdmann conditions; Pontryagin Maximum Principle; Transversality condition; Applications

Total : 60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hamdy Taha. A.	Operations Research	Prentice – Hall of India Private Limited, New Delhi	2013
2	Dr. Grewal B.S.	Higher Engineering Mathematics	Khanna Publishers, New Delhi	2013

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Natarajan A.M., Balasubramani P., Thamilarasi A	Operations Research	Pearson Education, New Delhi.	2005
2	Srinivasan G	Operations Research: Principles and Applications	PHI Private Limited, New Delhi.	2007
3	Winston	Operations Research, Applications and Algorithms	Cengage Learning India Pvt. Ltd, New Delhi.	2004
4	Kanti Swarup, Manmohan, Gupta	Operations Research	Sultan Chand & Sons, New Delhi.	2010

WEBSITES:

1. www.mathworld. Wolfram.com
2. www.mit.edu
3. www.nptel.com

16BEBME301B LINEAR ALGEBRA AND SPECIAL FUNCTIONS 3 2 0 4 100

COURSE OBJECTIVES:

- To introduce the basic concepts of vector space
- To study about the linear transformations
- To introduce the concepts of inner product spaces
- To learn about the concepts of hyperbolic, beta and gamma functions
- To learn about the concepts of Bessel functions
- To provide a firm basis for further reading and study in the subject.

INTENDED OUTCOMES:

The student will be able to

- To explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- To apply the fundamental concepts in their respective engineering fields
- To visualize linear transformations as matrix form
- To recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
- To articulate the importance of Linear Algebra and its applications in branches of Mathematics
- To be able to build and solve the special functions

UNIT I VECTOR SPACES (12)

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II LINEAR TRANSFORMATIONS ` (12)

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNIT III INNER PRODUCT SPACES (12)

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

UNIT IV HYPERBOLIC FUNCTIONS, BETA AND GAMMA FUNCTIONS (12)

Hyperbolic functions: Hyperbolic functions and Inverse Hyperbolic functions – Identities – Real and imaginary parts – solving problems using hyperbolic functions.

Beta And Gamma Functions : Definitions – Properties – Relation between beta and gamma integrals – Evaluation of definite integrals in terms of beta and gamma functions.

UNIT V BESSEL FUNCTIONS (12)

Bessel Functions – Preliminaries – Definitions – Bessel Differential Equation – Differential recurrence relations – the pure recurrence relation – A generating function – Bessel's integral – Index half and odd integer.

Total : 60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dr. Grewal B.S.	Higher Engineering Mathematics	Khanna Publishers, New Delhi.	2013
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES:

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com

16BEBME302 DIGITAL ELECTRONICS 3 2 0 4 100

COURSE OBJECTIVES:

The goal of this course is for students

- To explain the methods for simplifying Booleanexpressions
- Tooutlinetheformalproceduresfortheanalysisanddesignofcombinationalcircuitsandsequential circuits
- To introduce the design of various combinational digital circuits using logic gates
- To illustrate the concept of synchronous sequentialcircuits
- To bring out the analysis and design procedures for asynchronous sequential circuits
- To summarize the concept of memories and programmable logicdevices.

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Demonstrate the methods for simplifying Booleanexpressions
- Design various combinational digital circuits using logic gates.
- Use Boolean algebra and apply it to digital systems.
- Explain the formal procedures for the analysis and design of combinational circuits and sequentialcircuits
- Interpret the concept of synchronous and asynchronous sequentialcircuits
- Apply the concept of memories and programmable logicdevices.

UNIT-I NUMBER SYSTE MS AND BO OLEAN ALGEBRA (12)

Binary, Octal, Decimal, Hexadecimal-Number base conversions – complements – signed Binar y numbers. Binar y Arithmetic- Binar y codes: Weighted –BCD-2421-Gra y code-Excess 3 code-ASCII – Error detecting code – conversion from one code to another-Boolean postulates and laws –De-Morgan's Theorem- Principle of Dualit y- Boolean expression – Boolean function- Minimization of Boolean expressions – Sum of Products (SOP) –Product of Sums (POS)-Minterm- Maxterm- Canonical forms – Conversion between canonical forms –Karnaugh map Minimization – Don't care conditions.

UNIT-II LOGIC GATES AND COMBINA TIONAL CIRCUITS (12)

LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR- Implementations of Logic Functions using gates, NAND –NOR implementations –Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates.

COMBINATIO NAL CIRCUITS: Design procedure – Adders-Subtractors – Serial adder/ Subtractor - Parallel adder/ Subtractor- Carr y look ahead adder- BCD adder- Magnitude Comparator- Multiplexer/ Demultiplexer- encoder / decoder – parit y checker – code converters. Implementation of combinational logic using MUX.

UNIT-III SEQUEN TIAL CIRCUIT (12)

Flip flops SR, JK, T, D and Master slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering –Realization of one flip flop using other flip flops –As ynchronous / Ripple counters – S ynchronous counters –Modulo – n counter –Classification of sequential circuits – Moore and Meal y -Design of S ynchronous counters: state diagram- State table –State minimization – State assignment- ASM-Excitation table and maps-Circuit implementation - Register – shift registers- Universal shift register – Shift counters – Ring counters.

UNIT-IV ASYNCH RONOUS SEQUENTIAL CIRCUITS (12)

Design of fundamental mode and pulse mode circuits – primitive state / flow table – Minimization of primitive state table –state assignment – Excitation table – Excitation map- c ycles – Races –Hazards: Static –Dynamic –Essential –Hazards elimination.

UNIT-V MEMORY DEVICES (12)

Classification of memories –RAM organization – Write operation –Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell –Dynamic RAM cell –ROM organization - PROM –EPROM –EEPROM – EAPROM –Programmable Logic Devices – Programmable Logic Array (PLA)- Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA). Implementation of combinational logic using ROM, PAL and P LA

Total - 60

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Morris Mano.M	Digital Design	Prentice Hall of India Pvt. Ltd., New Delhi	2003
2	John M .Yarbrough	Digital Logic Applications and Design	Thomson- Vikas publishing house, New Delhi	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Salivahanan.S and Arivazhagan.S	Digital Circuits and Design	Vikas Publishing House Pvt. Ltd, New Delhi	2004
2	Charles H.Roth	Fundamentals of Logic Design	Thomson Publication Company, New Delhi.	2003
3	Donald P.Leach and Albert Paul Malvino	Digital Principles and Applications	Tata McGraw Hill Publishing Compan y Limited, New Delhi	2003
4	Jain.R.P	Modern Digital Electronics	Tata McGraw–Hill publishing compan y limited, New Delhi	2003
5	Thomas L. Flo yd	Digital Fundamentals	Pearson Education, New Delhi	2003

WEBSITES:

http://www.allaboutcircuits.com/vol_2/chpt_9/2.htmlhttp://www.educypedia.be/electronics/di gital.html

16BEBME303 C++ AND DATA STRUCTURES 3 0 0 3 100

COURSE OBJECTIVES:
The goal of this course is for students:

- To analyse Object Oriented Programming concepts and basic characteristics ofC++
- To design problem solutions using Object Oriented Techniques.
- To infer the principles of packages, inheritance andinterfaces
- To define exceptions and use I/Ostreams
- To develop a C++ application with threads and genericsclasses
- To design and build simple Graphical User Interfaces

COURSE OUTCOMES:
Upon completion of this course, the student will be able to

- Utilize a simple Java programming environment, compile programs and interpret compiler errors.
- Distinguish and use the fundamental datatypes.
- Design classes and organise them intopackages.
- Utilize the basic datastructures.
- Compare the basic search and sortalgorithms.
- Apply appropriate data structure and algorithm to solve aproblem.

UNIT – I INTRODUCTION TO DATA STRUCTURES
Abstract data types – Arrays – Static, Dynamic and Generic arrays. Strings – Fixed and variable size – static and dynamic strings.

UNIT – II LINKED LISTS
Dynamic storage management – singly and doubly linked list – Stack – Application of stack – Fixed, variable and Generic stack – queues – queue based on Dynamic linked list – Trees – Binary Trees – Graphs – Warshall's Algorithms – Shortest paths.

UNIT – III OBJECTS ORIENTED PROGRAMMING
objects and classes – methods, messages, encapsulation, abstraction, inheritance, polymorphism, dynamic building. Traditional approach Versus object orientation; benefits of object orientation – flexibility in software development – reusability – extensibility – maintainability.

UNIT – IV OBJECTS AND CLASSES
specifying classes – using – C++ objects and data types – constructors and destructors – object as function arguments – structures and classes. Array fundamentals – array as class member data – array of objects. Structures – simple structure – accessing structure member – structure within structure – structure and classes – Function overloading – Inline function – Virtual function and polymorphism.

UNIT – V OPERATOR OVERLOADING
Overloading unary operator – overloading binary operator – data conversion. Inheritance – derived class and base class – derived class constructors – public and private inheritance – level of inheritance. C++ graphics – text – mode graphics functions – graphics – mode graphics functions – colors – rectangles and lines – polygons and inheritance – text in graphics mode – Addresses and pointers, Simple file operations: streams – string I/O – character I/O.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	N.S. Kutti and P.Y. Padhye	Data Structures in C++	Prentice Hall of India Pvt., Ltd., New Delhi	2001
2	Liberty & Keogh	C++: An introduction to programming	Prentice Hall of India Pvt., Ltd., New Delhi	2002

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Bjarne Stroustrup	The C++ Programming Language	Addison Wesley by publication, New York	1994
2	Jean – Paul Tremblay and Paul G.Sorenson	An Introduction to Data Structures with Applications	Tata McGraw Hill	1998
3	E. Balagurusamy	Object oriented Programming with C++	Tata McGraw Hill, New Delhi	1996

16BEBME304 ELECTRONIC DEVICES AND CIRCUITS 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students :

- To discuss the operational characteristics of a Semiconductor in Equilibrium and Non- Equilibrium conditions.
- To aware with the structure of basic electronic devices.
- To understand the operation and applications of electronic devices.
- To explain the working of PN junction diodes and special purposediodes.
- To define the basic working of BJT and FET both in ideal and non- idealconditions.
- To improve knowledge about the working of Rectifiers and Voltageregulators.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Demonstrate the fundamental concepts of electronicdevices
- Build an electronic circuits using transistors.
- Analyze any electronic circuits logically
- Understand the specifications of regulators and power supply circuits.
- Apply positive feedback principle and design oscillators.
- Design multivibrator circuits.

UNIT I SEMICONDUCTOR DIODES AND SPECIAL PURPOSE DIODES (10)

Overview on Physics and Properties of Semiconductors: Intrinsic semiconductor – extrinsic semiconductor – Fermi level in an intrinsic semiconductor – conductivity of a metal, intrinsic semiconductor and extrinsic semiconductor. Semiconductor diodes : Formation of PN junction – working principle – VI characteristics – PN diode currents – diode current equation – diode resistance – transition and diffusion capacitance. Special purpose diodes : Zener diode–varactor diode – schottky diode, LED.

UNIT II BIPOLAR TRANSISTORS (8)

Bipolar Transistors: Construction – working – transistor currents –transistor configurations and input-output characteristics – Early effect (base width modulation) – transistor as an amplifier Transistor as a switch.

UNIT III FIELD EFFECT TRANSISTORS (9)

Field-Effect Transistors: construction, working and VI characteristics of JFET – comparison of BJT and JFET – MOSFET – enhancement MOSFET, depletion MOSFET, their working principle and VI characteristics, comparison of MOSFET with JFET, comparison of D MOSFET with E MOSFET, CMOS, CCD.

UNIT IV DC POWER SUPPLIES (9)

Rectifiers and Filters: Block schematic of a typical DC power supply, single phase HWR, FWR, full-wave bridge rectifier, power supply filters (ripple factor and efficiency analysis), Voltage regulators: voltage regulation, Zener diode shunt regulator, transistor series regulator, transistor shunt regulator, switching regulators.

UNIT V OSCILLATORS AND MULTIVIBRATORS (9)

RC phase shift oscillator, Wein-bridge oscillator, Hartley oscillator, Colpitts oscillator, types of multivibrators, Astable, monostable and bistable multivibrators.

TEXT BOOKS:

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Millman and Halkias	Electronic devices and Circuits	Tata McGraw Hill International	2010
2	David A.Bell	Fundamental of electronic devices and circuits	Oxford press	2009

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Street Man	Solid State Electronic Devices'	Prentice Hall Of India,6th edition	2005
2	Mathur Kulshrestha and Chadha	Electron devices and Applications and Integrated circuits'	Umesh Publications	2005
3	Thomas L. Floyd	Electron Devices	Charles and Messil Publications	2012
4	G.K.Mithal	Electronic Devices and Circuits	Khanna Publishers	2013
5	Robert L. Boylestad and Louis Nashelsk y	Electronic Devices and Circuit Theory	Pearson Education, 9th Edition,	2009.
6	B. Somanathan Nair	Electronic Devices and Applications	PHI,	2006

16BEBME305 ANATOMY AND HUMAN PHYSIOLOGY 3 0 0 3 100

COURSE OBJECTIVES

The goal of this course is for students

- To discuss all the organelles of an animal cell and theirfunction.
- To perceive structure and functions of the various types of systems of humanbody.
- To outline about eye, ear and Endocrine glands ofhuman
- To learn organs and structures involving in system formation and functions.
- To understand all systems in the human body.
- Toinferbasicunderstandingoftheinterconnectionofvariousorgansystemsinhumanbody

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Explain basic structure and functions of cells and itsorganelles
- Demonstrate about anatomy and physiology of various organsystems
- Illustrate eye, ear and Endocrine glands of human
- Explain the interconnect of various organ systems in humanbody
- Enlighten organs and structures involving in system formation and functions.
- Elucidate special senses in the human body.

UNIT I CELL (9)

StructureofCell– Organellesanddescription–Functionofeachcomponentofthecell– Membranepotential–ActionPotential–Generation andConduction –Electrical Stimulation. BloodCell–Composition –OriginofRBC–BloodGroups–EstimationofRBC,WBCandPlatelet.

UNIT II CARDIACANDNERVOUSSYSTEM (9)

Heart,Majorbloodvessels–CardiacCycle–BloodPressure–FeedbackControlforBloodPressure–NervousControlofHeart- Cardiacoutput–CoronaryandPeripheral Circulation –StructureandfunctionofNervous tissue–Neuron -Synapse - Reflexes -Receptors -Brain-Brainstem -Spinal cord–Reflexaction– VelocityofConductionofNerveImpulses–AutonomicNervousSystem.

UNIT III RESPIRATORY SYSTEMANDMUSCULOSKELETALSYSTEM (9)

Physiological aspects ofrespiration –Trachea andlungs -Exchange ofgases –Regulation ofRespiration-Disturbance ofrespirationfunction -Pulmonary function test-Muscles-tissue-types-structure ofskeletalmuscle-typesofmuscleandjoints.

UNIT IV DIGESTIVEANDEXCRETORY SYSTEM (9)

OrganisationofGISystem,Digestionandabsorption –Movements ofGItract–Intestine-Liver-Pancreas-StructureofNephron–Mechanism ofUrineformation–UrineReflex–SkinandSweatGland–Temperature regulation.

UNIT V EYE,EAR,ENDOCRINE GLANDS (9)

Optics ofEye–Retina –Photochemistry ofVision –Accommodation -Neurophysiology ofvision –EOG. Physiologyofinternalear–MechanismofHearing–AuditoryPathway,HearingTests-Endocrineglands.

Total : 45

TEXTBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SaradaSubramanyam, K.MadhavanKuttyandH.D.Singh	TextBookof‘HumanPhysiology	S.Chand&Company	1996
2	Ranganathan,T.S	TextBookofHumanAnatomy	S.Chand&Co. Ltd.,Delhi	1996

REFERENCEBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Tobin,C.E.,	BasicHumanAnatomy	McGraw-HillPublishing Co.Ltd.,Delhi	1997
2	J.Gibson	ModernPhysiologyand AnatomyforNurses	BlackwellSCPublishing	1981
3	Arthur.C.Guyton	JohnEHall–,TextbookofMedicalPhysiology	W.B.Saunders Company	2000

16BEBME306 BIOCHEMISTRY 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students

- To study about the biochemistry of living cells, metabolism of biomolecules and the methods of investigation and diagnostic tools.
- To summarize the role of these biomolecules by providing basic information on specific metabolic diseases and disorders of these biomolecules.
- To analyse the structural and functional properties of carbohydrates, proteins and lipids
- To discuss about functions of each organelles and Transport of substances across biological membranes
- To infer about the biochemistry of living cells
- Demonstrate the concepts of biochemistry of living cells

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Understand the concepts of biochemistry of living cells
- Understand the concepts of metabolism of carbohydrates
- Understand the concepts of protein biochemistry
- Understand the concepts of biochemistry of lipids
- Understand the concepts of investigation of metabolism.
- Understand the structural and functional properties of various organalles and biomolecules

UNIT I BIOCHEMISTRY OF LIVING CELLS (9)

Biochemistry of living cells, sub cellular fractionation using the differential centrifugation method. Functions of each organelles, redox potential, oxidative phosphorylation, Transport of substances across biological membranes.

UNIT II CARBOHYDRATES (9)

Carbohydrates: Definition, classification, biological functions; glycolysis, TCA cycle, glycogenesis, glycogenolysis, Diabetes Mellitus – Blood Sugar analysis and glucose tolerance test.

UNIT III PROTEINS (9)

Proteins: Definition, classification, architecture, biological functions; Classification of amino acids, Oxidative and non oxidative deamination, transamination, decarboxylation, urea cycle, Purification of proteins.

UNIT IV LIPIDS (9)

Lipids: Definition, classification, biological functions; biosynthesis of long chain fatty acids, degradation of fatty acids - oxidation of fatty acids.

UNIT V METHODS OF INVESTIGATION OF METABOLISM (9)

Liver function tests, Real function tests, Gastric function tests. Diagnostic tools: Principles and applications of photometry, spectrophotometry, flurometry, flame photometry, automation in clinical laboratory. Uses of isotopes in biochemistry.

TOTAL : 45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	. Ambiga Shanmugam	Fundamentals of Biochemistry for Medical Students	Karthick Printers, Madras	1997

REFERENCE BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Lehninger.A .L., Nelson D.L., Cox .M.M.,	Principles of Biochemistry	CBS Publications	1993
2	Varley	Clinical Biochemistry	CBS Publications	1988

16BEBME311 CIRCUITS AND DEVICES LABORATORY 003 2 100

The goal of this course is for students :

- To analyze the Biasing network for BJT and FET, transient analysis and frequency response of BJT and FET in single stage and Oscillator
- To develop the ability to analyze and design analog electronic circuits using discrete components.
- To outline the amplitude and frequency responses of electronic circuits
- To simplify the operation of Oscillators and wave form generators.
- Understand the specifications of power supply circuits.
- To understand the concept of AC to DC conversion

COURSE OUTCOME:

Upon completion of this course, the student will be able to:

- Utilize the fundamental concepts of electronic devices
- Build basic electronic circuits with BJT and FET
- Deduct the circuit defects
- Design oscillator circuits
- Understand wave shaping concepts
- Demonstrate halfwave and full wave rectifier.

1. Characteristics of PN diode
2. Characteristics of Zener diode
3. Input and Output Characteristics of BJT
4. Drain and transfer characteristics of JFET
5. Characteristics of UJT
6. Design of RC coupled amplifier
7. Hartley Oscillator
8. Colpitt Oscillator
9. AstableMultivibrator
10. Clippers and Clampers
11. Half wave rectifier– with and without filter
12. Full wave rectifier – with and without filter

.

TOTAL:45

16BEBME3 BIOCHEMISTRY AND HUMAN PHYSIOLOGY LABORATORY 0 0 3 2 100

Course Objectives

The goal of this course is for students

- To estimate and quantify biomolecules.
- To divide amino acid molecules
- To evaluate and interpret of biochemical parameter
- To understand differential count of WBCs
- To understand the Ishihara chart
- To understand the auditory conduction

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Solve the quantitative test of different biomolecules
- Label the separation technology of proteins and aminoacids.
- Blood group identification
- Estimate of blood glucose
- Estimaten of Hemoglobin
- Perceive the Biochemistry laboratory functional parameters

1. Generaltestsforcarbohydrates,proteinsand lipids.
2. Preparationofserumandplasmafromblood.
3. Estimationofbloodglucose.
4. Estimationofserumcholesterol.
5. AssayofSGOT/SGPT.
6. Estimationofcreatinineinurine.
7. Electrophoresisofserumproteins.
8. Separationofaminoacidsusingthinlayerchromatography.
9. ESR,PCV,MCH,MCV,MCHC,totalcountofRBCsandHemoglobinestimation
10. Differential count ofdifferentWBCsandBloodgroupidentification
11. IshiharachartforcolorblindnessandSnellen'schartfor myopiaandhyperopia–bylettersreadingandopthalmoscopetoviewretina.
12. Weber'sandRinnee'stestforauditoryconduction.

TOTAL:60

16BEBME313 Course Oriented project-I 0 0 2 1 100

16BEBME351 SOFT SKILLS 1 0 0 - 100

Course Objectives :

- To encourage the all round development of students by focusing on soft skills.
- To make the engineering students aware of the importance, the role and the content of soft skills
- To give instruction, knowledge acquisition, demonstration and practice on soft skills
- To develop and nurture the soft skills of the students through individual and group activities.
- To expose students to right attitudinal and behavioural aspects
- To build the right attitudinal through activities

Course Outcomes:

On completion of the course, student will be able to

- Effectively communicate through verbal/oral communication and improve the listening skills
- Write precise briefs or reports and technical documents .
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations
- Become more effective individual through goal/target setting, self motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams
- Handle team work, Inter-personal relationships, conflict management and leadership quality

People skills – social skills – communication skills – character traits – attitudes – career attributes – emotional intelligence coefficient – common sense – cognitive or emotional empathy– interpersonal skills – courtesy – flexibility – integrity – interpersonal skills – positive attitude – professionalism – responsibility – team work – work ethics.

TOTAL:15HOURS

16BEBME401 PROBABILITY AND STATISTICS 3 2 0 4 100

COURSE OBJECTIVES:

The goal of this course is for students

- To construct the required skill to apply the statistical tools in engineeringproblems.
- To explain the basic concepts of probability and randomvariables.
- To discuss the basic concepts of two dimensional randomvariables.
- To build the knowledge of testing of hypothesis for small and large samples which plays an important role in real lifeproblems.
- To design an experiment
- To infer the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical qualitycontrol.

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to:

- Explain the fundamental concepts of probability and standard distributions which can describe real lifephenomenon.
- Explain the basic concepts of one and two dimensional random variables and their applications inengineering.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the fieldof agriculture and statistical qualitycontrol.
- Discuss the notion of sampling distributions and statistical techniques used in engineering and managementproblems.
- Discuss about the techniques in quality control that model engineeringproblems.

UNIT I RANDOM VARIABLES (9)

Discrete and continuous random variables - Properties- Moments - Moment generating functions and their properties. Binomial, Poisson ,Geometric, Negative binomial, Uniform, Exponential, Gamma, and Weibull distributions.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES (9)

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression – function of a random variable-Transformation of random variables - Central limit theorem.

UNIT III TESTING OF HYPOTHESIS (9)

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS (9)

Analysis of variance – One way classification – CRD - Two – way classification – RBD - Latin square.

UNIT V RELIABILTY AND QUALITY CONTROL (9)

Concepts of reliability-hazard functions-Reliability of series and parallel systems- control charts for measurements (x and R charts) – control charts for attributes (p, c and np charts)

TOTAL : 45

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	P.S.S.Sundar Rao and J.Richard	Introduction to Biostatistics and Research Methods	Prentice Hall of India, New Delhi.	2012
2	R.A.Johnson and C.B.Gupta	Miller and Freund's Probability and Statistics for Engineers	Pearson Education Asia, New Delhi.	2007
3	S.C.Gupta and V.K.Kapoor	Fundamentals of Applied Statistics	Sultan Chand & Sons, New Delhi	2007

16BEBME402 LINEAR INTEGRATED CIRCUITS 3 0 0 3 100

COURSE OBJECTIVES

The goal of this course is for students :

- To discuss the basic concepts of linear integratedcircuits
- To study the circuit configuration and introduce practical applications of linear integrated circuits.
- To introduce the concept of PassiveandActivefilters
- To infer the theory and applications ofPLL
- To make use of the theory of ADC and DAC using OP –AMPS
- To demonstrate the concepts of waveform generation and introduce some special functionICs

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Define linear and non linear applications of OP – AMPS
- Create waveforms using OP – AMPCircuits
- Ability to design new analog linear circuits and develop linear IC based Systems.
- Understand the concept of application of waveform generators
- Design ADC and DAC using OP –AMPS
- Analyze special functionICs

UNIT I OPERATIONAL AM PLIFIER CHARACTERISTICS (9)

Op-amp symbol, terminals, packages and specifications - Block diagram Representation of op-amp- Ideal op-amp & practical op-amp - Open loop & closed loop configurations – DC & AC performance characteristics of op-amp – Frequency compensation - Noise – Differential amplifiers -Electrical Characteristics and internal schematic of 741 op - amps.

UNIT II OPAMP APPLICATIONS (9)

Basic op-amp circuits: Inverting & Non-inverting voltage amplifiers -Voltage follower -Summing, scaling & averaging amplifiers - AC amplifiers.Linear Applications: Instrumentation Amplifiers-V-to-I and I-to-V converters-Differentiators and Integrators. Non-linear Applications: Precision Rectifiers – Wave Shaping Circuits (Clipper and Clampers) – Log and Antilog Amplifiers – Analog voltage multiplier circuit and its applications - Comparators and its applications.

UNIT III WAVEFORM GENERATORS AND PLL (9)

Waveform Generators: Sine-wave Generators – Square / Triangle / Sawtooth Wave generators. IC 555 Timer: Monostable operation and its applications, Astable operation and its applications P LL: Operation of the Basic P LL-Closed loop analysis of P LL-Voltage Controlled Oscillator-PLL Applications

UNIT IV ACTIVE FILTERS & VOLTAGE REGULATOR (9)

Filters: Comparison betweenPassive and Active Networks-Active Network Design – Filter Approximations-Design of LPF, HPF, BPF and Band Reject Filters – State Variable Filters Voltage Regulators: Basics of Voltage Regulator – Linear Voltage Regulators using Op-amp – IC Regulators (78x x, 79xx, LM 317, 723)-Switching Regulators.

UNIT V DATA CONVERSION DEVICES (9)

Digital to Analog Conversion: DAC Specifications – DAC circuits – Weighted Resistor DAC-R-2R Ladder DAC- Inverted R-2R Ladder DAC Monolithic DAC Analog to Digital conversion: ADC specifications-ADC circuits-Ramp Type ADC-Successive Approximation ADC-Dual Slope ADC-Flash Type ADC.

TOTAL : 45

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Roy Choudhur y and Shail Jain	Linear Integrated Circuits	New Age International Publishers	2003
2	Ramakant A.Gayakwad	Op-Amps and Linear Integrated Circuits	Prentice Hall of India, New Delhi	2000

REFERENCES:

S.NO.	**Author(s) Name**	**Title of the book**	**Publisher**	**Year of publication**
1	Robert F. Coughlin, Frederick F. Driscoll	Operational-Amplifiers and Linear Integrated Circuits	Prentice Hall of India, New Delhi	2001
2	Sergio Franco	Design with operational amplifier and analog integrated circuits	McGraw Hill	2015

16BEBME403 BIOSENSORS AND TRANSDUCERS 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students

- To define the basic concepts such as generalized instrumentation system, general properties of input transducers, static and dynamic characteristics of transducers and sensors
- To perceive a thorough understanding of principle of sensors
- To know the principle of transduction, classifications and the characteristics of different transducers
- To create the biomedical applications of the transducers andsensors.
- To discuss working of some of the above transducers andsensors.
- To know the different display and recording devices.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Have a clear understanding of generalized medical instrumentation system, general properties of input transducers, static and dynamic characteristics of transducers and sensors.
- Demonstrate various transducers and sensors in thecourse.
- Describe the purpose and methods of measurements.
- Explain the principle of different sensors and its applications
- Apply the transducers and sensors learnt in the course in suitable medicalcontexts.
- Implement working knowledge of some of the transducers andsensors

UNIT I INTRODUCTION TO TRANSDUCERS AND ITS CHARACTERISTICS (10)

Introduction: Generalized Instrumentation System, General Properties of Input Transducer Static Characteristics: Accuracy, Precision, Resolution, Reproducibility, Sensitivity, Drift, Hysteresis, Linearity, Input Impedance and Output Impedance. Dynamic Characteristics: First Order and Second Order Characteristics, Time Delay, Error Free Instrument, Transfer Functions. Design Criteria, Generalized Instrument Specifications.

UNIT II MEASUREMENTS (8)

Displacement, motion and Pressure Measurement: (with applications) Resistive: Potentiometers, Strain Gauges and Bridge Circuits. Inductive: Variable Inductance and LVDT Capacitive type, Piezoelectric Transducers. Types of Diaphragms, Bellows, Bourdon Tubes.

UNIT III THERMAL MEASUREMENTS (6)

Temperature Measurement: Thermistor, Thermocouple, Resistive Temperature Detector, IC based Temperature Measurement, Radiation Sensors and Applications .

UNIT IV ELECTRODES (10)

Biopotential Electrodes: Electrodes Electrolyte Interface, Half-Cell Potential, Polarization, Polarizable and Non Polarizable, Electrodes, Calomel Electrode, Electrode Circuit Model, Electrode Skin-Interface and Motion Artifact. Body Surface Electrodes. Internal Electrodes: Needle and Wire Electrodes (Different Types). Microelectrodes: Metal, Supported Metal Micropipette (Metal Filled Glass And Glass Micropipette Electrodes)

UNIT V BIOSENSORS (11)

Chemical Sensors: Blood gas and Acid- Base Physiology Potentiometric Sensors, Ion Selective Electrodes, ISFETS. AmperometricSensors, Clark Electrode with examples - pH, pO2, pCO2 Electrodes, Transcutaneous Arterial Oxygen Tension, Carbon Dioxide measurements: capnostat. Fiber Optic Sensors: Design Principles in Fabrication of Fiber Optic Sensors - Temperature, Chemical, Pressure. Biosensor: Classifications: Biological phenomenon, Transduction Phenomenon i.e. Enzyme Sensor and Electrode based: Affinity Sensors (Catalytic Biosensors), Two examples of each Biosensors and Immunosensors.

TOTAL : 45

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	RichardS.C. Cobbold	Transducers forBiomedical Measurements: Principles and Applications	JohnWiley&Sons	1974
2	Hermann K P. Neubert	Instrument Transducer–AnIntro to their performance and design	Hermann K P. Neubert	2000
3	HarryN,Norton.	Biomedical sensors – fundamentals and application	HarryN,Norton.	2001
4	TatsuoTogawa, ToshiyoTamma and P. AkeÖberg	Biomedical TransducersandInstruments	TatsuoTogawa,	1994
5	NandiniK	Electronics inMedicineandBiomedicalInstrumentation	JogPHISecond Edition	2013

REFERENCEBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	LaGeddesandL.E.Baker	Principles of applied BiomedicalInstrumentation	LaGeddesandL.E.Baker	1997
2	LeslieCromwell,Fred. J.WeibellandPfeiffer	Biomedicalinstrumentationand measurement	LeslieCromwell,Fred.J.WeibellandPfeiffer	2002
3	Richard Aston	Principles of Biomedical Instrumentation and Measurement	Merril Publishing Co., Columbus	1990
4	Ernest O. Doeblin	MeasurementSystems,Applicationand Design	McGraw-Hill	1985
5	Jacob Fraden	Handbook ofModern Sensors – Physics, Designand Application	AIP press	2000

16BEBME404 SIGNALS AND SYSTEMS 3 0 0 3 100

COURSE OBJECTIVES

The goal of this course is for students :

- To discuss the basic properties of signal andsystems
- To understand about the continuous time and discrete time signals and systems.
- To analyze continuous timesignals
- To analyze discrete timesignals
- To learn the analysis of CT systems using Fourier and Laplace transform.
- To demonstrate the DTFT and Z –transforms for discretesignals

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Describe the continuous time and discrete time signals and systems.
- Analyze the signals in both continuous time and discrete time
- Apply Laplace and Fourier transform for continuous signals
- Analyze continuous time LTI systems using Fourier and LaplaceTransforms
- Apply DTFT and Z transforms for discretesignals
- Analyze discrete time LTI systems using Z transform and DTFT

UNIT-I REPRESENTATION OF SIGNALS (10)

Classification of Signals – Periodic, aperiodic, even, odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – periodicity – unit impulse – unit step impulse functions – Transformation in independent variable of signals: time scaling, time shifting. Determination of Fourier series representation of continuous time and discrete time periodic signals – Explanation of properties of continuous time and discrete time Fourier series.

UNIT-II ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS (12)

Continuous time Fourier Transform and Laplace Transform analysis with examples – properties of the Continuous time Fourier Transform and Laplace Transform basic properties, Parseval's relation, and convolution in time and frequency domains. Basic properties of continuous time systems: Linearity, Causality, time invariance, stability of frequency response of LT I systems -Analysis and characterization of LT I systems using Laplace transform: Computation of impulse response and transfer function using Laplace transforms.

UNIT-III SAMPLING THEOREM AND Z-TRANSFORMS (10)

Sampling theorem – Reconstruction of a Signal from its samples, aliasing – sampling of band pass signals. Basic principles of z -transform - z-transform definition – Region of Convergence – Properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion, Relationship between z - transform and Fourier transform.

UNIT-IV DISCRETE TIME SYSTEMS (9)

Computation of Impulse response & Transfer function using Z Transform. DTFT Properties and examples – LTI-DT systems - Characterization using difference equation – Block diagram representation – Properties of convolution and the interconnection of LTI Systems – Causality and stability of LTI Systems.

UNIT-V FILTER REALIZATION STRUCTURES (4)
Realization structures – Direct Form – I, Direct Form – II, Cascade, Parallel and Transpose forms.

TOTAL : 45

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	AlanV.Oppenheim, Alan S.Willsky and Hamid Nawab.S	Signals and Systems	Pearson Education, New Delhi	2003
2	Roberts.M.J	Signals and Systems Analysis using Transform method and MATLAB	TMH, New Delhi	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	John G.Proakis and Dimitris G.Manolakis	Digital Signal Processing, Principles, Algorithms and Applications	PHI, New Delhi	2000
2	Simon Ha ykin and Barr y Van Veen	Signals and Systems	John Wile y, New York	2002
3	Lindner.K	Signals and Systems	McGraw Hill International, New York	2001
4	Moman .H. Ha ys	Digital Signal Processing	Tata McGraw-Hill Co Ltd., New Delhi	2004
5	Ashok Amhardar	Analog and Digital Signal Processing	PHI,New Delhi	2002

WEBSITES:

www.relisoft.com
www.astro.berkele y.edu
www.dsp guide.com

16BEBME405 PATHOLOGY AND MICROBIOLOGY 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To appraise the concept of cellbiology.
- To analyse the about the structural and functional aspects of livingorganisms.
- To perceive the etiology and remedy in treating the pathological diseases.
- To define the importance of publichealth.
- To understand the structural and functional aspects of living organisms.
- To know the etiology and remedy in treating the pathological diseases.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Define about the structural and functional aspects of livingorganisms.
- Demonstrate about the function ofmicroscope
- Elaborate about the importance of publichealth.
- Explain about the methods involved in treating the pathologicaldiseases
- Perceive knowledge on Disease caused by bacteria, fungi and protozoal
- Distinguish Natural and artificial immunity

UNIT I NORMAL CELL STRUCTURE (9)

Normal cell structure – Cell degeneration and regeneration – Inflammations. Neoplasia – Classification, Difference between benign and malignant tumours – Ethiology of tumours – Spread of tumours.

UNIT II MICROBIOLOGICAL TECHNIQUES (9)

Tissue processing – Histokinates – Block making – Microtomes and knives. Cryostat – Frozen section. Basic Stain and special stains (fat, iron stains, PAS).

UNIT III DISEASES DIAGNOSIS METHODS (9)

Diagnosis of diseases by immunological and molecular methods – role of computers in disease diagnosis.

UNIT IV MICROSCOPY (9)

Microscope – Light Microscopy, Phase contrast microscopy, Electron microscopy, Bacterial Cell structure, Growth, development and differentiation.

UNIT V MICROBIAL DISEASES (9)

Sterilization, Diseases caused by bacteria, fungi and viruses and their control by using drugs.

TOTAL : 45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Robbins.S.L. and Ramzi.S.C.,	Pathologic Basis of Diseases	W.B. Saunders Co	-
2	Prescot, Harley and Klein	Microbiology	Tata McGraw Hill Publications, Fifth Editi...	2003

3	. Michael.J.Pelczar.J.R., E.C.S.Chan and Noel.R.Krieg.,	Microbiology	Tata McGraw Hill Publications	-
4	Ananthanarayanan.R and Jayaram	Text Book of Microbiology	Orient Longman	-

16BEBME406 BIOMATERIALS AND ARTIFICIAL ORGANS 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To discuss the overview of artificial organs
- To extend the principles of implant design with a casestudy
- To explain the implant design parameters and solution inuse
- To simplify about various blood interfacingimplants
- To know the biocompatibility of artificial organs
- To learn about the implantable medical devices

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Explain the implant design parameters and solution inuse
- Analyze about various blood interfacing implants
- Evaluate response of biomaterials in living system
- Perceive knowledge about artificial organs
- Demonstrate different types of soft tissue replacement and hard tissuereplacement
- Assess biocompatibility of artificial organs

INTENDED OUTCOMESBIOMATERIALS AND ARTIFICIAL ORGANS

Understanding and gaining the knowledge of various concepts in biomaterials, bio-compatibility, implant materials, polymeric implant materials, tissue replacements and artificial organs.

UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY (9)

Definition and classification of bio-materials, mechanical properties, visco elasticity, wound-healing process, body response to implants, blood compatibility.

UNIT II IMPLANT MATERIALS (9)

Metallic implant materials, stainless steels, co-based alloys, Ti-based alloys, ceramic implant materials, aluminum oxides, hydroxyapatite glass ceramics carbons, medical applications.

UNIT III POLYMERIC IMPLANT MATERIALS (9)

Polymerization, polyamides, Acryrilic polymers, rubbers, high strength thermoplastics, medical applications. Bio polymers: Collagen and Elastin.

UNIT IV TISSUE REPLACEMENT IMPLANTS (9)

Soft-tissue replacements, sutures, surgical tapes, adhesive, Percutaneous and skin implants, maxillofacial augmentation, blood interfacing implants, hard tissue replacement implants, internal fracture fixation devices, joint replacements.

UNIT V ARTIFICIAL ORGANS (9)

Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenateor), Artificial Kidney (Dialyser membrane) , Dental Implants.

TOTAL : 45

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Sujata V. Bhatt	Biomaterials	Second Edition ,Narosa Publishing House	2005
2	Joon B.Park Joseph D. Bronzino	Biomaterials - Principles and Applications	CRC Press	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	PARK J.B.,	Biomaterials Science and Engineering	Plenum Press	1984
2	Myer Kutz	Standard Handbook of Biomedical Engineering & Design	McGraw- Hill	2003

16BEBME411 LINEAR INTEGRATED CIRCUITS LAB 0 0 3 2 100

COURSE OBJECTIVES:

The goal of this course is for students,

- To discuss working principle of op-amp.
- To experiment with basic functions of multivibrators
- To make use of Oscillators.
- To understand the concept of timer circuit
- To analyse timing characteristics of IC555
- To understand about PLL

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Interpret the characteristics of amplifier
- Illustrate the importance of the sensors and transducers for medicalapplications.
- Analyse the characteristics frequency filter
- Distinguish amplifier and Oscillator
- Design dc power supply
- Design and Simulate the various frequency filters

LIST OF EXPERIMENTS

1. Inverting, Non-inverting and differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier.
4. Active lowpass, highpass and Bandpass filter.
5. Astable, Monostable multivibrators and Schmitt Trigger using op-amp.
6. Phase shift and Wienbridge oscillator using op-amp.
7. Astable and Monostable using NE555 Timer.
8. PLL characteristics and Frequency Multiplier using PLL.
9. Study of DC power supply using LM317and LM723 and SMPS control ICSG 3524/SG3525.
10. Simulation of Experiments 1, 2, 3, 4, 5 using PSpice / MultiSim

16BEBME412 BIOSENSORS AND TRANSDUCERS LAB 0 0 3 2 100

COURSE OBJECTIVES:

The goal of this course is for students,

- To discuss working principle of Transducers and various Biomedical sensors.
- To experiment with basic functions of Biosensors.
- To make use of different physiological signals.
- To discuss working principle of Transducers
- To experiment with basic functions of Biosensors.
- To make use of different physiological signals.

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Solve the quantitative test of different biomolecules
- Label the separation technology of proteins and aminoacids.
- Blood group identification
- Estimate of blood glucose
- Estimaten of Hemoglobin
- Perceive the Biochemistry laboratory functional parameters

LIST OF EXPERIMENTS

1. Measurement of strain using strain gauge for(i) Quarter bridge (ii)Half bridge (iii) Full bridge

2. PlottingcharacteristicsofPhotoelectricTransducer,TemperatureTransducer,Piezo- electric Transducer, and Thermoelectric Transducer.

3. DeterminationofcharacteristicsofPolarizedElectrodes,Non-polarizedElectrodes, Multi Point Electrodes.

4. Determinationofcharacteristicsof(i)DCAmplifier(ii)ChopperAmplifierand(iii) Instrumentation Amplifier.

5. Characteristics of Ultrasound Transducer and Phono Transducer.

6. Measurement of Hearing Threshold using Audiometer and plotting its characteristics.

7. Measurement of Skin Resistance &constructionof a simpleLiedetector.

8. Generation of original sequence along with operation on sequence like shifting, folding, time scaling and multiplication.

9. GenerationofPeriodic,Exponential,Sinusoidal,Dampedsinusoidal,Step,Impulse, Ramp

signals using MATLAB in both discrete and analog form

10. Evaluationofconvolutionintegral,Fouriertransformforperiodic&non-periodic signals and simulation of differential equations using MATLAB

11. Cross correlation, Auto correlation & Spectral content of signals.

16BEBME413 Course Oriented project-II 0 0 2 1 100

16BEBME451 HANDS ON TRAINING IN ELECTRONIC EQUIPMENTS 1 0 0 – 100

OBJECTIVE:

- To gain the knowledge on various electronic equipments
- To learn the working principle of voltmeter
- To learn the working principle of digital voltmeter
- To discuss the working principle of Ammeter
- To distinguish analog multimeter digital multimeter
- To understand the operation of function generator

OUTCOME:

- Understand the working of various electronic equipments
- Analyse the operations of voltmeter and Ammeter
- Use RLC meter and LCR meter
- Understand the applications of EMF meter
- handle analog multimeter digital multimeter
- Demonstrate the operation of function generator

Study of Voltmeter – Ammeter– ohmmeter – capacitance meter – regulated power supply – oscilloscope – function generator – time-domain reflectometer – digital voltmeter – digital counter – Analog multimeter & Digital multimeter – Signal injector – RLC meter – LCR meter – EMF meter – Electrometer – AC and DC Power Supplies – digital pattern generator – pulse generator – Frequency synthesizer – probes – IEEE electronic equipment standards.

16BEBME501 BIO CONTROL SYSTEM 3 2 0 4 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To provide insights of modelling techniques of physiologicalsystems
- To discuss the concept of different systems of body in mathematicalmodel.
- To demonstrate the working of physiological system in terms ofequations.
- To define the parameters involved in thermal regulatorysystem
- To model dynamically varying physiological system
- To develop differential equations to describe the dynamic models

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Analyze models of physiological system.
- Recall the application of basic physiologicalsystem
- Reproduce the concept of circulatorysystem
- Describe the parameters involved in thermal regulatorysystem
- Discuss the process of ultra-filtrationsystem
- Explain the mechanism ofrespiration

UNIT I INTRODUCTION TO BIO CONTROL SYSTEM (9)

Introduction: Technologicalcontrol system, transfer function, mathematical approaches, system stability,introductiontobiologicalcontrolsystem,Modelingandblockdiagram, closedloop dynamics of first order and secondordercontrolsystem,similaritiesbetween biological and engineering control system, biological receptors and receptor characteristics.

UNIT II PROCESS REGULATION (9)

Acid-base balance, extra-cellular water and electrolyte, interstitial fluid volume, blood pressure, blood glucose, CO2.

UNIT III MODELINGOF HUMANTHERMALREGULATORYSYSTEM (9)

Parametersinvolved,controlsystemmodeletc.Biochemistryofdigestion,typesofheatlossfrombody,modelsofheattransferbetween subsystems of human body like skin - core etc. and systems like within body, body environment.

UNIT IV BIOLOGICAL CONTROL I (9)

Cardiac rate,bloodpressure,respiratoryrate,massbalancingoflungs, oxygenuptakebyRBCandpulmonarycapillaries, oxygen and carbon dioxide transport in blood and tissues.

UNITV BIOLOGICAL CONTROL II (9)

Urine formation and control,Pupilcontrolsystems, skeletal muscle servomechanism and semicircular canal. Free swinging limbs, Endocrine control system.

TOTAL : 45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SujitK.Chaudhuri	ConciseMedicalPhysilogy	NewCentralBookagency	1997
2	Ogata Katsuhika	Modern control engineering	2nd edition, Prentice Hall of	-

REFERENCE BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	BarryR.Dworkin	LearningandPhysiological Regulation(Hardcover)	UniversityOf Chicago Press	March 1993
2	E. Carson, E. Salzsieder	Modelling and Control in Biomedical Systems 2000 (including Biological Systems)	Pergamon Publishing	January 2001

16BEBME502A BIOMEDICAL SIGNAL PROCESSING 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To study the formation of an image and its acquisition
- To introduce the use and application of transforms in image processing
- To explain the fundamentals of medical image acquisition, processing andstorage.
- To discuss simple image enhancement techniques in Spatial and Frequencydomain.
- To appraise the concepts of degradation function and restorationtechniques.
- To apply image compression and recognitionmethods.

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Explain the image fundamentals and mathematical transforms necessary for imageprocessing.
- Illustrate the image enhancementtechniques.
- Preprocess the image using filtering techniques
- Utilize image restorationprocedures.
- Segment the region of interest in images.
- Apply the image compressionprocedures.

UNIT I DISCRETE – TIME SIGNALS AND SYSTEMS (9)

Sampling of Analogue signals – aliasing – standard discrete time signals – classification – discrete time systems – Linear time invariant stable casual discrete time systems – classification methods – linear and circular convolution – difference equation representation – DFS, DTFT, DFT – FFT computations using DIT and DIF algorithms.

UNIT II INFINITE IMPULSE RESPONSE DIGITAL FILTERS (9)

Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of digital filters using bilinear transform – pre warping – Frequency transformation in digital domain – Realization using direct, cascade and parallel forms.

UNIT III FINITE IMPULSE RESPONSE DIGITAL FILTERS (9)

Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Frequency sampling technique – Window design using Hamming, Hanning and Blackmann Windows – Concept of optimum equiripple approximation – Realisation of FIR filters – Transversal, Linear phase and Polyphase realization structures.

UNIT IV ANALYSIS OF BIO –SIGNALS (9)

Removal of artifacts-ECG, Event detection –ECG,P wave, QRS Complex, T wave, correlation analysis of ECG signals, Averaging of signals-PCG, ECG and EMG.

UNIT V SPECIAL TOPICS IN BSP (9)

Heart rate variability Analysis, Analysis of PCG signals, Analysis of Time variant systems, Fixed segmentation –STFT, ACF, SEM and GLR.

TOTAL : 45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	John G. Proakis and Dimitris G.Manolakis	Digital Signal Processing, Algorithms and Applications	PHI of India Ltd., New Delhi, 3rd Edition	2000
2	Rangaraj.M.Rangayyan	Biomedical signal processing	-	-
3	SanjitK.Mitra	Digital Signal Processing', A Computer Based Approach	Tata McGraw-Hill, New Delhi	1998

16BEBME502B INSTRUMENTAL METHODS OF ANALYSIS 3 0 0 3 100

OBJECTIVE

- To know about various instrumental techniques and analysis
- To give exposure on the basics of Biomedical engineering to the students.
- To have a basic knowledge on basic measurement
- To be familiarize with instrumental methods
- To analyse he applications of spectroscopy
- To lean about chromatography

OUTCOMES

- To study and understanding the concepts of measurements
- To study and understanding the concepts of optical methods
- To study and understanding the concepts of molecular spectroscopy
- To study and understanding the concepts of thermal methods
- To study and understanding the concepts separation methods
- To analyse various instrumental methods

UNIT I BASICS OF MEASUREMENT (8)

Classification of methods – calibration of instrumental methods – electrical components and circuits – signal to noise ratio – signal – noise enhancement

UNIT II OPTICAL METHODS (8)

General design – sources of radiation – wavelength selectors – sample containers – radiation transducers – types of optical instruments – Fourier transform measurements.

UNIT III MOLECULAR SPECTROSCOPY (11)

Measurement of transmittance and absorbance – beer's law – spectrophotometer analysis – qualitative and quantitative absorption measurements - types of spectrometers – UV – visible – IR – Raman spectroscopy – instrumentation – theory.

UNIT IV THERMAL METHODS (5)

Thermo-gravimetric methods – differential thermal analysis – differential scanning calorimetry.

UNIT V SEPARATION METHODS (13)

Introduction to chromatography – models – ideal separation – retention parameters – van – deemter equation – gas chromatography – stationary phases – detectors – kovats indices – HPLC – pumps – columns – detectors – ion exchange chromatography – size exclusion chromatography – supercritical chromatography – capillary electrophoresis.

TOTAL : 45

REFERNCES & TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Willard and .H. Merrit	Instrumental Methods of Analysis	Phi	1999
2	D. Skoog	Instrumental Methods of Analysis		2000

16BEBME503 BIOMEDICAL INSTRUMENTATION 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To illustrate origin of bio potentials and itspropagations
- To understand the basic theory of Bio potential Electrodes and Bio potential measurement.
- To appraise the different types of electrodes and its placement for variousrecordings
- To design bio amplifier for various physiological recordings
- To study the various bio chemical measurements.
- To perceive the different measurement techniques for non-physiologicalparameters.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Differentiate different bio potentials and itspropagations.
- Describe the electrode behavior and circuit models
- Illustrate different electrode placement for various physiologicalrecordings
- Design bio amplifier for various physiological recordings
- Explain various technique for non-electrical physiologicalmeasurements
- Measure various biochemical parameters.

UNIT I BIO POTENTIAL ELECTRODES (9)

Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode–skin interface, half-cell potential, impedance, polarization effects of electrode – nonpolarizable electrodes. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - measurement with two electrodes.

UNIT II ELECTRODE CONFIGURATIONS (9)

Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG, ERG and EOG – unipolar and bipolar mode.

UNIT III BIO AMPLIFIER (8)

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference.

UNIT IV MEASUREMENT OF NON-ELECTRICAL PARAMETER (10)

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers - systolic, diastolic, mean detector circuit. Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurement.

UNIT V BIO-CHEMICAL MEASUREMENT (9)

Biochemical sensors - pH, pO2 and pCo2, Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

TOTAL : 45

TEXT BOOKS

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	K.Rayand K.M. Bhurchandi,	Advanced Microprocessors and Peripherals– Architectures, Programming and Interfacing	Indian edition. Tata McGraw Hill, New Delhi	2001 Reprint
2	Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. MCKinlay	The8051Microcontrollerand Embedded Systems	Pearson Education, New Jersy.	2008

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004

REFERENCE

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.
3. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGraw-Hill Publisher, 2003.

16BEBME504 MICROPROCESSORAND MICROCONTROLLER 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students :

- To infer processor architecture and its programming
- To discuss interfacing concepts
- To appraise advanced processor architecture
- To utilize the concepts of Interfacing with Peripherals for buildingapplications
- To demonstrate the concepts Reduced Instruction Set Computer (RISC) architecture and Advanced RISC Machine (ARM)architecture
- To develop skill to explore system design technique .

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to

- Design assembly language programming (ALP) for different applications for 8085
- Compile assembly language programming (ALP) for different applications for8086
- Perceive knowledge on advanced processors andcontrollers
- Create application by Interfacing memory and I/O device withcontrollers
- Demonstrate the architectures of Reduced Instruction Set Computer (RISC) and Advanced RISC Machine (ARM)processors
- Design and deploy the Interfacing peripherals in real time scenario.

UNIT -I THE 8085 MICROPROCESSOR 9

Introduction to 8085 – Microprocessor architecture – Instruction set – Programming the 8085 – Code conversion.

UNIT II THE 8086 MICROPROCESSOR 9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

UNIT IV MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits – Instruction set - Addressing modes - Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER 9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

TOTAL:45

TEXTBOOKS

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	K.Rayand K.M. Bhurchandi,	Advanced Microprocessors and Peripherals– Architectures, Programming and Interfacing	Indian edition. Tata McGraw Hill, New Delhi	2001 Reprint
2	Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. MCKinlay	The8051Microcontrollerand Embedded Systems	Pearson Education, New Jersy.	2008

REFERENCES

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	KrishnaKant	Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051and8096	PHI, New Delhi.	2007
2	Kenneth.J.Ayala	The8051Microcontroller	Thompson Delmar Learning, New Delhi	2007
3	Ray.A.K, Bhurchandi.K.M	Advanced Microprocessor and Peripherals	TataMcGraw-Hill, NewDelhi	2007
4	BarryB.Brey	The Intel Microprocessors Architecture, Programming and Interfacing	PearsonEducation, NewDelhi	2007
5	RameshS.Goankar	Microprocessor Architecture, Programming, and Applications withthe8085	PHI, NewDelhi.	2002
6	DouglasV.Hall	Microprocessor and Interfacing, Programming and Hardware	Indianedition.Tata McGrawHill,New Delhi	2007
7	JonathanW Valvano	Introduction to Arm(r)Cortex-M Microcontrollers	Createspace Independent Publisher	2012

16BEBME511 MICROPROCESSOR AND MICROCONTROLLER LAB 0 0 3 2 100

COURSE OBJECTIVES:

The goal of this course is for students,

- To introduce ALP concepts and features
- To design and implement programs on 8085 microprocessor
- To write ALP for arithmetic and logical operations in 8086 and 8051
- To differentiate Serial and Parallel Interface
- To interface different I/Os with Microprocessors
- To be familiar with MASM

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Write ALP Programmes for fixed and Floating Point and Arithmetic operations
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8051
- Use Serial and Parallel Interface
- Perform A/D and D/A conversion

LIST OF EXPERIMENTS

8085 Programs using kits

1. Basic arithmetic and Logical operations
2. Sorting and searching

8086 Programs using kits

3. Basic arithmetic and Logical operations
4. Code conversion, decimal arithmetic and Matrix operations.
5. Floating point operations, string manipulations, sorting and searching

Peripherals and Interfacing Experiments

6. Traffic light control
7. Stepper motor control
8. Key board and Display
9. Serial interface and Parallel interface
10. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM

11. Basic arithmetic and Logical operations
12. Code conversion

16BEBME512A BIOMEDICALSIGNALPROCESSING LAB 0 0 3 2 100

.

COURSE OBJECTIVES:

The goal of this course is for students:

- To experiment with basic signal processing operations such as Linear Convolution, Circular Convolution, Auto Correlation, Cross Correlation and Frequency analysis in MATLAB
- To analyse FIR and IIR filters in MATLAB and DSPProcessor
- To discuss the architecture of DSPprocessor

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Design different types of biomedical signals and identify their spectral components.
- Utilize different filters on biomedical signals and judge filter performance.
- Identify physiological interferences and artifacts affecting ECG signal.
- Assess power and correlation spectra of EEG signal.
- Analyze biosignals in time and frequency domains.
- Perform classification and recognition Biosignals

LIST OF EXPERIMENTS

1. Representation of time-series; computation of convolution.
2. Response of a difference equation to initial conditions; stability.
3. DFT computation.
4. Computational experiments with digital filtering.
5. Sampling and waveform generation.
6. FIR and IIR filters implementation.
7. Fast Fourier Transform.
8. Simulation of biosignals.
9. Analysis of ECG signals.
10. Analysis of EEG signals
11. Analysis of EMG signals

16BEBME512B INSTRUMENTAL METHODS OF ANALYSIS LAB 0 0 3 2 100

OBJECTIVES

- To have a practical hand on experience on absorption spectroscopic methods
- To acquire experience in the purification by performing chromatography
- To validate and analysis using spectrometric and microscopic techniques
- To understand the concept of nephelometry
- To understand the concept of Flourimetry
- To exlain the concept of Chromatography

OUT COMES

- Understand UV spectra of nucleic acids
- Describe the Precision and validity
- Find the molar absorbtivity and stoichiometry
- Estimate SO – by nephelometry
- Estimatie A13+ by Flourimetry
- Understand Chromatography

LIST OF EXPERIMENTS

1. Precision and validity in an experiment using absorption spectroscopy
2. Validating Lambert-Beer'S law using KMnO4
3. Finding the molar absorbtivity and stoichiometry of the Fe(1, 10 Phenanthroline)3 using absorption spectrometry
4. Finding the pKa of-nitrophenol using absorption spectroscopy
5. UV spectra of nucleic acids
6. Chemical actinometry using potassium ferrioxolate
7. Estimation of SO – by nephelometry
8. Estimation of A13+ by Flourimetry
9. Limits of detection using aluminium alizarin complex
10. Chromatography analysis using TLC
11. Chromatography analysis using column chromatography

16BEBME513 BIOMEDICAL INSTRUMENTATION LAB 0 0 3 2 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To discuss the working principle of Biomedical Instrumentation systems.
- To infer the basic acquisition techniques of bioelectricsignals.
- To learn about Audiometer
- To analyse ECG signal
- To explain about patient monitoring system
- To lean about pH measurement

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Differentiate different bio potentials and its propagations.
- Describe the electrode behavior and circuit models
- Illustrate different electrode placement for various physiological recordings
- Design bio amplifier for various physiological recordings
- Explain various technique for non-electrical physiological measurements
- Measure various biochemical parameters.

LIST OF EXPERIMENTS

1. Study of Biological Preamplifiers.
2. Recording of ECG signal.
3. Audiometer.
4. Recording of EMG.
5. Recording of various physiological parameters using patient monitoring system and telemetry units.
6. Measurement of pH, pO2 and conductivity.
7. Study and analysis of functioning and safety aspects of surgical diathermy.

16BEBME514 Course Oriented project-III 0 0 2 1 100

16BEBME551 **BasicSimulationLaboratory** **1 0 0 - 100**

COURSE OBJECTIVES:

The goal of this course is for students:

- To learn about MATLAB tool in signal processing application
- To infer the basic simulation techniques for ECG/EMG/EEG
- To apply different Detection, correlation and averaging of various biomedicalsignals.
- To analyse ECG signal
- To dunderstand about Detection of QRS complex
- To experiment with basic signal processing operations such as Linear Convolution, Circular Convolution, Auto Correlation, Cross Correlation and Frequency analysis in MATLAB

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Understand correlation techniques.
- Simulate various biosigmals ECG/EEG/EMG
- Analyse ECG signal
- Use MATLAB tool for biosignal analysis
- Use MATLAB tool for biomedical applications
- Understand about SNR improvement

Laboratory Experiments:

1. Simulation of ECG using MATLAB.
2. Simulation of EEG using MATLAB.
3. Simulation of PPG using MATLAB.
4. Simulation of EGG using MATLAB.
5. Simulation of PCG using MATLAB.
6. Simulation of EMG using MATLAB.
7. Simulation of EOG using MATLAB.
8. Detection of QRS complex and heart rate measurement.
9. Signal Averaging to improve the SNR.
10. Auto-correlation and cross correlation of ECG signals.

16BEBME552 **Inplant training** **0 0 0 - 100**

16BEBME601 IMAGE PROCESSING 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To study the formation of an image and its acquisition
- To introduce the use and application of transforms in image processing
- To explain the fundamentals of medical image acquisition, processing andstorage.
- To discuss simple image enhancement techniques in Spatial and Frequencydomain.
- To appraise the concepts of degradation function and restorationtechniques.
- To apply image compression and recognitionmethods.

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Explain the image fundamentals and mathematical transforms necessary for imageprocessing.
- Illustrate the image enhancementtechniques.
- Preprocess the image using filtering techniques
- Utilize image restorationprocedures.
- Segment the region of interest in images.
- Apply the image compressionprocedures.

UNIT I DIGITALIMAGEFUNDAMENTAL (9)

Elementsofdigitalimageprocessingsystems,ElementsofVisualperception,Imagesamplingandquantization,SomeBasicrelationshipsbetweenpixels,MatrixandSingularValuerepresentationofdiscreteimages.

UNIT II IMAGE TRANSFORMS (9)

1D DFT, 2D DFT, Cosine, Sine Hadamard, Haar, Slant, KL transform and their properties.

UNIT III IMAGE ENHANCEMENT (9)

Histogram – Modification and specification techniques, Enhancement by point processing Image smoothening, Image sharpening, generation of spatial masks from frequency domain specification, Homomorphic filtering, and color image processing.

UNIT IV IMAGE RESTORATIONAND RECONSTRUCTION OF MEDICAL IMAGES (9)

Image degradation models, Unconstrained and Constrained restoration, inverse filtering, Least mean square filter, Image reconstruction from projections – Radon transforms, Filter back projection algorithm, 3D tomography, Fourier reconstruction of MRI Images.

UNIT V MEDICAL IMAGE COMPRESSION TECHNIQUES (9)

Run length, Huffman coding, arithmetic coding, Pixel coding, transform coding, JPEG Standard, predictive techniques, Application of image processing techniques in thermography, SPECT, PET images.

TOTAL : 45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Rafael C., Gonzalez and Richard E. Woods	Digital Image Processing	Pearson Education Asia	2001
2	Anil K. Jain	Fundamentals of Digital Image Processing	Prentice Hall of India	1997

REFERENCE BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	William K. Pratt	Digital Image Processing	John Wiley	1987

16BEBME602A BIOMECHANICS 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To perceive about the principles ofbiomechanics.
- To study about the mechanics involved with various physiological systems.
- To gain knowledge about musculoskeletal mechanics
- To infer the mechanics of physiologicalsystems.
- To discuss the mechanics of joints.
- To create mathematical models used in the analysis of biomechanicalsystems

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Explain the principles of biomechanics.
- Discuss the mechanics of physiologicalsystems.
- Demonstrate the mechanics ofjoints.
- Analyze the biomechanical systems using mathematical models.
- Design and develop the models specific to orthopedic applications
- Illustrate the mathematical models used in the analysis of biomechanicalsystems.

UNIT I BIOFLUIDMECHANICS (9)

Introduction:
Newton'slaws,Stress,Strain,NonViscousfluid,NewtonianViscousfluid,Viscoelasticity, BloodCharacteristics, Mechanical Interaction of Red blood cells with solid wall, Thrombousformation and dissolution,Medicalapplicationsofbloodrhelogy

UNIT II BONE&ITSPROPERTIES (9)

Bone structureandComposition, BloodCirculationinBone, Viscoelasticpropertiesof Bone, ElectricalPropertiesofBone,FractureMechanismandCrackPropagationinbones,KineticsandKinematicsofJoints.

UNIT III CARDIACMECHANICS (9)

Cardiovascularsystem,Mechanicalpropertiesofbloodvessels-Arteries,Arterioles, Capillaries, Veins,Bloodflow-Laminar&turbulent,ProstheticHeartValves&replacement.

UNIT IV BIOMECHANICSOFSPINEANDLOWEREXTREMITY (9)

Biomechanics ofSpine-Structure,Movements, LoadsonSpine,ExoskeletalsystemforParaplegics, Structure ofHip-Movements, LoadsonHip,TotalHipProsthesis,StructureofKnee-Movements,loadsonknee,Knee prosthesis,Poweredwheelchair,Crutchesandcanes.

UNIT V GAITANALYSIS (9)

Human Locomotion- Gait Analysis, Foot Pressure measurements- Pedobarograph , Mechanics of Foot- Arthritis,Biomechanicaltreatment.

TOTAL:45

TEXTBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Y.C.Fung	BasicBiomechanics	Biomechanics-CirculationSpringerVerlang	1997

REFERENCEBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Alexander.R. Mc.Neill	Biomechanics	ChapmanandHall	1975
2	D.N.Ghista	BiomechanicsofMedicalDevices	MacelDekker	1982
3	VCMowandWCHayes	BasicOrthopedicBiomechanics	Lippineott–RavenPublishers	-

16BEBME602B BIOINFORMATICS 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To enablethestudentsto get awareof availabletools anddatabasesfor performingresearchinbioinformatics.
- To provide the thorough understanding of protein structure in detail.
- To understand the bioinformatics at a level appropriate for biology majors
- To infer the knowledge of chemical principles that underlie biochemistry, molecular biology and genomics,
- To analyse the relational databases
- To constructthe predictive mathematical models of biological systems.

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- understand the importance of Bioinformatics in various sectors.
- expose to biological database management and microarray technology.
- Examinethe advanced methods in computational biology
- Be capable of using critical thinking and research methods in Bioinformatics to understand computational and experimental data
- Demonstrate the ability to produce and present original research in Bioinformatics.
- Choose appropriate algorithms forreal time problems.

UNIT I INTRODUCTION (9)

Basic UNIX commands – telnet – ftp – protocols – hardware – topology -search engines – search algorithms – Perl programming.

UNIT II DATABASES (9)

Data management – data life cycle – database technology – interfaces and implementation – biological databases and their uses

UNIT III PATTERN MATCHING & MACHINE LEANING (9)

Pairwise sequence alignment – local vs. global alignment – multiple sequence alignment – dot matrix analysis – substitution matrices – dynamic programming – Bayesian methods – tools – BLAST – FASTA- machine learning – neural networks – statistical methods – Hidden Markov models – Homology Modeling.

UNIT IV PHYLOGENY (9)

Introduction; mutations; irrelevant mutations; controls; mutations as a measure of time; distances; reconstruction; distances between species; estimating time intervals from distances.

UNIT V ADVANCED TOPICS IN BIOINFORMATICS (9)

Biomolecular and cellular computing – micro array analysis – systems biology.

TOTAL:45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	B. Bergeron	Bioinformatics Computing	PHI	2002
2	Westhead, D.R., Parish, J.H., Twyman, R.M	Instant Notes In Bioinformatics	BIOS Scientific Publishers	2000

REFERENCE

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	C. Gibas& P. Jambeck	Developing Bioinformatics Skills	O'Reilly	1999

16BEBME603 DIAGNOSTIC EQUIPMENTS 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To perceive the medical devices applied in measurement of parameters related to cardiology, neurology and the methods of continuous monitoring and transmittingthem.
- To analyze some of the cardiac assistdevices.
- To understand the principle of diathermy
- To discuss about the measurement of the signalsgenerated by muscles.
- To summarize the need and use of some of the extracorporealdevices.
- To learn the patient safety measures

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Utilize different medical devices applied in measurement of parameters related to cardiology,neurology
- Explain about cardiac assist devices, its continuous monitoring andtransmission
- Measure signals generated bymuscles
- Analyze different types of diathermy units.
- Identify the electrical hazards and Implement methods of patient safety
- Interpret the need and use of the extracorporealdevices

UNIT I CARDIAC EQUIPMENTS (9)

Electrocardiograph, Normal and Abnormal Waves, Heart rate monitor, Arrhythmia Simulator, Holter Monitor, Phonocardiography, Plethysmography. Cardiac Pacemaker- Internal and External Pacemaker–Batteries, AC and DC Defibrillator- Internal and External.

UNIT II NEUROLOGICAL EQUIPMENTS (9)

Clinical significance of EEG, Multi channel EEG recording system, Epillepsy, Evoked Potential –Visual, Auditory and Somatosensory, MEG (Magneto Encephalon Graph). EEG Bio Feedback Instrumentation.

UNIT III SKELETAL MUSCULAR SYSTEM (9)

Sliding theory of contraction, recording and analysis of EMG waveforms, fatigue characteristics , Muscle stimulators, nerve stimulators, Nerve conduction velocity measurement, EMG Bio Feedback Instrumentation.

UNIT IV RESPIRATORY MEASUREMENT STSTEM (9)

Instrumentation for measuring the mechanics of breathing – Spirometer-Lung Volume and vital capacity, measurements of residual volume, pneumotachometer - Airway resistance measurement, Whole body plethysmography, Intra-Alveolar and Thoracic pressure measurements, Apnea Monitor. Types of Ventilators – Pressure, Volume, Time controlled. Flow, Patient Cycle Ventilators, Humidifiers, Nebulizers, Inhalators.

UNIT V SENSORY MEASUREMENT (9)

Psycho Physiological Measurements-for testing and sensory Responses, Electro occulograph, Electro retinograph, Audiometer-Pure tone, Speech. EGG (Electrogastrograph), galvanic skin resistance(GSR).

TOTAL:45

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Joseph J. Carr and John M. Brown	Introduction to Biomedical equipment technology	Pearson education	2003
2	John G.Webster	Medical Instrumentation Application and Design	third edition, Wiley India Edition	2007

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Myer Kutz	Standard Handbook of Biomedical Engineering & Design	McGraw Hill	2003
2	KhandpurR.S	Handbook of Biomedical Instrumentation	McGraw Hill	2003
3	L.A Geddes and L.E.Baker	Principles of Applied Biomedical Instrumentation	-	-
4	Leslie Cromwell	Biomedical Instrumentation and Measurement	Pearson Education, New Delhi	2007

16BEBME604 HOSPITAL MANAGEMENT 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To discuss the fundamentals of hospital administration.
- To learn about Bio-Medical Waste Management.
- To analyze the market related research process.
- To summarize the quality and safety aspects in hospital.
- To perceive knowledge about human resource management in hospital
- To explain about hospital information systems

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Explain various information management systems and relative supportiveservices.
- Interpret market related research processes in healthcare and hospitalsectors.
- Illustrate the quality and safety aspects inhospital.
- Demonstrate about human resource management inhospital
- Understand about NABH and NABL
- Explain the importance of supportive services

UNIT I HEALTHSYSTEM (9)

Healthorganisationofthecountry,thestate,thecitiesandtheregion,HealthFinancingSystem,Organisati onofTechnicalSection.

UNIT II HOSPITALORGANISATIONANDMANAGEMENT (9)

Management ofHospitalorganisation,NursingsectionMedicalSector,CentralServices,TechnicalDepartment, Definition and Practice of Management by Objective, Transactional Analysis Human relation in Hospital, ImportancetoTeamWork,LegalaspectinHospitalManagement.

UNIT III REGULATORYREQUIREMENTANDHEAITHCARECODES (9)

FDA Regulation, jointcommission ofAccreditation for Hospitals, National Fire Protection AssociationStandard,IRPC.

UNIT IV EQUIPMENTMAINTENANCEMANAGEMENT (9)

OrganisingMaintenanceOperations,PaperWorkControl,MaintenanceJob, PlanningMaintenanceWorkMeasurement andStandards, Preventive Maintenance, Maintenance Budgeting andForecasting, Maintenance Training,ContractMainframe.

UNIT V TRAINEDTECHNICAL PERSONNEL (9)

FunctionofClinicalEngineer,RoletobeperformedinHospital,ManpowerMarket,Professional Registration, Structureinhospital.

TOTAL : 45

REFERENCEBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Cesar A.Caceresand Albert Zara	The practice of Clinical Engineering	Academic Press	1977
2	Webster, J.G. and Albert M.Cook	Clinical Engineering Principles and Practices	Prentice Hall Inc. Englewood Cliffs	1979
3	Antony Kelly	Maintenance planning and control	Butterworths London	1984
4	Hans P feiff,VeraDammann(Ed.)	Hospital Engineering in Developing Countries	ZreportEschborn	1986
5	Jacob Kline	Handbook of Bio Medical Engineering	Academic Press, SanDiego	1988
6	R.C.Goyal	Handbook of Hospital Personal Management	Prentice Hall of India	1993

16BEBME6E-- PROFESSIONAL ELECTIVE-II 3 0 0 3 100

16BEBME6E-- PROFESSIONAL ELECTIVE-III 3 0 0 3 100

16BEBME611A BIOMECHANICS LAB 0 0 3 2 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To provide with an overview of the major challenges in movement biomechanics and experience with the engineering tools
- To use to address the challenges in movement biomechanics
- To understand the concept of Fracture Mechanism
- To explain the electrical Properties of Bone
- To learn about Kinetics and Kinematics of Joints.
- To analyse prosthetic devices

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Describe the biological, mechanical, and neurological mechanisms by which muscles produce movement
- Identify and use engineering tools that are used to study movement
- Analyse Kinetics and Kinematics of Joints
- Write and solve equations of motion for simple models of human movement
- Analysis of Knee and spine prosthesis
- Apply biomechanics principles to “real-world” clinical and biomechanical research.

LIST OF EXPERIMENTS

1. Study and Analysis of Newton’slaws,Stress,Strain,NonViscousfluid
2. Study and Analysis of NewtonianViscousfluid,Viscoelasticity,
3. Study of Blood Characteristics
4. Study and Analysis of Thrombous formation and dissolution
5. Study of Blood circulation in bone
6. Study and Analysis of viscoelastic properties of Bone
7. Study of Electrical Properties of Bone
8. Study of Fracture Mechanism and Crack Propagation in bones
9. Analysis of Kinetics and Kinematics of Joints.
10. Analysis of Blood flow-Laminar&turbulent, Prosthetic HeartValves.
11. Analysis of Knee and spine prosthesis
12. Gait analysis,
13. Analysis of Foot Pressure measurements
14. Analysis of Foot Arthritis mechanics

16BEBME611B BIOINFORMATICS LAB 0 0 3 2 100

CourseObjectives

- To explain the sequence retrieving techniques from biologicaldatabases.
- To explain how to utilize the tools such as BLAST, FASTA CLUSTAL OMEGA,EMBOSS, PHYLIPetc.
- To illustrate the basics of pattern matching by pairwise and multiple sequencealignment.
- To explain the molecular visualization tools and impart knowledge on ExPASyServer.
- To understand the basics of Perlprogramming

Course Outcomes

- Outline the techniques to retrieve sequences from different biological databases.
- Discuss the pattern matching by pairwise and multiple sequencealignment
- Construct phylogenetic tree by using distance based and character basedmethods
- Predict and validate 3D structure ofprotein
- Predict the protein parameters using ExPASy proteomicstools.
- Understand the programming using PERLlanguage.

LIST OF EXPERIMENTS

1. Introduction to UNIX basic commands and UNIX Filters.
2. Perl programming and applications to Bioinformatics.
    - Basic scripting.
    - Regular expressions.
    - File i/o& control statement.
    - Subroutines & functions.
    - Writing scripts for automation.
3. Types of Biological Databases and Using it.
    - Genbank.
    - Protein Data Bank .
    - Uniprot.
4. Sequence Analysis Tools
    - Use of BLAST, FASTA (Nucleic Acids &Protiens).
    - Use of Clustal W.
    - Use of EMBOSS.
5. Phylogenetic Analysis
    - Use of Phyllip.
6. Molecular Modeling
    - Homology Modeling – Swissmodeller.
    - Any Open Source Software

16BEBME612 IMAGE PROCESSING LAB 0 0 3 2 100

COURSE OBJECTIVES:

The goal of this course is for students to:

- To implement fundamental image processing techniques in Biomedical Images.
- To infer enhancement and Transformation of Medical Images.
- To perceive knowledge about reconstruction of images.

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Apply various pre-processing techniques in Medical Images.
- Outline enhancement and transformation of Medical Images.
- Simplify and reconstruct medical images.
- Use MATLAB tool for image processing application
- Perform Image analysis
- Perform image compression

LISTOFEXPERIMENTS:

1. DigitalimageFundamentals.
2. ImageEnhancementandTransformation.
3. Edgedetectionandboundarytracingtechniques.
4. Removalofnoiseinmedicalimages.
5. Imagecompressions.
6. RestorationofCTimages.
7. Reconstruction ofimages.
8. ImageAnalysis.
9. Matlabimplementation.

16BEBME651 Mini Project 0 0 1 - 100

16BEBME652 Technical Presentation & Seminar 0 0 1 - 100

16BECC701 PROFESSIONAL ETHICS PRINCIPLES OF MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT **3 0 0 3 100**

COURSE OBJECTIVES

The goal of this course is for students:

- To develop managerial and entrepreneurial skills our culture andethics
- To Distinguish DirectandPreventiveControl
- To perceive Knowledge on the principles of management is essential for all kinds of people inall kinds oforganisations
- To have a clear understanding of the managerial functions like planning, organizing, staffing, leading andcontrolling
- To create an awareness and practice through engineering ethics and humanvalues
- To outline how business ethicsworks

COURSE OUTCOMES

Upon completion of this course, the student will be able to:

- Advanced philosophical knowledge of the profession of recreation andleisure
- Synthesis of trends and issues as related to current professionalpractice
- Evaluate organizational theories and human resource managementprinciples
- Analyse the informationcompetency
- Follow Ethical practice and ethical management
- Understand Modelsof Professional Roles

UNIT I ENGINEERING ETHICS **9**

Senses of 'Engineering Ethics' – variety of moral issued – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – Models of Professional Roles – theories about right action – Self–interest – customs and religion – uses of ethical theories.

UNIT II FACTORS OF CHANGES **9**

Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws. Social changes – Meaning and nature – Theories.

UNIT III HISTORICAL DEVELOPMENT, PLANNING, ORGANISING **9**

Definition of Management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies and Planning Premises– Forecasting – Decision–making – Formal and informal organization – Organization Chart –.

UNIT IV DIRECTING AND CONTROLLING **9**

Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment –Process of Communication – System and process of Controlling – Requirements for effective control – Control of Overall Performance – Direct and Preventive Control – Reporting.

UNIT V ENTREPRENEURSHIP AND MOTIVATION 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

Total : 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harold Kooritz and Heinz Weihrich	Essentials of Management	Tata McGraw Hill, New Delhi	2010
2	Khanka S.S	Entrepreneurial Development	S.Chand and Co. Ltd., NewDelhi	2006
3	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw–Hill, NewYork	2005

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Tripathy P.C and Reddy P.N	Principles of Management	Tata McGraw Hill, New Delhi	2008
2	Rabindra N Kanungo	Entrepreneurship and innovation	Sage Publications, New Delhi	1998
3	Charles E Harris, and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, New Delhi	2013

WEB REFERENCES

1. http://www.managementstudyguide.com/taylor_fayol.htm
2. http://tutor2u.net/business/gcse/people_motivation_theories.htm

16BEBME702A VIRTUAL INSTRUMENTATION DESIGN FOR MEDICAL SYSTEM 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To introduce virtual instrumentation concepts and applications.
- To discuss about programming structure inLabVIEW.
- To analyze data acquisitionhardware.
- To infer knowledge on VI programs for specificapplications.
- To perceive the basics of virtualinstrumentation.
- To program virtual instrumentation software for biomedical applications

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Illustrate programming concepts of virtual instruments.
- Compile programming structure inLabVIEW.
- Understand the use of VI for data acquisition.
- analyze different types of interfaces.
- Choose data from hardwaresystems.
- Develop VI programs for specificapplications.

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UNIT I REVIEW OF VIRTUAL INSTRUMENTATION (9)

Historical perspectives, Need of VI, advantages, Define VI, block diagram and architecture of a virtual instrument, data -flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II VI PROGRAMMING TECHNIQUES (9)

VIS and sub-VIS loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Graphical programming in data flow, comparison with conventional programming.

UNIT III DATA ACQUISITION BASICS (9)

ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation. GPIB/IEEE 488 concepts, and embedded system buses - PCI, EISA, CPCI, and USB & VXI. A

UNIT IV COMMON INSTRUMENT INTERFACES (9)

Current loop, RS.232C/RS.485, GPIB, System buses, interface buses: USB, PCMCIA, VXI, SCXI, PXI, etc., networking basics for office &.Industrial applications, Visa and lVI, image acquisition and processing. Motion control. ADC, DAC, DIO, DMM, waveform generator.

UNIT V USE OF ANALYSIS TOOLS (9)

Fourier transforms, power spectrum correlation methods, windowing & filtering, Major equipments- Oscilloscope, Digital Multimeter, Pentium Computers, Application in Biomedical field.

TOTAL : 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Gary Jonson	Labview Graphical Programming	Second Edition, McGraw Hill, New York	1997
2	Lisa K. wells & Jeffrey Travis	Labview for everyone	Prentice Hall Inc., New Jersey	1997

REFERENCEBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Sokoloff	Basic concepts of Labview 4	Prentice Hall Inc., New Jersey	1998
2	S. Gupta, J.P: Gu.pta	PC interfacing for Data Acquisition & Process Control	Second Edition, Instrument Society of America	1994
3	L.T. Amy	Automation System for Control and Data Acquisition	ISA	1992

16BEBME702B THERAPEUTIC EQUIPMENTS 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To perceive the medical devices applied in measurement of parameters related to cardiology, neurology and the methods of continuous monitoring and transmittingthem.
- To analyze some of the cardiac assistdevices.
- To understand the principle of diathermy
- To discuss about the measurement of the signalsgenerated by muscles.
- To summarize the need and use of some of the extracorporealdevices.
- To learn the patient safety measures

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Utilize different medical devices applied in measurement of parameters related to cardiology,neurology
- Explain about cardiac assist devices, its continuous monitoring andtransmission
- Measure signals generated bymuscles
- Analyze different types of diathermy units.
- Identify the electrical hazards and Implement methods of patient safety
- Interpret the need and use of the extracorporealdevices.

UNIT I ULTRASONIC TECHNIQUESFORDIAGNOSIS (9)

Basic principlesof Echo technique, display techniques A, B, M modes, Echo cardiograms, Echo encephalogram, Ultrasonicappliedasdiagnostictoolinophthalmology, obstetricsandgynecology.

UNIT II PATIENTMONITORING ANDBIOTELEMETRY (9)

Patient monitoring system – ICU, post-operative, ICCU, single channel telemetry, multi-channel telemetry, frequencyallotment,radiopill.TransmissionofBiosignalsovertelephonelines.

UNIT III DIATHERMY (9)

Clinical applications of electrotherapy, shortwave diathermy, ultrasonic diathermy, microwave diathermy, surgicaldiathermyunit,IRlamps,UVlamps.

UNIT IV SPECIALDIAGNOSTIC TECHNIQUES (9)

PrinciplesofCryogenictechniqueandapplication,Endoscopy,Laproscopy,Thermography.

UNIT V PATIENTSAFETY (9)

Sources ofleakagecurrent, MicroandMacroshock, monitoring circuits, earthingschemes. ElectroMagneticinterference tomedicalelectronic Equipment–SourcesofEMI,EMIeffects,EMItoBiomedicalsensorsandECGequipment.

TOTAL:45

TEXTBOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	KhandpurR.S	HandbookofBiomedicalInstrumentation	, TataMcGraw-Hill,NewDelhi	1997

REFERENCEBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	JohnG.Webster	MedicalInstrumentationApplicationandDesign	JohnWileyandsons	1998
2	JosephJ.CarrandJohnM.Brown	IntroductiontoBiomedicalequipmenttechnology	JohnWileyandsons	1997

16 ____OE__ OPEN ELECTIVE - 1 3003 100

16 ____OE__ OPEN ELECTIVE - 2 3003 100

16BEBME7E-- PROFESSIONAL ELECTIVE IV 3003 100

16BEBME711A VIRTUAL INSTRUMENTATION DESIGN FOR MEDICAL SYSTEM LAB 0 0 3 2 100

COURSE OBJECTIVE:

The goal of this course is for students:

- To perceive the basics of virtual instrumentation
- To familiarize the students with Virtual Instrumentation and to do programming for applications
- To understand the D/A acquisition interface
- To analyse timing issues
- To learn about GPIB
- To do program with Lab view software for biomedical applications

COURSE OUTCOME

Upon completion of this course, the student will be able to:

- study about Programming Techniques
- study about Data Acquisition and inter facing techniques
- do programming for process control and other applications
- use D/A acquisition interface
- use serial communication interface
- use Lab view software for biomedical signal analysis

LISTOFEXPERIMENTS

1.GettingStartedwithLabVIEW–Basicoperations,controlsandindicators.

2.SimpleprogrammingstructuresandTimingIssues

3.LabVIEW–DebuggingaVI,Sub-VI's

4.LabVIEW–TrafficLight-ProgrammingStructure,Sub-Vis,Clusters

5.GPIB-SerialpollByte

6.Communication viaRS232/SerialPort.

7.Oscilloscope-AttributeNodes,Menus

8.RCCircuitmeasurement-Timingissues

9. Lab VIEW – Incorporating user written C subroutines

10. Digital-to-Analog acquisition interfacing - Analog I/O

11. The RS232 Interface – Function Generator

12. Importing pictures, Global/ local variables. Arrays, Clusters

16BEBME711B BIOMEDICAL EQUIPMENTS LAB 0 0 3 2 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To discuss the working principle of Biomedical recording systems.
- To infer the basic acquisition techniques of bioelectricsignals.
- To understand about defibrilator
- To learn about biotelemetry
- to understand the diathermy
- To apply Electrical safetymeasures in biomedical engineering

COURSE OUTCOMES:

Upon completion of this course, students will be able to:

- Develop preamplifiers and amplifiers for various bio signalrecordings.
- Measure various non-electrical parameters using suitablesensors/transducers
- Apply electrical safety measures
- Simulate ECG signal
- Understand about the pacemaker simulation
- Demonstare defibrilator simulation

LISTOFEXPERIMENTS

1. RecordingandanalysisofECGsignalsRecordingandanalysisofEEGsignals.
2. Recording- FatiguetestofEMGsignals.
3. SimulationofECG–detectionofQRScomplexandheartrate
4. Studyof Pacemaker simulator
5. Studyof Defibrillator simulator
6. Studyofshortwaveandultrasonic diathermy.
7. Studyofbiotelemetry
8. Electrical safetymeasurements.

16BEBME791 PROJECT WORK PHASE I 0 0 8 4 100

16BEBME8E__	**PROFESSIONAL ELECTIVE-V**	**3 0 0 3**	**100**
16BEBME8E__	**PROFESSIONAL ELECTIVE-VI**	**3 0 0 3**	**100**
16BEBME891	**PROJECT WORK PHASE II AND VIVA-VOCE**	**0 0 3216**	**300**

FOR SEMESTER V (ELECTIVE-I)

16BEBME5E01 BIOFLUIDS AND DYNAMICS 3 0 0 3 100

COURSE OBJECTIVES:

The aim of the course is to:

- Tounderstandthe concept of fluid mechanics
- Study the flow properties of blood and their relation to blood vessel structure
- TorecognizeMechanicalpropertiesofbloodvessels
- ToidentifyissuesinthePhysicsofcardiovasculardiseases.
- Identify the correct advantages and disadvantaintellectual gesof Prostheticheart valves and replacements
- Apply basic concepts in fluid mechanics to clinical fluid dynamic measurements

COURSE OUTCOMES:

Attheendofthecourse,thestudentshouldbe ableto:

- Demonstrateknowledgeengineeringprinciplesunderlyingfluid mechanics.
- Analyze problems involving circulatory biofluid mechanics and blood rheology T
- Evaluate different methods of Cardiac output measurement
- TorecognizeStudy the operation of heart valves and its relation to blood flow in arteries
- Differentiate between viscid and in-viscid flow
- Apply basic concepts in fluid mechanics to clinical fluid dynamic measurements

UNIT I BIO-FLUIDMECHANICS

Newton’slaws,Stress,Strain,Elasticity,Hooks-law,viscosity, Newtonian fluid,Non-Newtonian fluid,Viscoelasticfluids,vasculartree,Relationshipbetweendiameter,velocityandpressureofbloodflow,Resistanceagainstflow. Viscoelasticity -Viscoelastic models, Maxwell, Voigt and KelvinModels,ResponsetoHarmonicvariation,Useofviscoelasticmodels, Bio-Viscoelasticfluids:Protoplasm,Mucus,Saliva,Synovialfluids.

UNITII FLOW PROPERTIESOFBLOOD

Physical, ChemicalandRheological propertiesof blood.Apparentandrelativeviscosity,Bloodviscosityvariation:Effectofshearrate, hematocrit,temperature,proteincontentsofblood.Casson’sequation,Problemsassociatedwithextracorporealbloodflow. Fahraeus-Lindquisteffectandinverseeffect,distributionofsuspendedparticlesinanarrowrigidtube.Natureofredbloodcellsintightlyfittingtubes,hematocritinverynarrow tube.

UNITIII CARDIACMECHANICS

Cardiovascularsystem.Mechanicalpropertiesofbloodvessels: arteries,arterioles,capillariesandveins.Bloodflow:Laminarand Turbulent,Physicsofcardiovasculardiseases,Prostheticheartvalvesandreplacements.

UNITIV RESPIRATORYMECHANICS

Alveoli mechanics, Interaction of Blood and Lung P-V curveofLung:Breathingmechanism,Airwayresistance,PhysicsofLungdiseases.

UNITIV SOFTTISSUEMECHANICS

Pseudoelasticity, non-linear stress-strainrelationship, Viscoelasticity, Structure,functionandmechanicalpropertiesofskin,ligamentsand tendons.

TEXTBOOKS:

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S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Wei Yin Mary D. Frame	Biofluid Mechanics: An Introduction to Fluid Mechanics, Macrocirculation, and Microcirculation	Academic Press	2011

16BEBME5E02 BIOMETRIC SYSTEMS 3 0 0 3 100

COURSE OBJECTIVES:

The aim of the course is to:

- Tounderstandthetechnologiesoffingerprint,iris,faceandspeechrecognition
- Tounderstandthegeneralprinciplesof designofbiometricsystemsandtheunderlying trade-offs.
- **To**recognizepersonalprivacyandsecurityimplicationsofbiometricsbasedidentification technology.
- Toidentifyissuesintherealisticevaluationofbiometricsbasedsystems.
- Identify the correct advantages and disadvantages of each biometric method
- Demonstateknowledgeengineeringprinciplesunderlyingbiometricsystems.

COURSE OUTCOMES:

Attheendofthecourse,thestudentshouldbe ableto:

- Demonstrateknowledgeengineeringprinciplesunderlyingbiometricsystems.
- Analyzedesignbasicbiometricsystemapplications.
- Tounderstandthegeneralprinciplesof designofbiometricsystemsandtheunderlying trade-offs.
- Torecognizepersonalprivacyandsecurityimplicationsofbiometricsbasedidentification technology.
- identifyissuesintherealisticevaluationofbiometricsbasedsystems.
- Identify the correct advantages and disadvantages of each biometric method

UNITI INTRODUCTIONTOBIOMETRICS

Introductionandbackground–biometrictechnologies–passivebiometrics–activebiometrics-Biometricsystems–Enrollment–templates–algorithm–verification–Biometricapplications–biometriccharacteristics-Authenticationtechnologies–Needforstrongauthentication-Protecting privacyandbiometricsandpolicy–Biometricapplications–biometriccharacteristics

UNITII FINGERPRINTTECHNOLOGY

Historyoffingerprintpatternrecognition-Generaldescriptionoffingerprints-Fingerprintfeatureprocessingtechniques-fingerprintsensorsusingRFimagingtechniques–fingerprintquality assessment–computerenhancementandmodelingoffingerprintimages–fingerprintenhancement –Featureextraction–fingerprintclassification–fingerprintmatching

UNITIII FACERECOGNITIONANDHANDGEOMETRY

Introductiontofacerecognition,Neuralnetworksforfacerecognition–facerecognitionfrom correspondencemaps–Handgeometry–scanning–FeatureExtraction-AdaptiveClassifiers-Visual-BasedFeatureExtractionandPatternClassification-featureextraction–typesof algorithm–Biometricfusion.

UNITIV MULTIMODALBIOMETRICSANDPERFORMANCEEVALUATION

VoiceScan– physiologicalbiometrics–BehavioralBiometrics-Introductiontomultimodalbiometric system–Integrationstrategies–Architecture–leveloffusion–combinationstrategy–trainingand adaptability– examplesofmultimodalbiometricsystems–Performanceevaluation-StatisticalMeasuresofBiometrics–FAR–FRR–FTE– EER–Memoryrequirementandallocation.

UNITV BIOMETRICAUTHENTICATION
Introduction-BiometricAuthenticationMethods-BiometricAuthenticationSystems–Biometric authenticationbyfingerprint-BiometricAuthenticationbyFaceRecognition.-.Expectation-Maximizationtheory-SupportVectorMachines.Biometricauthenticationbyfingerprint–biometric authenticationbyhandgeometry-Securingandtrustingabiometrictransaction–matchinglocation – localhost-authenticationserver–matchoncard(MOC)–MultibiometricsandTwo-FactorAuthentication

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	JamesWayman,AnilJain,DavideMaltoni	BiometricSystems,TechnologyDesignandPerformance Evaluation	Springer	2005
2	S.Y.Kung,S.H.Lin,M.W.Mak	BiometricAuthentication:AMachineLearningApproach	PrenticeHall	2005

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Paul Reid	Biometrics for Network Security	Pearson Education	2004
2	Nalini K Ratha, Ruud Bolle	Automatic fingerprint Recognition System	Springer	2003
3	L C Jain, I Hayashi, S B Lee, U Halici	Intelligent Biometric Techniques in Fingerprint and	CRC Press	1999
4	John Chirillo, Scott Blaul	Implementing Biometric Security	John Wiley	2003
5	Arun A. Ross, Karthik Nanda Kumar, Anil K. Jain	Handbook of Multibiometrics	Springer	2006

16BEBME5E03 ADVANCED BIOCHEMISTRY 3 0 0 3 100

COURSE OBJECTIVES

The goal of this course is for students

- To study about the biochemistry of living cells, metabolism of biomolecules and the methods of investigation and diagnostic tools.
- To summarize the role of these biomolecules by providing basic information on specific metabolic diseases and disorders of thesebiomolecules.
- To analyse the structural and functional properties of carbohydrates, proteins andlipids
- To discuss about functions of each organelles and Transport of substances across biological membranes
- To infer about the biochemistry of living cells
    - Demonstrate the concepts of biochemistry of livingcells

COURSE OUTCOMES

Upon completion of this course, students will be able to:

- Understanding the concepts of biochemistry of living cells
- Understanding the concepts of metabolism of carbohydrates
- Understanding the concepts of protein biochemistry
- Understanding the concepts of biochemistry of lipids
- Understanding the concepts of investigation of metabolism.
- Understand the structural and functional properties of various organalles and biomolecules

UNIT-I BIOENERGETICS (8)

Energy relationship between the catabolic and anabolic pathways, Five major reactions in living cells, Bioenergetics and thermodynamics. Phosphoryl group transfers;ATP hydrolysis in two steps, Ping-Pong mechanism of nucleoside diphosphate kinase.

UNIT-II METABOLISM OF CARBOHYDRATES (9)

Majorpathwaysofglucoseutilization:glycolysis,fermentation,gluconeogenesis: carbohydratesynthesisfromsimpleprecursors. Pentose phosphatepathway;TCAcycle:Reactions and regulations,geneticdisordersaffecting carbohydrate metabolism

UNIT III METABOLISM OF NUCLEIC ACIDS (9)

Biosynthesis of nucleotides, denovo and salvage pathways for purines and pyrimidines, regulatory mechanisms: Metabolic disorders associated with nucleic acid metabolism.

UNIT-IV METABOLISM OF AMINOACIDS (10)

BiosynthesisofaminoacidsfromacetylcoA, Biosynthesisofessentialaminoacids(Met,Thr,Lys,Ile,Val, Leu, Phe, Trp, Tyr).Glucose-alaninecycle, Ureacycle.Pathwaysofdegradation of aromatic, glucogenic and ketogenic aminoacids. Human genetic disordersaffectingaminoacid metabolism.

UNIT-V METABOLISMOFLIPIDS (9)

Biosynthesisoffattyacid,Triacylglycerol.Biosynthesisofcholesterol. Digestion,mobilization,andtransportoffats,fattyacidentryintomitochondriaviatheacyl-carnitine/carnitinetransporter.The β-oxidationpathway.Oxidationofamonounsaturated and polyunsaturatedfattyacid.GeneticdefectsinfattyAcyl–CoA dehydrogenases causingseriousdiseases.

TOTAL: 45

TEXTBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Nelson, D.L et al.,	Lehninger's Principles of Biochemistry	-	-
2	Stryer, Lubert	Biochemistry	4th Edition, W.H Freeman & Co.,	2000
3	Voet, D.J and J.G. Voet and C.W. Pratt	Principles of Biochemistry	3rd Edition, John Wiley & Sons Inc.,	2008
4	Murray, R.K., et al.,	Harper's Illustrated Biochemistry	27th Edition.McGraw-Hill	2006

REFERENCES

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Creighton. T.E.,	Proteins: Structure and Molecular Properties	2nd Edition, W.H. Freeman and Co	1993
2	Salway, J.G.,	Metabolism at a Glance	2nd Edition, Blackwell Science Ltd	2000

17BEBME5E04 ELEMENTS OF BIOTECHNOLOGY 3003 100

COURSE OBJECTIVES

The goal of this course is for students

- To develop skills of the students in the field of biotechnology and its applications in various fields.
- The course will serve as an effective course to understand Socio-economic issues of biotechnology.

- Scope of micro particles in biomedical field
- Ethical issues working with micro particles
- Learn about micro surgical devices
- BenefitsandchallengesinMolecularmanufacturing

COURSE OUTCOMES:

Attheendofthecourse,thestudentshouldbe ableto:

- identify the potential areas where biotechnologycan be utilized.
- Expose to the ethical issues regarding the use of biotechnology.
- Explain the TechniqueImmunotechnology
- Distinguish industrial& microbial biotechnology
- Elaborate Patenting of Biological Material

UNIT I BIOTECHNOLOGY 9

General Features of Biotechnology – History, Definition and Scope – Recombinant DNA and Genetic Engineering: Cloning and Expression Vectors Recombinant – DNA and Genetic Engineering: Chimeric DNA, Probes and Genomic/cDNA Libraries – PCR and Microarrays – Isolation and Synthesis of Genes (Including Synthesis of a Bacterial Genome) – Molecular Markers and DNA Sequencing (Including Whole Genome Sequencing).

UNIT II ANIMAL BIOTECHNOLOGY 9

Animal Cell and Tissue Culture – Laboratory Facilities, Culture Media and Procedures – Animal Cell and Tissue Culture – Primary Culture, Cell Lines & Cloning – Animal Cell and Tissue Culture – Tissue and Organ Culture: Primary Explanation Techniques – In Vitro Fertilization and Embryo Transfer in Humans and Livestock – Transfection Methods and Transgenic Animals – Immunotechnology – Immune System, Antibodies, Interferons and Vaccines –. Immunotechnology – Hybridoma and Monoclonal Antibodies (Mabs) – Animal Genomics – Molecular Maps – Animal Genomics – Whole Genome Sequences and Their Annotation – Biotechnology in Medicine.

UNIT III PLANT BIOTECHNOLOGY 9

Plant Cell and Tissue Culture: –Culture Media and Cell Culture; –Plant Cell and Tissue Culture: –Tissue Culture, Micropropagation and Somaclonal Variation; –Plant Cell and Tissue Culture: –Production and Uses of Haploids; – Plant Cell and Tissue Culture: –Protoplast Culture, Regeneration and Somatic Hybridization; –Gene Transfer Methods in Plants; – Transgenic Plants–Chloroplast and Mitochondrion Engineering; –Plant Genomics: –Molecular Maps of Plant Genomes; – Plant Genomics:– Whole Genome Sequences.

UNIT IV INDUSTRIAL& MICROBIAL BIOTECHNOLOGY 9

Enzyme Biotechnology–Protein Engineering – Immunotoxins and Drug Designing –Metabolic Engineering for Overproduction of Metabolites–Microbial Biotechnology –Isolation, Culture and

Genetic Manipulation of Microbes–Microbial Biotechnology–Microbes for Production of Chemicals–Microbial Biotechnology–Microbes for Cleaner Technologies–Microbial Biotechnology–Microbes for Agriculture–Microbial Biotechnology–Microbial Genomics for Industry

UNIT V BIOTECHNOLOGY & INTELLECTUAL PROPERTY RIGHTS ENVIRONMENT 9

Pollution Control–Bioremediation (Including Phytoremediation)–Bioenergy and Biofuels–Restoration of Degraded Lands–Biodiversity and its Conservation–Biotechnology & Intellectual Property–Intellectual Property Rights (IPR) & Intellectual Property Protection (IPP)–Biotechnology & Intellectual Property–Patenting of Biological Material: Obligations and Implications.

Total : 45

TEXT BOOK

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Prof. P. K. Gupta	Elements of Biotechnology	2nd Edition (3rd Reprint)	2015-16

FOR SEMESTER VI (ELECTIVE-II & III)

16BEBME6E01 PHYSIOLOGICAL MODELLING 3 0 0 3 100

COURSE OBJECTIVES

The goal of this course is for students:

- To understand properties of systems and electrical analog.
- To discuss about transfer functions..
- To build simple impedance concept..
- To understand feedback systems.
- To develop simulation of biological systems.
- To gain knowledge about the concepts of physiological modelling.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Explain the concept of properties of systems and electrical analog
- Analyse various protocols about transfer functions.
- Build simple simpleimpedance concept
- Apply feedback systems.
- Analyse applications simulation of biological systems.
- Utilize concepts of physiological modelling..

UNIT I PROPERTIES OF SYSTEMS AND ELECTRICAL ANALOG 9

System concept, system properties – Resistance, storage, resistance – compliance, piece- wise linear approximation, electrical analog for compliance, thermal storage, step response of first order systems – resistance- compliance systems, and pulse response of first order systems

UNIT II TRANSFER FUNCTIONS 9

Transfer functions and its use, Study of transfer function of first order and second order systems, engineering concept in coupled system, example of Transformed signals.

UNIT III IMPEDANCE CONCEPT 9

Transfer functions with impedance concept, prediction of performance, identification of the system from impedance function, periodic signals, relationship between transfer function and sinusoidal response, evaluation of transfer function from frequency response.

UNIT IV FEEDBACK SYSTEMS 9

Characteristics of physiological feedback systems, stability analysis of systems.

UNIT V SIMULATION OF BIOLOGICAL SYSTEMS 9

Simulation of thermal regulation, pressure and flow control in circulation, occulo motor system, endocrinal system, functioning of receptors.

Total : 45

REFERENCES

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	William B.Blesser	System approach to Bio-medicine	McGraw-Hill book co., NewYork	1969
2	Manfred Clynes and John H.Milsum	Bio-medical engineering system	McGraw-Hill book co., NewYork	1970
3	Michael C.K. Khoo	Physiological Control Systems - Analysis, Simulation andEstimation	Prentice Hall of India Pvt. Ltd., New Delhi	2001
4	Douglas S.Regs	Control theory and physiological feedback mechanism	TheWilliam& Williams co., Baltimore	1970

16BEBME6E02 TELEHEALTH TECHNOLOGY 300 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To infer the key principles for telemedicine and health.
- To define telemedical technology.
- To know telemedical standards, mobile telemedicine and it applications.
- To State the principles of clinical telehealth
- To understand the scope, benefits and limitations of Telemedicine and security in telemedicine applications

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Apply multimedia technologies in telemedicine.
- Explain Protocols behind encryption techniques for secure transmission of data.
- Utilize telehealth in healthcare.
- Outline the basic concepts involved in telemetry based transmission and reception
- Discuss the communication devices and Networks of telemedicine.
- Describe telehealth systems for secure transmission of medical data and retrieval of telemedicine based information.

UNITI TELEMEDICINEANDHEALTH 9

HistoryandEvolutionoftelemedicine,Functionaldiagramoftelemedicinesystem,Telemedicine, Telehealth,Telecare,Organsoftelemedicine,GlobalandIndianscenario,Ethicalandlegalaspects ofTelemedicine-Confidentiality,Socialandlegalissues,Safetyandregulatoryissues,Advancesin Telemedicine.

UNITII TELEMEDICALTECHNOLOGY 9

PrinciplesofMultimedia-Text,Audio,Video,data,Datacommunicationsandnetworks,PSTN,POTS, ANT,ISDN,Internet,Air/wirelesscommunications:GSMsatellite,andMicrowave,Modulation techniques,Typesof Antenna,Integrationandoperationalissues,Communicationinfrastructurefor telemedicine–LANandWANtechnology.Satellitecommunication.Mobilehandhelddevicesand mobilecommunication.Internettechnologyandtelemedicineusingworldwideweb(www).Video andaudioconferencing.Clinicaldata–localandcentralized.

UNITIII TELEMEDICALSTANDARDS 9

DataSecurityandStandards:Encryption,Cryptography,Mechanismsofencryption,phasesofEncryption.Protocols:TCP/IP,ISO-OSI,StandardstofollowedDICOM,HL7,H.320series(Video phonebasedISBN)T.120,H.324(VideophonebasedPSTN),VideoConferencing,Real-time Telemedicineintegratingdoctors/Hospitals,Clinicallaboratorydata,Radiologicaldata,andother clinicallysignificantbiomedicaldata,Administrationofcentralizedmedicaldata,securityand confidentiallyofmedicalrecordsandaccesscontrol,Cyberlawsrelatedtotelemedicine.

UNITIV MOBILETELEMEDICINE 9

Teleradiology:Definition,Basicpartsofteleradiologysystem:ImageAcquisitionsystemDisplay system,Telepathology,multimediadatabases,colorimagesofsufficientresolution,Dynamicrange, spatialresolution,compressionmethods,Interactivecontrolofcolor,Medicalinformationstorageand managementfortelemedicine-patientinformationmedicalhistory,testreports,medicalimages diagnosisandtreatment.Hospitalinformationsystem-Doctors,paramedics,facilitiesavailable. Pharmaceuticalinformationsystem.

UNITV TELEMEDICALAPPLICATIONS 9

Telemedicineaccesstohealthcareservices–healtheducationandselfcare.·Introductionto roboticssurgery,Telesurgery,Telecardiology,Teleoncology,Telemedicineinneurosciences, ElectronicDocumentation,e-healthservicessecurityandinteroperability.,Telemedicineaccessto healthcareservices–healtheducationandselfcare,Businessaspects-Projectplanningand costing,Usageoftelemedicine.

Total : 45

TEXTBOOK

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	.Norris,A.C	EssentialsofTelemedicineandTelecare	Wiley	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Wootton,R.,Craig,J.,Patterson,V	IntroductiontoTelemedicine.RoyalSocietyofMedicine	Taylor&Francis	2006
2	O'Carroll,P.W.,Yasnoff,W.A.,Ward,E.,Ripp	PublicHealthInformaticsandInformationSystems	Springer	2003
3	Ferrer-Roca,O.,Sosa-Iudicissa,M.	HandbookofTelemedicine.Technologyand Informatics	IOSPress(StudiesinHealth)Volume54	2002
4	Simpson,W.	VideooverIP,Apracticalguidetotechnologyandapplications	FocalPressElsevier	2006
5	Bemmel,J.H.van,Musen,M.A.	HandbookofMedicalInformatics	Springer	1997
6	MohanBansal	MedicalInformatics	TataMcGraw-Hill	2004

16BEBME6E03 CANCER BIOLOGY 3003 100

COURSE OBJECTIVES

The goal of this course is for students:

- To infer the key principles for fundamentalsofcancerbiology
- To define principlesofcarcinogenesistechnology.
- To know molecularcellbiologyofcancer.
- To State the principlesofcancermetastasis**.**
- To understand the scope, benefits and limitations of newmoleculesforcancertherapy.
- TodevelopskillsofthestudentsintheareaofCancerBiology.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Learntaboutpathogenesisofcancer,identificationsofcancerthroughtoolsdevelopedbybiotechnologyresearch&moleculessynthesizedforcancertherapy.Thiswillbeverybeneficialforthestudenttotakeupprojectsin CancerBiology.
- Explain Protocols behind molecularcellbiologyofcancer.
- Utilize principlesofcancermetastasisin healthcare.
- Outline the basic concepts involved in newmoleculesforcancertherapy
- Discuss the fundamentalsofcancerbiology.
- Describe theareaofCancerBiology

UNITI FUNDAMENTALSOFCANCERBIOLOGY 9

Regulationofcellcycle, mutationsthatcausechangesinsignalmolecules, effectsonreceptor,signalswitches,tumoursuppressorgenes,modulationofcellcycleincancer, differentformsof cancers,dietand cancer. Cancerscreeningand early detection, Detectionusingbiochemicalassays,tumormarkers,moleculartoolsforearlydiagnosis ofcancer.

UNITII PRINCIPLESOFCARCINOGENESIS 12

Theoryofcarcinogenesis,Chemicalcarcinogenesis, metabolismofcarcinogenesis, principlesofphysicalcarcinogenesis,x-rayradiation-mechanismsofradiation carcinogenesis.

UNITIII PRINCIPLESOFMOLECULARCELLBIOLOGYOFCANCER 9

Signal targetsandcancer,activationofkinases;Oncogenes,identificationofoncogenes, retrovirusesandoncogenes, detection of oncogenes. Oncogenes/proto oncogene activity, Growthfactorsrelatedtotransformation,Telomerases.

UNITIV PRINCIPLESOFCANCERMETASTASIS 9

Clinical significancesofinvasion, heterogeneity of metastaticphenotype, metastatic cascade,basementmembranedisruption,threesteptheoryofinvasion,proteinasesand tumour cell invasion.

UNITV NEWMOLECULESFORCANCERTHERAPY 6

Different forms oftherapy,chemotherapy,radiationtherapy,detectionofcancers, predictionofaggressivenessofcancer,advancesincancerdetection.Useofsignaltargetstowardstherapyofcancer;Genetherapy.

Total : 45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	MalyB.W.J	VirologyAPracticalApproach	“”,IRLlPress,Oxford	1987
2	DunmockN.J And Primrose S.B	Introduction to Modern Virology	Blackwell ScientificPublications,Oxford	1988

REFERENCE

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	MalyB.W.J	AnIntroductionTopCellular AndMolecularBiologyofCancer	OxfordMedical Publications	1991

16BEBME6E04 BIOSIGNAL CONDITIONING CIRCUITS 3 0 0 3 100

COURSE OBJECTIVE

- To gain in depth knowledge of fundamentals of operational amplifier circuits
- To study the various applications using operational amplifiers.
- To analyze the applications of opamp
- To understand A/D conversion
- To study the characteristics of frequency filters
- To learn the need of isolation amplifier

COURSE OUTCOME

- Elaborate the fundamentals of operational amplifier circuits
- Apply the various applications using operational amplifiers.
- Use the applications of opamp
- Distinguish A/D and D/A conversion
- Design the filter circuits for various frequency range
- Explain the need of isolation amplifier

UNIT 1 INTRODUCTION TO OPAMP 9

Introduction, Signal conditioning, 741 General purpose OPAMP: ideal characteristics, offset voltages and currents. Open & Closed Loop Configuration. Inverting, Non-Inverting, Summing, Voltage Follower, Integrator, differentiators, Log & Anti-Log Amplifiers, Differential Amplifiers, CMRR.

UNIT 2 APPLICATION OF OPAMPS 9

Comparator- Zero crossing detector, Inverting and non inverting comparator, Schmitt Trigger, Precision rectifiers- Half wave and Full wave rectifiers, Peak detectors, Monostable, Astable multivibrators, Sawtooth generator, Triangular waveform generator, Sine Wave Generators-RC Phase Shift Oscillator, Wein Bridge oscillator.

UNIT 3 FILTERS 9

Introduction- Analog Filters, Active Filters and Passive Filters, First order and Second order Low Pass Filters, High Pass Filters, Band Pass Filters- Narrow Band Pass, Wide band Pass Filters,, Band Reject Filters- Notch Filter, All Pass filters and higher Order filters- Design and applications.

UNIT 4 A/D AND D/A CONVERTERS 9

Sample and Hold circuit - D/A converters: Resistive divider and R-2R ladder networks, A/D converters: Counting type, Successive approximation, parallel comparator, Voltage to Current Converter, 555 Timer and its applications- Astable multivibrators and Monostable Multivibrator.

UNIT 5 AMPLIFIERS 9

Instrumentation amplifiers, Bridge Amplifiers, Bioelectric Amplifiers: - Properties desired, Isolation Amplifiers:- Battery Powered, Carrier, Optically Coupled, Current Loading, Chopper Stabilized amplifier, Input Guarding.

Total : 45

TEXT / REFERENCE BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Ramakant A Gayakwad	Operational Amplifiers & Linear Integrated Circuits	Prentice Hall	2000
2	Joseph J. Carr& John M. Brown	Introduction to Biomedical Equipment Technology	Pearson Education Pvt. Ltd, 4th edition	2001
3	Roy Choudhary	Linear Integrated Circuits	New Age International (P) Ltd,	2004
4	John P.Bentley	Principles of Measurement System	Longman Science & Technology	1995
5	Jacob Mill man	Micro Electronics	McGraw-Hill	1987
6	Robert Coughlin and Fredrer	Operational Amplifiers & Linear Integrated Circuits	Prentice Hall	2001

16BEBME6E05 RADIOLOGICAL EQUIPMENTS3 0 0 3 100

COURSE OBJECTIVE:

- To Understandgenerationofx-raysanditsusesinimaging.
- To Learndifferenttypesof radiodiagnostictechniques.
- To Knowtechniquesusedforvisualizingdifferentsectionsofthebody.
- ToLearnradiationtherapymethodologiesandthe radiationsafety.
- To perceive the knowledge of medical devices applied in measurement of parameters relatedmedical imaging and the methods of continuous monitoring and transmittingthem.
- To understand Radiationtherapy and its safety

COURSE OUTCOME:

- Utilize different medical devices applied in measurement of

parameters

related to medical imaging

- Explain about cardiac assist devices, its continuous monitoring andtransmission
- Measure signals generated bymuscles
- Analyze different types of nuclear medicine systems
- Explainthe differentradio diagnosticandtherapeutictechniques.
- Analyze the safety aspects of Radiationtherapy

UNITI MEDICALX-RAYEQUIPMENT 9

Natureof X-rays-X-Ray absorption–Tissuecontrast.X-RayEquipment(Block Diagram)–X-Ray Tube,thecollimator,BuckyGrid,powersupply,DigitalRadiography-discretedigitaldetectors, storagephosphorandfilmscanning,X-rayImageIntensifiertubes–Fluoroscopy–Digital Fluoroscopy.Angiography,cineAngiography.DigitalsubtractionAngiography.Mammography.

UNITII COMPUTEDTOMOGRAPHY 9

Principlesoftomography,CTGenerations,X-Raysources-collimation-X-Raydetectors-Viewing systems-spiralCTscanning–UltrafastCTscanners.Imagereconstructiontechniques-back projectionanditerativemethod.

UNITIII MAGNETICRESONANCEIMAGING 9

Fundamentalsofmagneticresonance-InteractionofNucleiwithstaticmagneticfieldandRadio frequencywave-rotationandprecession–Inductionofmagneticresonancesignals–bulk magnetization–RelaxationprocessesT1andT2.BlockDiagramapproachof MRIsystem-system magnet(Permanent,ElectromagnetandSuperconductors),generationsofgradientmagneticfields, RadioFrequencycoils(sendingandreceiving),shimcoils,Electroniccomponents,fMRI.

UNITIV NUCLEARMEDICINESYSTEM 9

RadioIsotopes-alpha,beta,andgammaradiations.RadioPharmaceuticals.Radiationdetectors–gasfilled,ionizationchambers,proportionalcounter,GMcounterandscintillationDetectors,Gamma camera-Principleofoperation,collimator,photomultipliertube,X-Ypositioningcircuit,pulseheight analyzer.Principlesof SPECTandPET.

UNITV RADIATIONTHERAPYANDRADIATIONSAFETY 9

Radiationtherapy–linearaccelerator,TelegammaMachine.SRS –SRT,-RecentTechniquesin radiationtherapy-3DCRT–IMRT–IGRTandCyberknife-radiationmeasuringinstruments-Dosimeter,filmbadges,ThermoLuminescentdosimeters-electronicdosimeter-Radiationprotection inmedicine-radiationprotectionprinciples.

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SteveWebb	ThePhysicsofMedicalImaging	AdamHilger,Philadelpia	1988
2	R.HendeeandRussellRitenour	MedicalImagingPhysics	FourthEditionWilliam,Wiley-Liss,	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	GopalB.Saha	PhysicsandRadiobiologyofNuclearMedicine	ThirdeditionSpringer	2006
2	B.H.Brown,PVLawford,RHSmallwood,DRH [illegible]	MedicalphysicsandbiomedicalEngineering	CRCPress	1999
3	MyerKutz,	StandardhandbookofBiomedicalEngineeringanddesign	McGrawHill	2003

FOR SEMESTER VII (ELECTIVE-IV)

16BEBME7E01 REHABILITATION ENGINEERING 3 0 0 3 100

COURSE OBJECTIVE:

- To perceive the rehabilitation concepts and Rehabilitation team for futuredevelopment andapplications.
- To understand the Primary & secondary Disabilities
- To discuss various Principles of RehabilitationEngineering.
- To infer the various orthotic devices and prosthetic devices to overcomeorthopedic problems.
- To explain the need for medical aids.
- To explain about different types of models of Hand and arm replacement

COURSE OUTCOME:

- Elaborate about the needs of rehabilitations and its futuredevelopment.
- Understand the terminologies used by the rehabilitation team
- Demonstrate Engineering Concepts in Sensory & Motor rehabilitation.
- Apply the different types of Therapeutic Exercise Technique to benefit thesociety.
- Understand the need of virtual reality based rehabilitation
- Simplify about different types of models of Hand and armreplacement.

UNITI MEDICALX-RAYEQUIPMENT 9

NatureofX-rays-X-Rayabsorption–Tissuecontrast.X-RayEquipment(BlockDiagram)–X-Ray Tube,thecollimator,BuckyGrid,powersupply,DigitalRadiography-discretedigitaldetectors, storagephosphorandfilmscanning,X-rayImageIntensifiertubes–Fluoroscopy–Digital Fluoroscopy.Angiography,cineAngiography.DigitalsubtractionAngiography.Mammography.

UNITII COMPUTEDTOMOGRAPHY 9

Principlesoftomography,CTGenerations,X-Raysources-collimation-X-Raydetectors-Viewing systems-spiralCTscanning–UltrafastCTscanners.Imagereconstructiontechniques-back projectionanditerativemethod.

UNITIII MAGNETICRESONANCEIMAGING 9

Fundamentalsofmagneticresonance-InteractionofNucleiwithstaticmagneticfieldandRadio frequencywave-rotationandprecession–Inductionofmagneticresonancesignals–bulk magnetization–RelaxationprocessesT1andT2.BlockDiagramapproachof MRIsystem-system magnet(Permanent,ElectromagnetandSuperconductors),generationsofgradientmagneticfields, RadioFrequencycoils(sendingandreceiving),shimcoils,Electroniccomponents,fMRI.

UNITIV NUCLEARMEDICINESYSTEM 9

RadioIsotopes-alpha,beta,andgammaradiations.RadioPharmaceuticals.Radiationdetectors–gasfilled,ionizationchambers,proportionalcounter,GMcounterandscintillationDetectors,Gamma camera-Principleofoperation,collimator,photomultipliertube,X-Ypositioningcircuit,pulseheight analyzer.PrinciplesofSPECTandPET.

UNITV RADIATIONTHERAPYANDRADIATIONSAFETY 9

Radiationtherapy–linearaccelerator,TelegammaMachine.SRS –SRT,-RecentTechniquesinradiationtherapy-3DCRT–IMRT–IGRTandCyberknife-radiationmeasuringinstruments-Dosimeter,filmbadges,ThermoLuminescentdosimeters-electronicdosimeter-Radiationprotection inmedicine-radiationprotectionprinciples.

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SteveWebb	ThePhysicsofMedicalImaging	AdamHilger,Philadelpia	1988
2	R.HendeeandRussellRitenour	MedicalImagingPhysics	FourthEditionWilliam,Wiley-Liss	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	GopalB.Saha	PhysicsandRadiobiologyof NuclearMedicine	ThirdeditionSpringer	2006
2	B.H.Brown,PVLawford,RHSmallwood	MedicalphysicsandbiomedicalEngineering	CRCPress	1999
3	MyerKutz	StandardhandbookofBiomedical Engineeringanddesign	McGrawHill	2003
4	P.Ragunathan	MagneticResonanceImagingand SpectroscopyinMedicine	-	-

16BEBME7E02 LASERS AND FIBER OPTICS IN MEDICINE 3 0 0 3 100

OBJECTIVES:

The goal of this course is for students

- To Understand Biomedical Laser principles and applications.
- To be familiar with optical properties of tissues
- To infer the knowledge of photonics
- To be exposed to Optical Holography
- To explain the various applications of Laser
- To understand photodynamictherapy.

OUTCOMES:

Upon completion of this course, students will be able to:

- Analyse the optical properties of tissues
- Use the Photonics instrumentation
- Apply lasers in different areas of medicine.
- Perceive the lasersin ophthalmology
- Discuss about opticalhologram
- Explain the special techniques of Lasers.

UNITI OPTICALPROPERTIESOFTHETISSUES 9

Refraction,scattering,absorption,lighttransportinsidethetissue,tissueproperties,Lightinteraction withtissues,optothermalinteraction,fluorescence,speckles.

UNITII INSTRUMENTATIONINPHOTONICS 9

Instrumentationforabsorption,scatteringandemissionmeasurements,excitationlightsources–highpressurearclamp,solidstateLEDs,opticalfilters,polarisers,timeresolvedandphaseresolved detectors.

UNITIII APPLICATIONSOFLASERS 9

Laserintissuewelding,lasersindermatology,lasersinophthalmology,otolaryngology,urology.

UNITIV OPTICALHOLOGRAPHY 9

Wavefronts,interferencepatterns,principleofhologram,opticalhologram,applications.

UNITV SPECIALTECHNIQUES 9

Nearfieldimagingofbiologicalstructures,in-vitroclinicaldiagnostic,fluorescentspectroscopy, photodynamictherapy.

Total : 45

TEXTBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	LeonGoldman,M.D., &R.JamesRockwell,Jr	LasersinMedicine	GordonandBreach, SciencePublishersI	1975
2	AbrahamKatzir	LasersandOpticalFibersinMedicine	AcademicPressEdition	1998

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	TuanVoDirh	BiomedicalPhotonics–Handbook	CRCPress,Bocaraton	2003
2	Glasser,O.,	MedicalPhysics--Vol1,2, 3	AdamHilgarBrustolInc	1987
3	G.DavidBaxter	TherapeuticLasers–Theoryandpractice	ChurchillLivingstonePublicationsEdition	2001

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16BEBME7E03 PATIENT AND DEVICES SAFETY 3 0 0 3 100

COURSEOBJECTIVES:

The goal of this course is for students

- To provide basic knowledge on the concept of Healthcare Quality management towards continuous improvementofpatientcare
- To Understandhospitalsafety.
- To be familiar with electrical & fire safety.
- To infer the knowledge of regulatoryrequirementforhealthcare.
- To be exposed to standardization ofqualitymedicalcareinhospitals
- To explain the assessingqualityhealthcare

COURSE OUTCOME:

Upon completion of this course, students will be able to:

- Makethestudentsawareoftheroleofbiomedicalengineerinhospitals,especiallyinthemanagementofelectricalsupply,maintenanceofelectricalsafety.
- Analyse the hospitalsafety.
- Use the electrical & fire safety.
- Apply regulatoryrequirementforhealthcare in different areas of medicine.
- Perceive thestandardization ofqualitymedicalcareinhospitals.
- Discuss about the assessingqualityhealthcare.

UNITI STANDARDIZATION OFQUALITYMEDICALCAREINHOSPITALS 9

DefineQuality-NeedforStandardization&QualityManagement, TQMinHealthcareorganization-Qualityassurancemethods, Q A in(MedicalImaging&Nuclearmedicine) Diagnosticservices–Classificationofequipments

UNITII REGULATORYREQUIREMENTFORHEALTHCARE 9

FDAregulations,Accreditationforhospitals-JCI,NABHandNABL,OtherregulatoryCodes.

UNITIII HOSPITALSAFETY 9

Security &SafetyofHospital-Property, Staff&Patients, Radiation safety, Safetyprecautions, hazardous effectsofradiation, allowedlevelsofradiation,ICRPregulationsforradiationsafety, DisposalofBiologicalwaste.

UNITIV ELECTRICAL&FIRESAFETY 9

Sourcesofshocks, macro&microshocks-Hazards, monitoring andinterruptingtheOperationfromleakagecurrent- Elements offire,causesoffire,ActiontobetakenincaseoffireinaHospital.

UNITV ASSESSINGQUALITYHEALTHCARE 9

PatientSafetyOrganization-Governmental&Independent,MeasuringQualitycare–Evaluationofhospitalservices–sixsigmaway,QualityAssuranceinHospitalsSop's–PatientOrientationfor TotalPatientSatisfaction.5Stechniques.

Total : 45

REFERENCES

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	CesarA.Cacere&AlbertZana	ThePracticeofClinicalEngg.	Academicpress,NewYork	1977
2	WebsterJ.GandAlbertM.Cook	ClinicalEngg,Principles&Practices,PrenticeHallInc.,	Engle woodCliffs,NewJer	1979
3	B.M.Sakharkar	PrinciplesofHospitaladministrationandPlanning	JAYPEEBrothers, MedicalPublishers	-

FOR SEMESTER VIII (ELECTIVE-V & VI)

16BEBME8E01 BIOLOGICAL SPECTROSCOPY 3 0 0 3 100

COURSE OBJECTIVE

- To develop the skills of students in the area of Biological spectroscopy.
- To learn various aspects of mass spectroscopy
- To Understand NMR Spectroscopy
- To Know various diffraction methods
- To Learn about Polarized light
- To be Familiarised optical rotation

COURSE OUTCOMES:

At the end of the course, the student would have learnt about

- To learn various aspects of mass spectroscopy
- Understand NMR Spectroscopy
- Know various diffraction methods
- Learn about Polarized light
- Familiarise optical rotation
- various kinds spectroscopic techniques to study biological system.

UNIT I OPTICAL ROTATORY DISPERSION 5

Polarized light – optical rotation – circular dichroism – circular dichroism of nucleic acids and proteins.

UNIT II NUCLEAR MAGNETIC RESONANCE 10

Chemical shifts – spin – spin coupling – relaxation mechanisms – nuclear overhauser effect – multidimensional NMR spectroscopy – determination of macromolecular structure by NMR – magnetic resonance imaging.

UNIT III MASS SPECTROMETRY 10

Ion sources sample introduction – mass analyzers and ion detectors – biomolecule mass sepctrometry – peptide and protein analysis – carbohydrates and small molecules – specific applications.

UNIT IV X-RAY DIFFRACTION 10

Scattering by x- rays – diffraction by a crystal – measuring diffraction pattern – bragg reflection – unit cell – phase problem – anomalous diffraction – detemination of crystal structure – electron and neutron diffraction.

UNIT V SPECIAL TOPICS AND APPLICATIONS 10

Electron microscopy – transmission and scanning electron microscopy – scanning tunneling and atomic force microscopy – combinatorial chemistry and high throughput screening methods.

Total : 45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Campbell I.D and DwekR.A	Biological Spectroscopy	Benjamin Cummins and	1986
2	Atkins P.W	Physical Chemistry	Oxford IV Edition	1990

16BEBME8E02 ROBOTICS AND AUTOMATION 3 0 0 3 100

COURSE OBJECTIVES:

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots.
- To study the Euler, Lagrangianformulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the control of robots for some specific applications.
- Use Robots in different applications

COURSE OUTCOMES:

Upon completion of the course, the student should be able to:

- Explain the basic concepts of working of robot
- Analyze the function of sensors in the robot
- Write a program to use a robot for a typical application
- Use Robots in different applications
- Know the Euler, Lagrangianformulation of Robot dynamics.

UNIT I BASIC CONCEPTS (9)

Definition and origin of robotics–different types of robotics–various generations of robots–degrees of freedom–Asimov's laws of robotics–dynamic stabilization of robots.

UNITII POWER SOURCESAND SENSORS (9)

Hydraulic, pneumatic and electric drives–determination of HP of motor and gear ingratio–variable speed arrangements–path determination – micro machines in robotics– machine vision – ranging– laser–acoustic –magnetic, fiber optic and tactile sensors.

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS (9)

Construction of manipulators– manipulator dynamics and force control –electronic and pneumatic manipulator control circuits–end effectors–U various types of grippers –design considerations.

UNIT IV KINEMATICSAND PATH PLANNING (9)

Solution of inverse kinematics problem–multiple solution jacobianwork envelop–hill Climbing Techniques– robot programming languages

UNIT V CASE STUDIES (9)

Multiple robots–machine interface–robots in manufacturing and non-manufacturing applications–robot cell design–selection of robot.

Total : 45

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Mikell P.WeissG.M.,NagelR.N. , OdrajN.G,	Industrial Robotics	McGraw-Hill Singapore	1996
2	Ghosh	Control in Robotics and Automation: Sensor Based	Allied Publishers, Chennai	1998

		Integration		

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Deb.S.R	Robotics Technology and flexible Automation	John Wiley, USA	1992
2	KlafterR.D., Chimielewski T.A., NeginM	Robotic Engineering– An integrated approach	Prentice Hall of India, New Delhi	1994
3	McKerrowP.J	Introduction to Robotics	Addison Wesley, USA,	1991
4	Issac Asimov	Robot	Ballantine Books, NewYork	1986
5	Barry Leatham- Jones	Elements of industrial Robotics	PITMAN Publishing	1987
6	Mikell P.Groover, Mitchell Weiss, Roger N. Nagel Nicholas G. Odrey	Industrial Robotics Technology, Programming and Applications	McGraw Hill Book Company	1986
7	Fu K.S. Gonzaleaz R.C. and Lee C.S.G	Robotics Control Sensing, Vision and Intelligence	McGraw Hill International Editions	1987

16BEBME8E03 NANOTECHNOLOGY IN MEDICINE 3003 100

COURSE OBJECTIVE:

- To study and gain the knowledge of Nanotechnology in the field of medicine.
- To study and gain the knowledge of Cellular Nano machines and the Building Blocks of Life
- Know the Importance of various nano materials in health and medicine.
- To gain the knowledge of Molecular therapy
- To study Stem cell therapy,
- .Application of nanotechnology in health monitoring systems

COURSE OUTCOMES:

After learning the course the students should be able to understand:

- Applications of nanotechnology health care and medicine.
- Cellular Nano machines and the Building Blocks of Life
- Importance of nanomaterials in drug delivery.
- Application of nanomaterials and nanosystems in Medical Diagnostics and Therapeutics.
- Know Application of nanotechnology in health monitoring systems.
- Familiarise Cellular Nano machines

UNIT I INTRODUCTION (9)

Cellular Nano machines and the Building Blocks of Life, A New Generation of Nano tools, Importance of various nano materials in health and medicine.

UNIT II NANOPARTICLES FOR DIAGNOSTICS (9)

Nanoparticles in Medical Diagnostics and Therapeutics, Targeted drug delivery, Magnetic Nanoparticles as Contrast Agents for Medical Diagnosis, Liposome based delivery, Bio Inspired Nanomaterials for a New Generation of Medicine.

UNIT III THERAPEUTIC NANO DEVICES (9)

Definition and scope, Synthetic Approaches: top-down versus bottom-up Approaches for Nanotherapeutic Device Components, Applications for Nano therapeutic Devices.

UNIT IV NANOSYSTEMS FOR HEALTHCARE MONITORING – I (9)

Single-Molecule Detection Techniques for Monitoring Cellular Activity at the Nano scale Level, Nano probes, Integrated Cantilever-Based Biosensors for the Detection of Chemical and Biological Entities.

UNIT V NANOSYSTEMS FOR HEALTHCARE MONITORING – II (9)

Nano pore Methods for DNA Detection and Sequencing, Nano tube Based Membrane Systems, micro/nano fluidic systems for bio-object sorting, single chip electrophoresis system.

Total : 45

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Tuan Vo-Dinh	Nanotechnology in Biology and Medicine: Methods, Devices and Applications	CRC press	2006

REFERENCE BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Chala Kumar	Bio functionalization of nanomaterials	Wiley	2005
2	Charles Pooles, Frank J. Ownes	Introduction to Nanotechnology	Wiley	2003
3	Bharat Bhushan	Handbook of Nanotechnology	Springer	2003

16BEBME8E04 TISSUE ENGINEERING 3 0 0 3 100

COURSE COBJECTIVES:

- To learn the fundamentals of tissue engineering and tissue repairing
- To acquire knowledge on clinical applications of tissue engineering
- To understand the basic concept behind tissue engineering focusing on the stem cells, biomaterials and its applications
- Overall exposure to the role of tissue engineering and stem cell therapy in organogenesis
- Ability to understand the components of the tissue architecture
- To learn the fundamentals of tissue engineering and tissue repairing

COURSE OUTCOMES:

- Ability to understand the components of the tissue architecture
- Opportunity to get familiarized with the stem cell characteristics and their relevance in medicine
- Awareness about the properties and broad applications of biomaterials
- Overall exposure to the role of tissue engineering and stem cell therapy in organogenesis
- To learn the fundamentals of tissue engineering and tissue repairing
- To acquire knowledge on clinical applications of tissue engineering

UNIT I INTRODUCTION (9)

Introduction to tissue engineering: Basic definition; current scope of development; use in therapeutics, cells as therapeutic agents, cell numbers and growth rates, measurement of cell characteristics morphology, number viability, motility and functions. Measurement of tissue characteristics, appearance, cellular component, ECM component, mechanical measurements and physical properties.

UNIT II TISSUE ARCHITECTURE (9)

Tissue types and Tissue components, Tissue repair, Engineering wound healing and sequence of events. Basic wound healing Applications of growth factors: VEGF/angiogenesis, Basicproperties, Cell-Matrix & Cell-Cell Interactions, telomeres and Selfrenewal, Control of cell migration in tissue engineering.

UNIT III BIOMATERIALS (9)

Biomaterials: Properties of biomaterials, Surface, bulk, mechanical and biological properties. Scaffolds & tissue engineering, Types of biomaterials, biological and synthetic materials, Biopolymers, Applications of biomaterials, Modifications of Biomaterials, Role of Nanotechnology.

UNIT IV BASIC BIOLOGY OF STEM CELLS (9)

Stem Cells: Introduction, hematopoietic differentiation pathway Potency and plasticity of stem cells, sources, embryonic stem cells, hematopoietic and mesenchymal stem cells, Stem Cell markers, FACS analysis, Differentiation, Stem cell systems- Liver, neuronal stem cells, Types & sources of stem cell with characteristics: embryonic, adult, haematopoetic, fetal, cord blood, placenta, bone marrow, primordial germ cells, cancer stem cells induced pleuripotent stem cells.

UNIT V CLINICAL APPLICATIONS (9)

Stem cell therapy, Molecular therapy, In vitro organogenesis, Neurodegenrative diseases, spinal cord injury, heart disease, diabetes, burns and skin ulcers, muscular dystrophy, orthopedic applications, Stem cells and Gene therapy Physiological models, tissue engineered therapies, product characterization, components, safety, efficacy. Preservation –freezing and drying. Patent protection and regulation of tissue engineered products, sethical issues.

Total : 45

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Bernhard O.Palsson, Sangeeta N.Bhatia	Tissue Engineering	Pearson Publishers	2009
2	Meyer, U.; Meyer, Th.; Handschel, J.; Wiesmann, H.P.	Fundamentals of Tissue Engineering and Regenerative Medicine	-	2009

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Bernard N. Kennedy (editor)	Stem cell transplantation, tissue engineering, and cancer applications	New York: Nova Science Publishers	2008
2	Raphael Gorodetsky, Richard Schäfer	Stem cell based tissue repair	Cambridge: RSC publishing	2011
3	R. Lanza, I. Weissman, J. Thomson, and R. Pedersen	Volume 1-Embryonic Stem Cells; Volume 2-Adult & Fetal Stem Cells	Academic Press	2004
4	R. Lanza, J. Gearhart etal (Eds)	Essential of Stem Cell Biology	Elsevier Academic press	2006
5	J. J. Mao, G. Vunjak-Novakovic et al (Eds)	Translational Approaches In Tissue Engineering &Regenrative Medicine	Artech House, INC Publications	2008
6	Naggy N. Habib, M.Y. Levicar, , L. G. Jiao,.and N. Fisk	Stem Cell Repair and Regeneration	Imperial College Press	2007

16BEBME8E05 SPEECH PROCESSING 3 0 0 3 100

COURSE OBJECTIVES:

- Tointroducespeechproductionandrelatedparametersof speech.
- Toshowthecomputationanduseoftechniquessuchas shorttimeFouriertransform,linear predictivecoefficientsandothercoefficientsintheanalysisofspeech.
- Tounderstanddifferentspeechmodelingproceduressuchas Markovandth eir implementationissues.
- To introduce the models of speech production and acoustic phonetics
- . To teach time and frequency domain techniques for estimating speech parameters
- To teach predictive techniques for speech coding

COURSE OUTCOMES:

Uponcompletionofthecourse,studentswillbeableto

- Modelspeechproductionsystemanddescribethefundamentalsof speech.
- Extractandcomparedifferentspeechparameters.
- Chooseanappropriatestatisticalspeechmodelforagivenapplication.
- Designaspeechrecognitionsystem.
- Usedifferentspeechsynthesistechniques.
- .Analyze application of speech processing in speech compression, speech recognition, and speech synthesis

UNITI BASICCONCEPTS 9

SpeechFundamentals:ArticulatoryPhonetics–ProductionandClassificationofSpeechSounds; AcousticPhonetics–Acousticsofspeechproduction;ReviewofDigitalSignalProcessingconcepts; Short-TimeFourierTransform,Filter-BankandLPCMethods.

UNITII SPEECHANALYSIS 9

Features,FeatureExtractionandPatternComparisonTechniques:Speechdistortionmeasures– mathematicalandperceptual–Log–SpectralDistance,CepstralDistances,WeightedCepstral DistancesandFiltering,LikelihoodDistortions,SpectralDistortionusingaWarpedFrequencyScale , LPC,PLPandMFCCCoefficients,TimeAlignmentandNormalization–DynamicTimeWarping, MultipleTime–AlignmentPaths.

UNITIII SPEECHMODELING 9

HiddenMarkovModels:MarkovProcesses,HMMs–Evaluation,OptimalStateSequence–Viterbi Search,Baum-WelchParameterRe-estimation,Implementationissues.

UNITIV SPEECHRECOGNITION 9

LargeVocabularyContinuousSpeechRecognition:Architectureofalargevocabularycontinuous speechrecognitionsystem–acousticsandlanguagemodels–n-grams,contextdependentsub-word units;Applicationsandpresentstatus.

UNITV SPEECHSYNTHESIS 9

Text-to-SpeechSynthesis:Concatenativeandwaveformsynthesismethods,sub-wordunitsfor TTS, intelligibilityandnaturalness–roleofprosody,Applicationsandpresentstatus.

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	LawrenceRabinerand Biing-HwangJuang	FundamentalsofSpeechRec ognition	Pearson Education	2003
2	DanielJurafskyandJam esH Martin	SpeechandLanguageProcessing – AnIntroductiontoNaturalLangua geProcessing,ComputationalLin guistics,andSpeechRecognition	Pearson Education	2002
3	FrederickJelinek	StatisticalMethodsofSpeechRec ognition	MITPress	1997

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	StevenW.Smith	TheScientistandEngineer‟s GuidetoDigitalSignalProce ssing	California TechnicalPublishin g	1997
2	ThomasFQuatier	Discrete-TimeSpeechSignalProcessing–PrinciplesandPractice	PearsonEducation	2004
3	ClaudioBecchettiandL ucioPrinaRicotti	SpeechRecognition	JohnWileyandSons	1999
4	BenGoldandNelsonM organ	Speechandaudiosignalprocessin g,ProcessingandPerceptionofSp eechandMusic	Wiley-IndiaEdition	2006

16BEBME8E06 RAPID PROTOTYPING 3 0 0 3 100

OBJECTIVE:

- GeneratingagoodunderstandingofRPhistory,itsdevelopmentandapplications.
- Toexposethe studentstodifferenttypesof Rapidprototypingprocesses,
- MaterialsusedinRPsystemsandreverse engineering.
- ToprovideknowledgeondifferenttypesofRapidPrototypingsystemsanditsapplicationsin variousfields
- Understand SelectiveLaserSintering
- Know Directshellproductioncasting

OUTCOME:

- ToprovideknowledgeondifferenttypesofRapidPrototypingsystemsandits applicationsin variousfields
- GeneratingagoodunderstandingofRPhistory,itsdevelopmentandapplications.
- Toexposethe studentstodifferenttypesof Rapidprototypingprocesses,
- MaterialsusedinRPsystemsandreverse engineering.
- Familiarise LaserEngineeredNetShaping(LENS).
- Know medicaldataprocessing

UNITI INTRODUCTION 9

History–DevelopmentofRP systems–ApplicationsinProductDevelopment,ReverseEngineering, RapidTooling,RapidManufacturing-Principle–Fundamental–Fileformat–Othertranslators–medicalapplicationsofRP-Ondemandmanufacturing–Directmaterialdeposition-Shape DepositionManufacturing.

UNITII LIQUIDBASEDANDSOLIDBASEDRAPIDPROTOTOTYPINGSYSTEMS 9

Classification–Liquidbasedsystem-StereolithographyApparatus(SLA),detailsofSLprocess, products,Advantages,Limitations,ApplicationsandUses.Solidbasedsystem- FusedDeposition Modeling,principle,process,products,advantages,applicationsanduses-LaminatedObject Manufacturing

UNITIII POWDERBASEDRAPIDPROTOTOTYPINGSYSTEMS 9

SelectiveLaserSintering–principlesofSLSprocess,principleofsinterbondingprocess,Laser sinteringmaterials,products,advantages,limitations,applicationsanduses.ThreeDimensional Printing–process,majorapplications,researchanddevelopment.Directshellproductioncasting–keystrengths,process,applicationsanduses,casestudies,researchanddevelopment.Laser SinteringSystem,e-manufacturingusingLasersintering,customizedplasticparts,customizedmetal parts,e-manufacturing-LaserEngineeredNetShaping(LENS).

UNITIV MATERIALSFORRAPIDPROTOTOTYPINGSYSTEMS 9

Natureof material–typeofmaterial–polymers,metals,ceramicsand composites-liquidbased materials,photopolymerdevelopment–solidbasedmaterials,powderbasedmaterials-casestudy.

UNITV REVERSEENGINEERINGandNEWTECHNOLOGIES 9

Introduction,measuringdevice-contacttypeandnon-contacttype,CADmodelcreationfrompoint clouds-preprocessing,pointcloudstosurfacemodelcreation,medicaldataprocessing-typesof medicalimaging,softwareformakingmedicalmodels,medicalmaterials,otherapplications–Casestudy.

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	RafiqI.Noorani	RapidPrototyping–PrinciplesandApplications	Wiley&Sons	2006
2	ChuaC.K,LeongK.FandLimC.S	RapidPrototyping:PrinciplesandApplications	second edition,WorldScien	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	N.HOPKINSON,R.J.M,HAUGE,PM,DICKENS	RapidManufacturing–AnIndustrialrevolutionforthedigitalage	Wiley	2006
2	IANGIBSON	AdvancedManufacturingTechnologyforMedicalapplications:Rev	Wiley	2006
3	PaulF.Jacobs	RapidPrototypingandManufacturing,“FundamentalsofStereolithography	McGrawHill	1993
4	D.T.PhamandS.S.Dimov	RapidManufacturing	SpringerVerlog	2001

16BEBME8E07 **BIO MEMS** **3 0 0 3** **100**

COURSE OBJECTIVES:
Thestudentshouldbemadeto:

- LearnvariousMEMSfabricationtechniques.
- Understanddifferenttypesof sensorsandactuatorsandtheirprinciplesof operationatthemicroscalelevel.
- KnowtheapplicationofMEMSindifferentfieldofmedicine.
- DiscussvariousMEMSfabricationtechniques.
- Explaindifferenttypesofsensorsandactuatorsandtheirprinciplesof operationatthemicroScalelevel.
- ApplyMEMSindifferentfieldofmedicine.

COURSE OUTCOMES:
Attheendofthecourse,thestudentshouldbe ableto:

- DiscussvariousMEMSfabricationtechniques.
- Explaindifferenttypesofsensorsandactuatorsandtheirprinciplesof operationatthemicroScalelevel.
- ApplyMEMSindifferentfieldofmedicine.
- LearnvariousMEMSfabricationtechniques.
- Understanddifferenttypesof sensorsandactuatorsandtheirprinciplesof operationatthemicroscalelevel.
- KnowtheapplicationofMEMSindifferent

UNITI MEMSMATERIALSANDFABRICATION
9

Typical MEMs and Microsystems, materials for MEMS - active substrate materials-Silicon and its compounds, Silicon piezoresistors, Gallium Arsenide, quartz, polymers. Micromachining photolithography, thin film deposition, doping, etching, bulk machining, wafer bonding, LIGA

UNITII MECHANICALANDTHERMALSENSORSANDACTUATORS 9

MechanicsforMEMsdesign-staticbendingofthinplates,mechanicalvibration,thermomechanics, fractureandthinfilmmechanics.Mechanicalsensorsandactuators–beamandcantilever–microplates,strain,pressureandflowmeasurements,Thermalsensorsandactuators-actuator basedonthermalexpansion,thermalcouples,thermalresistor,Shapememoryalloys-Inertia sensor,flowsensor

UNITIII ELECTROSTATICANDPIEZOELECTRICSENSORSANDACTUATORS 9

Parallelplatecapacitor,pullineffect,Electrostaticsensorsandactuators-Inertiasensor,Pressure sensor,flowsensor,tactilesensor,combdrive.Propertiesofpiezoelectricmaterials,Piezoelectricse nsorandactuator–inchwormmotor,inertiasensor,flowsensor.

UNITIV MICROFLUIDICSYSTEMS 9

Fluiddynamics,continuityequation,momentumequation,equationofmotion,laminarflowin circularconduits,fluidflowinmicroconduits,insubmicrometerandnanoscale.Microscalefluid
,
expressionforliquidflowinachannel,fluidactuationmethods,dielectrophoresis,microfluiddis

penser,microneedle,micropumps-continuousflowsystem,micromixers

UNITV APPLICATIONSOFBIOMEMS
9
CADforMEMs,Drugdelivery,micrototalanalysissystems(MicroTAS)detectionandmeasuremen t methods,microsystemapproachestopolymerasechainreaction(PCR),DNAsensor,MEMSbased drugdelivery

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Tai RanHsu	MEMSandMicrosystemsDesignandManufacture	TataMcGrawHillPublishing Company,NewDelhi	2002
2	WanjunWang,Stephen A.Soper	BioMEMs:TechnologiesandApplications	CRCPress,NewYork	2007

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	MarcJ.Madou	FundamentalsofMicrofabrication:theScienceof Miniaturization	CRCPress	2002
2	NadimMaluf,KirtWilliams	AnintroductiontoMicroelectroMechancialSystemsEngineering	SecondEdition,ArtechHouseInc,MA,	2004
3	ChangLiu,	FoundationsofMEMS	PearsonEducationInternational,NewJersey,USA	2006
4	NitaigourPremchand Mahalik	MEMS	TataMcGrawHillPublishingCompany,NewDelhi	2007

16BEBME8E08 INTELLECTUAL PROPERTY RIGHTS 3003 100

OBJECTIVES:

Thestudentshouldbemadeto:

- Learnhowtovalueintangibleassets,takingintoaccounttheircommercialpotentialandlegal status.
- Explorethelegal&businessissuessurroundingmarketingofnewproductsrelatedto technology.
- Reviewanintellectualpropertyportfolioandcomprehendtheextentof theirprotection.
- Developabusinessplanthatadvancesthevalueoftheirintellectualpropertyportfolio
- Developastrategyofmarketingtheirintellectualpropertyandunderstandsomenegotiation basics.
- Explainsomeofthelimitsof theirintellectualpropertyrightsandcomprehendsomebasic legal pitfalls.

OUTCOMES:

Uponcompletionofthecourse,studentswillbeableto:

- Reviewanintellectualpropertyportfolioandcomprehendtheextentof theirprotection.
- Developabusinessplanthatadvancesthevalueoftheirintellectualpropertyportfolio
- Learnhowtovalueintangibleassets,takingintoaccounttheircommercialpotentialandlegal status.
- Explorethelegal&businessissuessurroundingmarketingofnewproductsrelatedto technology.
- Developastrategyofmarketingtheirintellectualpropertyandunderstandsomenegotiation basics.
- Explainsomeofthelimitsof theirintellectualpropertyrightsandcomprehendsomebasic legal pitfalls.

UNITI INTRODUCTION 9

Introduction–InventionandCreativity–IntellectualProperty(IP)–Importance–ProtectionofIPR – Basictypesofproperty(i)MovableProperty(ii)ImmovablePropertyand(iii)IntellectualProperty.

UNITII PATENTS,COPYRIGHTSANDTRADEMARKS 9

IP –Patents–Copyrightsandrelatedrights–TradeMarksandrightsarisingfromTrademark registration–Definitions–IndustrialDesignsandIntegratedcircuits–ProtectionofGeographical Indicationsatnationalandlnternationallevels–ApplicationProcedures.

UNITIII INTERNATIONALSTANDARDISATION 9

InternationalconventionrelatingtoIntellectualProperty–EstablishmentofWIPO–Missionand Activities– History–GeneralAgreementonTradeandTariff(GATT).

UNITIV INDIANSTRATEGIES 9

IndianPositionVsWTOandStrategies–IndianIPRlegislations–commitmentstoWTO-Patent OrdinanceandtheBill–DraftofanationalIntellectualPropertyPolicy–Presentagainstunfair competition.

UNITV CASESTUDIES 9

CaseStudieson –Patents(Basumatirice,turmeric,Neem,etc.) –Copyrightandrelatedrights–TradeMarks–IndustrialdesignandIntegratedcircuits–Geographicindications–Protectionagainstunfaircompetition.

Total : 45

TEXTBOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SubbaramN.R	HandbookofIndianPatentLawandPractice	S.Viswanathan,PrintersandPublishers Pvt.Ltd	1998

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	EliWhitney	UnitedStatesPatentNumber :72X	CottonGin	March14, 1794
2	DerwentIP Matters	UsingtheInternetfornon-patentpriorartsearches	-	July2000 .

OPEN ELECTIVES - OFFERED BY OTHER DEPARTMENTS

SCIENCE AND HUMANITIES

16BTSHOE01 PROBABILITY AND RANDOM PROCESS 3 0 0 3 100

OBJECTIVES:

- To gain knowledge in measures of central tendency.
- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one- and two-dimensional random variables
- To introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of random processes which are widely used in IT fields.
- To understand the concept of correlation and spectral densities.

COURSE OUTCOMES:

- Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
- To understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- To understand the basic concepts of one- and two-dimensional random variables and apply in engineering applications.
- To apply the concept random processes in engineering disciplines.
- The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable.
- The students will have an exposure of various distribution functions, correlation and spectral densities.

UNIT-I MEASURES OF CENTRAL TENDENCY AND PROBABILITY
Measures of central tendency–Mean, Median, Mode-Standard Deviation Probability-Random Variable-Axioms of Probability-Conditional Probability-Total probability–Bayes' theorem.

UNIT-II STANDARD DISTRIBUTIONS
Functions of a random Variable-Binomial, Poisson, Uniform, Exponential, Gamma (one Parameter only) and Normal Distributions-Moment generating functions, Characteristic function and their properties–Chebyshev's in equality.

UNIT-III TWO DIMENSIONAL RANDOM VARIABLES
Joint Distributions-Marginal and conditional Distributions-Probability Mass Function Probability density functions–Covariance-Correlation and regression

UNIT-IV CLASSIFICATION O FRANDOM PROCESS
Definition and examples-first order, second order, strictly stationary, wide–sense stationary and

Ergodic Processes-Markov Process-Binomial, Poisson and Normal Processes-Sinewave process.

UNIT-V CORRELATION AND SPECTRAL DENSITIES

Autocorrelation-Cross Correlation-Properties–Power spectral density–Cross spectral density- Properties–Wiener-Khintchine relation–Relationship between cross power spectrum and cross correlation Function-Linear time invariant System-System transfer function–Linear systems with random inputs – Autocorrelation and cross correlation functions of input and output.

TEXTBOOK:

S. No.	Author(s)Name	Title of the book	Publisher	Year of Publication
1	Peebles Jr, P. Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Pubishers, New Delhi.	2002

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Henry Starkand John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002
2	Ochi, M. K	Applied Probability and Stochastic Process	John Wiley &Sons, New York	1990
3	Ross, S	A first Course in Probability	Pearson Education, New Delhi(Chap2to8)	2002
4	Gupta, S.C .and Kapur, V. K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2007
5	Veerarajan, T.	Probabilitiy, StatisticsandRandom process	Tata McGraw-Hill Publications, Second Edition, New Delhi	2002

WEBSITES:

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld.Wolfram.com

16BTSHOE02 FUZZY MATHEMATICS 3 0 0 3 100

OBJECTIVES:

- Be able to understand basic knowledge of fuzzy sets and fuzzy logic
- Be able to apply basic knowledge of fuzzy operations.
- To know the basic definitions of fuzzy relations
- Be able to apply basic fuzzy inference and approximate reasoning
- To know the applications of fuzzy Technology.
- To understand the concepts of Probability Measures vs Possibility Measures

COURSE OUTCOMES:

- To gain the main subject of fuzzy sets.
- To understand the concept of fuzziness involved in various systems and fuzzy set theory.
- To gain the methods of fuzzy logic.
- To comprehend the concepts of fuzzy relations.
- To analyze the application of fuzzy logic control to real time systems.
- The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

UNIT I FUZZY SET (9)

Fuzzy Sets: Basics Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations – Level Sets – Fuzzy functions - Zadeh's Extension Principle

UNIT II OPERATIONS ON FUZZY SETS (9)

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tonearms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III FUZZY RELATION (9)

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNIT IV FUZZY MEASURE (9)

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures Vs Possibility Measures

UNIT V FUZZY INFERENCE (9)

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

Total : 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	George J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic: Theory and Applications	Prentice Hall of India, New Delhi.	2003

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Zimmermann H.J.	Fuzzy Set Theory and its Applications	Kluwer Academic publishers, USA.	2001
2	Michal Baczynski and Balasubramaniam Jayaram	Fuzzy Implications	Springer-Verlag publishers, Heidelberg	2008
3	Kevin M Passino and Stephen Yurkovich	Fuzzy Control	Addison Wesley Longman publishers, USA	1998

WEBSITES:

1. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

16BTSHOE03 LINEAR ALGEBRA 3 0 0 3 100

OBJECTIVES:

- To introduce the basic concepts of vector space
- To know the fundamentals of linear Algebra
- To solve system of linear equations
- To study about the linear transformations
- To introduce the concepts of inner product spaces
- To understand the importance of Linear Algebra and its applications in branches of Mathematics

OUTCOMES:

- To explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- To describe the fundamental concepts of Eigen values and Eigen vectors by using Power method.
- To apply the fundamental concepts in their respective engineering fields
- To visualize linear transformations as matrix form
- To recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
- To articulate the importance of Linear Algebra and its applications in branches of Mathematics.

UNIT I VECTOR SPACES (9)

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II EIGEN VALUES AND EIGEN VECTORS (9)

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

UNIT III SYSTEM OF LINEAR EQUATIONS (9)

Direct methods, Gauss elimination method, Gauss Jordan method, Croute's method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNIT IV LINEAR TRANSFORMATIONS (9)

Linear Transformations - The Null Space and Range - I isomorphism - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNIT V INNER PRODUCT SPACES (9)

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application: Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Shahnaz Bathul	Text book of Engineering Mathematics (Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES:

4. www.sosmath.com
5. www.nptel.ac.in
6. www.mathworld.wolfram.com

16BTSHOE04 ENGINEERING ACOUSTICS 3 0 0 3 100

OBJECTIVES:

- To disseminate the fundamentals of acoustic waves. (K)
- To inculcate the characteristics of radiation and reception of acoustic waves. (K)
- To divulge knowledge on the basics of pipe resonators and filters.(S)
- To introduce the features of architectural acoustics.**(S)**
- To impart the basic knowledge of transducers and receivers.(K)
- To introduce the applications of Engineering acoustics

COURSE OUTCOMES:

- Develop the idea of the fundamentals of acoustic waves.
- Apply the concepts of radiation and reception of acoustic waves.
- Explain the basic ideas of pipe resonators and filters.
- Illustrate the basics of architectural acoustics.
- Illustrate the transducers and receivers and its applications in various electronic devices.
- Apply the knowledge inputs of the course for engineering applications.

UNIT I INTRODUCTION (9)

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves - Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales .Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence –method of images.

UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES (9)

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers. Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III PIPES RESONATORS AND FILTERS (9)

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

UNIT IV ARCHITECTURAL ACOUSTICS (9)

Sound in endo sure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design.Environmental Acoustics: Highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

UNIT V TRANSDUCTION (9)

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

Total: 45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	LawerenceE.Kinsler, Austin R.Frey,	Fundamentals of Acoustics	John Wiley & Sons	2000

REFERENCE:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	F. AltonEverest & Ken Pohlmann	Master Handbook of Acoustics	McGraw Hill Professional	2014

WEBSITES:

1. www.acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www. ocw.mit.edu

16BTSHOE05 SOLID WASTE MANAGEMENT 3 0 0 3 100

OBJECTIVES:

- To make the students conversant with basics of Solid waste sand its classification.
- To make the student acquire sound knowledge of different treatments of solid wastes.
- To acquaint the student with concepts of waste disposals.
- To develop an understanding of the basic concepts of Hazardous waste managements.
- To acquaint the students with the basics of energy generation from waste materials.
- To understand the chemical principles in field of engineering and technology

COURSE OUTCOMES:

- Outline the basic principles of Solid waste and separation of wastes (K).
- Identify the concepts of treatment of solid wastes (S).
- Identify the methods of wastes disposals. (S)
- Examine the level of Hazardousness and its management. (S)
- Examine the possible of the energy production using waste materials. (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A).

UNIT I SOLID WASTE (9)

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

UNIT II WASTE TREATMENT (9)

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNIT III WASTE DISPOSAL (9)

Sanitary Land Fill Method of Solid Waste Disposal – Land Fill Classification, Types, Methods &Siting Consideration – Layout & Preliminary Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfill Remediation

UNIT IV HAZARDOUS WASTE MANAGEMENT (9)

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure, Remediation, risk assessment.

UNIT V ENERGY GENERATION FROM WASTE (9)

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, Energy recovery systems. Biological & Chemical conversion technologies – Aerobic composting, low solids. Anaerobic digestion, high solids anaerobic digestion, Energy production from biological conversion products, other biological transformation processes. Chemical transformation processes.

Total: 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dara.S.S,Mishra.D.D	A Text book of Environmental Chemistry and Pollution Control	S.Chand and Company Ltd., New Delhi.	2011

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Naomi B. Klinghoffer and Marco J. Castaldi	Waste to Energy Conversion Technology (Woodhead Publishing Series in Energy)	Woodhead Publishing Ltd., Cambridge, UK	2013
2.	Frank Kreith, George Tchobanoglous	Hand Book of Solid Waste Management- 2nd edition	McGraw Hill Publishing Ltd., Newyork	2002
3.	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall (P) Ltd., New Delhi.	1999

WEBSITES:

1.www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.

2.http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/

3.www.alternative-energy-news.info/technology/garbage-energy/

16BTSHOE06 GREEN CHEMISTRY 3 0 0 3 100

OBJECTIVES:

- To make the students conversant about the green chemistry
- To make the student acquire sound knowledge of the atom efficient process and synthesis elaborately.
- To acquaint the student with concepts of green technology.
- To develop an understanding of the basic concepts of renewable energy resources.
- To acquaint the students with the basics information on catalysis.
- To understand the chemical principles in in field of engineering and technology

COURSE OUTCOMES:

- Outline the basic principles of green chemistry (K).
- Examine the different atom efficient process and synthesis elaborately (S).
- Apply the concepts combustion of green technology (S).
- Identify and apply the concepts of renewable energy (S).
- Apply the concepts of green catalysts in the synthesis (S).
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO GREEN CHEMICAL PRINCIPLES (9)

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

UNIT II ATOM EFFICIENT PROCESSES (9)

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

UNIT III BIO TECHNOLOGY AND GREEN CHEMISTRY (9)

Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

UNIT IV RENEWABLE RESOURCES (9)

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

UNIT V CATALYSIS IN GREEN CHEMISTRY (9)

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Sanjay K. Sharma, AckmezMudhoo	Green Chemistry for Environmental Sustainability	CRC Press , London	2010
2.	Ahluwalia V. K. and M.Kidwai	New Trends in Green Chemistry 2nd edition	Anamaya publishers., New Delhi.	2007

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons., New Delhi.	2012
2.	Mukesh Doble. Ken Rollins, Anil Kumar	Green Chemistry and Engineering, 1st edition	Academic Press, Elesevier., New Delhi.	2007
3.	Desai K. R.	Green Chemistry	Himalaya Publishing House, Mumbai.	2005
4.	Matlack A. S.	Introduction to Green Chemistry	Marcel Dekker: New York	2001

WEBSITES:

1.http://www.organic-chemistry.org/topics/green-chemistry.shtm

2.http://www.essentialchemicalindustry.org/processes/green-chemistry.html

3. http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm

4. http://www.epa.gov/research/greenchemistry/

16BTSHOE07 APPLIED ELECTROCHEMISTRY 3 0 0 3 100

OBJECTIVES:

- To make the students conversant with the information on electrochemical material.
- To make the student acquire sound knowledge of conducting polymers.
- To acquaint the student with concepts of Energy storage devices.
- To develop energy storage devices.
- To impart knowledge on basic principles of solar cells and its applications
- To understand about electrochemical material science

COURSE OUTCOMES:

- Outline the basic principles of chemistry in **electrochemical material (K).**
- Examine the properties of conducting polymers (S).
- Apply the concepts of electrochemistry in storage devices. (S)
- Identify the concepts of storage devices and its applications. (S)
- Apply the suitable materials for the manufacturing of storage devices. (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I METAL FINISHING (9)

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electro plating for electronic industry- Alloy plating, brass plating-Electro less plating of nickel- anodizing – Electroforming – Electro winning.

UNIT II CONDUCTING POLYMERS AND ELECTROCHEMICALS (9)

Lector polymerization- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene-Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNIT III BATTERIES AND POWER SOURCES-I (9)

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNIT IV BATTERIES AND POWER SOURCES-II (9)

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

UNIT V ELECTROCHEMICAL MATERIAL SCIENCE (9)

Solar cells- Preparation of CdS/Cu_2S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO N
1.	Cynthia G. Zoski	Hand Book of Electrochemistry	Academic Press, Elesevier., UK	2007
2.	D.Pletcher and F.C.Walsh	Industrial Electrochemistry	Chapman and Hall, London	1990

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATI ON
1.	M. Barak	Electrochemical Power Sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
2.	Bruno Scrosati	Applications of Electroactive Polymers	Chapman & Hall, London	1993
3.	K.L. Chopra and I. Kaur	Thin Film Devices and their Application	Plenum Press, New York.	1983
4.	M.M.Baizer	Organic Electrochemistry	Dekker Inc. New York	1983

WEBSITES:

1. http://www.anoplate.com/finishes/
2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html

16BTSHOE08 INDUSTRIAL CHEMISTRY 3 0 0 3 100

OBJECTIVES:

- To make the students conversant with cement and lime and its uses.
- To make the student acquire sound knowledge of abrasives and refractories.
- To acquaint the student with concepts of inorganic chemicals.
- To develop an understanding of the basic concepts explosives.
- To acquaint the students with the basics of agriculture chemicals.
- To understand the chemical principles in in field of engineering and technology

COURSE OUTCOMES:

- Outline the basic chemistry of **cement and lime (K).**
- Examine the uses of abrasives and refractories (S).
- Identify the usage of the inorganic chemicals. (S)
- Identify the concepts of explosives and smoke screens (S).
- Identify the usage of the **agriculture** chemicals (S).
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A).

UNIT I CEMENT AND LIME (9)

Manufacture of Portland cement – settling of hardening of port land cement – re gauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials- manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – Magnesian lime – dolomitic lime – hydraulic lime.

UNIT II ABRASIVES AND REFRACTORIES (9)

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories – definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

UNIT IIIINORGANIC CHEMICALS (9)

Common salt and soda ash – manufacture – different grades – products – alkalis – Na_2CO_3, caustic soda and color-alkali industry – manufacture principles of electrolytic process – chlorine – storage. Hydrochloric acid – manufacture – absorption – uses, Sulphur and sulphuric acid – extraction of Sulphur – manufacture of H_2SO_4 – chamber – contact processes – industrial uses.

UNIT IV EXPLOSIVES (9)

Explosives – uses – properties and tests – explosives for war – nitrocellulose – picric acid and T.N.T. – industrial explosives – nitroglycerin and dynamites – black powder – smoke screens – incendiaries – gas mask.

UNIT V AGRICULTURE CHEMICALS (9)

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Hari krishan	Industrial Chemistry	Goel Publishing House, Meerut.	2014
2.	B.K. Sharma	Industrial Chemistry	Goel Publishing House, Meerut.	2000

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH Publishing CO. New Delhi.	1998
2.	James A. Kent	Hand Book of Industrial Chemistry, 9th edition	Van Nostrand Reinhold, New York.	1992
3.	R.N. Sherve	Chemical Process Industries	McGraw-Hill, Kugakuisha Ltd., Tokyo.	1984
4.	S.D. Shukla and G.N. Pandy	A Text book of Chemical Technology	Vikas Publishing House (P) Ltd, New Delhi.	1979

WEBSITES:

1.http://en.wikipedia.org/wiki/Cement

2. http://www.hon.ch/HONselect/Selection/D01.html

3. http://fas.org/man/dod-101/navy/docs/fun/part12.htm

LIST OF OPEN ELECTIVES OFFERED BY

COMPUTER SCIENCE ENGINEERINGDEPARTMENT

16BECSOE01 INTERNET PROGRAMMING 3 0 0 3 100

Course Objectives:

- To introduce the Java programming language and explore its current strengths and Weaknesses
- To study the way that object-oriented concepts are implemented in the Java programming language
- To write working Java code to demonstrate the use of applets for client side programming
- To study the way that exceptions are detected and handled in the Java programming language
- To write working Java code that demonstrates multiple threads of execution
- To understand about various Internet applications

Course outcome:

- Know Java programming language and explore its current strengths and Weaknesses
- Explain about object-oriented concepts
- Learn Java code to demonstrate the use of applets for client side programming
- To study the way that exceptions are detected and handled in the Java programming language
- know Java code that demonstrates multiple threads of execution
- use various Internet applications

UNIT I INTRODUCTION **9**

Introduction - Network of Networks, Intranet, Extranet and Internet. World Wide Web- Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. TCP/IP- Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Sub netting and addressing- Classful and Classless Addressing, Sub netting

UNIT II HTML **9**

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Color name, Color value. Image Maps- map, area, attributes of image area- Extensible Markup Language (XML)- Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts- Introduction- Environment Variable, GET and POST Methods.

UNIT III PERL **9**

Introduction, Variable, Condition, Loop, Array, implementing data structure, Hash, String, Regular Expression, File handling, I/O handling- JavaScript- Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies- Definition of cookies, Create and Store a cookie with example. Java Applets-Container Class, Components, Applet Life Cycle, Update method, Applications.

UNIT IV Client-Server programming **9**

Client-Server programming in Java - Java Socket, Java RMI. Threats - Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks- Network security techniques- Password and Authentication- VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH). Firewall- Introduction, Packet filtering, Stateful, Application layer, Proxy.

UNIT V INTERNET TELEPHON 9

Introduction, VoIP- Multimedia Applications- Multimedia over IP: RSVP, RTP, RTCP and RTSP-Streaming media, Codec and Plugins, IPTV- Search Engine and Web Crawler- Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

TOTAL:45

TEXT BOOKS:

1. Paul Deitel, Harvey Deitel and Abby Deitel, "Internet and World Wide Web- How to Program", 5th Edition, 2011.

2. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.

REFERENCES:

1. Rahul Banerjee, Internetworking Technologies, An Engineering Perspective, PHI Learning, Delhi, 2011.

2. Robert W. Sebesta, "Programming the World Wide Web", Pearson Education, 2016

16BECSOE02 **MULTIMEDIA AND ANIMATION**

3003 100

COURSE OBJECTIVE:

- To study the graphics techniques and algorithms
- To study the multimedia concepts and various I/O technologies.
- To enable the students to develop their creativity
- To impart the fundamental concepts of Computer Animation and Multimedia.
- To understand Techniques of Animation
- To Learn about different 3D Animation

COURSE OUTCOMES:

After the course the student will be able to:

- Get Familiarised With Animation
- Types Of 3D Animation
- Know about motion caption
- Work With The Timeline And Tween-Based Animation
- Learn about 3D Animation
- Master the techniques of computer animation and multimedia

UNIT I Introduction **9**

What is mean by Animation – Why we need Animation – History of Animation– Uses of Animation
– Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects -Creating Animation.

UNIT II Creating Animation in Flash **9**

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers - Action script.

UNIT III 3D Animation & its Concepts **9**

Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation.

UNIT IV Motion Caption **9**

Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage – Different Language of Script Animation Among the Software.

UNIT V Concept Development **9**

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

TOTAL: 45

Text Books:

1. Computer Graphics, Multimedia and Animation-Malay K. Pakhira,PHI Learning PVT Ltd,2010

References:

1. Principles of Multimedia – Ranjan Parekh, 2007, TMH. (Unit I, Unit V)
2. Multimedia Technologies – Ashok Banerji, Ananda Mohan Ghosh – McGraw Hill Publication.
3. Encyclopedia of Multimedia and Animations-Pankaj Dhaka, Anmol Publications-2011

16BECSOE03 PC HARDWARE AND TROUBLE SHOOTING 3 0 0 3 100

COURSE OBJECTIVES:

- Assemble/setup and upgrade personal computer systems
- Perform installation, configuration, and upgrading of microcomputer hardware and software.
- Install/connect associated peripherals.
- Diagnose and troubleshoot microcomputer systems hardware and software, peripheral equipment.
- Know Multitasking and Multiprogramming
- Familiarise Various Types of faults

COURSE OUTCOMES

After the course student will be able to:

- Familiarise Special Peripherals.
- Know Computer Organization
- Know about Memory Space
- Familiarise Motherboard Logic
- Know Programmable LSI's
- Know about Data Recovery

UNIT I Introduction 9

Introduction - Computer Organization – Number Systems and Codes – Memory – ALU – CU – Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques – Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC and User.

UNIT II Peripheral Devices 9

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices – FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNIT III PC Hardware Overview 9

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC.

UNIT IV Installation and Preventive Maintenance 9

Introduction – system configuration – pre installation planning – Installation practice – routine checks – PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery.

UNIT V Troubleshooting 9

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LSI's – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.

Text Books:

1. B. Govindarajalu, “IBM PC Clones Hardware, Troubleshooting and Maintenance”, 2/E, TMH, 2002.

References:

1. Peter Abel, Niyaz Nizamuddin, “IMB PC Assembly Language and Programming”, Pearson Education, 2007
2. Scott Mueller, “Repairing PC's”, PHI, 1992

16BECSOE04 JAVA PROGRAMMING 3 0 0 3 100

COURSE OBJECTIVES:

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development.
- Have the ability to write a computer program to solve specified problems.
- Be able to use the Java SDK environment to create, debug and run simple Java programs
- To understand Object oriented programming concepts

COURSE OUTCOMES:

After the course student will be able to:

- Familiar with programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java and work with 2D shapes
- Be familiar with Arrays – Strings - Packages
- Have the ability to write a computer program to solve specified problems.
- Work on Java SDK environment to create, debug and run simple Java programs
- To understand abstract classes

UNIT I INTRODUCTION TO JAVA

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members –constructors – finalize method

UNIT II PACKAGES

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy –polymorphism – dynamic binding – final keyword – abstract classes

UNIT III I/O STREAMS

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes.

UNIT IV EXCEPTION HANDLING

Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions – Using exceptions for debugging

UNIT V THREADS

Introduction, Creating Threads, The Life Cycle of a Thread, Thread Methods, Using Threads, Synchronization of Threads, Summary

TEXT BOOKS:

1.Cay S. Horstmann and Gary Cornell Core Java: Volume I–Fundamentals Sun Microsystems

Press 2008

REFERENCE BOOKS:

1. K. Arnold and J. Gosling The JAVA programming language Third edition, Pearson Education, 2009.
2. Timothy Budd Understanding Object-oriented programming with Java Updated Edition, Pearson Education 2002.
3. C. Thomas Wu An introduction to Object-oriented programming with Java Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2008

WEBSITES:

http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/

http://www.winprog.org/tutorial/msvc.html
http://www.tutorialized.com/tutorials/Visual-C/1

http://www.freeprogrammingresources.com/visualcpp.html

LIST OF OPEN ELECTIVES OFFERED BY

ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT

16BEEEOE01 ELECTRIC HYBRID VEHICLES L T P C 3 0 0 3

COURSE OBJECTIVES:

- To understand the basic concepts of electric hybrid vehicle.
- To gain the knowledge about electric propulsion unit.
- To understand and gain the knowledge about various energy storage devices.
- To know the concept of electric hybrid vehicle
- Understand the various energy storage schemes
- Know about the various fuel efficiency schemes

COURSE OUTCOMES:

- At the end of the course the student will be understand the concept of electric hybrid vehicle and its energy storage schemes.
- Battery based energy storage and its analysis,
- Familiarise Fuel Cell based energy storage and its analysis
- Super Capacitor based energy storage and its analysis,
- Understand Flywheel based energy storage and its analysis,
- Know Hybridization of different energy storage devices.

UNIT I INTRODUCTION 9

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II HYBRID ELECTRIC DRIVE-TRAINS 9

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT 9

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE 9

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENT STRATEGIES 9

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

TOTAL: 45

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press – 2nd edition	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	Standards media – 2nd edition	2009
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley – 2nd edition	2012

16BEEEOE02 ENERGY MANAGEMENT AND ENERGY AUDITING 3 0 0 3 100

Course Objectives:

To gain the knowledge about energy management.

- To understand the basic concepts in economic analysis in energy management.
- To understand the basic principles of energy audit.
- To gain the knowledge about the basic concept of types of Energy Audit
- To gain and Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- To study about the behaviour changes of PF requirement in motor currents

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the concept of Energy Management.
- Analyze the different methods for economic analysis
- Knowledge about the basic concept of Energy Audit and types.
- Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- Investigate the different methods to improve power factor.

UNIT I ENERGY MANAGEMENT 9

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS 9

Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worth method.

UNIT III BASIC PRINCIPLES OF ENERGY AUDIT 9

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT IV ENERGY EFFICIENT MOTORS 9

Electric Motors: Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation –over motoring – motor energy audit-

Energy conservation: Importance-energy saving measures in DG set-fans and blower's pumps- air conditioning system- energy efficient transformers.

UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS 9

Power factor - methods of improvement, location of capacitors, p.f with nonlinear loads, effect of harmonics on p.f,- p.f motor controllers –Energy efficient lighting system design and practice- lighting control– Measuring Instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLCs.

TOTAL: 45

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Murphy W.R. and G.Mckay Butter worth	Energy Management	Heinemann Publications	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John.C.Andreas	Energy Efficient Electric Motors	Marcel Dekker Inc Ltd – 3rd edition	2005
2	W.C.Turner Steve Doty	Energy Management Handbook	Lulu Enterprises, Inc. - 8th Edition Volume II	2013

16BEEEOE03 PROGRAMMABLE LOGIC CONTROLLER 3 0 0 3 100

Course Objectives

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To gain the knowledge of storage techniques in PLC
- To acquire the knowledge about how to handle the data and functions
- To study about flow charts of ladder and spray process system
- To understand the principles of PID.

Course Outcome

- At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.
- To acquire the knowledge of storage techniques in PLC
- Students know how to handle the data and functions
- Students known about advanced controller in PLC applications
- Students gather real time industrial application of PLC
- Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION 9

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING 9

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS 9

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS 9

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES 9

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	JR Hackworth and F.D Hackworth – Jr	Programmable Logic Controllers – Programming Method and Applications	Pearson	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	2004
2	W.Bolton	Programmable Logic controller	Elsevier Newnes Publications, 5th Edition	2009

WEBSITE

http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logic controller

16BEEEOE04 RENEWABLE ENERGY RESOURCES L T P C 3 0 0 3

Course Objectives

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
- To study about solar energy collectors and its storages
- To study about the inter connected system in wind power
- To understand the basic principles fuel cell, Geo thermal power plants.
- To gain the knowledge about hydro energy.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Analyze the Energy Scenario in india
- Understand the concept of Solar Energy
- Understand the concept of Wind Energy
- Understand the concept of Hydro Energy
- Analyze the different energy sources
- Students gathered the real time inter connected system modelling in wind power

UNIT I INTRODUCTION 9

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

UNIT II SOLAR ENERGY

9

Introduction to solar energy: solar radiation, availability, measurement and estimation– Solar thermal conversion devices and storage – solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

UNIT III WIND ENERGY

9

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNIT IV HYDRO ENERGY 9

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V OTHER SOURCES 9

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rai.G.D	Non-conventional sources of energy	Khanna publishers	2011
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rao.S. &Parulekar	Energy Technology	Khanna publishers, Eleventh Reprint	2013
2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis – 3rd edition	2015

WEBSITES

1. www.energycentral.com
2. www.catelelectricpowerinfo.com

LIST OF OPEN ELECTIVES OFFERED BY

ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT

16BEECOE01	**REAL TIME EMBEDDED SYSTEMS**	**L T P C** **3 0 0 3**	**100**

Course Objectives

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing
- To study about memory management
- To imparts knowledge on

Course Outcomes

At the end of the course the students will be able to

- Understand overview of embedded systems architecture
- Acquire knowledge on embedded system, its hardware and software.
- Gain knowledge on overview of Operating system
- Discuss about task Management
- Gain knowledge about semaphore management and message passing.
- Gain knowledge about memory management.

UNIT-I INTRODUCTION TO EMBEDDED SYSTEM 9

Introduction- Embedded systems description, definition, design considerations &requirements-Overview of Embedded SystemArchitecture (CISC and RISC)-Categories of Embedded Systems-embedded processor selection &tradeoffs- Embedded design life cycle -Product specifications-hardware / software partitioning- iterations and implementation- hardware software integration – product testing techniques–ARM7.

UNIT-II OPERATING SYSTEM OVERVIEW 9

Introduction–AdvantageandDisadvantageofUsingRTOS–Multitasking–Tasks-RealTimeKernels – Scheduler- Non-Preemptive Kernels – Preemptive Kernels – Reentrancy- ReentrantFunctions–Round Robin Scheduling- Task Priorities- Static Priorities– Mutual Exclusion–Deadlock– Inter task Communication–Message Mailboxes–Message Queues- Interrupts- TaskManagement–Memory Management-Time Management–Clock Ticks.

UNIT-III TASK MANAGEMENT 9

Introduction-µ C/OS-II Features-Goals ofµ C/OS-II-Hardware and Software Architecture–Kernel Structures: Tasks–Task States–Task Scheduling–Idle Task–Statistics Task–Interrupts Under µC/OS-II –Clock Tick-µ C/OS- II Initialization. Task Management: Creating Tasks–Task Stacks–StackChecking–Task'sPriority–SuspendingTask–ResumingTask.TimeManagement: Delaying aTask–Resuming a Delayed Task–System Time. Event Control Blocks-Placing a Task in the ECB Wait List–Removing a Task from an ECB wait List.

UNIT-IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING 9

Semaphore Management: Semaphore Management Overview– Signaling a Semaphore.

MessageMailbox Management: Creating a Mailbox –Deleting Mailbox–Waiting for a Message box–Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue– Deleting a Message Queue–Waiting for a Message Queue–Sending Message to a Queue– Flushing a Queue.

UNIT-V MEMORY MANAGEMENT **9**

Memory Management: Memory Control Blocks–Creating Partition-Obtaining a Memory Block–Returning a Memory Block. Getting Started withμ C/OS-II–Installingμ C/OS-II–Portingμ C/OS-II:Development Tools–Directories and Files– Testing a Port -IAR Workbench withμ C/OS-II-μ C/OS- II Porting on a 8051CPU– Implementation of Multitasking- Implementation of Scheduling andRescheduling –Analyze the Multichannel ADC with help ofμ C/OS-II.

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	JeanJ. Labrosse	Micro C/OS–II The Real Time Kernel	CMPBOOKS	2009
2	David Seal	ARM Architecture Reference Manual.	Addison-Wesley	2008
3	Steve Furbe,	ARM System-on-Chip Architecture,	Addison-Wesley Professional, California	2000

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	K.V.K.K.Prasad	Embedded Real-Time Systems: Concepts, Design & Programming	Dream Tech Press	2005
2	Sriram V Iyer, Pankaj Gupta	Embedded Real Time Systems Programming	Tata McGraw Hill	2004

16BEECOE02 CONSUMER ELECTRONICS L T P C 100
3 0 0 3

Course Objectives

- To study about various speakers and microphone
- To learn the fundamental of television systems and standards
- To learn the process of audio recording and reproduction
- To study various telephone networks
- To discuss about the working of home appliances
- To familiarize with TV services like ISDN.

Course Outcomes

At the end of the course the students will be able to

- Understand working of various type of loud speakers
- Acquire knowledge on various types of picture tubes
- Demonstrate the working of various optical recording systems
- Distinguish various standards for color TV system
- Acquire knowledge on various telecommunication networks
- Demonstrate the working of various home appliances

UNIT I LOUDSPEAKERS AND MICROPHONES 9

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters – Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNITII TELEVISION STANDARDS AND SYSTEMS 9

Components of a TV system–interlacing–composite video signal.Colour TV– Luminance and Chrominance signal; Monochrome and Colour Picture Tubes- Color TV systems– NTSC, PAL, SECAM-Components of a Remote Control.

UNITIII OPTICAL RECORDING AND REPRODUCTION 9

Audio Disc– Processing of the Audio signal–readout from the Disc –Reconstruction of the audio signal–Video Disc–Video disc formats- recording systems–Playback Systems.

UNITIV TELECOMMUNICATION SYSTEMS 9

Telephone services-telephone networks–switching system principles–PAPX switching–Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network.Wireless Local Loop.VHF/UHF radio systems, Limited range Cordless Phones; cellular modems.

UNITV HOME APPLIANCES 9

Basic principle and block diagram of microwave oven; washing machine hardware and software;

Components of air conditioning and refrigeration systems.

Total Hours: 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	S.P. Bali	Consumer Electronics	PearsonEducation	2007
2	J.S.Chitode	Consumer Electronics	Technical Publications	2007

REFERENCE:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Philip Hoff,Philip Herbert Hoff.	Consumer Electronics for Engineers.	Cambridge University Press	1998

16BEECOE03 NEURAL NETWORKS AND ITS APPLICATIONS L T P C 100
3 0 0 3

Course Objectives

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.
- To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
- To gain exposure in the field of neural networks and relate the human neural system into the digital world
- To provide knowledge of computation and dynamical systems using neural networks

Course Outcomes

At the end of the course the students will be able to

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks
- Apply perception concept in design
- Design using ART phenomena
- Gain knowledge on SOM concepts
- Ability to develop the use of Soft Computing to solve

UNIT I INTRODUCTION TONEURAL NETWORKS 9

Introduction-biological neurons and their artificial models-learning, adaptation and neural network's learning rules-types of neural networks-single layer, multiple layer-feed forward, feedback networks

UNIT II LEARNING PROCESS 9

Error– correction learning– memory based learning- hebbian learning-competitive learning-Boltzmann learning-supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT III PERCEPTION 9

Single layer Perception-Adaptive filtering-unconstrained Optimization-Least-mean square algorithm- Leaning Curve-Annealing Technique-perception convergence Theorem-Relationship between perception and Baye’s Classifier-Back propagation algorithm

UNIT IV ATTRACT OR NEURAL NETWORK AND ART 9

Hopfield model-BAM model -BAM Stability-Adaptive BAM -Lyapunov function-effect of gain-Hopfield Design-Application to TSP problem-ART-layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP.

UNIT V SELF ORGANIZATION 9

Self-organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical Vector Quantization. Applications of self-organizing maps: The Neural Phonetic Type Writer Learning Ballistic Arm Movements.

Total Hours: 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SimonHaykin	Neural Networks and Learning Machines 3rd Edition	Pearson/Prentice Hall	2009
2	SatishKumar	Neural Networks: A Classroom Approach	TMH	2008

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Rajasekaran.S, VijayalakshmiPai. G.A	Neural Networks, Fuzzy Logic and Genetic Algorithms,	PHI, New Delhi.	2003
2	LaureneFausett	Fundamentals of Neural Networks: Architectures, Algorithms, and Applications	Pearson/PrenticeHall	1994
3	Wasserman P.D	Neural Computing Theory & Practice	Van Nortrand Reinhold	1989
4	Freeman J.A., S kapura D.M	Neuralnetworks, algorithms, applications, and programming techniques.	AdditionWesley	2005

16BEECOE04 FUZZY LOGIC AND ITS APPLICATIONS L T P C 100
3 0 0 3

Course Objectives

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.
- Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
- To learn about applications on Fuzzy based systems
- To familiarize with fuzzy fiction and de fuzzy fiction procedures

Course Outcomes

At the end of the course the students will be able to

- Understand the basic concepts of Fuzzy logic and its applications in various domain
- Gain knowledge on theory of Reasoning
- Develop fuzzy controllers
- Understand concepts of adaptive fuzzy control
- Ability to develop how to use Fuzzy computation to solve real- world problems
- Design fuzzy based model for any application

UNITI 9

Basics of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT II 9

Theory of Approximate Reasoning: Linguistic variables, Fuzzy proportions, Fuzzy if-then statements, inference rules, compositional rule of inference-fuzzy models

UNIT III 9

Fuzzy Knowledge Based Controllers (Fkbc): Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzy fiction and de fuzzy fiction procedures–Design of Fuzzy
Logic Controller

UNIT IV 9

Adaptive Fuzzy Control: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

UNIT V 9

Fuzzy based systems: Simple applications of FKBC-washing machines-traffic regulations-lift control-fuzzy in medical Applications-Introduction to ANFIS.

Total Hours: 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	D .Diankar ,H. Hellendoom and M .Rein frank	An Introduction to Fuzzy Control	Narosa Publishers India	1996
2	G.J. KlirandT.A. Folger	Fuzzy Sets Uncertainty and Information	PHI IEEE	1995

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Timothy J. Ross	Fuzzy Logic with Engineering Applications	McGraw Hill	1997
2	George. J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic	Prentice Hall, USA	1995

OPEN ELECTIVES
(COURSES OFFERED BY OTHER DEPARTMENTS)
BIO TECHNOLOGY

16BTBTOE01 BIOREACTOR DESIGN 3003100

COURSE OBJECTIVES:

- To understand the basic design of bioreactors
- To understand the principle of heat transfer inside a bioreactor
- Design of various reactors
- Study various mass transfer equipments
- Learn about cylindrical storage tnks and various applications
- Design of plate and frame filters

COURSE OUTCOMES:

After completion of this course students will be able to

- Design bioreactors for various operations.
- Select the appropriate separation equipment based on the nature of the product.
- Familiarise mass transfer equipments
- Work with cylindrical storage tnaks and know various applications
- Design of plate and frame filters in reactors
- Know varius separation equipments

UNITI ENGINEERINGPROPERTIES AND STORAGE TANK (9)

Introduction to various mechanical properties of material to be used material of construction, design of cylindrical storage tank.

UNITII REACTOR DESIGN (9)

Design of Airlift fermentor, Bubble column reactor and Continuous stirred tank reactor.

UNITIII HEATTRANSFER EQUIPMENTS (9)

Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulation evaporator.

UNITIV MASSTRANSFER EQUIPMENTS (9)

Design of Bollman extractor, fractionating column, packed tower and spray tray absorber

UNITV SEPERATIONEQUIPMENTS (9)

Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rotartdrum drier and Swenson–walker crystallizer.

TEXTBOOKS:

S.No	Author(s)Name	Title of the book	Publisher	Year o Publications
1	James Edwin Bailey, DavidF.Ollis	Biochemical Engineering Fundamentals	McGraw-Hill	2007
2	DonW.Green,RobertH. Perry	Chemical Engineer Handbook	The McGraw-Hill Companies	2008

REFERENCE BOOKS

S.No	Author(s)Name	Title of the book	Publisher	Year of Publications
1	Pauline.M.Doran	Bioprocess Engineering Principles	Academic Press	2013

16BTBTOE02 FOOD PROCESSING AND PRESERVATION 3003100

OBJECTIVES:

- To understand the importance of food processing
- To make the students learn the various processing and preservation techniques.
- Understand various Pasteurization and Freezing techniques
- Learn about Infrared radiation processing-
- Concepts andequipment used. In various food processing methods
- Learn about preservation of fruits and vegetables

INTENDED OUTCOMES:

The students are exposed to

- Properties off Food materia
- Various methods used for preserving Fruits and vegetables
- Learn about chemical preservation
- Know food preservation by cooling methods
- Learn about Food irradiation
- Understand fermentation techniques

UNITI SCOPE AND IMPORTANCE OF FOOD PROCESSING (9)

Properties of food- Physical, thermal, mechanical, sensory. Raw material Preparation -Cleaning, sorting, grading, peeling.

UNITII PROCESSING METHODS (9)

Heating- Blanching and Pasteurization. Freezing - De hydration- canning- additives- fermentation- extrusion cooking -hydrostatic pressure cooking- dielectric heating- micro wave processing and aseptic processing –Infrared radiation processing- Concepts and equipment used.

UNITIII FOOD CONVERSION OPERATIONS (9)

Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membraneseparation-filtration-equipmentand application.

UNITIV FOOD PRESERVATION BY COOLING (9)

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Water activity, methods to control water activity.

UNITV PRESERVATION METHODS FOR FRUITS ANDVEGETABLES (9)

Preprocessingoperations - preservation by reduction of water content: drying / dehydration and concentration –chemical preservation –preservation of vegetables by acidification, preservation with sugar - Heat preservation– Food irradiation- Combined preservation techniques.

TEXT BOOKS

S.No	Author(s)Name	Title of the book	Publisher	Year of Publications
1	R.PaulSingh,DennisR. Heldman	Introduction to food Engineering.	Academic Press	2001
2	P.Fellows.	Food Processing Technology, Principles and practice.	Wood head Publishing Ltd	2000
3	MirceaEnachescuDauthy	Fruit and Vegetable Processing	FAO agricultural services	1995

REFERENCEBOOKS

S.No	Author(s)Name	Title of the book	Publisher	Year of Publications
1	M.A. Rao, Syed S.H. Rizvi, AshimK.Datta	Engineering properties Of foods	CRC Press	2005
2	B.Sivasankar	Food processing and preservation	PHI Learning Pvt.Ltd	2002

16BTBTOE03 **BASIC BIO INFORMATICS** **3003100**

Course Objectives

- To understand the available tools and databases for performing research in bioinformatics.
- To expose students to sequence alignment tool inbioinformatics.
- To construct the phylogenetic trees forevolution.
- To get familiar with the 3D structure of protein andclassification.
- To acquire basic knowledge in protein secondary structureprediction.
- To extend the brief knowledge in Micro array dataanalysis.

Course Outcomes

- Summarize the basic concepts and importance of Bioinformatics in varioussectors.
- Demonstrate the sequence alignment tool inbioinformatics.
- Construct the phylogenetic trees forevolution.
- Analyze the three dimensional protein structure and classification using varioustools.
- Illustrate the protein secondary structure prediction by comparativemodeling.
- Extend the knowledge in micro array technology and applications of bioinformatics in varioussectors.

UNITI OVERVIEW OFBIOINFORMATICS (9)

The scope of bio informatics; bio informatics & the internet; useful bio informatics sites. Data acquisition: sequencing DNA, RNA & proteins; determination of protein structure; gene & protein expression data; protein interaction data. Databases–contents, structure & annotation: file formats; annotated sequence databases; miscellaneous databases.

UNITII RETRIEVAL OF BIOLOGICAL DATA (9)

Data retrieval with Entrez &DBGET/ Link DB; data retrieval with SRS (sequence retrieval system).Searching sequence databases by sequence similarity criteria: sequence similarity searches; amino acid substitution matrices ; database searches, FASTA & BLAST; sequence filters; iterative database searches &PSI-BLAST .Multiple-sequence alignment, gene & protein families: multiple-sequence alignment & family relationships; protein families & pattern databases; protein domain families.

UNITIII PHYLO GENETICS (9)

Phylogenetic, cladistics &ontology; building phylogenetic trees; evolution of Macro molecular sequences. Sequence annotation: principles of genome annotation; annotation tools & resources.

UNITIV STRUCTURAL BIOINFORMATICS (9)

Conceptual models of protein structure; the relationship of protein three-dimensional structure to protein function; the evolution of protein structure & function; obtaining, viewing & analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure: CATH &SCOP; introduction to protein structure prediction; structure prediction by comparative modeling; secondary structure prediction; advanced protein structure prediction & prediction strategies.

UNITV MICROARRAYDATAANALYSIS (9)

Microarray data, analysis methods; microarray data, tools & resources; sequence sampling &SAGE. Bioinformatics in pharmaceutical industry: informatics &drug discovery; pharma informatics resources. Basic principles of computing in bio informatics: running computer software; computer operating systems; software downloading &installation; data base management.

TEXTBOOK

S.No.	Author (s) Name	Title of the book	Publisher	Year of Publication
1	Dan E. Krane,Micha L.Rayme	Fundamental Concepts of Bioinformatics	Pearsoneducation	2004
2	Andreas D. Baxevanis,B. F.Francis Ouellette	Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins	Wiley-Inter science	2004
3	David W. Mount	Sequence and GenomeAnalysis	Cold Spring Harbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

REFERENCEBOOKS

S.No.	Author (s) Name	Title of thebook	Publisher	Year of Publication
1	Michael J. Korenberg	Microarray Data Analysis: Methods and Applications	SpringerScience&BusinessMedia	2007

16BTBTOE04 FUNDAMENTALS OF NANO BIOTECHNOLOGY 3003100

Course Objectives

- To impart the skills in the field of nano biotechnology and itsapplications.
- To acquire knowledge in the nano particles and its significance in variousfields.
- To extend the knowledge in types and application of nano particles insensors.
- To define the concepts of biomaterials through molecular selfassembly.
- To equip students with clinical applications of nanodevices.
- To describe deeper understanding of the socio-economic issues innanobiotechnology.

Course Outcomes

- Develop skills in the field of nano biotechnology and itsapplications.
- Summarize the nanoparticles and its significance in variousfields.
- Extend the knowledge in types and application of nano particles insensors.
- Define the concepts of biomaterials through molecular selfassembly.
- Outline the clinical applications of nanodevices.
- Describe the socio-economic issues innanobiotechnology.

UNITI INTRODUCTION (9)

Introduction, Scope and Overview, Length scales , Importance of Nano scale and Technology, History of Nanotechnology, Future of Nanotechnology :Nano Technology Revolution, Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concept, Controversies and confusions, Understanding advanced capabilities, Nanotechnology in Different,Fields:Nanobiotechnology,Materials,Medicine,Dentalcare.

UNITII NANOPARTICLES (9)

Introduction, Types of Nano particles, Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Applications, Toxic effects of Nanomaterial's, Significance of Nanoparticles Nanofabrications-MEMS/NEMS,AtomicForceMicroscopy,Selfassembledmonolayers/Dip-pen Nanolithography, Soft Lithography, PDMS Molding, Nanoparticles, Nanowires and Nanotubes.

UNITIII APPLICATIONS (9)

Nanomedicine, Nano biosensor and Nano fluidics. Nano crystals in biological detection, Electrochemical DNA sensors and Integrated Nano liter systems. Nano-Bio devices and Systems. Fabrication of Novel Biomaterials through molecular self-assembly-Small scale systems for in vivo drug delivery-Future Nano machine.

UNITIV NANO BIOTECHNOLOGY (9)

Clinical applications of Nano devices. Artificial neurons. Real-time Nano Sensors-Applicationsincancerbiology.
Nanomedicine.Syntheticretinylchipsbasedonbacteriorhodopsins. Highthroughput
DNA sequencing with Nano carbon tubules. Nano surgical devices.

UNITV ETHICAL ISSUES IN NANOTECHNOLOGY (9)

Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology: With Especial Reference to Nano medicine, Nano medicine Applied in Nonmedical Contexts, Social Issues Relating to Nano medicine. Social and Ethical Issues, Economic Impacts, Other Issues, Nano technology and Future Socio-economic challenges.

TEXT BOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Niemeyer, C.M. and Mirkin, C.A	Nano biotechnology: Concepts, Applications and Perspectives	Wiley-VCH	2004
2	Good sell, D.S.	Bio nanotechnology	John Wiley and Sons, Inc	2004

REFERENCEBOOKS

S.No.	**Author(s) Name**	**Title of the book**	**Publisher**	**Year of Publications**
1	Shoseyov,O. and Levy,I	Nano biotechnology: Bio inspired Devices and Materials of the Future	Humana Press	2007
2	Bhushan,B.	Springer Handbook of Nanotechnology	Springer-VerlagBeri Heidelberg	2004
3	FreitasJrR.A	Nano medicine	Landes	2004
4	Kohler,M.and Fritzsche,W.	Nanotechnology–An Introduction to Nano structuring Techniques	Wiley-VCH	2004

MECHANICAL ENGINEERING
OPEN ELECTIVES
(COURSES OFFERED TO OTHER DEPARTMENTS)

16BEMEOE01 COMPUTER AIDED DESIGN 3 0 0 3 100

Course Objective

1. To apply basic concepts to develop construction (drawing) techniques.
2. To ability to manipulate drawings through editing and plotting techniques.
3. To understand geometric construction and Produce template drawings.
4. To understand and demonstrate dimensioning concepts and techniques.
5. To understand Section and Auxiliary Views.
6. To become familiar with Solid Modelling concepts and techniques.

Course Outcome

1. Apply basic concepts to develop construction (drawing) techniques.
2. Ability to manipulate drawings through editing and plotting techniques.
3. Understand geometric construction and Produce template drawings.
4. Understand and demonstrate dimensioning concepts and techniques
5. Understand Section and Auxiliary Views
6. Become familiar with Solid Modelling concepts and techniques.

UNIT I OVERVIEW OF CAD SYSTEMS 9

Conventional and computer aided design processes-advantages and disadvantages. Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations. Networking of CAD systems.

UNIT II INTERACTIVE COMPUTER GRAPHICS AND GRAPHICS TRANSFORMATIONS 9

Generative, cognitive and image processing graphics. Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Two- and Three – Dimensional graphics concepts, Graphical input technique, Geometric transformations, Visual Realism, Computer animation, customizing graphics software.

UNIT III GEOMETRIC MODELING 9

Wireframe, surface, NURBS and solid modeling-applications and advantages. Creating primitive solids, sweeping solids, boolean operations. Extracting entities from a solid. Filleting of edges of solids. Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

UNIT IV PARAMETRIC DESIGN AND OBJECT REPRESENTATION 9

Types of co-ordinate systems. Parametric design - definition and advantages. Parametric representation of analytic and synthetic curves. Parametric representation of surfaces and solids - manipulations.

UNIT V PRODUCT DESIGN AND DEVELOPMENT 9

Automated 2D drafting - basics, mechanical assembly - bill of materials generation. Mass property calculations.

TOTAL HOURS 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vera B Anand	Computer Graphics and Geometric Modeling for Engineers	John Wiley & Sons, New York	2000
2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	Dhanpat Rai & Sons, New Delhi	2002
2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	William M Newman and Robert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994
5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998
6	Rao S S	Optimization Techniques	Wiley Eastern, New Delhi	2003

16BEMEOE02 INDUSTRIAL SAFETY AND ENVIRONMENT 3 0 0 3 100

Course Objective

- To recognize and evaluate occupational safety and health hazards in the workplace.
- To determine appropriate hazard controls following the hierarchy of controls.
- To analyse the effects of workplace exposures, injuries and illnesses, fatalities.
- To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
- To teach student the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
- To prevent or mitigate harm or damage to people, property, or the environment.

Course Outcome

- Recognize and evaluate occupational safety and health hazards in the workplace.
- Determine appropriate hazard controls following the hierarchy of controls.
- Analyse the effects of workplace exposures, injuries and illnesses, fatalities.
- Prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
- Understand the concept of Industrial Safety & provide useful practical knowledge for workplace safety.

- Prevent or mitigate harm or damage to people, property, or the environment

UNIT I INTRODUCTION TO LOGISTICS 9

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNIT II PHASES OF SUPPLY CHAIN 9

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAIN MODELS 9

Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain with customer.

UNIT IV SUPPLY CHAIN ACTIVITIES 9

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNIT V SCM ORGANISATION AND INFORMATION SYSTEM 9

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERP Software's

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Shari.P.B and Lassen.T.S	Managing the global supply chain	Viva books, New Delhi	2000
2	Ayers.J.B	Hand book of supply chain management	The St. Lencie press	2000

REFERENCES

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nicolas.J.N	Competitive manufacturing management - continuous improvement, Lean production, customer focused quality	McGrawHill, New York	1998
2	Steudel.H.J and Desruelle.P	Manufacturing in the nineteen - How to become a mean, lean and world class competitor	Van No strand Reinhold, New York	1992

16BEMEOE03 TRANSPORT PHENOMENA 3 0 0 3 100

Course Objective

- To generalized equations for mass, momentum and heat.
- To understand the concepts of Reynolds and Gauss theorems.
- To learn combined diffusive and convective transport.
- To apply Film- and penetration models for mass and heat transfer.
- To apply Stefan-Maxwells equations for multi-component diffusion.
- To Solve the given set of equations either analytically or numerically.

Course Outcome

- Generalized equations for mass, momentum and heat.
- Understand the concepts of Reynolds and Gauss theorems.
- Learn combined diffusive and convective transport.
- Apply Film- and penetration models for mass and heat transfer.
- Apply Stefan-Maxwells equations for multi-component diffusion.
- Solve the given set of equations either analytically or numerically.

UNIT I INTRODUCTION AND BASIC CONCEPTS 9

General overview of transport phenomena including various applications, Transport of momentum, heat and mass , Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II PROPERTIES, UNITS AND OTHER PHYSICAL PARAMETERS 9

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III MOMENTUM TRANSPORT 9

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNIT IV ENERGY TRANSPORT 9

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heat transfer

UNIT V MASS TRANSPORT 9

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion- Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

TOTAL 45

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

WEB REFERENCE

1. https://laulima.hawaii.edu/portal

16BEMEOE04 INTRODUCTION TO BIOMECHANICS 3 0 0 3 100

Course Objective

- To describe the principles of the study of human movement.
- To describe the range of factors that influence the initiation, production and control of human movement.
- To identify the body's lever systems and their relationship to basic joint movement and classification.
- To distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
- To explain joint and muscle function and the forces acting upon the human body during various sporting activities.
- To relate the different body systems necessary for human movement to occur.

Course Outcome

- Describe the principles of the study of human movement.
- Describe the range of factors that influence the initiation, production and control of human movement.
- Identify the body's lever systems and their relationship to basic joint movement and classification.
- Distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
- Explain joint and muscle function and the forces acting upon the human body during various sporting activities.
- Relate the different body systems necessary for human movement to occur.

UNIT I INTRODUCTION 9

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNIT II KEY MECHANICAL CONCEPTS 9

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY 9

Gross (Whole-Body) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups - Anthropometric Data

UNIT IV ANATOMICAL DESCRIPTION 9

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNIT V MECHANICS OF THE MUSCULOSKELETAL SYSTEM 9

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit - Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle - Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control.

TOTAL 45

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Duane Knudson	Fundamentals of Biomechanics	Springer Science+ Business Media, LLC	2007
2	C. Ross Ethier Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

OPENELECTIVES
(COURSES OFFERED TO OTHER DEPARTMENTS)
AUTOMOBILE ENGINEERING

16BEAEOE01 AUTOMOBILE ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES

- To impart knowledge on the constructional details and principle of operation of various automobile components.
- To learn the function and working of various components in transmission and drive lines.
- To study the concept and working of steering and suspension systems in an automobile.
- To give knowledge on the wheels, tyres and brakes of automobiles.
- To provide information on the current and future trends in automobiles.
- Identify and explain the types of steering system..

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

- Demonstrate the operating principles and constructional details of various automobile components.
- Explain the function and working of components in transmission and drive lines.
- Identify and explain the types of steering system.
- Identify and explain the types of suspension system.
- Classify and describe the types of wheels, tyres and brakes of automobiles.
- Discuss the current and future trends in the automobiles

UNIT-I ENGINE AND FUEL FEED SYSTEMS

Classification of Engine, construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburetor working principle, requirements of an automotive carburetor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNIT –II TRANSMISSION SYSTEMS

Requirements of transmission system. Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. Objective of the gearbox - Determination of gear ratios for vehicles. Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propeller Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

UNIT -III SUSPENSION SYSTEM

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension – Pneumatic suspension – Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

UNIT-IV BRAKES

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theory, Brake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System (ABS).

UNIT -V ELECTRICAL SYSTEM

Principle and construction of lead acid battery. Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator. Starting System and charging system.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2.	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., New Delhi	2003
3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publishes	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
2.	Crouse.W.H	Automobile Electrical Equipment", 3rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAE Inc	2001

16BEAEOE02 BASICS OF TWO AND THREE WHEELERS 3 0 0 3 100

COURSE OBJECTIVES

- The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.
- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
- Explain the servicing of two and three wheelers.

UNIT I INTRODUCTION

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS

2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburetor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHES AND TRANSMISSION

Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992.
2.	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century book house.	1988.

REFERENCES:

SL. NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M.M.Griffin.	Motor cycles from inside and outside.	Prentice Hall Inc, New Jersey.	1978.
2.	Bruce A. Johns, David D.Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAEOE03 AUTOMOBILE MAINTENANCE 3 0 0 3 100

COURSE OBJECTIVES:

- The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems in Automobile.
- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.
- Explain the fault diagnosis in the electrical and air conditioner systems

UNIT I MAINTENANCE OF RECORDS AND SCHEDULES

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF

				PUBLICATION
1.	John Doke	Fleet Management	McGraw Hill Co	1984
2.	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011
3.	Service Manuals from Different Vehicle Manufacturers			

16BEAEOE04 INTRODUCTION TO MODERN VEHICLE TECHNOLOGY 3 0 0 3 100

COURSE OBJECTIVES

- To impart knowledge on trends in the vehicle power plants.
- To learn the various advanced driver assistance systems.
- To study the working of advanced suspension and braking systems in an automobile.
- To give information about motor vehicle emission and noise pollution control.
- To provide knowledge of the vehicle telematics.
- To give information about the noise control techniques.

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

- Distinguish and describe the various modern vehicle power plant systems.
- List and explain the various driver assistant mechanisms.
- Identify and describe the working of advanced suspension and braking systems.
- Apply the knowledge of motor vehicle emission and noise pollution control.
- Describe the noise control techniques
- Describe the vehicle telematics and its applications

UNIT I TRENDS IN POWER PLANTS

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNIT II DRIVER ASSISTANCE SYSTEMS

Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti-spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNIT III SUSPENSION BRAKES AND SAFETY

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT IV NOISE & POLLUTION

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT VTELEMATICS

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

TEXT BOOKS

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	LjuboVlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001
2.	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems –Progress in Technology	Automotive Electronics Series,SAE, USA.	1998

REFERENCES

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William B Riddens	“Understanding Automotive Electronics”, 5th Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold,	“Understanding Automotive Electronics”	SAE	1998
3.	Robert Bosch,	“Automotive HandBook”, 5th Edition	SAE	2000

OPENELECTIVES
(COURSES OFFERED TO OTHER DEPARTMENTS)
CIVIL ENGINEERING

16BECEOE01 HOUSING, PLAN AND MANAGEMENT 3 0 0 3 100

COURSE OBJECTIVES

- To examine the role and tasks of basic housing policies and building bye laws
- Understand the process of integrated service delivery in the context of economic, social, environmental and institutional factors
- Analyze the Innovative construction methods and Materials
- Analyze city management strategies and strengthen the urban governance through a problem solving approach
- To know the Importance of basic housing policies and building bye laws
- To use Housing Programmes and Schemes

COURSE OUTCOME

- The students will be able to
- Know the Importance of basic housing policies and building bye laws
- Use Housing Programmes and Schemes
- Plan and Design of Housing projects
- Examine Innovative construction methods and Materials
- Know Housing finance and loan approval procedures
- Understand Construction as well as managing techniques

UNIT I INTRODUCTION TO HOUSING 9

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II HOUSING PROGRAMMES 9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organizations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems).

TOTAL HRS : 45

TEXT BOOKS

1.Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 2002.

2.Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 2001.

REFERENCES

1.Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.

2.UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 2000.

16BECEOE02 BUILDING SERVICES 3 0 0 3 100

COURSE OBJECTIVES

- Defining and identifying of eng. services systems in buildings.
- The role of eng. services systems in providing comfort and facilitating life of users of the building.
- The basic principles of asset management in a building & facilities maintenance environment
- Importance of Fire safety and its installation techniques
- To Know the principle of Refrigeration and application
- To Understand Electrical system and its selection criteria

COURSE OUTCOME

The students will be able to

- Machineries involved in building construction
- Understand Electrical system and its selection criteria
- Use the Principles of illumination & design
- Know the principle of Refrigeration and application
- Importance of Fire safety and its installation techniques
- Know the principle behind the installation of building services and to ensure safety in buildings

UNIT I MACHINERIES 9

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS 9

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN 9

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilization factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS 9

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors –

Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION 9

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

TOTAL HRS : 45

TEXT BOOKS

1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 2002.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2005.

REFERENCES

1. Philips Lighting in Architectural Design, McGraw-Hill, New York, 2000.
2 A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 2005.
3 National Building Code.

16BECEOE03 MANAGEMENT OF IRRIGATION SYSTEMS 3 0 0 3 100

OBJECTIVES

- To enable the students for a successful career as water management professionals.
- To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.
- To expose the students the need for an interdisciplinary approach in irrigation water management
- To providing a platform to work in an interdisciplinary team.
- To provide students an ability to understand the applications of mathematical and scientific concepts to analyse intricate technical, social and environmental problems in irrigation water management and finding solutions for them.
- To promote student awareness for a life-long learning process and inculcate professional ethics and codes of professional practice in water management.

OUTCOME

At the end of this the students will be in a capacity to

- Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.
- Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management
- Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach.
- Gain insight on local and global perceptions and approaches to participatory water resource management
- Learn from successes and failures in the context of both rural and urban communities of water management.
- Exposure on the use of economic concepts in irrigation development and to impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector.

UNIT I. IRRIGATION SYSTEM REQUIREMENTS 9

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNIT II. IRRIGATION SCHEDULING 9

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III. MANAGEMENT 9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV. OPERATION **9**

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V. INVOLVEMENT OF STAKE HOLDERS **9**

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL HRS : 45

TEXT BOOKS

1. Dilip Kumar Majumdar, "Irrigation Water Management – Principles and Practice", Prentice Hall of India Pvt. Ltd., New Delhi, 2000
2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi

REFERENCES

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 2000
2. Maloney, C. and Raju, K.V., "Managing Irrigation Together", Practice and Policy in India, Stage Publication, New Delhi, India, 2000

16BECEOE04 ADVANCED CONSTRUCTION TECHNOLOGY 3 0 0 3 100

OBJECTIVE:

- To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
- To study different methods of construction to successfully achieve the structural design with recommended specifications.
- To involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
- To study of construction equipment's, and temporary works required to facilitate the construction process
- To provide a coherent development to the students for the courses in sector of Advanced construction technology.
- To present the new technology of civil Engineering and concepts related Advanced construction technology.

OUTCOMES:

- Implementation of new technology concepts which are applied in field of Advanced construction.
- Different methods of construction to successfully achieve the structural design with recommended specifications.
- Application of scientific and technological principles of planning, analysis, design and management to construction technology.
- Will gain the Knowledge of construction equipment's, and temporary works required to facilitate the construction process
- Development to the students for the courses in sector of Advanced construction technology.
- The new technology of civil Engineering and concepts related Advanced construction technology.

UNIT - I MODERN CONSTRUCTION METHODS 9

Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT - II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES 9

Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines

UNIT - III MODERN CONSTRUCTION EQUIPEMENTS -I 9

Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting, Tunneling and hoisting

UNIT - IV MODERN CONSTRUCTION EQUIPEMENTS -II 9

Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant

UNIT - V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES 9

Principles and Practices of Temporary structures, Shoring, and Strutting, Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipment's

TOTAL HRS : 45

TEXT BOOKS

1.Peurifoyu , R. L., , Ledbette, W.B., Construction Planning , Equipment and Methods, Mc Graw Hill Co., 2000.

2. Antill J.M., PWD, Civil Engineering Construction, Mc Graw Hill Book Co., 2005

REFERENCE

1.Varma, M Construction Equipment and its Planning & Applications, Metropolitan Book Co., 2000

2.Nunnaly, S.W., Construction Methods and Management , Prentice – Hall, 2000

3.Ataev, S.S., Construction Technology, MIR , Pub. 2000ss

B.E. CIVIL ENGINEERING (REGULAR)

COURSE OF STUDY AND SCHEME OF EXAMINATIONS (2016 and Onwards)

SEMESTER I

SUB. CODE	TITLE OF THE COURSE	Sub. Area	PEO	PO	L	T	P	C	CIA	ESE	TOTAL	Contact Hours /week
THEORY												
16BECC101	Communicative English	HS	1	10	3	0	0	3	40	60	100	3
16BECC102	Engineering Mathematics I	BS	1	1	3	2	0	4	40	60	100	5
16BEPH103 16BECH103	Engineering Physics / Engineering Chemistry	BS	1,2	3	3	0	0	3	40	60	100	3
16BECE104	BasicCivilEngineering	ES	1	1	3	0	0	3	40	60	100	3
16BECE105A 16BECE105B	Basic Electrical and Electronics Engineering Elements of Mechanical Engineering	ES	**1**	**1**	3	0	0	3	40	60	100	3
PRACTICAL												
16BEPH111 16BECH111	Engineering Physics Laboratory/ Engineering Chemistry Laboratory	BS	1,2	3	0	0	4	2	40	60	100	4
16BECE112	EngineeringWorkshopPractice	ES	1	1	0	0	4	2	40	60	100	4
16BECE113	Computer Practice and Programming Lab	ES	1	2	1	0	4	3	40	60	100	5
TOTAL								**23**	**320**	**480**	**800**	**30**
VALUE ADDED COURSE												
16BECC151	HumanValues	MC	1	12	1	0	0	-	100	0	100	1
TOTAL CONTACT HOURS/WEEK												31

SEMESTER II

SUB. CODE	TITLE OF THE COURSE	Sub. Area	PEO	PO	L	T	P	C	CIA	ESE	TOT	Contact Hours /week
THEORY												
16BECC201A 16BECC201B	BusinessCommunication / Technical English	HS	1	10	3	0	0	3	40	60	100	3
16BECC202	Engineering Mathematics II	BS	1	11	3	2	0	4	40	60	100	5
16BEPH203 16BECH203	Engineering Physics / Engineering Chemistry	BS	1,2	3	3	0	0	3	40	60	100	3
16BECC204	Environmental Sciences	HS	3	7,12	3	0	0	3	40	60	100	3
16BECE205A 16BECE205B	Basic Electrical and Electronics Engineering / Elements of Mechanical Engineering	ES	1	1	3	0	0	3	40	60	100	3
16BECE206	Engineering Mechanics	ES	1	1	3	0	0	3	40	60	100	3
PRACTICAL												
16BEPH211 16BECH211	Engineering Physics Laboratory / Engineering Chemistry Laboratory	BS	1	1	0	0	4	2	40	60	100	4
16BECE212	EngineeringGraphics	ES	1	1	2	0	2	3	40	60	100	4
TOTAL								**24**	**320**	**480**	**800**	**28**
VALUE ADDED COURSE			1									
16BECE251	AptitudeTraining	MC		1	1	0	0	-	100	0	100	1

TOTAL CONTACT HOURS/WEEK	**29**

SEMESTERIII

SUB. CODE	TITLE OF THE COURSE	Sub. Area	PEO	PO	L	T	P	C	CIA	ESE	TOTAL	Contact Hours /week
THEORY												
16BECE301	Methods of Applied Mathematics	BS	1	1	3	2	0	4	40	60	100	5
16BECE302	Solid MechanicsI	ES	1	3	3	0	0	3	40	60	100	3
16BECE303	Mechanics of fluids	ES	1	3	3	0	0	3	40	60	100	3
16BECE304A 16BECE304B	Building Materials and Geology**(SC)**/ Equipment**(SC)**	PC	1	2	3	0	0	3	40	60	100	3
16BECE305	SurveyingI**(HC)**	PC	1	6	3	0	0	3	40	60	100	3
PRACTICAL												
16BECE311	Building PlanningandDrawingLaboratory **(HC)**	PC	1	4, 5	0	0	3	2	40	60	100	3
16BECE312	ConstructionMaterialsLaboratory **(HC)**	PC	1, 2	2	0	0	3	2	40	60	100	3
16BECE313	SurveyingPracticalI**(HC)**	PC	1	6	0	0	3	2				3
TOTAL								**22**	**320**	**480**	**800**	**26**
VALUE ADDED COURSE												
16BECE351	SoftSkills	MC	1	12	1	0	0	-	100	0	100	1
		TOTAL CONTACT HOURS/WEEK										**27**

SEMESTERIV

SUB. CODE	TITLE OF THE COURSE	Sub. Area	PEO	PO	L	T	P	C	CIA	ESE	TOTAL	Contact Hours /week
THEORY												
16BECE401	ConcreteTechnology**(HC)**	BS	1	2	3	0	0	3	40	60	100	3
16BECE402	Solid Mechanics II	ES	1	3	3	0	0	3	40	60	100	3
16BECE403	Applied Hydraulics and Machinery**(HC)**	ES	1	7	3	0	0	3	40	60	100	3
16BECE404	Mechanics of Soil **(HC)**	PC	1	3	3	0	0	3	40	60	100	3
16BECE405	SurveyingII**(HC)**	PC	1	6	3	0	0	3	40	60	100	3
PRACTICAL												
16BECE411	StrengthofMaterialsLaboratory **(HC)**	PC	1, 2	4, 9	0	0	3	2	40	60	100	3
16BECE412	Scientific Computing Laboratory	PC	1	1	2	0	2	3	40	60	100	4
16BECE413	SurveyingPracticalII**(HC)**	PC	1	6	0	0	3	2	40	60	100	3
TOTAL								**22**	**320**	**480**	**800**	**25**
VALUE ADDED COURSE												
16BECE451	Technical Presentation/Seminar	MC	1	12	1	0	0	-	100	0	100	1
TOTAL CONTACT HOURS/WEEK												**26**

SEMESTER V

SUB. CODE	TITLE OF THE COURSE	Sub. Area	PEO	PO	L	T	P	C	CIA	ESE	TOTAL	Contact Hours /week
THEORY												
16BECE501	Structural Analysis I **(HC)**	PC	1	2, 3	3	0	0	3	40	60	100	3
16BECE502	Design of RC Structures I **(HC)**	PC	1	2, 3	3	0	0	3	40	60	100	3
16BECE503A 16BECE503B	Transportation Engineering**(SC)**/High way Engineering**(SC)**	PC	1, 2	2, 3	3	0	0	3	40	60	100	3
16BECE504	Environmental Engineering I **(HC)**	PC	1, 3	6	3	0	0	3	40	60	100	3
16BECE5E--	Professional Elective I	PE	1	3	3	0	0	3	40	60	100	3
PRACTICAL												
16BECE511	Applied Hydraulics and Hydraulic Machinery Laboratory **(HC)**	PC	1, 3	7	0	0	3	2	40	60	100	3
16BECE512	Geotechnical Laboratory**(HC)**	PC	1, 3	7	0	0	3	2	40	60	100	3
16BECE513	Concrete and Highway Laboratory **(HC)**	PC	1, 2	4, 9	0	0	3	2				3
TOTAL								**21**	**320**	**480**	**800**	**24**
VALUE ADDED COURSE												
16BECE551	In-plant Training	MC	1	12	-	-	-	-	100	0	100*	-
16BECE552	Survey Camp	MC	1	6	-	-	-	-	100	0	100	-
TOTAL CONTACT HOURS/WEEK												**24**

SEMESTER VI

SUB. CODE	TITLE OF THE COURSE	Sub. Area	PEO	PO	L	T	P	C	CIA	ESE	TOTAL	Contact Hours /week
THEORY												
16BECE601	Structural Analysis II**(HC)**	PC	1	2,3	3	0	0	3	40	60	100	3
16BECE602	Design of RC Structures II**(HC)**	PC	1	2,3	3	0	0	3	40	60	100	3
16BECE603A 16BECE603B	Water Resources Engineering **(SC)**/ Irrigation Engineering**(SC)**	PC	1,3	6	3	0	0	3	40	60	100	3
16BECE604	Environmental Engineering II **(HC)**	PC	1	6	3	0	0	3	40	60	100	3
16BECE6E--	Professional Elective II	PE	1	3	3	0	0	3	40	60	100	3
16BECE6E--	Professional Elective III	PE	1	3	3	0	0	3	40	60	100	3
PRACTICAL												
16BECE611	Irrigation andEnvironmental Engineering Drawing**(HC)**	PC	1	3	0	0	3	2	40	60	100	3
16BECE612	Environmental Engineering Laboratory**(HC)**	PC	1	3	0	0	3	2	40	60	100	3
TOTAL								**22**	**320**	**480**	**800**	**24**
VALUE ADDED COURSE												
16BECE651	Computer Aided Design Laboratory	MC	1	4,5	1	0	0	-	100	0	100	1
TOTAL CONTACT HOURS/WEEK												**25**

SEMESTER VII

SUB. CODE	TITLE OF THE COURSE	Sub. Area	PEO	PO	L	T	P	C	CIA	ESE	TOTAL	Contact Hours /week
THEORY												
16BECC701	Professional Ethics, Principles of Management and Entrepreneurship Development	HS	**3**	**8**	3	0	0	3	40	60	100	3
16BECE702	Design of Steel Structures **(HC)**	PC	1	2,3	3	0	0	3	40	60	100	3
16BECE7E--	Professional Elective IV	PE	1	3	3	0	0	3	40	60	100	3
16BECE7E--	Professional Elective V	PE	1	3	3	0	0	3	40	60	100	3
	Open Elective I	OE	1	3	3	0	0	3	40	60	100	3
	Open Elective II	OE	1	3	3	0	0	3	40	60	100	3
PRACTICAL												
16BECE711	Structural Detailing and Drawing Laboratory **(HC)**	PC	1	11	0	0	3	2	40	60	100	3
16BECE791	Project Work-Phase I	PW	1,2,3	4,5,9,11	0	0	8	4	40	60	100	8
TOTAL								**24**	**320**	**480**	**800**	**29**
VALUE ADDED COURSE												
16BECE751	Planning and Execution of Civil Engineering Projects	MC	1	4,5	1	0	0	-	100	0	100	1
TOTAL CONTACT HOURS/WEEK												**30**

SEMESTER VIII

SUB. CODE	TITLE OF THE COURSE	Sub. Area	PEO	PO	L	T	P	C	CIA	ESE	TOTAL	Contact Hours /week
THEORY												
16BECE801	Estimation, Quantity Surveying and Valuation **(HC)**	PC	1	11	3	0	0	3	40	60	100	3
16BECE8E--	Professional Elective VI	PE	1	3	3	0	0	3	40	60	100	3
PRACTICAL												
16BECE891	Project Work - Phase II & Viva voce	PW	1,2,3	4,5,9,11	0	0	32	16	120	180	300	32
TOTAL								**22**	**200**	**300**	**500**	**38**
TOTAL CONTACT HOURS/WEEK												**38**

***To be evaluated internally by a committee of members**
Final report + (certificateifnecessary) – 50 marks
Final presentation andviva voce – 50marks

Total number of

L: Lecture Hour **T: Tutorial Hour** **CIA: Continuous Internal Assessment**
P: Practical Hour **C: Credit** **ESE : End semester Examination**

LIST OF ELECTIVES

PROFESSIONAL ELECTIVES (PE)

SEMESTER V
Elective I

SUB. CODE	TITLE OF THE PAPER	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
16BECE5E01	Hydrology	1,2	2,4,7,15	3	0	0	3	40	60	100
16BECE5E02	Cartography	1,2	5,6	3	0	0	3	40	60	100
16BECE5E03	Composite Materials and Structures	1,2	1,5,6	3	0	0	3	40	60	100
16BECE5E04	Foundation Engineering	1,2	2,3,4	3	0	0	3	40	60	100
16BECE5E05	Ground Water Engineering	1,2	2,3,7	3	0	0	3	40	60	100

SEMESTERVI
Elective II &III

SUB. CODE	TITLE OF THE PAPER	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
16BECE6E01	Urban Water Resources management	1,2	5,7,9	3	0	0	3	40	60	100
16BECE6E02	Ground Improvement Techniques	1,2	2,3,4	3	0	0	3	40	60	100
16BECE6E03	Building Services	1,2	1,5,6	3	0	0	3	40	60	100
16BECE6E04	Prefabricated Structures	1,2	1,9,12,15	3	0	0	3	40	60	100
16BECE6E05	Soil Pollution Engineering	1,2	2,3,4	3	0	0	3	40	60	100
16BECE6E06	Railways, Airports and Harbours	1,2	1,3,4,5,1 4	3	0	0	3	40	60	100
16BECE6E07	Repair and Rehabilitation of Structures	1,2	1,5,6	3	0	0	3	40	60	100
16BECE6E08	Municipal Solid Waste Management	1,2	4,7,11,14	3	0	0	3	40	60	100
16BECE6E09	Air Pollution Management	1,2	3,4,5,7	3	0	0	3	40	60	100

SEMESTER VII
Elective IV & V

SUB. CODE	TITLE OF THE PAPER	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
16BECE7E01	Design of Bridges	1,2	1,9,12, 15	3	0	0	3	40	60	100
16BECE7E02	Tall Buildings	1,2	1,9,12, 15	3	0	0	3	40	60	100
16BECE7E03	Traffic Engineering and management	1,2	1,3,4,5, 14	3	0	0	3	40	60	100
16BECE7E04	Smart Structures and smart Materials	1,2	5,9,6	3	0	0	3	40	60	100
16BECE7E05	Finite Element Techniques	1,2	1,2,5,6, 9	3	0	0	3	40	60	100
16BECE7E06	Geographical Information System	1,2	5,9,6	3	0	0	3	40	60	100
16BECE7E07	Remote sensing Techniques and Applications	1,2	5,9,6	3	0	0	3	40	60	100
16BECE7E08	Introduction to Soil Dynamics and Machine Foundations	1,2	2,3,4	3	0	0	3	40	60	100
16BECE7E09	Industrial Waste Management	1,2	4,7,11, 14	3	0	0	3	40	60	100

SEMESTER VII
Elective VI

SUB. CODE	TITLE OF THE PAPER	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
16BECE8E01	Industrial Structures	1,2	1,9,1 2,15	3	0	0	3	40	60	100
16BECE8E02	Seismic Design of Reinforced Concrete Structures	1,2	1,2,5 ,9,6	3	0	0	3	40	60	100
16BECE8E03	Environmental Impact assessment of Water resources development	1,2	4,7,1 1,14	3	0	0	3	40	60	100
16BECE8E04	Construction resource Planning and Management	1,2	1,9,1 2,15	3	0	0	3	40	60	100
16BECE8E05	Pre-stressed Concrete Structures	1,2	1,5,6	3	0	0	3	40	60	100

OPEN ELECTIVES

COURSES OFFERED BY OTHER DEPARTMENTS

SUB. CODE	TITLE OF THE PAPER	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
SCIENCE AND HUMANITIES										
16BESHOE01	Probability and Random Process	1	1	3	0	0	3	40	60	100
16BESHOE02	Fuzzy Mathematics	1	1	3	0	0	3	40	60	100
16BESHOE03	Linear Algebra	1	1	3	0	0	3	40	60	100
16BESHOE04	Engineering Acoustics	1,2	1,2	3	0	0	3	40	60	100
16BESHOE05	Solid Waste Management	1,2	7,11,14	3	0	0	3	40	60	100
16BESHOE06	Green Chemistry	1,2	1,3,5	3	0	0	3	40	60	100
16BESHOE07	Applied Electrochemistry	1,2	1,3,5	3	0	0	3	40	60	100
16BESHOE08	Industrial Chemistry	1,2	1,3,5	3	0	0	3	40	60	100
COMPUTER SCIENCE ENGINEERING										
16BECSOE01	Internet Programming	1,2	1,3	3	0	0	3	40	60	100
16BECSOE02	Multimedia And Animation	2	1,3	3	0	0	3	40	60	100
16BECSOE03	Pc Hardware And Trouble Shooting	2,	5,6	3	0	0	3	40	60	100
16BECSOE04	Java Programming	1,2	1,3	3	0	0	3	40	60	100
ELECTRICAL & ELECTRONICS ENGINEERING										
16BEEEOE01	Electric Hybrid Vehicle	1,2	1,5	3	0	0	3	40	60	100
16BEEEOE02	Energy Management &Energy Auditing	1,2	1,6,7	3	0	0	3	40	60	100
16BEEEOE03	Programmable Logic Controller	1	1,4	3	0	0	3	40	60	100
16BEEEOE04	Renewable Energy Resources	1,2	1,6,7	3	0	0	3	40	60	100
ELECTRONICS COMMUNICATION ENGINEERING										
16BEECOE01	Real Time Embedded Systems	1,2	1,2	3	0	0	3	40	60	100
16BEECOE02	Consumer Electronics	1	1	3	0	0	3	40	60	100
16BEECOE03	Neural Networks and its Applications	1,2	1,5	3	0	0	3	40	60	100
16BEECOE04	Fuzzy Logic and its Applications	1	1,5	3	0	0	3	40	60	100
BIOTECHNOLOGY										
16BTBTOE01	Bioreactor Design	1,2	1,3,4,6	3	0	0	3	40	60	100
16BTBTOE02	Food Processing and Preservation	1	1	3	0	0	3	40	60	100
16BTBTOE03	Basic Bioinformatics	1	1	3	0	0	3	40	60	100
16BTBTOE04	Fundamentals of NanoBiotechnology	1,2	1	3	0	0	3	40	60	100
MECHANICALENGINEERING										
16BEMEOE01	Computer Aided Design	1,2	1,3,4,6	3	0	0	3	40	60	100
16BEMEOE02	Industrial Safety and Environment	1,2	1,3,12	3	0	0	3	40	60	100
16BEMEOE03	Transport Phenomena	1,2	1,3,5	3	0	0	3	40	60	100
16BEMEOE04	Introduction to Biomechanics	1	1,2	3	0	0	3	40	60	100
AUTOMOBILE ENGINEERING										
16BEAEOE01	Automobile Engineering	1	1,2	3	0	0	3	40	60	100
16BEAEOE02	Basics of Two And Three Wheelers	1	1,5	3	0	0	3	40	60	100
16BEAEOE03	Automobile Maintenance	1	1,12	3	0	0	3	40	60	100

16BEAEOE04	Introduction to Modern Vehicle Technology	1	1,12	3	0	0	3	40	60	100

COURSES OFFERED TO OTHER DEPARTMENT

SUB. CODE	TITLE OF THE PAPER	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
16BECEOE01	Housing, Plan and Management	1,2	5,9,6	3	0	0	3	40	60	100
16BECEOE02	Building Services	1,2	8	3	0	0	3	40	60	100
16BECEOE03	Management of irrigation systems	1,2	7,9,11	3	0	0	3	40	60	100
16BECEOE04	Advanced construction technology	1,2	3,4,5, 7	3	0	0	3	40	60	100

Total number of credits:180

L: Lecture Hour **T: Tutorial Hour** **CIA: Continuous Internal Assessment**
P: Practical Hour **C: Credit** **ESE : End semester Examination**

Note:

1.The passing minimum for value added course is 50 marks out of 100 marks.There will be two tests,of which one will be class test covering 50% of syllabus for 50 marks and other for 50marks.

2. Credits for value added course are not counted for computation ofCGPA.

3. Interested students can opt one self study course in eighth semester from open electives which will be reflected in the mark sheet if he/shepasses.

**-- Skill Development
**-- Employability
**--Entrepreneurship

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO-1Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO-2 Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3 Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO-4 Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO-5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO-6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO-7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO-8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO-9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-11 Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSO)

The B.E. Degree Programme in Civil Engineering is offered in the department with the following programme specific outcomes:

PSO-13 The Graduates of this Programme with proficiency in mathematics and physical sciences will excel in the core areas of civil engineering such as structural, environmental and water resources engineering.

PSO-14 Utilize principles, methods, software’s and codes of practices to excel in the areas of planning, analysis and designs related to Civil Engineering systems.

PSO-15 Prepare detailed drawings, cost estimates, reports, walk through views, interact with clients, manage workers, work in a team and executes construction works.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Civil Engineering education at KAHE, Coimbatore, mainly based on practical oriented learning. The courses offered are focused on training the students to make them adaptable to any type of role in different fields of Civil Engineering.

The B.E. Degree Programme in Civil Engineering is offered in the department with the following educational objectives:

PEO-1 To equip the graduates with sufficient knowledge and experience to become leaders in industry and academia

PEO-2 To offer platform for research and development

PEO-3 To impart professional ethics with a commitment to the society and environment

PEO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	✓	✓	✓		✓			✓	✓		✓	✓
PEO2	✓	✓		✓	✓		✓		✓	✓	✓	✓
PEO3			✓		✓	✓	✓	✓		✓	✓	✓

PEO-PSO mapping

	PSO1	PSO2	PSO3
PEO1	✓	✓	✓
PEO2	✓	✓	✓
PEO3		✓	✓

SEMESTER I&II

SEMESTER I& II

16BECC101 COMMUNICATIVE ENGLISH 3 0 0 3 100

OBJECTIVES:

1. To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
2. To help students acquire their ability to speak effectively in real life situations.
3. To inculcate the habit of reading and to develop their effective reading skills.
4. To ensure that students use dictionary to improve their active and passive vocabulary.
5. To enable students to improve their lexical, grammatical and communicative competence
6. To acquiregood vocabulary for sentence structure and sentence formation.

OUTCOMES:

1. Use English language for communication: verbal & non –verbal.
2. Enrich comprehension and acquisition of speaking & writing ability.
3. Gain confidence in using English language in real life situations.
4. Improve word power: lexical, grammatical and communication competence.
5. Acquire good vocabulary for easy communication.
6. Be familiar with sentence structure and sentence formation.

UNIT I (9)

Listening– Types of listening - Listening to class reading - Video tapes/ Audio tapes. **Speaking** – Introduction on self - Introduction on one's friend. **Reading**- Reading for comprehension – Reading different kind of passages like descriptive, narrative, objective, conversational and argumentative. **Writing** – Formal and Informal letters- Free writing on any topic –My favorite place, hobbies, dreams, goals, etc- - To fill in different application forms. **Grammar** – Articles- WH questions –Yes/No Question - Subject Verb agreement. **Vocabulary** - Word Formation – Word expansion (Root word) - Prefix and Suffix.

UNIT II (10)

Listening – Understanding the passage in English –Pronunciation practice. **Speaking** – Asking and answering questions - Telephone etiquette. **Reading** – Critical reading – Finding key information in a given text (Skimming - Scanning). **Writing**– Coherence and cohesion in writing – Short paragraph writing – Writing short messages.**Grammar**– Parts of speech – Noun – Verb – Adjectives - Adverbs. **Vocabulary**– Compound Nouns/Adjectives – Irregular verbs.

UNIT III (10)

Listening – Listening for specific task – Fill in the gaps.**Speaking** – Phonemes – Syllables – Role play – Conversation Practice.**Reading** – Reading and Comprehension.**Writing** - Autobiographical writing – Biographical writing - Instruction writing. **Grammar** – Preposition – Infinitive – Gerund – Tenses. **Vocabulary** – Foreign words used in English – British and American usage.

UNIT IV (8)

Listening – Responding to questions – Reading in class for complete understanding and for better pronunciation. **Speaking** – Debate- Presentations in seminars.**Reading** – Making inference from the reading passage – Predicting the content of reading passages.**Writing** - Interpreting visual materials (tables, graphs, charts, etc) Letters to the Editor. **Grammar** – Sentence pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

UNIT V **(8)**

Listening - Listening to different accents, speeches/presentations. **Speaking-** Extempore talk –Just-a-minute talk.**Reading**-Reading strategies–Intensive reading – Text analysis.**Writing-** Creative writing – Writing circulars and notices – Writing proposal.**Grammar** – Direct and Indirect speech – Conditional sentences - Auxiliary verbs. **Vocabulary** – Abbreviations & Acronyms.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.**Total-45**

TEXT BOOK:

S. NO.	**AUTHOR(S) NAME**	**TITLE OF THE BOOK**	**PUBLISHER**	**YEAR OF PUBLICATION**
1	Sangeeta Sharma , Meenakshi Raman	Technical Communication: Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	**AUTHOR(S) NAME**	**TITLE OF THE BOOK**	**PUBLISHER**	**YEAR OF PUBLICATION**
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2009
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES:

www.learnerstv.com – Listening/ Speaking/ Presentation
www.usingenglish.com – Writing/ Grammar
www.englishclub.com – Vocabulary Enrichment/ Speaking
www.ispeakyouspeak.blogspot.com– Vocabulary Enrichment/ Speaking
www.teachertube.com – Writing Technically
www.Dictionary.com – Semantic / Grammar

SEMESTER I& II

16BECC102 ENGINEERING MATHEMATICS I 3 2 0 4 100

COURSE OBJECTIVES

1. To develop analyzing skills for solving different engineering problems.
2. To understand the concept of Matrices.
3. To remember the basics of differential calculus and its applications.
4. To apply the problems in differential equations.
5. To Create knowledge about functions of several variables and Sequence and Series.
6. To enhance the knowledge on the concepts of sequences and series.

COURSE OUTCOMES

The students will be able to

1. Acquire the basic knowledge and understanding of mathematics
2. Apply advanced matrix knowledge to engineering problems.
3. Improve their ability in evaluating geometrical applications of differential calculus problems.
4. To solve the problems by applying the differential Equations.
5. Evaluating engineering problems involving functions of several variables.
6. Understand the concepts of sequences and series.

UNIT I MATRICES (12)

Review of Matrix Algebra - Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction to canonical form through orthogonal reduction.

UNIT II DIFFERENTIAL CALCULUS (12)

Overview of Derivatives - Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes- Evolutes as Envelope of normals – Maxima and Minima of functions of two or more Variables – Method of Lagrangian Multipliers

UNIT III DIFFERENTIAL EQUATIONS (11)

Linear Differential equations of second and higher order with constant coefficients - Euler's form of Differential equations – Method of variation parameters.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES (12)

Partial derivatives – Euler's theorem for homogeneous functions – Total derivatives – Differentiation of implicit functions – Jacobians –Maxima and Minima of functions of two or more Variables - Method of Lagrangian multipliers.

UNIT V SEQUENCES AND SERIES (13)

Sequences: Definition and examples – **Series:** Types and Convergence – Series of positive terms – Tests of convergence: Comparision test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.

Total: 60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics	McGraw Hill Education (India) Private Limited, New Delhi.	2014
2	Sundaram, V. Lakhminarayan,K.A.&Balasubramanian,R.	Engineering Mathematics for first year.	Vikas Publishing Home, New Delhi.	2006

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Grewel . B. S.	Higher Engineering Mathematics	Khanna Publications, New Delhi.	2014
2	BhaskarRao. P. B, Sri Ramachary SKVS, BhujangaRao. M	Engineering Mathematics I	BS Publications, India.	2010
3	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
4	ShahnazBathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009
5	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES :

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.intmath.com/matrices-determinants
4. www. Intmath.com/calculus/calculus-intro.php

16BEPH103 **SEMESTER I& II**
16BEPH203 **ENGINEERING PHYSICS** **3 0 0 3 100**

OBJECTIVES:

1. To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology
2. Understand the basics of laser and optical fiber with appropriate applications.
3. Introduce the concepts of quantum mechanics for diverse applications.
4. Impart the basic knowledge of crystal and its various crystal structures.
5. Disseminate the fundamentals of nuclear physics and their applications.
6. To Disseminate the fundamentals of nuclear physics and their applications

OUTCOMES:

1. Identify the elastic nature of materials and its thermodynamic properties.
2. Infer the characteristics of laser and optical fibers for engineering applications.
3. Develop the idea of quantum mechanics through applications.
4. Identify the different atomic arrangements of crystals and its defects
5. Make use of the concepts of sound waves for medical applications
6. Illustrate the basic ideas of nuclear reactors for energy resources

INTENDED OUTCOME:

1. The students will have the knowledge on the basics of physics related to properties of matter, fiber optics, quantum, crystal physics and that knowledge will be used by them in different engineering and technology applications
2. To identify suitable materials for various engineering applications.
3. To select suitable materials for various engineering applications.
4. To gain the applications of materials in various industries.
5. To impart knowledge on the structure, properties of materials.
6. The students will have the knowledge on how to use Newton's laws of motion.

UNIT I PROPERTIES OF MATTER AND THERMODYNAMICS (9)

Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniform bending
Concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBER OPTICS (9)

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER - CO_2, Semiconductor LASER- Applications of LASER in industry and medicine.
Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNITIII QUANTUM PHYSICS (9)

Introduction to quantum theory – Black body radiation-Photo electric effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electron microscope.

UNIT IV CRYSTAL PHYSICS (9) Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures- crystal defects – point, line and surface defects

UNIT V ULTRASONICS AND NUCLEAR PHYSICS (9)

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications – Sonogram Introduction – basics about nuclear fission and fusion, nuclear composition –Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

Total- 45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Serway and Jewett	Physics for Scientists and Engineers with	Thomson Brooks/Cole, Indian reprint, New Delhi	2010
2	Gaur, R.K. and Gupta, S.C	Engineering Physics	DhanpatRaiPublications,New Delhi.	2011
3	M.N. Avadhanulu and PG	A Text book of Engineering Physics	S.Chand and company, Ltd., New Delhi	2011
4	D.C. Ghosh, N.C. Ghosh, P.K. Haldar	Engineering Physics	University Science, New Delhi	2011

5	P. Khare, A. Swarup	Engineering Physics: Fundamentals	Jones & Bartlett Learning	2009

WEBSITES:

- www.nptel.ac.in
- www.physicsclassroom.com
- www. oyc.yale.edu
- www.physics.org

16BECH103 SEMESTER I& II
16BECH203 ENGINEERING CHEMISTRY 3 0 0 3 100

OBJECTIVES:

1. To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
2. To estimate the amount of alkalinity ions, hardness, chloride in water sample
3. To make the student acquire practical skills in the determination of conductance of solutions, EMF etc
4. To acquaint the students with the determination of molecular weight of a polymer by viscometry
5. To carried out different types of titrations for estimation of concerned in materials
6. To acquaint the students with the basics of surface chemistry

OUTCOMES:

1. The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
2. Estimate the amount of alkalinity ions, hardness, chloride in water sample
3. Measure molecular/system properties of conductance of solutions, EMF etc
4. Acquaint the students with the determination of molecular weight of a polymer by visocometry
5. Determine the corrosion rate of steel by weight loss method.
6. Carrying out different types of titrations for estimation of concerned in materials using comparatively more qualities and quantities of materials involved for accurate results.

UNIT I WATER TECHNOLOGY (9)

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverse osmosis.

UNIT II ELECTRO CHEMISTRY AND STORAGE DEVICES (9)

Electrochemical cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - Fe^{2+}vs dichromate) –Electrolytic conductance-application (conductometric titration)-Batteries-Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell-H_2-O_2 Fuel Cell.

UNIT III FUELS AND COMBUSTION (9)

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method - Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, Combustion of fuel-Introduction-GCV-NCV-Flue gas analysis.

UNIT IV CORROSION SCIENCE (9)

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings – Organic coatings-Paints - Constituents and functions –Inorganic coatings- Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating - Hot dipping.

UNIT V SURFACE CHEMISTRY AND PHASE RULE (9)

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm- Role of adsorbents in industries (catalysis and water softening). Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pbsystem.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	Engineering Chemistry I& II	Sri Krishna Hi tech Publishing Company (P) Ltd., Chennai.	2012

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3rd Reprint NewDelhi.	2013
2.	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5th edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010
3.	Jain, P.C. and Monika Jain	Engineering Chemistry.	DhanpatRai Publishing Company (P) Ltd., New Delhi.	2009
4.	Dara.S.S	Text book of Engineering Chemistry.	S.Chand&Co.Ltd., New Delhi	2008
5.	Sharma.B. K	Engineering Chemistry	Krishna Prakasam Media (P) Ltd., Meerut	2001

WEBSITES:

1.http://www.studynotes.ie/leaving-cert/chemistry/
2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html
3.http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
4. http://ocw.mit.edu/courses/#chemistry
5. http://www.chem.qmul.ac.uk/surfaces/sec

SEMESTER I& II

16BECE104 BASIC CIVIL ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES:

1. To know about different materials and their properties
2. To know about engineering aspects related to buildings
3. To know about importance of surveying and the transportation systems
4. To get exposed to the rudiments of engineering related to dams, water supply, and sewage disposal
5. To know the Longitude and latitude of an object.
6. To gain the basic knowledge in the field of Civil Engineering.

INTENDED OUTCOMES:

1. To impart the properties of various building materials
2. To understand various building components and its uses.
3. To measure the linear distance by using survey equipment's
4. To find out the Longitude and latitude of an object.
5. To understand the formation of roads and formation – Bridge and its uses.
6. To know about the storage of water, retaining structures, water treatment for drink purpose, collection of sewage and to know the method of disposal with functional units

UNIT I SCOPE OF DIFFERENT FIELDS OF CIVIL ENGINEERING 9 Structural Engineering, Geotechnical Engineering, Environmental Engineering, Water Resources Engineering, Transportation Engineering. Recent development in construction techniques – case study

UNIT II – BUILDINGS AND BUILDING MATERIALS 9 Buildings - Definition-Classification according to NBC-plinth area, Floor area, carpet area, floor space index construction materials-stone, brick, cement, cement-mortar, concrete, steel- their properties and uses.

UNIT III - BUILDINGS AND THEIR COMPONENTS 9

Buildings- Various Components and their functions.Soils and their classification - Foundations-Functions and types of foundations, Masonry, Floors-functions and types of floors, Roofs and types of roofs.

UNIT IV - BASIC INFRASTRUCTURE 9

Surveying-classification, general principles of surveying – Basic terms and definitions of chain, compass and levelingsurveying , uses of surveying. Roads-types, Water bound macadam road, cement concrete road, bituminous road. Bridges -components and types of bridges. Dams-Purpose, selection of site, types of dams and components.

UNIT V – BUILDING DRAWING **9**

Types of drawing with appropriate scale & Uses of index map, key plan, village map, site plan, Layout plan –Types of Projection adopted in Building Drawing – Scales for various types of Drawings– Working drawing, large scale drawing– Symbols, Conventions and Abbreviations for – Electrical fittings , water supply ,sanitary fittings, materials of construction – Sizes of various standard papers.

. **Total: 45**

TEXT BOOKS:

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Basics of Civil Engineering	Raju K.V.B, Ravichandran P.T	Ayyappa Publications, Chennai	2012
2	Civil engineering drawing	V. B. Sikka	B. D. KatariaSons , Ludhiana	2009

REFERENCE BOOKS:

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Civil Engineering	Ramesh Babu	VRB Publishers, Chennai	2010
2	Building Materials	National Building Code of India, Part V		2005
3	Engineering Materials	Rangwala S.C	Charotar Publishing House, Anand	2012

16BECE105A SEMESTER I& II

16BECE205A BASIC ELECTRICAL AND ELECTRONICS ENGINEERING 3 0 0 3 100

OBJECTIVES

1. To impart the basic knowledge about the Electric circuits.
2. To understand the working of various Electrical Machines.
3. To know about various measuring instruments.
4. To understand the basic concepts in semiconductor devices and digital electronics.
5. To understand and analyze basic electric and magnetic circuits.
6. To gain the basic knowledge about the Electric circuits

INTENDED OUTCOMES

1. The students shall develop an intuitive understanding of the circuit analysis, basic concepts of electrical machines, basics of electronics and be able to apply them in practical situation.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.
4. Gained the knowledge in working of Electrical Machines and Transformers.
5. Students will gain the applications of transformers.
6. To understand and analyze basic electric and magnetic circuits.

UNIT I ELECTRIC CIRCUITS & MEASUREMENTS

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase balanced Circuits.

UNIT II ELECTRICAL MACHINES 9

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III MEASURING INSTRUMENTS 9

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT IV SEMICONDUCTOR DEVICES AND APPLICATIONS 9

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics

UNIT IV- DIGITAL ELECTRONICS 9

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems- simplification of Boolean expression - implementation of Boolean expressionsusing logic gates - standard forms of Boolean expression.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mittle, V.M	Basic Electrical Engineering	Tata McGraw Hill Edition, New Delhi	2004
2	SedhaR.S	Applied Electronics	S. Chand & Co	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Muthusubramanian R, and Muraleedharan K A	Basic Electrical, Electronics and Computer Engineering	Tata McGraw Hill, Second Edition	2006
2	Nagsarkar T K and Sukhija M S	Basics of Electrical Engineering	Oxford press	2005
3	MahmoodNahvi and Joseph A. Edminister	Electric Circuits	Schaum' Outline Series, McGraw Hill	2002
4	Premkumar N	Basic Electrical Engineering	Anuradha Publishers	2003

16BECE105B SEMESTER I& II
16BECE205B ELEMENTS OF MECHANICAL ENGINEERING 3 0 0 3 100

INTENDED OUTCOMES

1. To impart the basic knowledge of various basic fields of mechanical engineering.
2. To Study about basic manufacturing processes.
3. To study about basic machining process.
4. To study about power plants.
5. To study about automobile engineering
6. The principles of refrigeration and air- conditioning

INTENDED OUTCOMES

In the end of course students will be able to

1. Impart the basic knowledge of various basic fields of mechanical engineering.
2. Study about basic manufacturing processes.
3. Know about basic machining process.
4. Study about power plants.
5. Know about automobile engineering
6. The principles of refrigeration and air- conditioning

INTRODUCTION (Not included for examination)

Engineering and Technology - History of Mechanical Engineering- Mechanics - Statics and dynamics - Broad areas in Mechanical Engineering.

UNIT I MANUFACTURING PROCESSESFOUNDRY - Principles - Patterns - Types, Molding Processes, Cupola and Induction Furnaces. METAL FORMING - Principles - Hot and cold working of metals - Forging, rolling, extrusion and wire drawing, sheet metal operations. WELDING - Principles - Oxy-Acetylene Welding and Manual Metal Arc Welding, Brazing and Soldering.

UNIT II MACHINE TOOLS

Machining principles - Construction and working principles of basic machine tools - Lathe, Drilling, Shaper, Planer and Milling machine. Introduction to CNC machines.

UNIT III AUTOMOBILE ENGINEERING &POWER TRANSMISSION SYSTEMS

Working principle of petrol and diesel engines - Four stroke and two stroke cycles - Comparison between four stroke and two stroke engines - Working principle of simple carburetor - Lubrication system and cooling system.

Belt drives - Flat, V-belts - Rope, Chain drive. Gears - Spur, Helical, Bevel, Worm and worm wheel and Rack and Pinion – Simple problems in Power transmission.

UNIT IV ENERGY ENGINEERING&HYDRAULIC MACHINES

Introduction to Boilers - Working principle of Thermal, Hydro - Electric and Nuclear Power Plants - Merits and demerits. Solar – Wind power plants.

Turbines - Impulse turbine - Pelton wheel, Reaction turbines - Kaplan and Francis turbines - Pumps - Working principle of Reciprocating pumps and Centrifugal pumps.

UNIT V REFRIGERATION AND AIR- CONDITIONING

Terminology of Refrigeration and Air Conditioning - Basic principles of Vapour Compression and Absorption Refrigeration System – Window and Split Room Air Conditioners.

TEXT BOOKS:

S.No	**Title of the book**	**Author(s) Name**	**Publisher**	**Year of Publication**
1	Basic Mechanical Engineering	Shanmugam, G	Tata McGraw Hill Publishing company Limited, New Delhi	2008
2	Basic Mechanical Engineering	Rajput, R.K	Laxmi Publications (P) Ltd, New Delhi	2008

16BEPH111 SEMESTER I& II
16BEPH211 ENGINEERING PHYSICS LABORATORY 0 0 4 2 100

OBJECTIVES:

1. To develop basic laboratory skills and demonstrating the application of physical principles.
2. To prepare for the lab experiment and perform individually a wide spectrum of experiments.
3. To present experimental data in various appropriate forms like tabulation, and plots.
4. To analyze, Interpret and Summarize experimental results.
5. To communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
6. The ability to use modern engineering physics techniques and tools, including laboratory instrumentation.

OUTCOMES:

1. The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
2. Prepare for the lab experiment and perform individually a wide spectrum of experiments.
3. Present experimental data in various appropriate forms like tabulation, and plots.
4. Analyze, Interpret and Summarize experimental results.
5. Communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
6. Prepare to develop the skills for understanding basic electric circuits.

LIST OF EXPERIMENTS – PHYSICS

1. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
2. Determination of wavelength of mercury spectrum – spectrometer grating.
3. Determination of Young’s modulus of the material – Non uniform bending (or) Uniform bending.
4. Determination of Viscosity of liquid – Poiseuille’s method.
5. Spectrometer Dispersive power of a prism.
6. Torsional pendulum – Determination of Rigidity modulus.
7. Particle size determination using Diode Laser

8. Determination of Laser parameters – Wavelength, and angle of divergence.
9. Determination of acceptance angle in an optical fiber.
10. Determination of thickness of a thin wire – Air wedge method
11. Determination of Band Gap of a semiconductor material.
12. Determination of Specific resistance of a given coil of wire – Wheatstone Bridge

16BECH111 SEMESTER I& II

16BECH211 ENGINEERING CHEMISTRY LABORATORY 0 0 4 2 100

OBJECTIVES:

1. To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
2. To estimate the amount of alkalinity ions, hardness, chloride in water sample
3. To make the student acquire practical skills in the determination of conductance of solutions, EMF etc
4. To acquaint the students with the determination of molecular weight of a polymer by viscometry
5. To carried out different types of titrations for estimation of concerned in materials
6. To gain practical knowledge by applying the experimental methods to correlate with the theory.

OUTCOMES:

1. The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
2. Estimate the amount of alkalinity ions, hardness, chloride in water sample
3. Measure molecular/system properties of conductance of solutions, EMF etc
4. Acquaint the students with the determination of molecular weight of a polymer by visocometry
5. Determine the corrosion rate of steel by weight loss method.
6. Carrying out different types of titrations for estimation of concerned in materials using comparatively more qualities and quantities of materials involved for accurate results.

LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of alkalinity of Water sample.
2. Estimation of hardness of Water by EDTA
3. Estimation of chloride in Water sample (Argentometric method)
4. Determination of corrosion rate by weight loss method.
5. Conductometric Titration (Simple acid base).
6. Conductometric Titration (Mixture of weak and strong acids).
7. Conduct metric Titration using $BaCl_2$vs Na_2 SO_4.
8. pH Titration (acid & base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$).
10. Estimation of Ferric ion by Spectrophotometry.
11. Determination of water of crystallization of a crystalline salt (Copper sulphate).
12. Determination of molecular weight and degree of polymerization using Viscometry.
13. Determination of chemical oxygen demand.

SEMESTER I & II

16BECE112 ENGINEERING WORKSHOP PRACTICE 0 0 4 2 100

Course Objectives

1. To prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
2. To prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice.
3. To gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
4. To fabricate components with their own hands.
5. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
6. By assembling different components, they will be able to produce small devices of their interest.

Course Outcomes

1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
2. Students will be able to fabricate components with their own hands.
3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
4. By assembling different components, they will be able to produce small devices of their interest.
5. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
6. Communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice.

PART – A (CIVIL & MECHANICAL)

1. **WELDING** **6**

    i. Preparation of arc welding of butt joints, lap joints and tee joints.

2. **BASIC MACHINING** **6**

    i. Simple Turning and Taper turning

    ii. Drilling and Tapping

3. **SHEET METAL WORK** **6**

    i. Model making – Trays, funnels, etc.

4. **DEMONSTRATION ON** **4**

    i. Smithy operations

ii. Foundry operations

iii. Plumbing Works

iv. Carpentary Works

PART –B (ELECTRICAL & ELECTRONICS)

5. ELECTRICAL ENGINEERING 10

i. Study of electrical symbols and electrical equipments.

ii. Construct the wiring diagram for Stair case wiring and Fluorescent lamp wiring.

iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energy meter.

iv. Measurement of electrical quantities – voltage, current, power & power factor in R load.

v. Measurement of energy using single phase energy meter.

6. ELECTRONICS ENGINEERING 13

i. Study of Electronic components– Resistor (color coding), capacitors and inductors.

ii. Soldering practice – Components Devices and Circuits – Using general purpose PCB.

iii. Study of logic gates AND, OR, NOT, NOR and NAND.

iv. Study of HWR and FWR.

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Jeyachandran, K. and Balasubramanian, S	A Premier on Engineering Practices Laboratory	Anuradha Publications, Kumbakonam	2007
2	Jeyapoovan, T., Saravanapandian, M	Engineering Practices Lab Manual	VikasPuplishing House Pvt. Ltd, Chennai	2006
3	Bawa, H.S	Workshop Practice	Tata McGraw – Hill Publishing Company Limited, New Delhi	2007

SEMESTER I & II

16BECE113COMPUTER PRACTICE AND PROGRAMMING LABORATORY1 0 4 3 100

Course Objectives

1. Identify and understand the working of key components of a computer program.
2. Identify and understand the various kinds of keywords and different data types of C programming
3. Understand, analyze and implement software development tools like algorithm,
4. pseudo codes and programming structure
5. Study, analyze and understand logical structure of a computer program, and different construct to develop a program in “C” language
6. To use algorithms and programs in practical applications.

Course Outcomes

The course will enable the students

1. To formulate simple algorithms for arithmetic and logical problems
2. To translate the algorithms to programs (in C language)
3. To test and execute the programs and correct syntax and logical errors
4. To implement conditional branching, iteration and recursion
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach
6. To use arrays, pointers and structures to formulate algorithms and programs

THEORY:

What is computer- Computer Components- What is C- C Character set- Constants, Variables and Keywords-General form of C Program - Relational and Logical Operators - Selection Structures-If and nested if - Switch Case - Loops-Definition and types- Functions- Arrays- Introduction to Strings-Pointers.

PRACTICALS:

1. Working with word Processing, Spreadsheet and presentation software in Linux
2. Programming in Scratch:
   Practicing fundamental concepts of programming like sequence, selection decision statements, working of loops and event driven programming
3. C Programming:
   Practicing programs to get exposure to basic data types, algebraic expressions, Conditional statements, Input and Output Formatting, Decision Statements, Switch Case, Control structures, arrays, Strings and function, implementation of pointers.

Total Hours: 45
REFERENCES:

1. E. Balagurusamy, “ Computing Fundamentals and C Programming”, TMH Education, 5th Edition, 2014

2. YashavantKanetkar, “ Let us C”, BPB Publications, 13th Edition, 2013

VALUE ADDED COURSE

16BECC151 HUMAN VALUES 1 0 0 - 100

Course Objectives

1.To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings

2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence.

3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

4.To know the value of being a human being.

5.To provide a much needed orientational input in value education to the young enquiring minds.

6.To study the value of being a useful citizen.

Course Outcomes

1.To involves a systematic and rational study of the human being vis-à-vis the rest of existence.

2. To make free from any dogma or value prescriptions.

3. To analysis process of self-investigation and self-exploration, and not of giving sermons.

4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.

5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

6. To Educate the values and meaning of life in the young minds and to transform them as responsible citizens

UNIT I **3**

Human life on Earth - Concept of Human Values - Value Education - Aim of education and value education - Types of values - Components of values – Attitudes – types of attitudes

UNIT II **3**

Self Development :Self analysis – Goal Setting - Thought Analysis – Guarding against Anger - Respect to age, experience, maturity, family members, neighbors, co-workers

UNIT III **3**

Individual Qualities – Truthfulness – Constructivity – Sacrifice – Sincerity - Self Control – Altruism – Tolerance - Scientific Vision – Regulating Desire

UNIT IV **3**

Mind Culture - Modern Challenges of Adolescent - Emotions and behavior - Sex and spirituality - Adolescent Emotions - Meditation

UNIT V **3**

Body and Mind Fitness : (a) Physical Exercises (b) Activities: (i) Moralization of Desires (ii) Neutralization of Anger (iii) Eradication of Worries (iv) Benefits of Blessings

TOTAL 15

REFERENCES

S. No.	Author Name	Title of the book	Publisher	Year of Publication
1	Subramanian. R	Professional Ethics	Oxford, New Delhi	2013
2	Govindarajan. M, Natarajan. S,	Engineering Ethics	Prentice Hall of India, New Delhi	2004
3	Tripathi. A.N	Human Values	New Age International	2009
4	Pope. G. U.	Thirukkural with English Translation	Uma Publication, Thanjavur.	2002

SEMESTER I &II

16BECC201A BUSINESS COMMUNICATION 3 0 0 3 100

OBJECTIVES:

1. To help students comprehend the role of listening skills in effective communication.
2. To familiarize students with verbal and non-verbal communication.
3. To expose students to neutral accent.
4. To develop emotional intelligence skills in them for enhancing their self-esteem.
5. To assist them in setting goals and developing positive attitude.
6. To develop soft skills and inter personal skills which will make excel in their job.

OUTCOMES:

1. Design and deliver a persuasive presentation that convinces the audience of the topic's relevance and overcomes resistance, using appropriate visual support and adhering to a specified time limit.
2. Use a strategic communication model and critical thinking to identify objectives, analyze audiences, and choose the most effective structure and style for delivering strategically sound written and spoken messages.
3. Practice principles of effective business writing and document design in all written documents.
4. Build an understanding of different organizational cultures, business practices, and social norms to communicate more effectively in domestic and cross-cultural business contexts.
5. Develop their soft skills and inter personal skills, which will make the transition from college to workplace smoother and help them excel in their job.
6. Acquire decision making skills, problem solving skills and assertive skills.

UNIT I

What is Business Communication? - Types of Communication – Formal and informal communication – Process of Communication- modes of Communication – Barriers to communication.

UNIT II

Written Business Communication – Style- word-usage- organisation of Ideas – mechanics of writing and fill up of forms - Cover Letter- Letter for Job Application- Letter of Complaint - Memos - Resumes - Email- Reports Revising and proofreading- Advertising slogans- jargons- Description of Graphics and visual aids - interpretation of graphs using expressions of comparison and contrast .

UNIT III

Reading and Understanding the news articles - Oral Business Communication - First Impressions - Attire – Effective Presentation strategies- Nuances of delivery – Controlling nervousness and stage fright- Visual aids Presentations- Capturing Audience - Tone - Behavior - Telephone Etiquette- Non - verbal communication - Eye contact - Facial expressions - Posture - Gestures - Body langage – Etiquette- Organization of presentation – brain storming- Negotiations.

UNIT - IV

Difference between goals and dreams - SMART goal setting - 3 Ds of goal setting- Determination, Discipline and Direction - Developing the right attitude - Motivation - Intrinsic and Extrinsic motivation - Dealing with change - Dedication - Taking responsibilities - Decision making.

UNIT - V

Intrapersonal skills - Self-analysis - Thought process – Interpersonal skills - Confidence building - Resolving conflicts- Analytical skills - Team Building - Leadership skills - Planning/organizing - Ability to work independently - Professional ethics - Communicating via e-mail. Ethical perspectives and their implications for responsible communication - Proposal Presentation

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Meenakshi Raman ; Prakash Singh	Business Communication	Oxford University Press	2012

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Murthy, G .R. K.	Soft Skills for Success.	The ICFAI University Press, Hyderabad.	2008
2	Jagadeesan, G &Santanakrishnan, R.	Soft Skills Development:Training and Evaluation.	The ICFAI University Press, Hyderabad.	2008
3	Sherfield, Robert M., Rhonda J. Montgomery, & Patricia G. Moody	Developing Soft Skills	Pearson Education, New Delhi.	2005

WEBSITES

http://tribehr.com/social-hr-software/talent-management/skills-tracking
www.ispeakyouspeak.blogspot.com
https://alison.com/subjects/6/Personal-Development-Soft-Skills
www.learning-development.hr.toolbox.com
http://www.niit.com/solution/soft-skill-training
http://mybcommlab.com to test your understanding of the concepts presented in each chapter and explore additional materials that will bring the ideas to life in videos, activities, and an online multimedia e-book.

SEMESTER I &II

16BECC201B TECHNICAL ENGLISH 3 0 0 3 100

OBJECTIVES:

1. To motivate learners to acquire listening & speaking skills in both formal and informal context
2. To focus on question forms & to make them understand the important of using question tags and also the functional use of transformation of sentences.
3. To improve their reading habit and to train them in critical and analytical reading
4. To equip them to write for academic as well as work place context
5. To enable students to face interviews
6. To develop admire and appreciate elegancy in communication.

OUTCOMES:

1. Acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
2. Enhance them reading texts critically and analytically
3. Develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
4. Enrich the ability to face interviews with confidence.
5. Enable to write documents and formal written communication
6. Admire and appreciate elegancy in communication.

UNIT-1 (10)

Listening - Difference between Hearing & Listening –Listening to informal conversation. **Speaking** - Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., **Reading** – Extensive and Intensive reading. **Writing** – Report writing - Writing a covering letter. **Grammar** – Regular & Irregular verbs - Kinds of sentences - Question tags. **Vocabulary** – Homonyms and Homophones.

UNIT-II (8)

Listening – Note Taking- Improving grasping ability.**Speaking** – Welcome address - Vote of thanks - Master of ceremony.**Reading** – Active and Passive reading - Reading for vocabulary- Reading for a purpose. **Writing** - Writing a review (Film review) - Summary of a story.**Grammar** - Modal verbs – Conjunction - Expression of cause and effect. **Vocabulary** - Phrasal verbs - Idioms.

UNIT – III (9)

Listening - Barriers to listening (Physical, Psychological, Linguistic & Cultural). **Speaking** – Stress, Pause and Intonation. **Reading** – Rapid reading – Skimming, Scanning and Surveying. (SQ3R)**Writing** - Essay writing -Minutes of meeting - Agenda – **Grammar** - Active and Passive voice - Purpose expression. **Vocabulary** - Same words used as noun and verb - Often misspelt and confused words.

UNIT-IV (8)

Listening – Listening to telephone conversation - Viewing model interviews. **Speaking** – Group Discussion - Correlation between verbal & non - verbal communication.**Reading** – Reading comprehension (short & long text) - Reading job advertisements and profile of a company.**Writing**– Job application - Resume writing - Checklist preparation.**Grammar** - Numerical expressions – Collocations - **Vocabulary** - Singular and Plural (Nouns)

UNIT- V **(10)**

Listing – Types of listening- Improving listening comprehension**. Speaking** - Oral presentation - Vocal communication techniques - Voice, quality, volume, pitch etc., **Reading** -Note making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation writing – Short essays writing- **Grammar**- Transformation of sentences (Simple, Compound & Complex). **Vocabulary** - Collection of Technical Vocabularies with their meanings.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.**Total-45**

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Sangeeta Sharma , Meenakshi Raman	Technical Communication: Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2008
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES:

www.learnerstv.com – Listening/ Speaking/ Presentation www.usingenglish.com – Writing/ Grammar www.englishclub.com – Vocabulary Enrichment/ Speaking www.ispeakyouspeak.blogspot.com– Vocabulary Enrichment/ Speaking www.teachertube.com – Writing Technically www.Dictionary.com – Semantic / Grammar

SEMESTER I &II

16BECC202 ENGINEERING MATHEMATICS II 3 2 0 4 100

OBJECTIVES:

1. Determine mathematical tools needed in evaluating multiple integrals and their usage.
2. Utilize Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.
3. To understand the concepts and applications of partial differential equations
4. Apply the knowledge of Mathematics in various Engineering fields by making them to identify the functions in engineering problems as analytic function and their analyze as a function of a complex variables.
5. Develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, to specify some difficult integration that appear in applications can be solved by complex integration in application areas such as fluid dynamics and flow of the electric current.
6. Analysethe concept of complex integrals using the Cauchy integral formula and the residue Theorem and to appreciate how complex methods can be used to prove some important theoretical results.

OUTCOMES:

1. The students will be able to understand mathematical tools needed in evaluating multiple integrals and their usage. Find the areas and volumes using multiple integrals
2. To calculate with them and apply them and also to calculate grad, div and curl in Cartesian and other simple coordinate systems.
3. Improve their ability in Vector calculus
4. The student will be able to Understand how to solve the given standard partial differential equations.
5. To find the Analytic functions using the Cauchy Riemann equations and they will learn mapping properties of elementary functions and mapping properties of some special transcendental functions. They will understand relations between conformal mappings and quadratic differentials and how geometric structures are changing under conformal mappings.
6. To Evaluate complex integrals using the Cauchy integral formula and the residue Theorem and to appreciate how complex methods can be used to prove some important theoretical results.

UNIT I MULTIPLE INTEGRALS (11)

Double integral – Cartesian coordinates – Polar coordinates – Change of order of integration – Triple integration in Cartesian co-ordinates – Area as double integrals.

UNIT II VECTOR CALCULUS (13)

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem, Gauss divergence theorem and Stoke's theorems (Statement Only)- Surfaces : hemisphere and rectangular parallelopipeds.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS (11)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constantcoefficients.

UNIT IV ANALYTIC FUNCTIONS (12)

Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms – Sufficient condition for an analytic function (Statement Only) - Properties of analytic functions – Constructions of an analytic function - Conformal mapping: w = z+a, az, 1/z and bilinear transformation.

UNIT V COMPLEX INTEGRATION (13)

Complex Integration - Cauchy's integral theorem and integral formula (Statement Only) – Taylor series and Laurent series - Residues – Cauchy's residue theorem (Statement Only) - Applications of Residue theorem to evaluate real integrals around unit circle and semi circle (excluding poles on the real axis).

Total : 60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics I & II	McGraw-Hill Education Pvt.Ltd, New Delhi	2014
2	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2014

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Erwin Kreyszig	Advanced Engineering Mathematics.	John Wiley & Sons. Singapore	2011
2	Venkataraman, M. K.	Engineering Mathematics.	The National Publishing Company, Chennai	2005
3	Narayanan. S, Manicavachagampillay.T.K and	Advanced Mathematics for Engineering Students.	Viswanathan S.(Printers and Publishers) Pvt. Ltd.	2002

	Ramaniah.G		Chennai.	
4	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES:

1.www.efunda.com
2. www.mathcentre.ac.uk
3. www.sosmath.com/diffeq/laplace/basic/basic.html
4. www.mathworld.wolframe.com

SEMESTER I &II

16BECC204 ENVIRONMENTAL SCIENCES 3 0 0 3 100

OBJECTIVES:

1. To give a comprehensive insight into natural resources, ecosystem and biodiversity.
2. To educate the ways and means of the environment
3. To protect the environment from various types of pollution.
4. To impart some fundamental knowledge on human welfare measures
5. To impart knowledge on ecosystem and biodiversity.
6. To inculcate the environmental principles in the field of engineering and technology

OUTCOMES:

1. Recognize the importance of natural resources (S)
2. Associate themselves with the various ecosystems (S)
3. Describe the importance of biodiversity (S)
4. Identify and minimize the difference pollutions (S)
5. Prioritize and analyses the social issues (S)
6. Integrate the environmental principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES (9)

Definition, Scope and Importance – Need for public awareness -Forestresources: Useandover-exploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources-role of an individual in conservation of natural resources.

UNIT II ECOSYSTEM (9)

Chemistry and Environment- Environmental segments, Composition and Structure of atmosphere- Concept of an ecosystem- Structure, components and function of an ecosystem Energy flow in the ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marine ecosystem

UNIT III BIODIVERSITY (9)

Introduction to biodiversity, Definition- Genetic diversity, Species diversity and Ecosystem diversity, Biogeographical classification of India, Importance of biodiversity-Value of biodiversity - Hot Spots of biodiversity-Threats to biodiversity - Endangered and Endemic Species of India – Conservation of biodiversity- In-Situ and Ex-Situ conservation of biodiversity.

UNIT IV ENVIRONMENTAL POLLUTION (9)

Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control measures of urban and industrial wastes– Role of an individual in prevention of pollution–Disaster management-earthquake, tsunami, cyclone and landslides.

UNIT V SOCIAL ISSUES AND ENVIRONMENT (9)

From Unsustainable to Sustainable development, Urban problems related to energy sources, Water conservation, Rain water harvesting and Watershed management, Resettlement and rehabilitation of people, its problems and concerns, Environmental ethics- Issues and possible solutions- Climate change- Green house effect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation- Environment Protection Act- Human Rights- Value education, Role of Information Technology in Environment and Human health-Population growth, Variation of population among nations-Population explosion.

Total: 45

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Ravikrishnan, A	Environmental Science	Sri Krishna Hi tech Publishing Company Private Ltd., Chennai	2012
2.	Anubhakaushik C.P. Kaushik	Environmental Science and Engineering	New Age International (P) Ltd., New Delhi.	2010

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William P.Cunningham	Principles of Environmental Science	Tata McGraw -Hill Publishing Company, New Delhi.	2008
2.	Linda D. Williams	Environmental Science Demystified	Tata McGraw -Hill Publishing Company Ltd., New Delhi.	2005
3.	BharuchaErach	Environmental Science Demystified	Mapin Publishing (P) Ltd., Ahmedabad.	2005
4.	Tyler Miller G. Jr	Environmental Science	Thomson & Thomson Publishers, New Delhi.	2004
5.	Trivedi, R.K. and Goel, P.K	Introduction to Air Pollution	Techno-Science Publications, Jaipur.	2003

WEBSITES:

1. http://people.eku.edu/ritchisong/envscinotes1.html
2.http://nptel.ac.in/courses.php?disciplineId=120
3.www.newagepublishers.com/samplechapter/001281.
4.www.unesco.org/ext/field/beijing/scienceb.htm,www.infinitepower.org/education.htm
5. http://www.sciencedaily.com/news/top/environment/

16BECE206 ENGINEERING MECHANICS 3 0 0 3 100

OBJECTIVES:

1. To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.
2. A working knowledge of statics with emphasis on force equilibrium and free body diagrams.
3. Provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems.
4. To understanding of the mechanical behavior of materials under various load conditions.
5. To apply Newton's laws ofmotion in practical experiences.
6. To apply basic knowledge of maths and physics to solve real-worldproblems

OUTCOMES:

1. Ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
2. Ability to analyses the forces in any structures.
3. Ability to solve rigid body subjected to dynamic forces.
4. Analyses the forces in any structures.
5. Solve rigid body subjected to dynamic forces.
6. Gain basic knowledge about the forces and moments.

UNIT – I **9**

STATICS OF PARTICLES: Forces in plane and space - Vector addition of concurrent forces in plane and space-Problems involving the equilibrium of a particle - Free body diagram - Equilibrium of particle in space.

UNIT – II **9**

STATICS OF RIGID BODIES IN TWO DIMENSIONS: Rigid bodies -Two dimensional structure - Moment of force about a point and about an axis - Moment of a couple - Equivalent systems of coplanar forces - Rigid body in equilibrium - Problems involving equilibrium of rigid body

Application of Statics: Types of supports - Reactions of beams and rigid frames -

UNIT – III **9**

FRICTION: Laws of friction - Coefficient of friction - Problems involving dry friction - Wedge & ladder friction.

Introduction To Vibration: Simple Harmonic Motion - Mass spring system-Free vibration(elementary treatment only)

UNIT – IV **9**

KINEMATICS OF PARTICLES: Introduction - Plane, Rectilinear motion -Time dependent motion-Rectangular coordinates - Projectile motion.

Kinetics of Particles: Equation of motion - Rectilinear motion - Work energy method - Potential energy - Kinetic energy - Conservation of energy.

UNIT – V **9**

IMPULSE &MOMENTUM: Impulse - momentum principle - Concept of conservation of momentum - Impact-Direct central impact- Oblique central impact

TOTAL HRS: 45

TEXT BOOKS:

S.No	Title of the Book	Author of the Book	Publisher	Year of Publishing
1	Engineering Mechanics- Statics and Dynamics	Kottiswaran N	Sri Balaji Publications	2010

REFERENCE BOOKS:

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Engineering Mechanics	Bhavikatti S S&Rajasekarappa KG	New Age International (P) Ltd., New Delhi	2008
2	Engineering Mechanics	Bansal R K	Laxmi Publications (P), New Delhi.	2007
3	Engineering Mechanics- Statics and Dynamics	Rajasekaran S and Sankarasubramanian G	Vikas Publishing House Pvt. Ltd, New Delhi.	2005
4	Engineering Mechanics- Statics and Dynamics	Natesan S.C	Umesh Publications, New Delhi	2002

WEBSITES

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER I &II

16BECE212 ENGINEERING GRAPHICS 2 0 2 3 100

OBJECTIVES

1. To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
2. To give exposure to solid modeling, computer-aided geometric design, creating working drawings and engineering communication.
3. To develop graphic skill for communication of concepts, ideas and design of engineering products.
4. To give exposure to existing national standards related to technical drawings.
5. To gather skills in technical drawing.
6. To expose them to existing national standards related to technical drawings.

OUTCOMES:

On Completion of the course the student will be able to

1. perform free hand sketching of basic geometrical constructions and multiple views of objects.
2. do orthographic projection of lines and plane surfaces.
3. draw projections and solids and development of surfaces.
4. prepare isometric and perspective sections of simple solids.
5. demonstrate computer aided drafting.
6. Will gather skills in technical drawing

UNIT I INTRODUCTION 9

Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

UNIT II SCALES AND PLANE CURVES 8

SCALES:Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

UNIT III FREE HAND SKETCHING 9

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT IV PROJECTION OF POINTS, LINES AND PLANE SURFACES 8

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT V PROJECTION OF SOLIDS 8

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

Introduction to Drafting Software/Package (Not for Exam) **3**

Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings.Introduction to 3D primitives.

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venugopal K and Prabhu Raja V	Engineering Graphics	New Age International Publishers	2007
2	VTU	A Primer on Computer Aided Engineering Drawing	Belgaum	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kumar M S	Engineering Graphics	D D Publications, Chennai	2007
2	Bureau of Indian Standards	Engineering Drawing Practices for Schools and Colleges SP 46-2003	BIS, New Delhi	2003
3	Luzadder W J	Fundamentals of Engineering Drawing	Prentice Hall Book Co., New York	1998

WEB REFERENCES

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

VALUE ADDED COURSE

16BECE251 APTITUDE TRAINING 1 0 0 - 100

COURSE OBJECTIVES

1. To understand the basic concepts of QUANTITATIVE ABILITY
2. To understand the basic concepts of LOGICAL REASONING Skills
3. To acquire satisfactory competency in use of VERBAL REASONING
4. To solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
5. To solve off-campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
6. To compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

COURSE OUTCOMES

1. Understand the basic concepts of QUANTITATIVE ABILITY
2. Understand the basic concepts of LOGICAL REASONING Skills
3. Acquire satisfactory competency in use of VERBAL REASONING
4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
5. Solve off-campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
6. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc

UNIT I 5

Introduction, Speed Math's, Problems on Numbers, Averages, Ratios and Proportions, Problems on Ages

UNIT I I 5

Percentage, Data Interpretation, Profit and loss, Simple and Compound Interest

UNIT I II 5

Time Speed and Distance, Time and Work, Pipes and Cistern, Geometry, Probability, Permutation and Combination

TOTAL 15

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Agarwal.R.S	Quantitative Aptitude for Competitive Examinations	S.Chand Limited	2011
2	AbhijitGuha	Quantitative Aptitude for Competitive Examinations	Tata McGraw Hill	2011
3	Edgar Thrope	Test Of Reasoning for Competitive Examinations	Tata McGraw Hill, 4th Edition	2012

SEMESTER III

SEMESTER III

16BECE301 METHODS OF APPLIED MATHEMATICS 3 2 0 4 100

OBJECTIVES:

1. The purpose of this unit to gain familiarity with Laplace transforms, including the Laplace transforms of step functions and related functions.
2. Fourier series to apply physical science and signal systems.
3. Some standard functions and some of the properties of the Fourier transform.
4. To study the basic principles of different transforms and Partial Differential Equations.
5. In mathematics and signal processing, the Z-transform converts a discrete time-domain signal, which is a sequence of real or complex numbers, into a complex frequency-domain representation
6. To enhance the transform techniques.

16BECE412

OUTCOMES:

1. Apply Laplace transform for analyzing linear time invariant systems.
2. To apply Fourier series in sinusoidal signals, such as engineering, physics and applied mathematics.
3. To be able to solve wave equation using Fourier transform.
4. To recognize the heat conduction equation and the wave equation and have some knowledge of their applicability.
5. To equip the student with the capability of applying Z-transform to solve difference equations.
6. The Learners can equip themselves in the transform techniques.

UNIT I LAPLACE TRANSFORM (13)

Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals – Initial and final value theorems. Inverse Laplace transforms – Convolution theorem (statement only) – Solution of Ordinary Differential Equations with constant coefficients using Laplace transforms – Transform of periodic functions.

UNIT II FOURIER SERIES (12)

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT III FOURIER TRANSFORM (12)

Fourier integral theorem (Statement Only) – Fourier transform pair –Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity – Relation between Fourier and Laplace transforms

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS (12)

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded)

UNIT V Z -TRANSFORM AND DIFFERENCE EQUATIONS (11)

Z-transform - Elementary properties – Inverse Z- transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

Total : 60

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2013
2	Erwin Kreyszig	Advanced Engineering Mathematics.	Wiley India (P) Ltd, New Delhi.	2014

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venkateswarlu S	Engineering Mathematics, Vol I	Anuratha Agencies and Publishers, Kumbakonam.	2007
2	Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G	Advanced Mathematics for Engineering Students. Volumes II and III,	Viswanathan S Printers and Publishers Pvt. Ltd. Chennai.	2002
3	Bali N P., Manish Goyal	A text book of Engineering Mathematics	Laxmi Publications Pvt. Ltd., New Delhi	2006
4	Ramana B V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Co. Ltd. New Delhi.	2008

WEBSITES:

1. www.sosmath.com
2. http://mathworld.wolfram.com/FourierSeries.html
3. www. nptel.ac.in

SEMESTER-III

16BECE302 SOLID MECHANICS 3 0 0 3 100

OBJECTIVES:

1. To impart to the students the concepts of stresses and strains and Hooke's law.
2. To enlighten the students about different types of truss analysis.
3. To teach the students about the beam analysis
4. To teach about thin cylindrical and spherical shell analysis when subjected to internal pressure
5. To impart ideas of torsional stresses
6. To evaluate it in circular sections and its applications in spring analysis.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. The concepts of stresses, strains and Hooke's law.
2. Different types of truss analysis, beam behavior and analysis.
3. Thin cylindrical and spherical shell analysis when subjected to internal pressure.
4. Ideas of torsional stresses and how to evaluate it in circular sections
5. Will gain the brief knowledge in the applications in spring analysis.
6. Understand the different types of beams and their applications

UNIT I **9**

SIMPLE STRESSES AND STRAINS-Hooke's Law-Principle of superposition-Composite Sections-Temperature Stress-Hoop Stress-Elastic Constants-Principal Stresses and Strains-Mohr's Circle-Strain Energy and impact loading-Stresses due to gradual, sudden and impact loading-Proof resilience-Shear resilience.

UNIT II **9**

GEOMETRICAL PROPERTIES OF SECTIONS-Centroid-Centre of mass-Centre of gravity-Moment of inertia-Area moment of inertia-Mass Moment of inertia-Rectangular moment of inertia-Polar moments of inertia-Radius of gyration of an area-Perpendicular axis theorem-Parallel axis theorem-Moment of inertia.

UNIT III **9**

BENDING OF BEAMS -Types of beams and loads - Theory of simple bending – B.M.D. and S.F.D for Cantilever, Simply Supported and Overhanging beams subjected to various types of loading –UDL, Point Load, UVL- point of contraflexure- Calculation of shear stress and bending stress

UNIT IV **9**

DEFLECTION OF BEAMS-Slope and Deflection at a point- Estimation of slope and deflection for Cantilever, Simply Supported and Overhanging beams subjected to various types of loading (Only application of formulae) -Mohr's theorem-Strain energy method.

UNIT V **9**

TORSION OF SHAFTS-Assumptions-horse power transmitted by a shaft-Strength of solid shaft, Hollow shafts, composite shafts & stepped shafts -Torsional strain energy.
Spring-Leaf spring-Helical springs-Strain energy stored in a spring.

TOTAL HRS: 45

TEXT BOOKS:

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Strength of Materials	S.Ramamrutham	Dhanpat Rai Publishing Company, New Delhi	2012

REFERENCE BOOKS:

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Strength of Materials and Theory of Structures Vol.I	Dr.B.C.Punima	Laxmi Publication, New Delhi	2013
2	Strength of Materials (Mechanics of Solids)	Rajput R.K	S.Chand& Company Ltd., New Delhi	2012
3	Strength of Materials (Mechanics of Solids)	Khurmi R.S.	S.Chand& Company Ltd., New Delhi	2012

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER-III

16BECE303 MECHANICS OF FLUIDS 3 0 0 3 100

OBJECTIVES:

1. To understand the properties of fluids and fluid statics.
2. To solve kinematic problems such as finding particle paths and stream lines.
3. To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems.
4. To study about specific speed and performance characteristics of different types of turbines.
5. To study types of centrifugal Pumps, work done and efficiency of the different types centrifugal pumps
6. To study about performance of pumps & characteristic curves.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Understand the basic principles of fluid mechanics.
2. Understand the concepts of statics and dynamics of fluid flow.
3. Develop skills in analyzing fluid flows through the proper use of modeling and the application of the basic fluid-flow principles.
4. Acquire knowledge in the selection of type of turbine required with reference to available head of water
5. Identification of type of turbine with estimated specific speed.
6. Capable of estimating efficiency of different pumps and performance of the pumps with the study of characteristics curves.

UNIT I 9

TYPES AND PROPERTIES OF FLUIDS: Introduction– Types of fluids- Basic properties – calculation of Viscosity, compressibility, surface tension.

Fluid statics:

Fluid pressure-various methods of measurement. Total pressure and centre of pressure – determination on plane surface only – Equilibrium of floating bodies – conditions and analysis.

UNIT II 9

KINEMATICS OF FLUID FLOW: Classification of fluid flow – stream function and velocity potential – (Reynolds number and its application) - Linear acceleration and constant rotation of fluids in a container – application and simple problems.

UNIT III 9

DYNAMICS OF FLUID FLOW: Euler's equation of motion – Bernoulli's theorem – Limitation of Bernoulli's theorem – Application – simple problems. Venturimeter – Flow nozzle meter – Bend meter – Pitot tube – current meter.

UNIT IV 9

FLOW THROUGH PIPES: Laminar and Turbulent flow – friction and minor losses (Study of Moody's diagram).Transmission of power through pipes – flow between reservoirs – parallel, series and siphon pipes – water hammer.

UNIT V 9

DIMENSIONAL AND MODEL ANALYSIS

Dimensional Homogeneity – Need – Rayleigh's method &Buckingham's Pi theorem – Significance of dimensionless numbers-Reynolds number, Froude number, Euler's number, Mach number and Weber number – Distorted models – Scale effect

TOTAL HRS: 45

TEXT BOOKS:

S.No	Title of the Book	Author of the Book	Publisher	Year of Publishing
1	Text book of Fluid Mechanics and Hydraulic Machines	Bansal. R.K	Lakshmi Publications, Madras	2005

REFERENCES:

S.No	Title of the Book	Author of the Book	Publisher	Year of Publishing
1	Fluid Mechanics & Hydraulic Machines	R K Rajput	M/s. S.Chand Co., Madras	2008
2	Fluid Mechanics, Hydraulics & Fluid Machinery	Ramamrutham.S	M/s.Dhanpatrai& Sons, New Delhi	2006
3	Fluid Mechanics, Hydraulics and Hydraulic machines	Arora K.R	Standard Publishers Distributors, New Delhi	2011

WEBSITES

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/

SEMESTER-III

16BECE304ABUILDING MATERIALS AND GEOLOGY 3 0 0 3 100

OBJECTIVES:

1. To understand the importance of geological knowledge such as earth, earthquake, volcanism and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor as well as to choose types of foundations.
2. Identify the main and most common igneous, sedimentary and metamorphic rocks encountered by foundations and construction.
3. Analyze geological parameters important in geotechnical studies.
4. To establish and describe topographical and geological sections,
5. Identify potential geological hazards and various structures and ways of preventing and dealing with them
6. To collect, analyze, and report geologic data using standards in engineeringpractice

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies.
2. Will realize the importance of this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor
3. Can choose the types of foundations and other related aspects.
4. Students are able to know the engineering properties of rocks and geological structures of outer surface which help in construction of dam, bridge, building etc.
5. Students will gain the knowledge of different materials used in construction.
6. To gain the knowledge of manufacturing of different construction materials.

UNIT– ISTONES, BRICKS, CONCRETE BLOCKS 9

Stone as building material – criteria for selection – test on stones – Deterioration and preservation of stone work – Bricks – classification and types– Tests on bricks – Bricks for special use – Refractory bricks – Concrete hollow blocks.

UNIT– IICEMENT, AGGREGATE AND SAND 9

Cement – Ingredients – Manufacturing processes – Types and grades – Properties – Hydration-applications

Aggregate – Natural stone aggregate – crushing strength – Impact strength – Flakiness – abrasion - Sand – bulking – codesofpractice -Mortar and concrete – Ingredients- types – manufacturing, Batching Plants

UNIT– IIITIMBER, STEEL, PAINTS AND OTHER MODERN MATERIALS. 9

Timber –Market forms –Industrial timber– Plywood, Veneer, laminates.

Steel, Aluminum & other materials – composition– uses – market forms– Mechanical treatment.

Paints, varnishes, distempers.

Glass– ceramic– sealants for joints – fiber glass reinforced plastic– clay products– glass refractoriness.

UNIT– IVGENERAL GEOLOGY, STRUCTURAL GEOLOGY & THEIR SIGNIFICANCE. 9

Geology in civil engineering– Earth processes– weathering– geological work of river, wind and sea– seismic activity– seismic zones in India – ground water.

Structural geology –study of structures – dip and strike – fold, faults and joints – Their significance.

UNIT –VMINERALS, ROCKS AND THEIR ENGINEERING SIGNIFICANCE 9

Elementary knowledge on minerals – Physical properties of minerals – study of following rock forming minerals – Quartz , Feldspar, Pyroxene, Hornblende & Mica family –Ore minerals – Clays minerals and their significance.

Rocks - Classification -Igneous, Sedimentary, Metamorphic rocks

TOTAL HRS: 45

TEXT BOOKS:

S.No.	Title of the book	Author of the book	Publisher	Year of publication
1.	Engineering materials	Dr. R.K. Bansal	Lakshmi publications Pvt. Ltd., New Delhi	2010
2.	Engineering and General Geology	Parbin Singh	S.K.Kataria& sons, New Delhi	2011

REFERENCE BOOKS:

S.No.	Title of the book	Author of the book	Publisher	Year of publication
1.	Building construction	S.C. Rangwala	Charotar Publishing Company, Anand-388 001	2009
2.	Geology and Engineering	Legeet	McGraw-Hill Book company, Newyork	2004
3.	Engineering materials	Dr. R.K. Rajput	S. Chand & Company Ltd., New Delhi	2000

WEBSITES

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/
- http://www.icivilengineer.com
- http://www.engineeringcivil.com/

SEMESTER-III

16BECE304B CONSTRUCTION MATERIALS AND EQUIPMENT 3 0 0 3 100

OBJECTIVES:

1. Will realize the importance of this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor
2. Can choose the types of foundations and other related aspects.
3. Students are able to know the engineering properties of rocks and geological structures of outer surface which help in construction of dam, bridge, building etc.
4. Students will gain the knowledge of different materials used in construction.
5. To gain the knowledge of manufacturing of different construction materials.
6. To gain the applications of materials in various fields.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Understand the basic building materials to be used in construction work
2. Know the various construction practices in the field and the different construction equipment used in the field
3. Make aware of the various construction techniques, practices and the equipment needed for different types of construction activities.
4. Will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies.
5. Will realize the importance of this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor
6. Can choose the types of foundations and other related aspects.

UNIT– I: STONES, BRICKS, CONCRETE BLOCKS9

Stone as building material – criteria for selection – test on stones – Deterioration and preservation of stone work – Bricks – classification and types– Tests on bricks – Bricks for special use – Refractory bricks – Concrete hollow blocks.

UNIT– II: CEMENT, AGGREGATE AND SAND9

Cement – Ingredients – Manufacturing processes – Types and grades – Properties – Hydration-applications Aggregate – Natural stone aggregate – crushing strength – Impact strength – Flakiness – abrasion - Sand – bulking – codes of practice. Mortar and concrete – Ingredients- types – manufacturing, Batching Plants

UNIT– III: TIMBER, STEEL, PAINTS AND OTHER MODERN MATERIALS. 9

Timber –Market forms –Industrial timber– Plywood, Veneer, laminates.

Steel, Aluminum & other materials – composition– uses – market forms– Mechanical treatment.

Paints, varnishes, distempers.

Glass– ceramic– sealants for joints – fiber glass reinforced plastic– clay products– glass refractoriness.

UNIT IV: CONSTRUCTION PRACTICES: 9

Specifications, Site Clearance – Marking – Earthwork - masonry – stone masonry – concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements –centering and shuttering sheet piles –scaffoldings – de-shuttering forms –weather and water proof – roof finishes .

UNIT V: CONSTRUCTION EQUIPMENT: 9

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling, drilling, blasting — dewatering and pumping equipment – Transporters.

TOTALHRS: 45

TEXT BOOKS:

S.No.	Title of the book	Author of the book	Publisher	Year of publication
1.	Planning Techniques and Method of Construction	Arora S.P. and Bindra S.P.	DhanpatRai and Sons	1997
2.	Construction Planning, Equipment and Methods	Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C.,	McGraw Hill, Singapore,	1995

REFERENCE BOOKS:

S.No.	Title of the book	Author of the book	Publisher	Year of publication
1.	Building construction	S.C. Rangwala	Charotar Publishing Company, Anand-388 001	2009
2.	Engineering materials	Dr. R.K. Rajput	S. Chand & Company Ltd., New Delhi	2000

WEBSITES

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/

- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/
- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com

SEMESTER-III

16BECE305 SURVEYING I 3 0 0 3 100

OBJECTIVES:

1. Chain, Compass, Plane table and Theodolite surveying. Levelling, Engineering surveys.
2. Skill to carry survey and to decide appropriate type of execution in construction works.
3. Numerical solutions for carrying out surveying in civil engineering field. Advanced surveying equipment's.
4. Work with survey observations, and performcalculations,
5. To Provides independent knowledge for carrying out individual projects.
6. To know the different surveys used in civil field.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Explore the different surveying instruments for surveying.
2. Describe the methods of measurement using level instrument and theodolite.
3. Provides independent knowledge for carrying out individual projects.
4. Able to identify and calculate the errors in measurements
5. Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveyingactivities
6. Translate the knowledge gained for the implementation of Civil infrastructure facilities

UNIT I 9

INTRODUCTION -Definition , Principles and Classification of surveying- Field work and office work - Scales - Conventional signs - Survey instruments, their care and adjustment –chain surveying- Ranging - Reciprocal ranging - Setting perpendiculars – well-conditioned triangles - Traversing - Plotting - Enlarging and reducing figures.

UNIT II 9

COMPASS SURVEYING AND PLANE TABLE SURVEYING : Prismatic compass - Surveyor's compass - Bearing - Systems and conversions - Local attraction - Magnetic declination - Dip - Traversing - Plotting - Adjustment of errors - Plane table instruments and accessories –Merits and demerits - Methods - Radiation - Intersection - Resection – Traversing- Two point and three point problem.

UNIT III 9

LEVELLING AND APPLICATIONS: Level line - Horizontal line - Levels and Staves - Spirit level - Sensitiveness - Bench marks - Temporary and permanent adjustments - Fly and check levelling - Booking - Reduction - Curvature and refraction - Reciprocal levelling - Longitudinal and cross sections

- Plotting - Calculation of areas and volumes - Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs.

UNIT IV **9**

THEODOLITE SURVEYING: Theodolite - Vernier and microptic - Description and uses - Temporary and permanent adjustments of vernier transit - Horizontal angles - Vertical angles - Heights and distances - Traversing - Closing error and distribution - Gale's tables - Omitted measurements.

UNIT V **9**

ENGINEERING SURVEYS : Reconnaissance, preliminary and location surveys for engineering projects - Lay out - Setting out works - Route Surveys for highways, railways and waterways - Curve ranging - Horizontal and vertical curves - Simple and reverse curves - Setting with chain and tapes, tangential angles by theodolite, double theodolite - Transition curves - Functions and requirements

TOTAL HRS: 45

TEXT BOOKS

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Surveying&levelling	N.N.Basak	Tata McGraw Hill	2011
2	Surveyingvol I	Dr.B.C.Punmia	Laxmi Publications	2011

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Plane and Geodetic Surveying, Vols. I and II	Aylmer Johnson	CRC Press	2004
2	Introduction to Surveying	James M.Anderson and Edward M.Mikhail	McGraw-Hill Book Company,New Delhi.	2005

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER-III

16BECE311 BUILDING PLANNING AND DRAWING LABORATORY 0 0 3 2 100

OBJECTIVES:

1. To understand the principles of planning and bylaws
2. To draw plan, elevation and section of load bearing and framed structures
3. To draw plan, elevation and section of public and industrial structures
4. To prepare detailed working drawing for doors, windows, etc.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Apply the principles of planning and bylaws used for building planning.
2. Draw plan, elevation and section for various structures.

DRAWING MANUALLY BY CONVENTIONAL METHODS

1. Conventional signs
2. Bonds in brick and stone masonry
3. Plan, elevation and section of simple buildings.

COMPUTER AIDED DRAWING

1. Buildings with load bearing walls (Flat and pitched roof) – Including details of doors and windows
2. Detailed drawings of floor plans, Elevations and Sections to show various features in a Building
3. Preparation of plot plans with study of property lines and Location of Buildings on site
4. RCC framed structures
5. Industrial buildings – North light roof structures – Trusses
6. Perspective view of one and two storey buildings

TEXT BOOKS

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Building Drawing	Shah, Kale and Patki	Tata McGraw-Hill Co. Ltd,New Delhi	2004

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Building planning & Drawing	Dr.N. Kumaraswamy, A. KameswaraRao	Charotar Publishing,Gijarat	2007
2	Civil Engineering. Drawing & House Planning	B.P. Verma	Khanna Publishers, Delhi	2013

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER-III

16BECE312 CONSTRUCTION MATERIALS LABORATORY 0 0 3 2 100

OBJECTIVES:

1. To learn the Procedure and Purpose of carrying out various tests on properties of materials used for construction.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Understand the basic building materials to be used in construction work
2. Know the various construction practices in the field and the different construction equipment used in the field
3. Make aware of the various construction techniques, practices and the equipment needed for different types of construction activities.

TEST ON MATERIALS

1. ORDINARY PORTLAND CEMENT:

Determination of the specific gravity of cement using Le-chaletier flask and the fineness by sieve analysis.

- Determination of the normal consistency and setting times.
- Determination of the soundness of OPC using Le-chaletier apparatus.
- Determination of the compressive strength of Ordinary Portland cement.

2. TEST ON AGGREGATE:

Determination of the Specific gravity, Bulk density and Water Absorption of Aggregates.

- Study of the phenomenon of Bulking of sand – River Sand and M Sand
- Determination of fineness modulus for fine and coarse aggregates by drawing grading curves - River Sand and M Sand.
- Determination of the impurities in aggregates.

3. TEST ON BRICKS:

- Determination of the compressive strength.
- Determination of the water Absorption.
- Determination of the degree of efflorescence.

- Checking of dimensional tolerance and warpage.

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REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Building Construction, Planning Techniques and Method of Construction	Arora S.P. and BindraS.P	DhanpatRai and Sons, New Delhi	2008
2	Construction Planning,Equipment and Methods	Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C	5th Edition, McGraw Hill, Singapore,	2004

CODE BOOKS

1. **IS 269 for 33 Grade cement**
2. **IS 8112 for 43 Grade Cement**
3. **IS 12269 for 53 Grade Cement**
4. **IS 383 for Testing of Aggregates**

SEMESTER-III

16BECE313 SURVEYING PRACTICAL I 0 0 3 2 100

OBJECTIVES:

1. Introduction to Chain Surveying
2. Traverse using Compass Surveying.
3. Plane Table Surveying – Radiation, intersection, Traverse, Resection,Leveling.
4. Tachometry and Theodolite survey trigonometric leveling to determine heights/elevations.
5. Total Station.
6. Setting out of curves (horizontal and vertical)

COURSE OUTCOMES

1. Use conventional surveying tools such as chain/tape, compass, plane table, level in the field of civil engineering applications such as structural plotting and highway profiling.
2. Apply the procedures involved in field work and to work as a surveying team.
3. Plan a survey appropriately with the skill to understand the surroundings. Take accurate measurements, field booking, plotting and adjustment of errors can be understood.
4. Traverse using Compass Surveying.
5. Plane Table Surveying – Radiation, intersection, Traverse, Resection,Leveling.
6. Setting out of curves (horizontal and vertical)

1. Study of chains and its accessories
2. Aligning, Ranging and Chaining
3. Chain Traversing
4. Compass Traversing
5. Plane table surveying: Radiation
6. Plane table surveying: Intersection
7. Plane table surveying: Traversing
8. Plane table surveying: Resection –Three point problem
9. Plane table surveying: Resection – Two point problem
10. Study of levels and levelling staff
11. Fly levelling using Dumpy level
12. Check levelling
13. LS and CS
14. Study of Contouring

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Surveying	Bannister A. and Raymond S	ELBS, Seventh Edition, Canada	2004
2	Surveying and Levelling Part 1 &2 , 23rd edition,	Kanetkar.T.P. &S.V.Kulkarni,	Punavidyarthigriha ,Prakashan,	2008

VALUE ADDED COURSE

16BECE351 **SOFT SKILLS** **1 0 0 - 100**

OBJECTIVE

1. To elevate the students into productivity powerhouses who can employ life skills to better their performances

UNIT I **4**

Overview to communication, self Introduction, Presentation on their own topic, Extempore, Group Activity

UNIT II **3**

Group Discussion, Do's and Don'ts of Group Discussion, Body language, Grooming and Resume, Resume correction

UNIT III **4**

Introduction to HRM – Questions - Do's and Don't's - Interview - Mock GD - Stress Management

UNIT IV **4**

Personality Development - Presentation skills, Interpersonal skills, Critical thinking, Confidence building and Stress management.

TOTAL **15**

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Barun K Mitra	Personality Development and Soft Skills	Oxford University Press-New Delhi	2012
2	Rajiv K. Mishra	Personality Development	Rupa& Co.	2012

SEMESTER IV

SEMESTER IV

16BECE401 CONCRETE TECHNOLOGY 3 0 0 3 100

OBJECTIVES:

1. To understand the properties of ingredients of concrete
2. To study the behavior of concrete at its fresh and hardened state
3. To study about the concrete design mix
4. To know about the procedures in concreting
5. To understand special concrete and their use.
6. To know the recent research technologies.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Test all the concrete materials as per IS code.
2. Design the concrete mix using ACI and IS code methods.
3. Will Determine the properties of fresh and hardened of concrete.
4. To Design special concretes and their specific applications.
5. Ensure quality control while testing/ sampling and acceptance criteria.
6. Recent advancements in the field of concrete Technology.

UNIT I **9**

CEMENT& ADMIXTURES: Types – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.

UNIT – II **9**

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

UNIT – III **9**

FRESHCONCRETE: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT IV **9**

HARDENED CONCRETE: Water / Cement ratio – Abram's Law – Gelspaoe ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

TESTING OF HARDENED CONCRETE: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods – codal provisions for NDT.

UNIT V **9**

MIX DESIGN: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

SPECIAL CONCRETES: Light weight concrete – Cellular concrete – No-fines concrete – High Strength concrete-High performance concrete- High density concrete – Fibre reinforced concrete - Polymer concrete – Properties – Applications — Self compacting concrete

TOTAL HRS:45

TEXT BOOKS:

Sl.No	**Title of Book**	**Author of Book**	**Publisher**	**Year of Publishing**
1	Concrete Technology	M.S.Shetty	S.Chand& Co, Uttar Pradesh	2004

REFERENCES:

Sl.No	**Title of Book**	**Author of Book**	**Publisher**	**Year of Publishing**
1	Concrete Technology	M.L. Gambhir	Tata Mc. Graw Hill Publishers, New Delhi	2004
2	Properties of Concrete	A.M.Neville	Canadian GovtPublishing Centre, Ottawa	2011
3	Concrete Technology	A.R.Santha Kumar	Oxford university Press, New Delhi	2006

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER IV

16BECE402 SOLID MECHANICS II 3 0 0 3100

OBJECTIVES:

1. To understand the concept of Principle of virtual work
2. To study the different methods of finding deflection of beam
3. To analyze the Indeterminate beams subjected to various loading
4. To study the different methods to find the deflection of truss
5. To analyze the column with different end conditions and stress in thick cylinders
6. To Analyze the Indeterminate beams subjected to various loading

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Apply the principle of virtual work.
2. Determine deflection of a beam for various loading conditions.
3. Apply unit load method to find the deflection of truss.
4. Determine different stresses developed in thick cylinders.
5. Visualize the behavior of column for combined bending and axial loading.
6. Determine the deflections if beam using different methods
7. Analyze the Indeterminate beams subjected to various loading

UNIT I **9**

FORCES IN STATICALLY DETERMINATE FRAMES-Method of joints-Method of sections-Graphical method –Deflection -Unit load method-Graphical method-Forces in redundant frames-Castigliano’s theorem-Maxwell’s method-Tension Co-efficient method.

UNIT II **9**

UNSYMMETRICAL BENDING-stresses in beams subjected to unsymmetrical bending-Deflection of beams –simply supported beams – fixed end beams – Over hanging beams – different load conditions (Point load, UDL,UVL) - under unsymmetrical bending-shear centre.

UNIT III **9**

COMBINED BENDING AND DIRECT STRESSES-Columns and struts-types-failure modes-Euler’s formula-Rankin’s formula-Johnson’s-IS code formula-practical end conditions and effective length factors**-** Eccentric loading-Middle third rule-Core of a section. Build – up columns and theories of failure

UNIT IV **9**

THIN CYLINDRICAL AND SPHERICAL SHELLS- Assumptions-Internal pressure-Change in volume-Minimum thickness of wall plates.

THICK CYLINDRICAL AND SPHERICAL SHELLS-Assumptions Lami's theory-Compound cylinders-Thick spherical shells.

UNIT V **9**

ELEMENTARY THEORY OF VIBRATIONS - Simple harmonic motion - Longitudinal vibration - Helical and Compound springs -Transverse vibrations of beams with point loads and UDL - Torsional vibrations of shafts.

TOTAL HRS: 45

TEXT BOOKS:

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Strength of materials and Theory of Structures Vol.I	Dr. B.C.Punmia	Laxmi Publications, Chennai	2011

REFERNENCE BOOKS:

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Applied mechanics	V.Devarajan	Padma Publications, New Delhi.	2012
2	Applied Mechanics and Strength of Materials	R.S.Khurmi	Niraja Construction and Development Limited, Tenth Edition, New Delhi,	2012

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER-IV

16BECE403 APPLIED HYDRAULICS AND MACHINERY 3 0 0 3 100

OBJECTIVES:

1. To classify the types of flows in open channel and also to design open channel sections in a most economical fashion with minimum wetted perimeter and learn about critical flows.
2. To study about non uniform flows in open channel and longitudinal slopes in open channel
3. To learn about the characteristics of hydraulic jump.
4. To develop an understanding of fluid flow patterns
5. To use boundary layer theory and Drag.
6. To provide insights to the Open channel hydraulics and introduce dimensional analysis for fluid flow problems.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Acquire specific knowledge regarding fluid flow phenomena observed.
2. Understand the basic principles of fluid flow patterns and boundary layer theory
3. Develop skills in analyzing fluid flows in open channel hydraulics and measurements such as weirs and flumes.
4. Will gain knowledge about the Open channel flow.
5. Understand hydraulic jump phenomenon
6. Design open channels for rectangular and non-rectangular channels for GVF and RVF.

UNIT I UNIFORM FLOW IN OPEN CHANNELS: 9

Types of Channels - Uniform flow – chezy's equation – Manning's equation-hydraulically best section of rectangular, trapezoidal and circular sections – circular sections not running full-flow measurement using orifices, mouthpieces, notches and weirs.

UNIT IINON-UNIFORM FLOW IN OPEN CHANNELS 9

Introduction - Critical depth – Specific Energy – Characteristics of non uniform flow – Analysis of hydraulic Jump – Back water curves –venturiflume – Surges in channels.

UNIT III IMPACT OF JETS 9

Flow over immersed bodies: Drag and lift – stream lined Bluff bodies – Terminal velocity – Estimation of drags and lift forces. Impulse – Momentum principle – and its application – dynamic force upon a body in motion – Torque in rotating machines – jet propulsion.

UNIT IVPUMPS 9

Classification of pumps – Centrifugal pumps – Reciprocating Pumps – Deep well pumps – Airlift Pump – Working principle only – Characteristic curves – Selection of pumps and Simple problems.

UNIT V TURBINE 9

Classifications – velocity triangles for turbines, work done and efficiency – study of pelton wheel, Francis and axial flow turbines – governing of turbines – characteristic curves – Specific speed – Model testing – Selection of turbines – Simple Problems to determine geometric dimensions.

TOTAL HRS: 45

TEXT BOOK:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	A Text book of Fluid Mechanics and Hydraulic Machines	Bansal.R.K	Lakshmi Publication, Madras	2012
2	Fluid Mechanics, Hydraulics & Fluid Machines	Ramamrutham. S	DhanpatRai& Sons, New Delhi	2013

REFERENCE BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Engineering Fluid Mechanics	Kumar.K.L	S. Chand Co., Madras	2012
2	Hydraulics, Fluid Mechanics & Hydraulic Machinery	Modi P.M, &Seth.S.M	Standard Book House, New Delhi	2008
3	Fluid Mechanics, Hydraulics and Hydraulic Machines	Arora, K.R	Standard Publishers Distributors, Delhi	2011

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER-IV

16BECE404 MECHANICS OF SOIL 3 0 0 3 100

OBJECTIVES:

1. To explain what Geotechnical Engineering is and how it is important to civil engineering
2. To explain how three phase system is used in soil
3. To know the soil properties estimated using three phase system
4. To explain role of water in soil behavior and how soil stresses, permeability and quantity of seepage including flow net are estimated
5. To determine shear parameters and stress changes in soil due to foundation loads
6. To estimate the magnitude and time-rate of settlement due to consolidation

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Carry out soil classification.
2. Solve three phase system problems.
3. Solve any practical problems related to soil stresses estimation,
4. Gain the knowledge in permeability and seepage including flow net diagram
5. Estimate the stresses under any system of foundation loads.
6. Solve practical problems related to consolidation settlement and time rate of settlement.

UNIT I BASIC PROPERTIES OF SOILS 9

Soil formation-Soil problems in Engineering –Physical properties of soil –Phase relations-Index properties of soil – Grain size distribution –Atterberg limits – classification of soils as per BIS –Fixed identification –simple tests

UNIT II STRESSES IN SOILS 9

Soil water statics – Concept of effective and neutral stresses – Capillary phenomenon –Vertical stress distribution in soil –Bossiness equation – Westerguards equation – Line load –uniformly distributed loads –New marks chart –construction and use –Pressure bulb .

UNIT III PERMEABILITY AND SEEPAGE 9

One dimensional flow through soil –permeability –Darcy’s law –field and laboratory permeability tests –Flow through stratified soil –Seepage pressure quick sand condition-Two dimensional flow –Laplace equation –Electrical analogy –Flow net –Methods of construction –properties –Applications –sheet pile cut off and earth dam –Phreatic line.

UNIT IV CONSOLIDATION AND SETTLEMENT 9

Consolidation –consolidation settlement –Laboratory test -Determination of Cv by curve fitting methods –Terzaghi’s one dimensional consolidation –Definition of terms –Normally consolidated clay –Over consolidated clay –Under consolidated clay –Field curve –Pre consolidation pressure –e vs p curve –Boundary condition –Time Factor –Time of consolidation. –computation of rate of settlement – Types of Settlements – Components of settlements – Factors affecting settlements

UNIT V SHEAR STRENGTH **9**

Shear strength of soil –importance and use –Mohr –coloumbs' theory –Factors affecting the shear strength. –Laboratory test –Direct shear test –Tri-axial compression test –types of triaxial test based on drainage conditions –UCC test –Field test

TOTAL HRS: 45

TEXT BOOKS

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Soil mechanics and foundations	Punmia. B.C	Laxmi Publications pvt.Ltd,New Delhi	2012

REFERENCE BOOK:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Basic and Applied Soil Mechanics	GopalRanjan and Rao, A.S.R	Wiley eastern Ltd., New Delhi	2009
2	A Text Book of Soil Mechanics and Foundation Engineering.	V.N.S.Moorthy	Marcel Dekker,Inc, Newyork	2013
3	Soil Mechanics and Foundation Engineering	Arora.K.R	Standard Publishers and Distributors,New Delhi	2012

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER-IV

16BECE405 SURVEYING II 3 0 03 100

OBJECTIVES:

The student will be able to gain knowledge on

1. Skill to carry survey and to decide appropriate type of execution in construction works.
2. Numerical solutions for carrying out surveying in civil engineering field. Advanced surveying equipment's.
3. Work with survey observations, and performcalculations,
4. To Provides independent knowledge for carrying out individual projects.
5. To know the different surveys used in civil field.
6. To have confidence in carrying out individual projects

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Explore the different surveying instruments for surveying.
2. Describe the methods of measurement using level instrument and theodolite.
3. Provides independent knowledge for carrying out individual projects.
4. Able to identify and calculate the errors in measurements
5. Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveyingactivities
6. Translate the knowledge gained for the implementation of Civil infrastructure facilities

UINT-I 9

TACHEOMETRIC SURVEYING: Tacheometric systems - Tangential, stadia and subtense methods - Stadia systems - Horizontal and inclined sights - Vertical and normal staffing - Fixed and movable hairs - Stadia constants - Analytic lens - Subtense bar.

UINT-II 9

CONTROL SURVEYING: Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line - Instruments and accessories - Corrections - Satellite station - Reduction to Centre – Trigonometric levelling - Single and reciprocal observations - Modern trends – Bench marking

UINT-III 9

SURVEY ADJUSTMENTS: Errors - Sources, precautions and corrections - Classification of errors - True and most probable values - weighted observations - Method of equal shifts - Principle of least squares - Normal equation - Correlates - Level nets - Adjustment of simple triangulation networks.

UINT-IV 9

REMOTE SENSING and GPS: Field of Applications –Natural Resources-Agriculture-Soil-Water Resources-Wasteland Management-Social resources-Cadastral Records-LIS Basic concepts of GPS and its applications

UINT-V 9

OTHER TOPICS: Fundamental principal:(Demo)Photogrammetry - Introduction - Terrestrial and aerial Photographs - Stereoscopy - Parallax –Introduction to Total Station- Electromagnetic distance measurement - Carrier waves - Principles - Instruments - Trilateration - Hydrographic Surveying - Tides - MSL - Sounding methods - Location of soundings and methods

TOTAL HRS: 45

TEXT BOOKS

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Surveying, Volume I, II and III	Punmia B.C	LaxmiPublications,Delhi	2012

REFERENCES

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Plane and Geodetic Surveying, Volume I and II	Aylmer Johnson	CRC Press , New York	2004
2	Introduction to Surveying	James M.Anderson and Edward M.Mikhail	McGraw-Hill Book Company, New York, Fifth Edition	2009
3	Elements of Cartography	Harley	McGraw-Hill Book Company New York, Fifth Edition	2001
4	Surveying and Levelling, Volume I and II	KanetkarT.P	United Book Corporation, Pune	2007
5	Surveying	Bannister A. and Raymond S	ELBS, Seventh Edition	2004
6	Surveying and Levelling	Basak.N.N	McGraw-Hill Book Company	2011

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/

SEMESTER-IV

16BECE411 STRENGTH OF MATERIALS LABORATORY 0 0 3 2 100

OBJECTIVES:

1. To find the Young Modulus, torsional strength, hardness and tensile strength of given specimens
2. To find impact value and crushing value of coarse aggregates
3. To find the compressive strength of concrete cubes and bricks
4. To find stiffness of open coiled and closed coiled springs
5. To find the physical properties of given coarse aggregate, fine aggregate and cement samples

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Evaluate Young Modulus, torsional strength, hardness and tensile strength of given specimens.
2. Determine the strength of coarse aggregates.
3. Find the compressive strength of concrete cubes and bricks.
4. Find stiffness of open coiled and closed coiled springs.
5. Determine the physical properties of given coarse aggregates, fine aggregates and cement samples.

LIST OF EXPERIMENTS

1. Study of UTM, Torsion testing machine, Hardness tester, Compression testing machine
2. Tension Test on M.S. and HYSD bars
3. Test involving Torsion to obtain the Torque vs. Angle of twist and hence the stiffness
4. Test on steel beam – Bending test - compression test
5. Tests on Metals
   - Hardness test on metals (Brinell and Rockwell Tests)
   - Impact test. (Izod and Charpy Tests)
   - Shear test
6. Tests on springs for Stiffness

The student should learn the use of deflectometer, extensometer, and strain gauges.

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Solid Mechanics	Kazimi S.M.A	Tata McGraw-Hill Publishing Co, New Delhi	2003
2	Theory and Problems of Strength of Materials	William Nash	Schaum's Outline Series, McGraw-Hill International,Delhi.	2005
3	Advanced Mechanics of Solids	Srinath L.S	Tata McGraw-Hill Publishing Co., Delhi	2003
4	Strength of Materials	R.S. Khurmi	S. Chand & Company Ltd, New Delhi	2008

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/

SEMESTER-IV

16BECE412 SCIENTIFIC COMPUTING LABORATORY 2 0 2 3 100

OBJECTIVES:

1. The objective of this course is to familiarize the students with statistical techniques.
2. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.
3. To introduce students to numerical methods used to solve engineering problems.
4. Fundamentals of numerical methods/algorithms to solve systems of different mathematical equations (e.g. linear/ non-linear algebraic equations, ordinary /partial differential equations), will be introduced.
5. The course would enable students to write their own computer programs using programming languages like C and software like Excel.
6. To give the practical knowledge on the solving of partial differential equations using programming languages like C and software like Excel

COURSE OUTCOMES:

1. To solve engineering problems involving Linear and non-linear equations.
2. Hands-on experience will be provided to apply these computer programs to solve problems in different areas of engineering.
3. To acquire skills in handling situations involving linear/ non-linear algebraic equations, ordinary /partial differential equations
4. To solving actual engineering problems through computer programming and coding.
5. To solve ordinary and partial differential equations using programming languages like C and software like Excel.
6. Student will understand procedure-oriented Excel concepts. Student will be capable of writing C and Excel programs efficiently.

LIST OF EXPERIMENTS

1. Finding solution of Transcendental equation
   i) Newton – Raphson Method
   ii) Bisection method
   iii) Iterative method by reducing the equation to the form x= f(x)
2. Finding the dominant eigenvalue and eigenvector by power method
3. Numerical integration
   i) Gauss 2 point and 3 point formulae
   ii) Trapezoidal method
   iii) Simpson's 1/3 rule
4. Solution of initial value problems governed by ODE
   i) Runge - Kutta 4^{th} order method
   ii) Modified Euler's method
   iii) Milne's method

iv) Adam – Bashforth method

5. Solution of BVP governed by PDE
   i) Laplace Equation
   ii) One – dimensional heat equation
      a) Explicit method : Bender – Schmidt's method
      b) Implicit method : Crank - Nicolson's method
   iii) One dimensional wave equation
      Implicit method

REFERENCE BOOKS:

S. No.	**Author(s) Name**	**Title of the book**	**Publisher**	**Year of Publication**
1	Curtis F. Gerald and Patrick O. Wheatley	Applied Numerical Analysis	Pearson Education, South Asia	2009
2	Steven C. Chapra, Raymond P. Canale	Numerical Methods for Engineers	McGraw - Hill Pub. Co. Ltd	2014

SE ME

SEMESTER-IV

16BECE413 SURVEYING PRACTICAL II 0 0 3 2 100

OBJECTIVES:

The Lab sessions would include experiments on

1. Introduction to Chain Surveying
2. Traverse using Compass Surveying.
3. Plane Table Surveying – Radiation, intersection, Traverse, Resection, Leveling.
4. Tachometry and Theodolite survey trigonometric leveling to determine heights/elevations.
5. Total Station.
6. Setting out of curves (horizontal and vertical)

Course outcomes

On completion of the course, the students will be able to:

1. Use conventional surveying tools such as chain/tape, compass, plane table, level in the field of civil engineering applications such as structural plotting and highway profiling.
2. Apply the procedures involved in field work and to work as a surveying team.
3. Plan a survey appropriately with the skill to understand the surroundings. Take accurate measurements, field booking, plotting and adjustment of errors can be understood.
4. Traverse using Compass Surveying.
5. Plane Table Surveying – Radiation, intersection, Traverse, Resection, Leveling.
6. Setting out of curves (horizontal and vertical)

1. Study of Theodolite, Total Station and GPS
2. Measurement of horizontal angles by reiteration and repetition and vertical angles
3. Heights and distances - Triangulation - Single plane method.
4. Tachometry - Tangential system - Stadia system - Subtense bar.
5. Setting out works - Foundation marking - Simple curve (right/left-handed).
6. Distance, height and area measurements using total station
7. Horizontal curve setting using total station for roads

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Surveying	Bannister A. and Raymond S	ELBS, tenth Edition, Canada.	2008
2	"Surveying and Levelling Part 1 &2 ", 23rd edition,	Kanetkar.T.P. &S.V.Kulkarni,	Punavidyarthigriha ,Prakashan,	2012

SEMESTER-IV
VALUE ADDED COURSE

16BECE451 TECHNICAL PRESENTATION/SEMINAR 1 0 0 -100

OBJECTIVES:
At the end of this course students should have learnt the presentation skills needed for the presentation in national and international conferences.

Topics are given in the current real time problems and students are required to present solutions to the problems by referring to Journals, magazines or by consulting experts.

SEMESTER V

SEMESTER-V

16BECE501 STRUCTURAL ANALYSIS I 3 0 0 3 100

OBJECTIVES:

1. To understand the concept of analysis of indeterminate structures by various classical methods
2. To study the use of ILD for determinate structure
3. To learn the concepts of moving loads and its effect on structures
4. To understand the concept of equivalent UDL
5. To study the reversal of stress under live load
6. To determine the reversal of stresses in trusses using ILD.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Use various classical methods for analysis of indeterminate structures.
2. Determine the effect of support settlements for indeterminate structures.
3. Apply the concepts of ILD and moving loads on determinate structures.
4. Apply the concept of equivalent UDL.
5. Determine the reversal of stresses in trusses using ILD.
6. To Analyse the building using different methods available for designing and analysing.

UNIT I STATIC AND KINEMATIC INDETREMINANCY 9

Degree of static and kinematic indeterminacies of frames- analysis of indeterminate frame- Degree of redundancy-Static and Kinematic indeterminacies-propped cantilever and fixed beams - reaction-B.M.D. and S.F.D.

UNIT II MOMENT DISTRIBUTION METHODS 9

Moment-Distribution and carryover of moments – Stiffness and carryover of factors – Analysis of Continuous beams – Analysis of Simple frames – Plane rigid frame with and without sway - Two cycle moment distributions method (No problems)

UNIT III INFLUENCE LINE DIAGRAM 9

Analysis for moving loads-Influence line Diagram (ILD) –ILD for beam with point loads, UDL shorter than span and several point loads at a section -Equivalent UDL-Absolute maximum bending moments for two wheel loads at a fixed distance apart.

UNIT IV ARCHES 9

Arches as structural forms-types of arches-Three-hinged arches-Horizontal thrust-Effect of Temperature change-Straining actions- Parabolic and Circular arches-Two-hinged arches-Horizontal thrust-Effect of temperature change-Straining actions- Parabolic and Circular arches.

UNIT V CABLES AND SUSPENSION BRIDGES 9

Equation of the cable-Horizontal thrust on the cable-Tension in the cable-Length of the cable-Effect of temperature on the cable-Stiffening girders in suspension bridges-with three-hinged and two-hinged stiffening girders

TOTAL: 45HRS

TEXT BOOKS:

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Strength of materials and Theory of Structures Vol.I& II	Dr. B.C.Punmia	Laxmi Publications, Chennai	2011

REFERENCE BOOKS:

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Intermediate Structural Analysis	C.K. Wang	McGraw Hill, New Delhi	2012
2	Introduction to Structural Analysis	B. D. Nautiyal	New Age International (P) Ltd	2010
3	Theroy of Simple Structures	.C.Shedd&J.Vauter	T, Wiley Eastern Ltd.	2001
4	Fundamentals of Structural Mechanics and Analysis	Gambhir.M.L.	PHI Learning Pvt. Ltd., New Delhi	2011
5	Theory of structures	S.Ramamrutham&R.Narayan	DhanpatRai Publishing Co, New Delhi	2013
6	Structural Analysis – Vol. 1 & Vol. 2	BhavaiKatti, S.S	Vikas Publishing Pvt Ltd., New Delhi	2008

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/

SEMESTER-V

16BECE502 DESIGN OF RC STRUCTURES I 3 0 0 3 100

OBJECTIVE

1. To study the stress strain behavior of steel and concrete
2. To understand the concept of working stress and limit state methods
3. To gain the knowledge of limit state design for flexure, shear, torsion, bond and anchorage
4. To understand the behavior of columns subjected to eccentric load and use of interaction diagrams
5. To design the beams, slab, stairs, column and footing.
6. To draw detailing of various RCC structural elements

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Apply the fundamental concepts of working stress method and limit state method.
2. Use IS code of practice for the design of concrete elements.
3. Design the beams, slab, stairs, column and footing.
4. Draw detailing of various RCC structural elements.
5. understand the behavior of columns subjected to eccentric load and use of interaction diagrams
6. gain the knowledge of limit state design for flexure, shear, torsion, bond and anchorage

UNIT I

INTRODUCTION 9

Materials for concrete- Stress-Strain curve for concrete in compression-Concrete mix proportioning-Design mix and nominal mix-Types of reinforcement-Plain and deformed bars-Stress-strain curve for reinforcing steel.

Concept of WSD (No problems) and LSD-Difference between WSD and LSD-Characteristic loads and strengths-Partial safety factor-Various limit states.

DESIGN FOR FLEXURE:

Design of singly and doubly reinforced rectangular and flanged sections as per IS code

UNIT II

DESIGN BASICS FOR SHEAR, BOND AND TORSION 9

Design for shear-concept of bond and anchorage-Design for torsion-IS code provision for the design of beams-Design of lintels-Design of continuous beams using B.M. and S.F. co-efficient as per IS code-detailing.

UNIT III

DESIGN OF SLABS 9

Types of slabs-IS code regulations-Stiffness requirements-Design of one-way simply supported and continuous slab using BM and SF co-efficient as per IS code-Principles of Rankine-Grashof'smethod(no problems)-design of two way, simply supported and continuous slab as per IS code.

UNIT IV

DESIGN OF COLUMNS 9

IS-code regulations-Design of short rectangular and circular columns subjected to axial compressive load-Design of short columns subjected to combined axial compressive load and uni-axial and biaxial bending moments using design aids(SP 16)- Introduction to long column design

UNIT V

DESIGN OF FOOTINGS 9

Design of wall footings- Design of isolated, square and rectangular footings.-combined rectangular and trapezoidal footings.

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1.	Reinforced Concrete Design	UnnikrishnaPillai&DevadosMenon	Tata McGraw Hill Publishing Co, New Delhi	2012
2.	IS 456-2000 Indian Standard Code of practice for Reinforced Concrete.			
3	SP-16 Design Aids for IS 456-1978. IS 875-1987-Code of Practice for Design Loads			

REFERENCE:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1.	Reinforced Concrete	Mallick, S.K., and Gupta, A.P	Oxford & IBH Publishing Co., New Delhi	2008
2.	Reinforced Concrete Design	Sibha,S.N.	Tata McGraw-Hill Publishing Co, Ltd., New Delhi	2001
3.	Reinforced Concrete Mechanics and Design	MacGregor J.G	Prentice Hall, New Jersey	2008
4.	Reinforced Concrete limit state design	Ashok K Jain	Nem Chand Bros, Roorkee	2012
5.	Limit State Design of R.C.Structures	Varghese, P.C	PHI Learning Pvt. Ltd.. New Delhi	2008

WEBSITES:

- http://www.icivilengineer.com

- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/

SEMESTER V

16BECE503A TRANSPORTATION ENGINEERING 3 0 0 3 100

OBJECTIVES:

1. To understand the importance of transportation and characteristics of road transport
2. To know about the history of highway development, surveys and classification of roads
3. To study about the geometric design of highways
4. To study about traffic characteristics and design of intersections
5. To know about the pavement materials and design
6. To design flexible and rigid pavements as per IRC.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Carry out surveys involved in planning and highway alignment.
2. Design cross section elements, sight distance, horizontal and vertical alignment.
3. Implement traffic studies, traffic regulations and control, and intersection design.
4. Determine the characteristics of pavement materials.
5. Design flexible and rigid pavements as per IRC.
6. Will gain the knowledge of horizontal and vertical curves.

UNIT I 9

CLASSIFICATION OF ROADS-Highway alignment and surveys-Highway economics and financing. Geometric design of High way-design speed-Cross sectional elements-super elevation-sight distances-Gradients-extra widening at curves.

UNIT II 9

HIGHWAY MATERIALS-Aggregates and Bituminous Materials-Selection and testing-Construction methods for Earth roads,gravel,W.B.M, roads, Bituminous pavements and Cement concrete pavements

UNIT III 9

TRAFFIC ENGINEERING-Traffic volume-Speed and delay studies-Parking and accident studies-Traffic signs, marking and signals-road intersections-Traffic forecasting-Need-limitation-Types of traffic-Forecasts of traffic. Traffic Compositions-Future traffic estimates-Design Vehicle-Dimensions-Types of Design Vehicles.

UNIT IV 9

NATURE OF TRAFFIC PROBLEMS IN CITIES: Growth of towns-Growth of Traffic-Nature of Present Difficulties-Measures to meet problems-Need for Study-Land use and City Planning Controls-Restrain measures-Public transport-Promotion of public transport pedestriauisation-Staggy traffic hours.
Traffic and free environment-Effects of traffic on the environment-Noise-Air-Vibration-Degrading the aesthetic-Land consumption-Evaluation procedures-Environmental areas-computer application in traffic engineering-Public transport systems-Simulation, Traffic Planning and Computer application-situation in India.

UNIT V **9**

AIRPORTS-their importance-spacing and position in relation to their zone-details of their location and layout-auxiliary and terminal buildings-their location and layout.

Runway lighting and drainage-Other accessories such as hangers and repair yards-airport zoning.

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Highway Engineering	C.E.G.Justo and S.K. Khanna	New Chand &Bros.,Roorkee	2000
2	Highway Engineering	Rangwala	CharotarPublications,Pune	2002

REFERENCE BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Highway Engineering	L.Kadiyali	Nath Market, Naisarak Delhi-110 006	2002
2	Highway Engineering	Paul K Wright and Karen K. Dixon	Replica Press Limited, Kundli, Seventh Edition	2009
3	Transportation Engineering & Planning,	C.S. Papacostas, P.D.Prevedouros	Prentice Hall of India, Third Edition, New York	2001

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/

SEMESTER V

16BECE503B HIGHWAY ENGINEERING 3 0 0 3 100

OBJECTIVES:

1. To understand the importance of transportation and characteristics of road transport
2. To know about the history of highway development, surveys and classification of roads
3. To study about the geometric design of highways
4. To study about traffic characteristics and design of intersections
5. To know about the pavement materials and design
6. To select pavement materials and design

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Carry out surveys involved in planning and highway alignment.
2. Design cross section elements, sight distance, horizontal and vertical alignment.
3. Implement traffic studies, traffic regulations and control, and intersection design.
4. Determine the characteristics of pavement materials.
5. Design flexible and rigid pavements as per IRC.
6. The pavement materials and design

UNIT I 9

HIGHWAY PLANNING AND ALIGNMENT: Macadam's method of Road Construction, Highway Development in India - Jayakar Committee RecommendationsTwenty-year Road Development Plans, Concepts of On-going Highway Development Programmed at National Level- Indian Roads Congress, Highway Research Board, National Highway Authority of India, Ministry of Road Transport and Highways (MORTH) and Central Road Research Institute. Requirements of Ideal Alignment, Factors Controlling Highway Alignment -Engineering Surveys for Alignment - Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards],

UNIT II 9

GEOMETRIC DESIGN OF HIGHWAYS: Design of Horizontal Alignments – Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems]-Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves-Sight Distances - Factors affecting Sight Distances, PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD]-Geometric Design of Hill Roads [IRC Standards Only]

UNIT III 9

DESIGN OF RIGID AND FLEXIBLE PAVEMENTS: Rigid and Flexible Pavements- Components and their Functions-Design Principles of Flexible and Rigid Pavements, Factors affecting the Design of Pavements - ESWL, Climate, Sub-grade Soil and Traffic-Design Practice for Flexible Pavements [CBR method, IRC Method and Recommendations- Problems]-Design Practice for Rigid Pavements – [IRC Recommendations-Problems] – Joints

UNIT IV **9**

HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE: Desirable Properties and Testing of Highway Materials: Soil – California Bearing Ratio Test, Field Density Test- Aggregate - Crushing, Abrasion, Impact Tests, Water absorption, Flakiness and Elongation indices and Stone polishing value test-Bitumen - Penetration, Ductility, Viscosity, Binder content and Softening point Tests.-Construction Practice - Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications]-Highway Drainage [IRC Recommendations]

UNIT V **9**

HIGHWAY MAINTENANCE: Types of defects in Flexible pavements – Surface defects, Cracks, Deformation, Disintegration – Symptoms, Causes and Treatments. Types of Pavement, Failures in Rigid Pavements – Scaling, Shrinkage, Warping, Structural Cracks Spalling of Joints and Mud Pumping – and Special Repairs. Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation, Evaluation of pavement Failure and strengthening - Overlay design by Benkelman Beam Method [Procedure only], Principles of Highway Financing

TOTAL HRS: 45

TEXT BOOKS

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Highway Engineering	Khanna K and Justo C E G	Khanna Publishers, Roorkee	2009

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Principles and Practice of Highway Engineering	Kadiyali L R	Khanna Technical Publications, Delhi.	2004

IRC Standards (IRC 37 - 2001 & IRC 58 -1998)

Bureau of Indian Standards (BIS) Publications on Highway Materials

Specifications for Road and Bridges, MORTH (India)

WEBSITES

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/

SEMESTER V

16BECE504 ENVIRONMENTAL ENGINEERING I 3 0 0 3 100

OBJECTIVES:

1. To make the students conversant with sources and its demand of water
2. To understand the basic characteristics of water and its determination
3. To expose the students to understand the design of water supply lines
4. To provide adequate knowledge about the water treatment processes and its design
5. To have adequate knowledge on operation and maintenance of water supply
6. To gain the knowledge of distribution system and their methods

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Identify the source of water and water demand.
2. Apply the water treatment concept and methods.
3. Apply water distribution processes and operation and maintenance of water supply.
4. Prepare basic process designs of water and wastewater treatment plants collect, reduce, analyze, and evaluate basic water quality data.
5. Gain the knowledge of distribution system and their methods.

understand the design of water supply lines

UNIT I **9**

PLANNING FOR WATER SUPPLY SYSTEMS: Planning Factors for Water Supply schemes-Population forecasting – Design period – Variations in demand pattern-Water demand characteristics - Standards –

UNIT II **9**

SOURCES OF WATER-classification of source- water quality parameters & significance –Intake structures, Wells,Infiltration Gallery, Tube wells- Construction & Development-Sanitary Protection of wells- yield of wells.

UNIT III **9**

CONVEYANCE OF WATER: Pipes and channels for transmitting water -Selection of materials for pipes and conduits-Laying, jointing & testing of pipes – Pipe appurtenances-Various types of pumps-Pump selection–Pumping station.

UNIT IV **9**

WATER TREATMENT: General layout of a water treatment plant– Principles of screening, flocculation, flash mixing, sedimentation, filtration-various techniques of disinfection– Brief on water softening, De-mineralization, and aeration

UNIT V

STORAGE&DISTRIBUTION OF WATER: **9**

Service reservoirs-elevated and ground level reservoirs-equalizing and service storage- factors affecting storage capacity-distribution network patterns – Analysis of distribution network – Hardy Cross method – Equivalent Pipe method – Leak detection in pipe network - Corrosion control, Lining of pipes-Appurtenances

TOTAL HRS: 45

TEXT BOOKS

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Water Supply Engineering	Garg, S.K	KhannaPublishers,New Delhi	2012

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Hand book on Water Supply and Drainage- SP35		B.I.S,New Delhi	2007
2	Water supply Engineering	Fair G.M, Geyer.J.C	Khanna Publishing Co., New Delhi	2007
3	Water Supply Engineering	Punmia B C Ashok Jain Arun Jain	Laxmi Publications, Delhi	2010

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER-V

16BECE5E-- PROFESSIONAL ELECTIVE I 3 0 0 3 100

TOTAL HRS: 45

SEMESTER-V

16BECE511APPLIED HYDRAULICS &HYDRAULIC MACHINERYLABORATORY

0 0 3 2 100

OBJECTIVES:

1. To understand the flow measurement in a pipe flow
2. To understand the flow measurement in a pipe flow using Constant Head method
3. To determine the energy loss in pipe flow
4. To study the characteristics of turbines
5. To study the characteristics of pumps
6. To measure the discharge in a open channel flow

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Measure discharge in pipes.
2. Determine the energy loss in conduits.
3. Demonstrate the characteristics curves of pumps
4. Demonstrate the characteristics curves of turbines.
5. Carry out discharge measurements in open channel.
6. understand the flow measurement in a pipe flow using Constant Head method

LIST OF EXPERIMENTS

1. Determination of co-efficient of discharge for orifice
2. Determination of co-efficient of discharge for venturimeter
3. Determination of co-efficient of discharge for orifice meter
4. Friction losses in pipes(Major& minor)
5. Determination of performance characteristics of Francis turbine
6. Determination of performance characteristics of Centrifugal pumps (Constant speed / variable speed)
7. Study on performance characteristics of Reciprocating pump.
8. Determination of performance characteristics of Submersible pump.
9. Experiment on Bernoulli’s theorem

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	A text book of Fluid Mechanics	Rajput, R.K	S.ChandPublishers,New Delhi	2012
2	Fluid Mechanics, Hydraulics & Fluid Machines	Ramamrutham. S	DhanpatRai& Sons, New Delhi	2013

SEMESTER-V

16BECE512 GEOTECHNICAL LABORATORY 0 0 3 2 100

OBJECTIVES:

1. To estimate index properties of soils (coarse and fine).
2. To estimate consistency limit of fine grained soils.
3. To estimate shear strength of soils by direct shear test, triaxial shear test, vane shear test & unconfined compressive test.
4. To estimate the engineering properties of the soils by density test, CBR test
5. To estimate the engineering properties of permeability test and consolidation test.
6. To classify the soil by physical observation of soil.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Classify soil by physical observation of the soils.
2. Classify soil based on estimated index and engineering characteristics of soils.
3. Carry out interpolation among the estimated soil design parameters.
4. Estimate shear strength of soils by direct shear test, triaxial shear test, vane shear test & unconfined compressive test.
5. Estimate the engineering properties of the soils by density test, CBR test
6. Estimate the engineering properties of permeability test and consolidation test.

LIST OF EXPERIMENTS

1. Specific gravity of soil grains(Specific gravity bottle &Pycnometer)
2. Grain size distribution - Sieve analysis
3. Relative density of sands
4. Atterberg limits test

   a) Liquid Limit
   b) Plastic Limit
   c)Shrinkage Limit

- Determination of moisture - Density relationship using standard Proctor test.
- Permeability determination (constant head and falling head methods)
- Determination of shear strength parameters.

  a) Direct shear test on cohesionless soil
  b) Unconfined compression test on cohesive soil
  c) Triaxial compression test (Study Experiment)
- One dimensional consolidation test (Determination of co-efficient of consolidation only, Study Experiment)
- Field density test

  a) Core cutter and

b) Sand replacement methods

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Manual of Soil Laboratory Testing (Vol-1 to 3),	Head, K.H	John Wiley & Sons, Chichester	2009
2	Soil Testing for Engineers	LambeT.W	John Wiley and Sons, New York	2009
3	Measurement of Engineering Properties of Soils,	Saibaba Reddy, E. and Rama Sastri, K	New Age International Publishers, New Delhi	2002
4	I.S.Code of Practice (2720) Relevant Parts, as amended from time to time			

SEMESTER V

16BECE513 CONCRETE AND HIGHWAY LABORATORY 0 0 3 2 100

OBJECTIVE

1. To find impact value and crushing value of coarse aggregates
2. To find the compressive strength of concrete cubes and bricks
3. To find the physical properties of given coarse aggregate, fine aggregate
4. To find the physical properties of given cement samples
5. To learn the characteristics, properties and testing procedures of aggregate
6. To learn the characteristics, properties and testing procedures of bitumen

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Determine the strength of coarse aggregates.
2. Find the compressive strength of concrete cubes and bricks.
3. Determine the physical properties of given coarse aggregates, fine aggregates and cement samples.
4. Characterize the aggregate used for road construction
5. Characterize the bitumen used for road construction.
6. Know the characteristics, properties and testing procedures of bitumen

LIST OF EXPERIMENTS

A. TEST ON CONCRETE

- Workability test on concrete- Slump, Compaction factor and Vee –Bee test
- Strength test on concrete – Compressive Strength ,Direct tensile strength, Split tensile strength test and Flexural strength test

B. TEST ON AGGREGATE

- Flakiness Index and Elongation Index
- Crushing Value and Impact Value
- Abrasion test- Deval abrasion test

C. TEST ON BITUMEN

- Ductility Test
- Viscosity Test
- Specific Gravity Test
- Flash and Fire Point Test

REFERENCES

S.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Specifications for Road and Bridges, MORTH (India)			1985
2	IS 1489 (Part 1 and 2) Specifications for Portland Pozzolana Cement			1976
3	IS 2386 (Part 1to 8) Methods of Test for Aggregates for Concrete			1986
4	IS 10262-1982 Recommended Guidelines for Concrete Mix Design			1982
5	IS 1199 1959 methods of Sampling and Analysis of Concrete			1959
6	Bureau of Indian Standards (BIS) Publications on Highway Materials			1965
7	Highway Engineering	Khanna K and Justo C E G	Khanna Publishers, Roorkee	2012
10	Concrete Technology	A.R. Santha Kumar	Oxford university Press, New Delhi	2012

SEMESTER-V

VALUE ADDED COURSE

16BECE551 INPLANT TRAINING - - - -100

OBJECTIVE

At the end of this course students should be able to know the practical applications of theory in the field.

Students are emphasised to take one month intensive training in reputed construction or design or architecture firm.

16BECE552 SURVEY CAMP - - - - 100

OBJECTIVE

At the end of this course students should be able to know the practical applications of survey in the field.

Students are emphasised to take intensive training in the field limited to one week.

SEMESTER VI

SEMESTER VI

16BECE601 STRUCTURAL ANALYSIS II 3 0 0 3100

OBJECTIVES:

1. To understand the influence line concepts for indeterminate structures
2. To understand the methods of analysis of intermediate trusses for external loads, lack of fit and thermal effect
3. To study behaviour of arches and their methods of analysis
4. To know the concept and analysis of cable stayed bridge
5. To study the multi storey frames subjected to gravity loads and lateral loads
6. To apply the methods of indeterminate truss analysis

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Demonstrate the concepts of qualitative influence line diagram for continuous beams and frames
2. Apply the methods of indeterminate truss analysis.
3. Demonstrate the behavior of arches and their methods of analysis.
4. Analyse cable suspension bridges.
5. Analyse multistory frames subjected to gravity loads and lateral loads.
6. Analyse multi storey frames subjected to gravity loads and lateral loads

UNIT I 9

Indeterminate structures - Slope deflection method - Continuous beams and fixedbeam– Simplification of hinged end – support settlement - Simple frames - Portal frames
Consistent-deformation method-continuous beams.

UNIT II 9

Strain energy method- Castigliano's theorem- Deflection by strain energy method – evaluation of strain energy in member under different loading – Application of strain energy method for Beams and frames - Beams curved in plan.

UNIT III 9

Flexibility method -Equilibrium and Compatibility – Determinate vs Indeterminate structures – Indeterminacy – Primary Structure – Compatibility conditions – Analysis of indeterminate pin – jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

UNIT IV 9

Stiffness method-Beams-Trusses-Simple frames-Portal frames-Grids-Lack of fit-Temperature stresses-Support settlements-Elastic supports.(Direct approach)- Introduction to Finite element.

UNIT V 9

Plastic Analysis of Structures : Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames.

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Strength of materials and Theory of Structures Vol.I, II	Dr.B.C.Punmia	Laxmi Publication, New Delhi	2012

REFERENCE BOOKS:

Sl.No	Title of the Book	Author of the Book	Publisher	Year of Publishing
1	Intermediate Structural Analysis	C.K. Wang	McGraw-Hill, New Delhi	2002
2	Matrix Analysis of Framed structures	W.Weaver and J.M Gere	Van NostrandReinhold,New York	2003
3	Structural analysis, a matrix approach	G.S.Pandit and S.P.Gupta	Tata McGraw Hill	2004
4	Theory of structures	S.Ramamrutham&R.Narayan	DhanpatRai Publishing Co, New Delhi	2013
5	Analysis of Structures-Vol.II	Prof.V.N. Vazirani, Dr.M.M.Ratwani, Dr.S.K.Duggal	Khanna Publishers, Chennai	2012

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER VI

16BECE602 DESIGN OF RC STRUCTURES II 3 0 0 3100

OBJECTIVE

1. To understand the design concept of various structures and detailing of reinforcements.
2. To understand the design of underground and elevated liquid retaining structures.
3. To study the design of material storage structures.
4. To know the effect of temperature on concrete structures.
5. To study the design of bridges subjected to IRC loading.
6. To draw the various reinforcements of structures

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Apply the concepts of liquid retaining structures.
2. Design material storage structures using various theories.
3. Apply the concepts of environmental and transportation structures.
4. Demonstrate the detailing of reinforcement.
5. Draw the various RCC structures.
6. design of material storage structures

UNIT 1

YIELD LINE THEORY 9

Introduction-Assumptions - Characteristics of yield line - Determination of collapse load / plastic moment- Application of virtual work method - square, rectangular, circular and triangular slabs With point load and UDL (Simply support and Fixed support)- Design problems.

UNIT II

BUILDING FRAMES 9

Multi storeyed structures and framed structures-Elastic analysis ,Suitable substitute frames for gravity loadings-Approximate analysis of single and two bay frames up to three storeys using portal method and cantilever method.

UNIT III

RETAINING WALLS 9

Design of Cantilever retaining wall – Design of Counterfort Retaining walls-Stability Analysis.

UNIT IV

WATER TANKS 9

Classification-IS code provisions-Principles of design-Design of rectangular and circular water tanks , below ground level, tanks resting on ground and Elevated tanks – Intze type water tank (Theory only)

UNIT V

SPECIAL ELEMENTS9

Design of staircases (Straight and doglegged) – Design of flat slabs – Design Principles of Mat foundation and box culvert.

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	R.C.C. Designs Reinforced Concrete Structures	Punmia B.C, Ashok Kumar Jain, ArunK.Jain	Laxmi Publications Pvt. Ltd., New Delhi	2006

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Advanced Reinforced Concrete Design	Varghese.P.C	Prentice Hall of India Pvt. Ltd New Delhi.	2012
2	Reinforced Concrete	Mallick, D.K. and Gupta A.P	Oxford and IBH Publishing Company, New York	2003
3	Reinforced Concrete Structures	Syal, I.C. and Goel, A.K	A.H. Wheelers & Co. Pvt. Ltd.,Chennai	2001
4	Design of Reinforced Concrete Structures	Gambhir.M.L	Prentice Hall of India Private Limited, New york	2012

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER-VI

16BECE603A WATER RESOURCES ENGINEERING 3 0 0 3 100

OBJECTIVES:

1. To build on the student's background in hydrology and hydraulics an understanding of water resources systems.
2. To develop the skills in modeling of flood flows and flood routing
3. To develop skills in the ground water flow, type of aquifer and yield from the well.
4. To provide the knowledge of design of reservoir, operation and sedimentation
5. To know the different aquifers and the water table level.
6. To planning of reservoirs and storage tanks.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Incorporate the analytical abilities in the planning and design of water resource systems.
2. Apply the knowledge on reservoir planning and investigation
3. Model the flood flows and flood routings.
4. Gain the knowledge of design of reservoir, operation and sedimentation
5. Will know the different aquifers and the water table level.
6. Planning of reservoirs and storage tanks.

UNIT I 9

INTRODUCTION: Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – environmental impacts of irrigation- Classification of irrigation projects - Crop and crop seasons – consumptive use of water – Duty, Delta and Base period – Factors affecting duty – Irrigation efficiencies.

PRECIPITATION: Types of precipitation – Forms of precipitation – Measurement of Rainfall –Losses from precipitation-- Hydrograph - Factors affecting Hydrograph – Base flow separation – Unit hydrograph – S curve hydrograph

UNIT II 9

RIVER ENGINEERING: Rivers –Types and Behavior

WATER LOGGING: Causes of water logging - Effects of water logging – Remedial measures for water logging

DRAINAGE: Necessity – Advantages – Methods.

RIVER STRUCTURES: Diversion Head works- Brief Description of component parts and their functions- - Seepage theories.

UNIT III 9

CANAL ENGINEERING: Alignment of canals – Classification of canals - Distribution network - Canal Losses - Cross sectional details - Sedimentation in canals - Silt theories - Balancing depth of cutting

CANAL LINING: Types, Construction and Maintenance

CANAL AND RIVER STRUCTURES: Canal regulators and Types - Canal Falls and Types

CROSS DRAINAGE WORKS: Types- Selection -River Training works – types.

UNIT IV **9**

RIGID STORAGE STRUCTURES: Gravity dams Description– Arch and Buttress dam – Spillways – Factors affecting location and type of dams – Forces on a dam – Galleries and types.

Non Rigid Storage Structures: Earth dams - Causes of failure - Typical cross sections to suit site conditions and available materials - Phreatic line – Tanks – Classification – Components - types of Bunds

UNIT V **9**

RESERVOIR PLANNING: Reservoirs- Types- Zones of storage – Capacity - Yield- Area - Elevation and capacity- Elevation curves - Mass curve analysis - Capacity for specific demand and yield for given capacity- Fixing reservoir capacity- Reservoir sedimentation and control- Selection of site for reservoir

Other Irrigation Structures: Surplus Weir- Tower Head Sluice- Wing wall type- (Theoretical Approach only)- Culverts- Small ROAD bridges across drains- Canal outlets and flumes- Types (Theoretical Aspect only).

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Irrigation Engineering and Hydraulic structures	Garg, S.K	KhannaPublishers,New Delhi	2012

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Irrigation and Water Power Engineering	Punmia B.C., Pande B.B.Lal	Lakshmi Publications, Chennai.	2012
2	Irrigation Engineering and Hydraulic Structures	SahasraBudheS.R	S.K. Kataria &Sons, Chennai	2014
3	Irrigation Engineering	RK Sharma, TK Sharma	S.Chand& Company Ltd., New Delhi	2009

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER-VI

16BECE603B IRRIGATION ENGINEERING 3 0 0 3 100

OBJECTIVES:

1. To understand the basic types of irrigation, irrigation standards and crop water assessment
2. To study the different aspects of design of hydraulic structures
3. To provide knowledge on various hydraulic structures such as energy dissipaters, head and cross regulators, canal falls and structures involved in cross drainage works
4. To understand the analysis of seepage and hydraulic jump
5. To design different types of dams.
6. To understand the different types of cross drainage works

Course outcomes

On completion of the course, the students will be able to:

1. Find the crop water requirement for various crops in the command area.
2. Understand the complete design of Dams and channel systems.
3. Understand the different types of cross drainage works.
4. Design various river training methods.
5. Gained Knowledge on various hydraulic structures such as energy dissipaters, head and cross regulators
6. design different types of dams

UNIT I **9**

INTRODUCTION: Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – environmental impacts of irrigation-History of irrigation development in India-Classification of irrigation projects Crop and crop seasons – consumptive use of water – Duty – Factors affecting duty – Irrigation efficiencies – Planning and Development of irrigation projects.

UNIT II **9**

IRRIGATION METHODS: Requirement of an irrigation method- sub surface irrigation-surface irrigation-burried irrigation-seepage line irrigation- Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits – Sprinkler irrigation – Drip irrigation – barrow pit method-participatory approach – water user associations- social aspects in water pricing

UNIT III **9**

DIVERSION AND IMPOUNDING STRUCTURES: Weirs – elementary profile of a weir – weirs on pervious foundations - Types of impounding structures - Tanks, Sluices and Weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams.

UNIT IV **9**

CANAL IRRIGATION: Design of irrigation channels - Alignment of canals – Classification of canals –Typical capacity –statement of roughness coefficient- Maximum and minimum permissible velocity - Canal drops – side slopes of banks- side slopes of canal- Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works.

UNIT V **9**

IRRIGATION WATER MANAGEMENT: Need for optimisation of water use – Minimizing irrigation water losses – On farm development works – Percolation ponds – Participatory irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation. Selection of site for hydropower plant- essential data for waterpower studies- requirement of water for hydel power

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	**Title of Book**	**Author of Book**	**Publisher**	**Year of Publishing**
1	Irrigation Engineering	Asawa, G.L	New Age International Publishers, New Delhi	2012
2	Irrigation Engineering	Sharma R.K., and Sharma T.K	S. Chand and company, New Delhi	2011
3	Irrigation Engineering	Gupta, B.L, & Amir Gupta	SatyaPraheshan, New Delhi	2011

REFERENCES:

Sl.No	**Title of Book**	**Author of Book**	**Publisher**	**Year of Publishing**
1	Irrigation Water Management (Principles & Practices)	Dilip Kumar Majumdar	Prentice Hall of India (P), Ltd, New york	2004
2	Irrigation Engineering	Basak, N.N	Tata McGraw-Hill Publishing Co,New Delhi	2009
3	Irrigation Engineering	Garg, S.K.,	Tata McGraw-Hill Publishing Co,New Delhi	2002

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/

SEMESTER-VI

16BECE604 ENVIRONMENTAL ENGINEERING II 3 0 0 3 100

OBJECTIVE

1. To learn the basics of sewage composition and its characteristics
2. To depict the information about various sewage treatment processes
3. To provide the adequate information on various disposal standards for industrial effluents
4. To study the information about air pollution and its effects
5. To understand the knowledge about solid waste generation and disposal methods.
6. To gain knowledge information about various sewage treatment processes

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Determine the sewage characteristics and design various sewage treatment plants.
2. Analyze the status of surface water and ground water quality and the remediation technologies.
3. understand the information about air pollution and its effects
4. gain knowledge information about various sewage treatment processes
5. Carry out municipal water and wastewater treatment system design and operation.
6. Manage hazardous wastes, risk assessment and treatment technologies apply environmental treatment technologies and design process.

UNIT I 9

SEWERAGE SYSTEM: Definitions-Classification – Quantity of sewage – Fluctuations in Flow pattern- Estimation of storm run off-Design of flow for separate and combined systems

UNIT II 9

SEWAGE COLLECTION: Sanitary Fixtures and Fittings- Systems of House Drainage- General Layout- Anti siphonage- Connection of House sewer to public sewer- Materials for sewers- – Laying, jointing and testing of sewers- Sewer Maintenance- Sewage pumping- Types of pumps Sewer appurtenances – Pump selection

UNIT III 9

SEWAGE TREATMENT- PHYSICO CHEMICAL: Objectives- Characteristics and Composition of sewage-Analysis- Cycles of decomposition- design - principles of sewage treatment- screen chamber, grit chamber, primary sedimentation tanks

UNIT IV 9

SEWAGE TREATMENT- BIOLOGICAL: Fundamentals of microbiology of waste water- Basic Principles of Biological Treatment-Design principles - trickling filter - activated sludge process- UASB reactor- Modifications- Low cost treatment methods

UNIT V 9

SLUDGE TREATMENT AND EFFLUENT DISPOSAL: Objectives of sludge treatment- Properties and characteristics of sludge- methods of disposal- Conventional and high rate digesters- Sludge Lagooning- Sludge thickening methods- Effluent disposal on land- Sewage farming practices- Dilution- Standards for disposal - Disposal into water bodies Eutrophication- Oxygen sag curve- Recycle and reuse of waste effluents

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Sewage and waste Disposal Engineering	Garg, S.K	Khanna Publishers, New Delhi	2012

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Wastewater Engineering – Treatment & Reuse	Metcalf and Eddy, M.C	Tata McGraw-Hill Publications, New Delhi	2003
2	Water supply Engineering	Fair G.M, Geyer.J.C	Khanna Publishing Co., New Delhi	2002
3	Water Supply and Sanitary Engineering	Birdie G.S	DhanpatRai& Sons, New Delhi	2003
4	Environmental engineering II Waste water engineering (including air pollution)	Punmia B.C Ashok K Jain Arun K Jain	Laxmi Publications, Delhi	2010

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/

SEMESTER-VI

16BECE6E-- PROFESSIONAL ELECTIVE II 3 0 0 3 100

TOTAL HRS: 45

SEMESTER-VI

16BECE6E-- PROFESSIONALELECTIVE III 3 0 0 3 100

TOTAL HRS: 45

SEMESTER-VI

16BECE611IRRIGATION AND ENVIRONMENTAL ENGINEERING DRAWING

0 0 3 2 100

OBJECTIVES:

1. To learn the software developing skills for structural design.
2. To understand the computing techniques in the field of transportation.
3. To gain knowledge in problem solving in water resources.
4. To apply computing techniques to transportation engineering.
5. To apply computing skills to water resources and environmental engineering.
6. To apply computing skills to geotechnical engineering.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Apply the software skills in the design of infrastructure.
2. Apply computing techniques to transportation engineering.
3. Apply computing skills to water resources and environmental engineering.
4. Apply computing skills to geotechnical engineering.
5. Learn the software developing skills for structural design.
6. Understand the computing techniques in the field of transportation.

ENVIRONMENTAL ENGINEERING DRAWING

This subject includes process design (excluding Structural Design) of major units associated with water and sewage treatment and transport including house building drainage. At the end of the course, the student is expected to know about the sizing of treatment plant units and draw the general arrangement.

1. General layout of water and waste treatment plants
2. Sedimentation aided with coagulation
3. Slow sand filter
4 Rapid sand filter
5 Trickling filter
6 Septic tank

TEXT BOOKS

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Irrigation Engineering and Design of Structures	Garg, S.K	Published by Mrs. L.Banumathi,Tuni	2012
2	Irrigation Design and Drawing	Satyanarayana Murthy	East Godavari District, A.P	2002
3	Irrigation Engineering and Hydraulic Structures	Sharma R.K	Oxford and IBH Publishing Co., New Delhi	2002

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi			1999
2	Manual of Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi			1993
4	Environmental Engineering	Peary, H.S., Rowe, D.R., and Tchobanoglous,G	McGraw-Hill BookCo., New Delhi	2005
5	Wastewater Engineering (Treatment and Reuse)", 4th Edition	Metcalf & Eddy	Tata McGraw-Hill, New Delhi	2003

SEMESTER-VI

16BECE612 ENVIRONMENTAL ENGINEERING LABORATORY0 0 3 2 100

OBJECTIVES:

1. To quantify the water and wastewater pollutant
2. To measure the concentration of air pollutants
3. To analyze the characteristics of water
4. To analyze the characteristics of wastewater and ambient air
5. To determine the characteristics of ambient air
6. To study the growth of microorganism and its quantification

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Quantify the pollutant concentration in water, wastewater and ambient air.
2. Recommend the degree of treatment required for the water and wastewater.
3. Analyse the survival conditions for the microorganism and its growth rate.
4. Quantify the water and wastewater pollutant
5. Measure the concentration of air pollutants
6. Analyze the characteristics of water

LIST OF EXPERIMENTS

1. Sampling and preservation methods and significance of characterization of water and wastewater.
2. Determination of
   i) PH and turbidity
   ii) Hardness
3. Determination of iron & fluoride
4. Determination of residual chlorine
5. Determination of Chlorides
6. Determination of Ammonia Nitrogen
7. Determination of Sulphate
8. Determination of Optimum Coagulant Dosage
9. Determination of available Chlorine in Bleaching powder
10. Determination of dissolved oxygen
11. Determination of suspended, volatile and fixed solids
12. B.O.D. test
13. C.O.D. test
14. Introduction to Bacteriological Analysis (Demonstration only)

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Standard methods for the examination of water and wastewater	Handbook	APHA, 20th Edition,Washington	2010
2	Environmental Engineering Vol. I & II	Garg, S.K	Khanna Publishers, New Delhi	2003

SEMESTER-VI

VALUE ADDED COURSE

16BECE651 COMPUTER AIDED DESIGN LABORATORY 1 00 - 100

OBJECTIVE

1. Students should be trained about the general purpose analysis and design software commands and input instructions and command formats and analysis of various structures.
2. They should also get familiar with various unit systems, co-ordinate systems and various structural analysis.
3. To apply basic concepts to develop construction (drawing) techniques.
4. To ability to manipulate drawings through editing and plotting techniques.
5. To understand geometric construction and Produce template drawings.
6. To understand and demonstrate dimensioning concepts and techniques.

Course Outcome

1. Apply basic concepts to develop construction (drawing) techniques.
2. Ability to manipulate drawings through editing and plotting techniques.
3. Understand geometric construction and Produce template drawings.
4. Understand and demonstrate dimensioning concepts and techniques
5. Understand Section and Auxiliary Views
6. Become familiar with Solid Modelling concepts and techniques.

LIST OF EXPERIMENTS

1. Model generation using Node/Beam Editor
2. Assigning Properties, Supports, Loads Analysis and design for 2 storey building
3. Analysis of Framed Structure and Applying Floor Loads and Wind load for 3 storey building
4. Analysis of Framed Structure and Applying Seismic Analysis for 3 storey building
5. Analysis of 3 storey school building and generate the stress diagrams on each beam and column
6. Analysis of Retaining Wall

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Structural Design & Drawing – Reinforced Concrete and Steel	N. Krishna Raju	University Press, Chennai	2012

SEMESTER VII

16BECC701 **SEMESTER-VII**

PROFESSIONAL ETHICS, PRINCIPLES OF MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT **3 0 0 3 100**

OBJECTIVES:

1. To enable the students to create an awareness on Engineering Ethics, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.
2. To familiarize the students to what constitutes professional practice, introduction of various stakeholders and their respective roles; understanding the fundamental ethics governing theprofession
3. To give a good insight into contracts and contracts management in civil engineering, dispute resolution mechanisms; laws governing engagement oflabour.
4. To give an understanding of Intellectual Property Rights,Patents.
5. To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineeringprofession
6. To develop good ideas of the legal and practical aspects of theirprofession

OUTCOMES:

1. To familiarize the students to what constitutes professional practice, introduction of various stakeholders and their respective roles; understanding the fundamental ethics governing theprofession
2. To give a good insight into contracts and contracts management in civil engineering, dispute resolution mechanisms; laws governing engagement oflabour.
3. To give an understanding of Intellectual Property Rights,Patents.
4. To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineeringprofession
5. To develop good ideas of the legal and practical aspects of theirprofession
6. Gathered ideas of the legal and practical aspects of theirprofession

UNIT I ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – variety of moral issued – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – Models of Professional Roles – theories about right action – Self–interest – customs and religion – uses of ethical theories.

UNIT II FACTORS OF CHANGES 9

Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws.Social changes – Meaning and nature – Theories.

UNIT III HISTORICAL DEVELOPMENT, PLANNING, ORGANISING 9

Definition of Management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies and Planning Premises– Forecasting – Decision–making – Formal and informal organization – Organization Chart –.

UNIT IV DIRECTING AND CONTROLLING 9

Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job

Enrichment –Process of Communication – System and process of Controlling – Requirements for effective control – Control of Overall Performance – Direct and Preventive Control – Reporting

UNIT V ENTREPRENEURSHIP AND MOTIVATION 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harold Kooritz and Heinz Weihrich	Essentials of Management	Tata McGraw Hill, New Delhi	2010
2	Khanka S.S	Entrepreneurial Development	S.Chand and Co. Ltd., NewDelhi	2006
3	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw–Hill, NewYork	2005

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Tripathy P.C and Reddy P.N	Principles of Management	Tata McGraw Hill, New Delhi	2008
2	Rabindra N Kanungo	Entrepreneurship and innovation	Sage Publications, New Delhi	1998
3	Charles E Harris, and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, New Delhi	2013

WEB REFERENCES

1. http://www.managementstudyguide.com/taylor_fayol.htm
2. http://tutor2u.net/business/gcse/people_motivation_theories.htm
3. http://lfkkb.tripod.com/eng24/gilligansthеory.html
4. http://www.developingeyes.com/five–types–of–entrepreneurs/

SEMESTER-VII

16BECE702 DESIGN OF STEEL STRUCTURES 3 0 0 3 100

OBJECTIVE

1. To learn IS 800-2007 code of practice for the design of Compression, Tension and Flexural members using various cross-sections.
2. To study the behaviour and design of compression and tension members using simple and built-up sections.
3. To understand behaviour of flexural members and the design laterally restrained and unrestrained beams.
4. To study the components of truss, loads on trusses, analysis
5. To design of purlins and truss members.
6. To study the design of bolted and welded connections and arranging field visit to industries.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Apply the IS code of practice for the design of steel structural elements.
2. Design compression and tension members using simple and built-up sections.
3. Calculate forces on the various members of the truss and design them.
4. Analyze the behavior of bolted connections and design them.
5. Design welded connections for both axial and eccentric forces.
6. Design components of truss, loads on trusses, analysis and design of purlins and truss members

UNIT I 9

INTRODUCTION: Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using, welding, bolting – Design of bolted, and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts

UNIT II 9

TENSION MEMBERS: Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

UNIT III 9

COMPRESSION MEMBERS: Types – Basis of codal provision for compression member design – Slenderness ratio – Design of single section and compound section– Design of lacing and battening – Design of column bases – Gusseted base

UNIT IV 9

BEAMS: Design of laterally supported and unsupported beams – Built up beams – Design of plate girders bolted and welded – Intermediate and bearing stiffeners – flange and Web splices

UNIT V 9

ROOF TRUSSES AND INDUSTRIAL STRUCTURES: types of Roof trusses – Roof and side coverings –Design loads, design of purlin and elements of truss; end bearing - Design of Gantry Girders

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Design of Steel Structures – Vol. I & II	Ramachandra, S	Standard Publication, New Delhi	2009

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Design of Steel Structures, Second edition	Dayaratnam, P	S. Chand & Company, Uttar Pradesh	2003
2	Design of Steel Structures	Gaylord, E.H., Gaylord, N.C., and Stall Meyer, J.E	McGraw-Hill Publications. New Delhi	2005
3	IS 800-2007 Code of Practice for General Construction in Steel IS 875 Part I,II,III			

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER-VII

16BECE7E-- PROFESSIONALELECTIVE IV3 0 0 3 100

TOTAL HRS: 45

SEMESTER-VII

16BECE7E-- PROFESSIONALELECTIVE V 3 0 0 3 100

TOTAL HRS: 45

SEMESTER-VII

OPEN ELECTIVE I3 0 0 3 100

TOTAL HRS: 45

SEMESTER-VII

OPEN ELECTIVE II3 0 0 3 100

TOTAL HRS: 45

SEMESTER VII

16BECE711 STRUCTURAL DETAILING AND DRAWING LABORATORY 0 0 3 2 100

OBJECTIVE

1. To learn the software skills in structural engineering.
2. To learn the software skills in the field of transportation engineering.
3. To learn the software skills in water resources engineering.
4. To apply the software skills in the field of transportation engineering
5. To apply the software skills in the field of water resource engineering.
6. To apply the software skills in the field of geotechnical engineering.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Apply the software skills in the field of structural engineering.
2. Apply the software skills in the field of transportation engineering
3. Apply the software skills in the field of water resource engineering.
4. Apply the software skills in the field of geotechnical engineering.
5. Learn the software skills in structural engineering.
6. Learn the software skills in the field of transportation engineering.

Concrete structures:

1.Design and detailing of R.C (Residential building)
2.Design and detailing of frame structure
3.Design and detailing of underground structure

The drawing includes

Design and detailing of RC beams (Simple Beam/Lintel, 'T' Beam floor)
Design and detailing of RC slabs
Design and detailing of RC columns
Design and detailing of RC footings
Design and detailing of RC retaining walls

Steel structures:

1. Design and detailing of industrial structures

The drawing includes

Design and detailing of beam column connection
Design and detailing of column and gusset plate connection
Design and detailing of trusses
Design and detailing of beams
Design and detailing of columns
Design and detailing of simple beam to column connections

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Structural Design & Drawing – Reinforced Concrete and Steel	N. Krishna Raju	University Press, Chennai	2012

16BECE791 PROJECT WORK-PHASE I0 0 8 4 100

INTENDED OUTCOMES

At the end of this, the students shall be able

1. To work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to Civil Engineering.
2. Each student shall finally produce a comprehensive report covering background information, literature Survey, problem statement, Project work details and conclusions.
3. This experience of project work shall help the student in expanding his / her knowledge base
4. Will provide opportunity to utilise the creative ability and inference capability.
5. Students will gain the presentation skills.
6. To explain his/her project to the external examiner and can publish the projects in a reputed journal.

VALUE ADDED COURSE

16BECE751PLANNING AND EXECUTION OF CIVILENGINEERING PROJECTS1 0 0 - 100

OBJECTIVES:

The students are emphasized to learn the by- laws (NBC),Planning, Marking, Testing of materials and Execution procedures of the building structures

Site visit to ongoing projects.

SEMESTER VIII

SEMESTER-VIII

16BECE801 ESTIMATION, QUANTITY SURVEYING AND VALUATION 3 0 0 3 100

OBJECTIVES:

1. To know the importance of preparing the types of estimates under different conditions.
2. To know about the rate analysis and bill preparations.
3. To study about the specification writing.
4. To understand the valuation of land and buildings.
5. To gain the knowledge of contracts.
6. To rate analysis and bill preparations

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Apply different types of estimates in different situations.
2. Carry out analysis of rates and bill preparation at different locations.
3. Demonstrate the concepts of specification writing.
4. Carry out valuation of assets.
5. The rate analysis and bill preparations
6. The types of estimates under different conditions

UNIT-I

INTRODUCTION **9**

Types of estimates – Units of measurements – Methods of estimates – Advantages - cost analysis.

UNIT-II **9**

ESTIMATE OF BUILDINGS: Detailed and abstract estimate –Calculation of quantities by centre line method – Long wall – Short wall method – Load bearing and framed structures.

UNIT-III **9**

ESTIMATE OF OTHER STRUCTURES: Estimating of septic tank, soak pit – water supply pipe line – sewer line –estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts.

UNIT-IV **9**

RATE, SPECIFICATIONS AND TENDERS: Data – Schedule of rates – Analysis of rates – Specifications –Detailed and general specifications – Tenders – Contracts – Types of contracts – Arbitration and legal requirements.

UNIT-V **9**

VALUATION &REPORT PREPARATION: Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortage – Lease -Principles for report preparation – report on estimate of residential building , Culvert , Roads , Water supply and sanitary installations , Tube wells and Open wells.

TOTAL HRS: 45

TEXT BOOKS

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Estimating and Costing in Civil Engineering	Dutta, B.N	UBS Publishers & Distributors Pvt. Ltd, Delhi	2013

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Civil Estimating and Costing	Mahajan	SathyaPrakashan,New Delhi	2012
2	Civil Estimating Costing and Valuation	Aggarwal	B.D Kataria and Sons, Ludhiana	2012
3	A Text Book of Estimating and Costing (Civil	Kohli, D.D and Kohli, R.C	S.Chand& Company Ltd, Uttar Pradesh	2012

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/
-

SEMESTER-VIII

16BECE8E-- PROFESSIONAL ELECTIVE VI3 0 0 3100

TOTAL HRS: 45

SEMESTER-VIII

16BECE891 PROJECT WORK-PHASE II & Viva voce00 32 16 300

OBJECTIVE

1. To work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to Civil Engineering.
2. Each student shall finally produce a comprehensive report covering background information, literature Survey, problem statement, Project work details and conclusions.
3. This experience of project work shall help the student in expanding his / her knowledge base
4. Will provide opportunity to utilise the creative ability and inference capability.
5. Students will gain the presentation skills.
6. To explain his/her project to the external examiner and can publish the projects in a reputed journal.

LIST OF ELECTIVES

PROFESSIONAL ELECTIVES (PE)

16BECE501 HYDROLOGY 3 0 0 3 100

OBJECTIVE:

1. To know the types of aquifers
2. To understand the surface and subsurface investigation in detail
3. To integrate the fundamental and basic knowledge of ground water movement
4. To understand the process of sea water intrusion and recharge
5. To introduce the different model studies
6. To visualize the occurrence and movement of groundwater.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Identify types of aquifers.
2. Carry out surface and subsurface investigation to locate groundwater.
3. Visualize the occurrence and movement of groundwater.
4. Select suitable type of ground water recharge.
5. Assess sea water intrusion and its control.
6. Understand the process of sea water intrusion and recharge

UNIT I 9

Precipitation: Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of Rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation.

UNIT II 9

Abstraction From Precipitation: Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

UNIT III 9

Hydrographs: Factors affecting Hydrograph – Base flow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph

UNIT IV 9

Floods And Flood Routing: Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control

UNIT V 9

Ground Water Hydrology: Types of aquifers – Darcy's law – Dupuit's assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

TOTAL: 45 HRS

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Engineering Hydrology	Subramanya, K	Tata McGraw-Hill PublishingCo,Ltd.New Delhi	2000
2	Hydrology	Raghunath, H.M	Wiley Eastern Ltd,New York	2000

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Hydrology for Engineers	Chow, V.T. and Maidment	McGraw-Hill Inc., Ltd, New Delhi	2000
2	Hydrology	Singh, V.P	McGraw-Hill Inc.,Ltd. New Delhi	2000

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE502 CARTOGRAPHY 3 0 0 3 100

OBJECTIVE:

1. To develop an understanding of cartography (earth-map relationship, map design, sources of data)
2. To expose the students to the integration of computers, automated surveying, remote sensing, GPS, and GIS for the cartographic process.
3. To get the sources of data's from maps.
4. To produce map.
5. To learnt the Nature and history of cartography
6. To learn about the Earth-Map relation

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. learnt the Nature and history of cartography
2. Earth-Map relation
3. Sources of data
4. Perception and design
5. Map production
6. Reproduction.

UNIT I **9**

Introduction: Cartography today - Nature of Cartography - History of Cartography - Graticules – Cartometry – applications.

UNIT II **9**

Earth: Earth-Map Relations - Basic Geodesy - Map Projections, Scale, Reference and Coordinate system - Transformation - Basic Transformation - Affin Transformation.

UNIT III **9**

Sources of Data: Sources of data - Ground Survey and Positioning - Remote Sensing data collection - Census and sampling - data - Models for digital cartographic information, Map digitizing.

UNIT IV **9**

Perception and Design: Cartographic design - Color theory and models - Color and pattern creation and specification - Color and pattern - Typography and lettering the map - Map compilation.

UNIT V **9**

Cartography Abstract: Selection and Generalisation Principles - Symbolisation - Topographic and thematic maps - Map production and Reproduction - Map series.

TOTAL: 45 HRS

TEXT BOOKS

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Basic Cartography for students and Technicians. Vol. I, II and III	Anson.R.W.and F.J. Ormeling	Elsevrir Applied SciencePublishers 2nd Edition,Canada	2002

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Elements of Cartography, Sixth Edition	Arthur, H. Robinson Et al	John Wiley and Sons, New York	2001
2	Cartography: Visualisation and spatial data	Kraak M J and Ormeling F J	Prentice Hall,Canada	2013

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE503 COMPOSITE MATERIALS AND STRUCTURES 3 0 0 3 100

OBJECTIVE:

1. To study the behaviour of composite materials and to investigate the failure and fracture characteristics.
2. To understand the fabrication, analysis and design of composite materials & structures
3. To discuss the benefits and disadvantages of using composites in aerospace structures
4. To describe current and emerging applications of composites in the aerospace industry
5. To calculate the elastic and strength properties of unidirectional laminates using micromechanics theory
6. To select the most appropriate manufacturing process for fabricating composite components

COURSE OUTCOMES

1. Discuss the benefits and disadvantages of using composites in aerospace structures
2. Describe current and emerging applications of composites in the aerospace industry
3. Calculate the elastic and strength properties of unidirectional laminates using micromechanics theory
4. Select the most appropriate manufacturing process for fabricating composite components
5. Demonstrate understanding of the different materials (fibers, resins, cores) used in composites
6. Behaviour of composite materials and to investigate the failure and fracture characteristics.

UNIT I INTRODUCTION 9

Introduction to Composites, Classifying composite materials, commonly used fiber and matrix constituents, Composite Construction, Properties of Unidirectional Long Fiber Composites and Short Fiber Composites.

UNIT II STRESS STRAIN RELATIONS 9

Concepts in solid mechanics, Hooke’s law for orthotropic and anisotropic materials, Linear Elasticity for Anisotropic Materials, Rotations of Stresses, Strains, Residual Stresses

UNIT III ANALYSIS OF LAMINATED COMPOSITES 9

Governing equations for anisotropic and orthotropic plates. Angle-ply and cross ply laminates – Static, Dynamic and Stability analysis for Simpler cases of composite plates, Interlaminar stresses.

UNIT IV FAILURE AND FRACTURE OF COMPOSITES 9

Netting Analysis, Failure Criterion, Maximum Stress, Maximum Strain, Fracture Mechanics of Composites, Sandwich Construction.

UNIT V APPLICATIONS AND DESIGN 9

Metal and Ceramic Matrix Composites, Applications of Composites, Composite Joints, Design with Composites, Review, Environmental Issues

TOTAL: 45 HRS

TEXT BOOKS

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	The Analysis of laminated Composite Structures	Calcote, L R	Von – Noastrand Reinhold Company, New York	1998
2	Mechanics of Composite Materials	Jones, R.M	McGraw-Hill, Kogakusha Ltd., Tokyo	1985.

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Analysis and Performance of Fibre Composites	Agarwal, B.D., and Broutman, L.J	**John Wiley and sons. Inc., New York**	1995.
2	Handbook on Advanced Plastics and Fibre Glass	Lubin, G	Von Nostrand Reinhold Co., New York,	1989.

16BECE504 FOUNDATION ENGINEERING 3 0 0 3 100

OBJECTIVE:

1. To explain the analysis of sheet pile wall under different support conditions
2. To explain overall stability analysis of well foundation
3. To explain fundamentals of soil dynamics and its application to machine foundation analysis including codal provisions
4. To explain problems related to expansive soils and solution to overcome
5. To explain the concept of slope stability analysis for various slope conditions including graphical methods
6. To analyse the stability of any kind of slope by using both theoretical and graphical methods.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Analyse and design any kind of sheet pile wall system including coffer dam.
2. Analyse and design well foundation including complete stability analysis.
3. Estimate soil parameters under dynamic conditions including machine foundations.
4. Design a suitable foundation system for any kind of problematic soils.
5. Analyse the stability of any kind of slope by using both theoretical and graphical methods.
6. Know the fundamentals of soil dynamics and its application to machine foundation analysis including codal provisions

UNIT I 9

Site Investigation And Selection Of Foundation: Scope and Objectives – Methods of exploration - Borings for Exploration – Wash boring and rotatory drilling – Depth of boring - Sampling – Representative and undisturbed sampling – sampling techniques – Split spoon sampler, Thin tube sampler, Stationary piston sampler – Penetration tests (SPT and SCPT) – Core cutter method, its significances and applications- Selection of foundation based on soil condition.

UNIT II 9

Shallow Foundation: Introduction – Location and depth of foundation — bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – factors affecting bearing capacity – problems - Bearing Capacity from insitu tests (SPT, SCPT and plate load) –Settlement – Components of settlement – Methods of minimizing settlement, differential settlement - subsoil stabilization - codalprovisions .

UNIT III 9

Footings and Rafts: Types of foundation – Raft foundation - Deep foundations – Dewatering system –- Contact pressure distribution below footings & raft - Isolated and combined footings – Types – proportioning - Mat foundation – Types – use - proportioning – Floating foundation.

UNIT IV 9

Piles: Types of piles and their function – Factors influencing the selection of pile – Load Carrying capacity of single pile in granular and cohesive soil - Static formula - dynamic formulae (Engineering News and Hiley's) – Negative skin friction –- Settlement of pile groups – Under reamed piles .

UNIT V **9**

Retaining Walls: Plastic equilibrium in soils –Types of Retaining Wall – Active and Passive states – Rankine's theory – cohesionless and cohesive soil –Coloumb's wedge theory – Graphical methods (Rebhann and Culmann) - Pressure on the wall due to line load – Stability of Retaining walls.
Introduction to Geo textiles – applications.

TOTAL: 45 HRS

TEXT BOOKS

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Soil Mechanics and Foundations	Punmia B.C	Laximi Publications Pvt. Ltd., New Delhi	2012

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Basic and Applied Soil Mechanics	GopalRanjan and Rao A.S.R.	Wile Eastern Ltd., New Delhi, India	2012
2	Foundation Engineering Standard	Varghese P C	Publishers Distributors New Delhi	2005
3	Soil Mechanics and Foundations Engineering	Arora K.R	Published by A.K Jain, New Delhi	2012

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/

16BECE505 GROUND WATER ENGINEERING 3 0 0 3 100

OBJECTIVES:

1. To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers,
2. To understand the techniques of development and management of groundwater.
3. To understand aquifer properties and its dynamics after the completion of the course.
4. It gives an exposure towards well design and practical problems of groundwater aquifers.
5. To understand the importance of artificial recharge and groundwater quality concepts.
6. To know the State of aquifers

COURSE OUTCOMES

1. Students will be able to understand aquifer properties and its dynamics after the completion of the course.
2. It gives an exposure towards well design and practical problems of groundwater aquifers.
3. Students will be able to understand the importance of artificial recharge and groundwater quality concepts.
4. Understand the techniques of development and management of groundwater.
5. Understand aquifer properties and its dynamics after the completion of the course.
6. Exposure towards well design and practical problems of groundwater aquifers.

UNIT I 9

Fundamentals of Ground Water: Introduction – Characteristic of Ground water – Distribution of water - ground water column –Permeability - Darcy's Law - Laboratory permeability test - Types of aquifers - Hydrogeological Cycle – water level fluctuations.

UNIT II 9

Hydraulics of Flow: Storage coefficient - Specific field - Heterogeneity and Anisotrophy - Transmissivity - Governing equations of ground water flow - Steady state flow - DupuitForchheimer assumptions - Velocity potential - Flow nets

UNIT III 9

Estimation Of Parameters: Transmissivity and Storativity – Pumping test - Unsteady state flow - Thiess method - Jacob method - Image well theory – Effect of partial penetrations of wells - Collectors wells.

UNIT IV 9

Ground Water Development: Infiltration gallery - Conjunctive use - Artificial recharge -Safe yield - Yield test – Geophysical methods – Selection of pumps.

UNIT V 9

Water Quality: Ground water chemistry - Origin, movement and quality - Water quality standards - Saltwater intrusion –Environmental concern.

TOTAL : 45 HRS

TEXT BOOKS:

Sl.No	**Title of Book**	**Author of Book**	**Publisher**	**Year of Publishing**
1	Ground Water Hydrology	Raghunath H.M	Wiley Eastern Ltd..	2000

2	Ground Water Hydrology	Todd D.K	John Wiley and Sons	2000

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Ground Water Resource Evaluation	Walton.C	McGraw-Hill Publications	2002

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER VI

16BECE6E01 URBAN WATER RESOURCES MANAGEMENT 3 0 0 3 100

OBJECTIVE:

1. To identify and quantify the hydrological data inputs necessary for various design applications in the field of water resources.
2. To introduce to the quantitative relationship that explains the understanding of hydrological processes in answering scientific and water-resources-management questions.
3. To know about urban hydrological cycle
4. To gather knowledge of urban water resources management models
5. To find the different and Effective urban water user organizations
6. To get the knowledge of Operation and maintenance of hydraulic structures.

COURSE OUTCOMES

Students will be able to understand

1. About urban hydrological cycle,
2. urban water resources management models,
3. urban storm water management,
4. Effective urban water user organizations,
5. Operation and maintenanceof hydraulic structures.
6. Quantify the hydrological data inputs necessary for various design applications in the field of water resources.

UNIT IURBAN HYDROLOGIC CYCLE 9

Water in the urban eco-system – Urban Water Resources – Major problems – Urban hydrological cycle – Storm water management objectives and limitations – Storm water policies – Feasibility consideration.

UNIT II URBAN WATER RESOURCES MANAGEMENT MODELS 9

Types of models – Physically based – conceptual or unit hydrograph based – Urban surface runoff models – Management models for flow rate and volume control rate – Quality models.

UNIT IIIURBAN STORM WATER MANAGEMENT 9

Storm water management practices (Structural and Non-structural Management measures) – Detention and retention concepts – Modeling concept – Types of storage – Magnitude of storage – Hydraulic analysis and design guidelines – Flow and storage capacity of urban components – Temple tanks.

UNIT IV MASTER PLANS 9

Planning and organizational aspects – Inter dependency of planning and implementation of goals and measures – Socio – economics financial aspects – Potential costs and benefit measures – Measures of urban drainage and flood control benefits – Effective urban water user organizations.

UNIT V OPERATION AND MAINTENANCE 9

General approaches to operations and maintenance – Complexity of operations and need for diagnostic analysis – Operation and maintenance in urban water system – Maintenance Management System – Inventories and conditions assessment – Social awareness and involvement.

TOTAL HRS: 45

TEXT BOOKS:

Name of the Book	Author Name	Publisher	Year
Role of Water in Urban Ecology	Hengeveld, H. and C. De Voch.t	John Wiley and sons, New York	2000

REFERENCES:

Name of the Book	Author Name	Publisher	Year

Storm Water Management	Martin, P. Wanelista and Yousef, A. Yousef	John Wiley and sons, New York	2000
Urban Water Infrastructure Planning, Management and Operations	Neil S. Grigg	John Wiley and Sons, New York	2002
Storm Water Modelling	Overtens D.E. and Meadows M.E	Academic Press, New York	2001

WEB SITES:

1. www.springer.com
2. www.nptel.com
3. www.wikipedia.com
4. www.civil.ubc.ca
5. www.aboutcivil.com

16BECE6E02 GROUND IMPROVEMENT TECHNIQUES 3 0 0 3 100

OBJECTIVE:

- At the end of the course student is expected to identify the problematic soil and suitable suggest remedial measures
- To understand the different problematic soils and effect of ground improvement techniques.
- To describe the seepage analysis and suitable dewatering systems for the particular soil conditions.
- To express the concept of compaction efforts on ground improvement and their installation and working principles.
- Describe the load transfer mechanism and effect of geotextiles reinforcements in ground improvement.
- Describe the various stabilization methods for the different types of problematic soils.

COURSE OUTCOMES

1. Student will be in a position to identify and evaluate the deficiencies if any in the deposits of a project area.
2. Capable of providing alternate methods to improve its character suitable to the project, so that the structures built will be stable and serve.
3. Describe the dewatering systems for different soil conditions and their effect.
4. Express the working principlesof different compaction methods on improving weak deposits.
5. Express the design of geo textiles reinforcements for ground improvement.
6. Express the soil stabilization methods for the problematic soils.

UNIT I 9

Introduction: Role of ground improvement in foundation engineering - methods of ground improvement – Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable ground improvement techniques based on soil condition.

UNIT II 9

Drainage and Dewatering: Drainage techniques - Well points - Vacuum and electro osmotic methods - Seepage analysis for two-dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases only).

UNIT III 9

Insitu Treatment of Cohesion less and Cohesive Soils : Insitu densification of cohesion less and consolidation of cohesive soils -Dynamic compaction and consolidation – Vibro flotation - Sand pile compaction - Preloading with sand drains and fabric drains – Stone columns – Lime piles - Installation techniques only - relative merits of various methods and their limitations.

UNIT IV 9

Earth Reinforcement: Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth – use of Geotextiles for filtration, drainage and separation in road and other works.

UNIT V 9

Grout Techniques: Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring – Stabilisation with cement, lime and chemicals - Stabilization of expansive soils.

TOTAL HRS: 45

TEXT BOOKS:

Sl.	***Title of Book***	***Author of Book***	***Publisher***	***Year of Publishing***
1	*Ground Improvement Techniques*	*Purushothama Raj, P*	Tata McGraw-Hill Publishing Company, New Delhi	*2012*

REFERENCES:

Sl.	***Title of Book***	***Author of Book***	***Publisher***	***Year of Publishing***
1	*Ground Improvement*	*Michael P. Moseley, Klaus Kirsch*	Blockie Academic and Professional, Chapman and Hall, Glasgow	*2004*
2	*Design with Geosynthetics, (3rd Edition)*	*Koerner, R.M.*	Prentice Hall, New Jersey	*2002*
3	*Soil Reinforcement with Geotextiles*	*Khedkar, M. S.,and Mandal, J. N.*	CIRIA special publication, London	*2009*
4	*Construction and Geotechnical Methods in Foundation Engineering*	*Koerner R.M*	McGraw-Hill, New Delhi	*2000*

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/

16BECE6E03 BUILDING SERVICES 3 0 0 3 100

OBJECTIVE:

1. To impart knowledge on electrical systems and light illumination in buildings.
2. To understand the basic principles of fire safety and its codal provisions in buildings.
3. To apply various fire safety installations.
4. To gain knowledge of different electrical systems in buildings
5. To know about motors and generators and services used in concrete mixers.
6. To gain the knowledge of the refrigerators and its applications.

COURSE OUTCOMES

Students will be able to understand

1. Various machineries of construction, electrical systems in building,
2. Design and principle of illumination, refrigeration principle
3. Application Various fire safety installations.
4. Different electrical systems in buildings
5. Different motors and generators and services used in concrete mixers.
6. Will gain the knowledge of the refrigerators and its applications.

UNIT I MACHINERIES 9

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS 9

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN 9

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS 9

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION 9

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Heat Pumps and Electric Heating*	*E.R.Ambrose*	John and Wiley and Sons, Inc., New York	*2002*
2	*Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2005.*			

REFERENCES:

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Lighting in Architectural Design*	*Philips*	McGraw-Hill, New York,	*2000.*
2	*Air-conditioning and Energy Conservation*	*A.F.C. Sherratt*	The Architectural Press, London	*2005.*
3	*National Building Code.*			

16BECE6E04 PREFABRICATED STRUCTURES 3 0 0 3 100

OBJECTIVE:

1. To impart knowledge to students on modular construction, industrialized construction
2. To design of prefabricated elements and construction methods.
3. To know the different components of Prefabricated structures.
4. To design join flexibility.
5. To understand the assembling and dismantling of prefabricated components
6. To understand the joining techniques in prefabrication

COURSE OUTCOMES

1. The student shall be able to design some of the prefabricated elements
2. The procedure of prefabrication
3. Have the knowledge of the construction methods in using these elements.
4. Design join flexibility.
5. Familiarize with joining techniques used for prefabrication.
6. Abnormal loads which are hazardous to the prefabricated structures.

UNIT I 9

Introduction: Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection.

UNIT II 9

Prefabricated Components: Behavior of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

UNIT III 9

Design Principles: Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV 9

Joint in Structural Members: Joints for different structural connections – Dimensions and detailing – Design of expansion joints

UNIT V 9

Design for Abnormal Loads: Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones - Importance of avoidance of progressive collapse.

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*CBRI, 1990, Building materials and components, India*			
2	*Knowledge based process planning for construction and manufacturing*	*Gerostiza C.Z., Hendrikson C. and RehatD.R*	Academic Press Inc.,	*2012*

REFERENCES:

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH*	*Koncz T*	Bauverlag, GMBH	*1971*
2	Structural design manual,Precast concrete connection details 1978.Society for the studies in the use of precast concrete Netherland BetorVerlag			

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE6E05 SOIL POLLUTION ENGINEERING 3 0 0 3 100

OBJECTIVE:

The students will

1. To develop an understanding of the classification, sources and effects of pollutants
2. To understand the fundamentals of meteorology
3. To study the principles and equipment description of control technologies
4. To review the sources and control of soil pollution.
5. To understand the sources and effects of key types of environmental pollutants
6. To have insight into fundamentals of meteorology

COURSE OUTCOMES

At the end of the course the students will be able to:

1. Understand the sources and effects of key types of environmental pollutants
2. Have insight into fundamentals of meteorology
3. Appreciate different pollution control strategies
4. Understand indoor air pollution and be aware of the control technologies
5. Develop an understanding of the classification, sources and effects of pollutants
6. Understand the fundamentals of meteorology

UNIT I PHYSICS AND CHEMISTRY OF SOIL 9

Soil formation – composition – soil fabric – mass-volume relationship – Index properties and soil classification – hydraulic and consolidation characteristics – Chemical properties – soil pH – Surface charge and point of zero charge – Anion and Cation exchange capacity of clays– Specific surface area- bonding in clays-soil pollution-factors governing soil-pollutant interaction.

UNIT II INORGANIC AND ORGANIC GEOCHEMISTRY 9

Inorganic geochemistry – Metal contamination – Distribution of metals in soils – Geochemical processes controlling the distribution of metals in soils – Chemical analysis of metal in soil – Organic geochemistry – Organic contamination – Distribution of NAPLs in soils – Process controlling the distribution of NAPLs in soil – Chemical analysis of NAPLs in soils.

UNITIIICONTAMINANTFATEANDTRANSPORTINSOIL 9

Transport processes – advection – diffusion – dispersion – chemical mass transfer processes – sorption and desorption – precipitation and dissolution – oxidation and reduction – acid base reaction – complexation – ion exchange – volatilization – hydrolysis – biological process-microbial transformation of heavy metals.

UNIT IV GROUND IMPROVEMENT TECHNIQUES IN WASTE MANAGEMENT 9

Role of Ground Improvement-Drainage and Ground Water Lowering-Electro osmotic Methods-Diaphragm walls-Thermal and Freezing methods - Insitu Densification - Deep Compaction -Dynamic Compaction -Blasting Sand piles pre-loading with sand drains-Stone Columns Lime piles- Earth reinforcement -rock bolts Cables and guniting Geotextiles as reinforcement Filtration. Drainage and Erosion control.

UNIT V SOIL REMEDIATION TECHNOLOGIES 9

Contaminated site characterization – Containment – Soil vapour extraction - Soil washing – Solidification and Stabilization – Electro-kinetic remediation – Thermal desorption – Vitrification – In-situ and Ex-situ Bioremediation – Phytoremediation – Soil fracturing – Biostimulation – Bioaugmentation –Chemical oxidation and reduction.

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*An Introduction to the Environmental Physics of Soil, Water and Water Sheds*	Calvin Rose	Cambridge University Press, London	2004
2	Reclamation of Contaminated Land	Paul Nathanail C. and Paul Bardos R	John Wiley & Sons Limited, New York	2004

REFERENCES:

Name of the Book	Author Name	Publisher	Year
Geo-Environmental Engineering : Site Remediation, Water Contaminant and Emerging Water Management Technologies	Hari D. Sharma and Krishna R. Reddy	John Wiley & Sons Limited, New York	2004
Groundwater Geochemistry : Fundamentals and Applications to Contamination	William J. Deutsch	Lewis Publishers, London.	2002

WEB SITES:

1. www.springer.com
2. www.nptel.com
3. www.wikipedia.com
4. www.civil.ubc.ca
5. www.aboutcivil.com

16BECE6E06 RAILWAYS, AIRPORTS AND HARBOURS 3 0 0 3 100

OBJECTIVE:

1. To expose the students to Railway planning, design, construction and maintenance and planning and design principles of Airports and Harbours.
2. Understand the history and development, role of railways, railway planning and development based on essential criteria's.
3. Learn different types of structural components, engineering properties of the materials, to calculate the material quantities required for construction
4. Understand various aspects of geometric elements, points and crossings, significance of maintenance of tracks.
5. Design and plan airport layout, design facilities required for runway, taxiway and impart knowledge about visual aids
6. Apply design features of tunnels, harbours, dock and necessary navigational aids; also expose them to various methods of tunneling and tunnel accessories.

COURSE OUTCOMES

1. At the end of this course the students should have learnt the Railway planning and design, railway track construction, Maintenance and operation, Airport planning and designing,
2. Airport layout, visual aids and air traffic control, Harbour engineering and other modes of transport.
3. cquires capability of choosing alignment and also design geometric aspects of railway system, runway and taxiway.
4. Suggest and estimate the material quantity required for laying a railway track and also will be able to determine the hauling capacity of a locomotive.
5. Develop layout plan of airport, harbor, dock and will be able relate the gained knowledge to identify required type of visual and/or navigational aids for the same.
6. Apply the knowledge gained to conduct surveying, understand the tunneling activities.

UNIT I **9**

Railway Planning And Design: Role of Indian Railways in National Development - Engineering Surveys for Track Alignment – Obligatory points - Permanent Way, its Components and Functions of each Component: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers-Density-Ballasts - Materials, Ballast less- Tracks -Geometric Design of Railway Tracks – Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal and Vertical Curves (Derivations of Formulae and Problems)

UNIT II **9**

Railway Track Construction, Maintenance And Operation: Points and Crossings - Design of Turnouts, Working Principle -Signaling, Interlocking and Track Circuiting-Construction & Maintenance – Conventional, Modern methods and Materials, Track Drainage-Track Modernization– Automated maintenance and upgrading, Technologies, Re-laying of Track -Lay outs of Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance, Level Crossings

UNIT III **9**

Airport Planning And Design: Advantages and Limitations of Air Transport, Components of Airports- Airport Planning – Air traffic potential, Site Selection, Design of Components- Institutional arrangements- Runway Design- Orientation, Cross wind Component, Wind rose Diagram (Problems), Geometric Design and Corrections for Gradients (Problems), Drainage-Taxiway Design – Geometric Design Elements, Minimum Separation Distances, Design Speed-Airport Drainage -Airport Zoning - Clearance over Highways and Railways

UNIT IV ***9***

Airport Layouts, Visual Aids, And Air Traffic Control: Airport Layouts – Apron, Terminal Building, Hangars, Motor Vehicle Parking Area and Circulation Pattern, Case studies of Airport Layouts-Airport Buildings – Primary functions, Planning Concept, Principles of Passenger Flow, Passenger Facilities -Visual Aids – Runway and Taxiway Markings, Wind Direction Indicators, Runway and Taxiway Lightings-Air Traffic Control – Basic Actions, Air Traffic Control Network-Helipads, Hangars, Service Equipments.

UNIT V **9**

Harbour Engineering & Other Modes Of Transport: Harbours, Ports, Docks, Tides and Waves, Littoral Drift, Sounding, Area, Depth, Satellite Ports-Requirements and Classification of Harbours– Speed of water, Dredging, Range of Tides, Waves and Tidal Currents, Soundings, Anchoring Grounds-Winds & Storms, Position and Size of Shoals-Shore Considerations- Coast Lines- Dry and Wet Docks,, Planning and Layouts- Position of Light Houses, Navigating -Terminal Facilities – Port Buildings, Warehouse, Transit Sheds -Coastal Structures- Piers, Breakwaters Spring Fenders-Coastal Shipping, Inland Water Transport and Container Transportation-Pipe Ways, Rope Ways,

TOTAL HRS: 45

TEXT BOOKS

Sl.No	***Title of Book***	***Author of Book***	***Publisher***	***Year of Publishing***
1	*A Course in Railway Engineering*	*SaxenaSubhash C and SatyapalArora*	DhanpatRai and Sons, Delhi	*2000*
2	*Airport Planning and Design*	*Khanna S K, Arora M G and Jain S S*	Nemchand and Brothers, Roorkee	*2002*
3	*A Course in Docks and Harbour Engineering*	*S P Bindra, 1993*	DhanpatRai and Sons,Delhi	*2002*

REFERENCES

Sl.No	**Title of Book**	**Author of Book**	**Publisher**	**Year of Publishing**
1	Railway Engineering	Rangwala	Charotar Publishing House,Gujarat	1995
2	Airport Engineering	Rangwala	Charotar Publishing House,Gujarat	1996

WEB SITES:

1. www.springer.com
2. www.nptel.com
3. www.wikipedia.com
4. www.civil.ubc.ca
5. www.aboutcivil.com

16BECE6E07 REPAIR AND REHABILITATION OF STRUCTURES 3 0 0 3 100

OBJECTIVE:

1. To make the students to gain the knowledge on quality of concrete, durability aspects, causes of deterioration.
2. To the assessment of distressed structures, repairing of structures and demolition procedures.
3. To gain the knowledge of available techniques and their application for strengthening or upgrading existing structural system
4. To conduct field monitoring and non-destructive evaluation of concrete structures.
5. To have a brief knowledge on various Nondestructive testing's.
6. To gain some knowledge on the different materials used for maintenance of structures.

COURSE OUTCOMES

1. Students must gained knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.
2. Assessment of distressed structures, repairing of structures and demolition procedures.
3. Available techniques and their application for strengthening or upgrading existing structural system
4. Conducting field monitoring and non-destructive evaluation of concrete structures.
5. Knowledge on various Nondestructive testing's.
6. Different materials used for maintenance of structures.

UNIT – I INTRODUCTION 9

Quality assurance for concrete construction as built concrete properties strength, permeability, thermal properties and cracking. Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors.

UNIT – II DURABILITY OF STRUCTURES 9

Corrosion mechanism – diagnosis- causes and effects - cover thickness and cracking, measurements for corrosion - methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection.

UNIT - III MAINTENANCE AND REPAIR STRATEGIES 9

Definitions: Maintenance, repair and rehabilitation, Facets of Maintenance importance of Maintenance Preventive measures on various aspects Inspection, Assessment procedure for evaluating a damaged structure causes of deterioration - testing techniques.

UNIT - IV MATERIALS FOR REPAIR 9

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete. eliminators and polymers coating for rebars during repair foamed concrete, mortar and dry pack, vacuum concrete.

UNIT - V TECHNIQUES FOR REPAIR AND REPAIR OF STRUCTURES 9

Non-destructive Testing Techniques , Corrosion protection techniques , Gunite and Shotcrete Epoxy injection, Mortar repair for cracks, shoring and underpinning. Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering wear, fire, leakage, marine exposure Engineered demolition techniques for Dilapidated structures - case studies

TOTAL HRS: 45

TEXT BOOK

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Repair of Concrete Structures*	R.T.Allen and S.C.Edwards	Blakie and Sons, UK,	*2011*

REFERENCES:

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Rehabilitation of concrete structures*	*Dr.B.Vidivelli*	Standard publishers, Chennai.	*2011*

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE6E08 MUNICIPAL SOLID WASTE MANAGEMENT 3 0 0 3 100

OBJECTIVE:

1. To understand the components of solid waste management system
2. To learn about recycling, reuse and reclamation of solid wastes
3. To study the collection, transfer, and transport of municipal solid waste
4. To examine the operation of a resource recovery facility
5. To study the design and operation of a municipal solid waste landfill
6. To study the different disposal methods of MSW

COURSE OUTCOMES

At the end of the course the students will be able to:

1. Review the components of solid waste management system
2. Be aware of the significance of recycling, reuse and reclamation of solid wastes
3. Develop an insight into the collection, transfer, and transport of municipal solid waste
4. Understand the importance and operation of a resource recovery facility
5. Understand the design and operation of a municipal solid waste landfill
6. the different disposal methods of municipal solid waste

UNIT I 9

Sources and Types of Municipal Solid Wastes: Sources and types of solid waste - Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization; Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs; Legislation.

UNIT II 9

On-Site Storage &Processing : On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

UNIT III 9

Collection and Transfer : Methods of Collection – types of vehicles – Manpower requirement – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions.

UNIT IV 9

Off-Site Processing : Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, Pyrolysis - options under Indian conditions.

UNIT V 9

Disposal: Dumping of solid waste; sanitary land fills – site selection, design and operation of sanitary landfills - Landfill liners- Management of leachate and landfill gas- Leachate collection & treatment

TOTAL HRS : 45

TEXT BOOKS

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Integrated Solid Waste Management	George	McGraw-Hill Publishers, New Delhi	2002

REFERENCES

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Manual on Municipal Solid Waste Management, 2000,CPHEEO, Ministry of Urban Development, Government of India, New Delhi			
2	Municipal Solid Wastes – problems and Solutions	R.E.Landreth and P.A.Rebers	Lewis Publishers	1997

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE6E09 AIR POLLUTION MANAGEMENT 3 0 0 3 100

OBJECTIVE:

The students will

1. Develop an understanding of the classification, sources and effects of pollutants
2. Understand the fundamentals of meteorology
3. Study the principles and equipment description of control technologies
4. Review the sources and control of indoor air pollution.
5. To induce operational considerations under the processing and control monitoring.
6. To apply sampling techniques of gaseous contaminants.

COURSE OUTCOMES

At the end of the course the students will be able to:

1. Understand the sources and effects of key types of environmental pollutants
2. Have insight into fundamentals of meteorology
3. Appreciate different pollution control strategies
4. Understand indoor air pollution and be aware of the control technologies
5. Control noise pollution by specific measurements, standard and preventive measures.
6. Gain the knowledge on the principles and design of control of indoor/ particulate / gaseous air pollutant and its emerging trends

UNIT I 9

Sources and Effects of Air Pollutants: Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

UNIT II 9

Dispersion of Pollutants: Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

UNIT III 9

Air Pollution Control: Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

UNIT IV 9

Air Quality Management: Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality

UNIT V 9

Noise Pollution: Sources of noise pollution – Effects – Assessment - Standards – Control methods - Prevention

TOTAL HRS : 45

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Air Pollution and Control Technologies	Anjaneyulu, D	Allied Publishers, Mumbai	2002

2	Environmental Pollution Control Engineering	Rao, C.S	Wiley Eastern Ltd., New Delhi	2002
3	Air Pollution Control	Rao M.N., and Rao H. V. N	Tata-McGraw-Hill, New Delhi	2000

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Industrial Air Pollution Control Systems	W.L.Heumann	McGraw-Hill, New York	2001
2	Pollution Control in Process Industries	Mahajan S.P	Tata McGraw-Hill Publishing Company, New Delhi	2005
3	Environmental Engineering Vol. II	Garg, S.K	Khanna Publishers, New Delhi	2005
4	Pollution Control in Process Industries	Mahajan, S.P.	Tata McGraw-Hill, New Delhi	2004

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER VII

16BECE7E01 DESIGN OF BRIDGES 3 0 0 3 100

OBJECTIVE:

1. To develop an understanding of basic concepts in bridge engineering like components, classification, importance, investigation of bridges and loading conditions.
2. To study the design of Culvert, Foot Bridge, Slab Bridge, T-beam Bridge and Box Culvert using IRC.
3. To study the design of various sub-structures like piers, abutments, foundations
4. To study the importance of the bearing and joints in construction of the bridge.
5. To select the suitable site and type of the bridge.
6. To prepare a detailed project report for the construction of bridge giving hydraulic particulars of the river and soil details

COURSE OUTCOMES

Upon completion of this course, the student will be able to:

1. Prepare a detailed project report for the construction of bridge giving hydraulic particulars of the river and soil details
2. Select the suitable site and type of the bridge.
3. Design various types of bridges like Culvert, Slab Bridge and T-beam Bridge using provisions of IRC.
4. Design pier, abutment, foundations, bearing and detailing of joints.
5. Design of Culvert, Foot Bridge, Slab Bridge, T-beam Bridge and Box Culvert using IRC.
6. understanding of basic concepts in bridge engineering like components, classification, importance, investigation of bridges and loading conditions.

UNIT I 9

Introduction: History of Bridges - Components of a Bridge and its definitions- Classification of Road Bridges - Selection of Site and Initial Decision Process - Survey and Alignment; Geotechnical Investigations and Interpretations. River Bridge: Selection of Bridge site and planning - Collection of Bridge design data - Hydrological calculation Road Bridges - IRC codes - Standard Loading for Bridge Design - Influence lines for statically determinate structures - I.L. for statically indeterminate structures - Transverse distribution of Live loads among deck longitudinal - Load combinations for different working state and limit state designs

Railway Bridges: Loadings for Railway Bridges; Railroad data. Pre-design considerations-
Railroad vs. Highway bridges

UNIT II 9

Steel Bridges : Design of through type steel highway bridges for IRC loading - Design of stringers, cross girders and main girders- Design of deck type plate girder railway bridges for railway loading- Design of main girders

UNIT III 9

Reinforced Concrete Slab Bridges : Design of solid slab bridges for IRC loading - Pigeaud's curves- Design of panel and cantilever for IRC loading

UNIT IV 9

Reinforced Concrete Girder Bridges : Courbon's theory – Design of Tee beam Girder bridges - Deck slab -Main girder-Cross girder - Design of PSC bridge.

UNIT V 9

Substructure, bearings and deck joints, parapets and railings

Substructure - Pier; Abutment - Wing walls- Importance of Soil-Structure Interaction - Types of foundations - Open foundation- Pile foundation- Well foundation- Simply supported bridge- Continuous Bridge - Bearings and Deck Joints - Different types of bridge bearings and expansion joints - Parapets and Railings for Highway Bridges

TOTAL HRS: 45

TEXT BOOKS:

Io	*le of Book*	*thor of Book*	*plisher*	*ir of Publishing*
1	*entials of Bridge Engineering*	*nson Victor D*	Oxford and IBH Publishing Co. New York	*2010*
2	*ign of Bridges*	*shna raju N*	Oxford and IBH Publishing Co. New York	*2010*

REFERENCES:

Io	*le of Book*	*thor of Book*	*plisher*	*ir of Publishing*
1	*dge Engineering*	*takD.R*	SatyaPrakashan, New Delhi	*2010*
2	*dge Engineering*	*nuswamy S*	Tata McGraw-Hill, New Delhi	*2011*

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE7E02 TALL BUILDINGS 3 0 0 3 100

OBJECTIVE:

1. The design aspects and analysis methodologies of tall buildings will be introduced.
2. . The stability analysis of tall buildings is another important objective of this course.
3. To learn the general planning consideration of various load factors, vertical structure plane, High rise building structure
4. To have the behavior, structural analysis and design and also other high-rise building structure.
5. To understand the behaviour of tall buildings subjected to lateral building.
6. To know the rudimentary principles of designing tall buildings as per the existing codes.

COURSE OUTCOMES

1. At the end of this course students should have learnt the general planning consideration of various load factors, vertical structure plane, High rise building structure
2. Will have the behavior, structural analysis and design and also other high-rise building structure.
3. Understanding on the behaviour of tall buildings subjected to lateral building.
4. Knowledge about the rudimentary principles of designing tall buildings as per the existing codes.
5. Design aspects and analysis methodologies of tall buildings will be introduced.
6. Stability analysis of tall buildings is another important objective of this course

UINT I 9

Introduction: The Tall Building in the Urban Context - The Tall Building and its Support Structure - Development of High Rise Building Structures - General Planning Considerations. Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading –Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material - Impact and Dynamic Loads - Blast Loads -Combination of Loads.

UINT II 9

The Vertical Structure Plane: Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - Shear Wall Arrangement - Behaviour of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing- Composite Floor Systems The High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel – Frame Systems - Multistory Box Systems.

UINT III 9

Common High-Rise Building Structures and Their Behavior Under Load: The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response.

UINT IV 9

Approximate Structural Analysis and Design of Buildings: Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading - Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings-Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.

UINT V 9

Other High-Rise Building Structure: Deep - Beam Systems -High-Rise Suspension Systems -

Pneumatic High -Rise Buildings - Space Frame Applied to High - Rise Buildings - Capsule Architecture.

TOTAL HRS: 45

TEXT BOOKS:

l.No	Title of Book	Author of Book	Publisher	ear of Publishing
1	h - rise building Structures	lfgang Schueller	John Wiley and Sons, New York	2001
2	l Building Structures , Analysis and Design	an Stafford Smith and Alex Coull	John Wiley and Sons, Inc,New York	2005

REFERENCES:

l.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	l Buildings	ll, A. and Smith, Stafford, B	Pergamon Press, London,	2006
2	ıctural Concepts and Systems for Architects and Engineers	T.Y. and Burry D.Stotes	John Wiley, New York	2008
3	ances in Tall Buildings	n S.Beedle	CBS Publishers and Distributors, Delhi	2010
4	ıctural Analysis and Design of Tall Buildings	anath.B.S.,	Mc Graw Hill,New Delhi.	2010

WEBSITES:

- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE703 TRAFFIC ENGINEERING AND MANAGEMENT 3 0 0 3 100

OBJECTIVE:

1. To learn the fundamentals of traffic engineering
2. To learn the methods of intersection design
3. To learn the skills of traffic control
4. To be introduced to the different theories of traffic flow
5. To be aware of the importance of traffic safety
6. To be aware of traffic flow theory

COURSE OUTCOMES

Upon completing of this course, the students should be able to:

1. Carry out traffic studies
2. Design intersections
3. Implement traffic system management
4. Be aware of traffic flow theory
5. Enhance safety in all design aspects
6. The skills of traffic control

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UNIT I **9**

Introduction: Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering- Road, Traffic and Land Use Characteristics

UNIT II **9**

Traffic Surveys And Analysis : Surveys and Analysis - Volume,Journey time ,Capacity, Speed and Delays, Origin and Destination, Parking Survey, Pedestrian Studies, Accident analysis and Safety Level of Services- applications and significance.

UNIT III **9**

Traffic Control: Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design

UNIT IV **9**

Geometric Design Of Intersections : Conflicts at Intersections, Classification of Intersections at Grade, - Chanallised and Unchanallised Intersection - Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Chanallisation and Rotary design (Problems), Grade Separators

UNIT V **9**

Traffic Management: Area traffic Management system- Traffic System Management (TSM) and Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS)-enforcement and education.

TOTAL HRS : 45

TEXT BOOKS:

Sl.No	***Title of Book***	***Author of Book***	***Publisher***	***Year of Publishing***
1	*Highway Engineering,*	*Khanna K and Justo C E G*	Khanna Publishers, Roorkee	*2001*
2	Traffic Engineering and Transport Planning	*Kadiyali L*	Khanna Technical Publications, Delhi	*2000*

REFERENCES:

Sl.No	***Title of Book***	***Author of Book***	***Publisher***	***Year of Publishing***
1	Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management			
2	Guidelines of Ministry of Road Transport and Highways, Government of India.			
3	*A Course in Traffic Planning and Design*	*SubhashC.Saxena*	DhanpatRai Publications, New Delhi	*2002*

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE7E04 SMART STRUCTURES AND SMART MATERIALS 3 0 0 3 100

OBJECTIVE:

1. To learn the smart materials and structures
2. To learn about the various strain measuring instruments
3. To learn about the sensors and its physical measurements
4. To learn about the signal processing and control systems
5. To know about the sensor technologies in the field of Civil engineering.
6. To gain knowledge of Data Acquisition and Processing

COURSE OUTCOMES

Upon completing of this course, the students should be able to:

1. Learn the types of smart material and its response, Strain measuring techniques, Sensing technology, Actuator techniques ,Signal processing and control systems.
2. Learn about the various strain measuring instruments
3. The sensors and its physical measurements
4. The signal processing and control systems
5. Know about the sensor technologies in the field of Civil engineering.
6. Gain knowledge of Data Acquisition and Processing

UNIT I 9

Introduction : Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT II 9

Measuring Techniques : Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheat stone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT III 9

Sensors : Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive
chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT IV 9

Actuators : Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magneto structure Material – Shape Memory Alloys – Electro archeological Fluids– Electro magnetic actuation – Role of actuators and Actuator Materials.

UNIT V 9

Signal Processing and Control Systems : Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

TOTAL HRS: 45

TEXT BOOKS

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Smart Structure and Materials*	Mel Schwartz	Artech House .Borton. London	2008

REFERENCES

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Experimental Stress Analysis*	*Srinath.L.S*	Tata McGraw-Hill, New Delhi	2003
2	*Experimental Stress Analysis*	*J. W. Dally.J.W. & W. F. Riley.*	Tata McGraw-Hill ,New Delhi	2003

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE7E05 FINITE ELEMENT TECHNIQUES 3 0 0 3 100

OBJECTIVE:

1. To apprise the students about the basics of Finite Element theory
2. To know the implementation of computer and its practical applications.
3. To learn basic principles of finite element analysis procedure.
4. To learn the theory and characteristics of finite elements that represent engineering structures.
5. To learn and apply finite element solutions to structural, thermal, dynamic problem.
6. To develop the knowledge and skills needed to effectively evaluate finite element analyses.

COURSE OUTCOMES

1. Students will be in a position to develop computer codes for any physical problems using FE techniques.
2. Understand the concepts behind formulation methods in FEM.
3. Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.
4. Develop element characteristic equation and generation of global equation.
5. Apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow
6. Apply suitable boundary conditions to axis symmetric and dynamic problems and solve them displacements, stress and strains induced.

UNIT I 9

Variational Formulation: General field problems in Engineering – Modelling – Discrete and Continuous models – Characteristics – Difficulties involved in solution – The relevance and place of the finite element method – Historical comments – Basic concept of FEM, Boundary and initial value problems – Gradient and divergence theorems – Functionals – Variational calculus – Variational formulation of VBPS. The method of weighted residuals – The Ritz method.

UNIT II 9

Finite Element Analysis of One Dimensional Problems : One dimensional second order equations – discrimination of domain into elements – Generalised coordinates approach – derivation of elements equations – assembly of elements equations – imposition of boundary conditions – solution of equations – Cholesky method – Post processing – Extension of the method to fourth order equations and their solutions – time dependant problems and their solutions – example from heat transfer, fluid flow and solid mechanics.

UNIT III 9

Finite Element Analysis of Two Dimensional Problems : Second order equation involving a scalar-valued function – model equation – Variational formulation – Finite element formulation through generalised coordinates approach – Triangular elements and quadrilateral elements – convergence criteria for chosen models – Interpolation functions – Elements matrices and vectors – Assembly of element matrices – boundary conditions – solution techniques.

UNIT IV 9

Isoparametric Elements and Formulation: Natural coordinates in 1, 2 and 3 dimensions – use of area coordinates for triangular elements in - 2 dimensional problems – Isoperimetric elements in 1,2 and 3 dimensional – Largrangean and serendipity elements – Formulations of elements equations in one and two dimensions - Numerical integration.

UNIT V 9

Applications to Field Problems in Two Dimensionals : Equations of elasticity – plane elasticity problems – axisymmetric problems in elasticity – Bending of elastic plates – Time dependent problems in elasticity – Heat – transfer in two dimensions – incompressible fluid flow.

TOTAL HRS : 45

TEXT BOOK:

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Introduction to Finite Element in Engineering, Third Edition*	*Chandrupatla, T.R., and Belegundu, A.D*	Prentice Hall, India	*2010*

REFERENCES:

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*An Introduction to Finite Element Method*	*Reddy J N*	McGraw-Hill, Intl. Student Edition, New Delhi	*2009*
2	The finite element method, Basic formulation and linear *problems, Vol.1*	*Zienkiewics*	McGraw-Hill, Book Co, New Delhi	*2000*
3	*The Finite Element Method in Engineering*	*Rao. S.S*	PergamanPress.New Delhi.	2010

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE6E06 GEOGRAPHICAL INFORMATION SYSTEM 3 0 0 3 100

OBJECTIVE:

1. To know about the principles of remote sensing and spectral signatures
2. To know about satellites, types of remote sensing and digital image processing
3. To study about the history and components of GIS
4. To study about data types and operations.
5. To know the applications of remote sensing and GIS for various applications on Civil Engineering.
6. To apply the concepts of DBMS in GIS.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Demonstrate the concepts of Electro Magnetic energy, spectrum and spectral signature curves.
2. Apply the concepts of satellite and sensor parameters and characteristics of different platforms.
3. Apply the concepts of DBMS in GIS.
4. Analyze raster and vector data and modeling in GIS.
5. Apply GIS in land use, disaster management, ITS and resource information system.

Know the types of remote sensing and digital image processing UNIT I 9
GIS Technique And Data Input : Development of GIS – Components of GIS – Hardware, software-MAP – Types of Maps.

UNIT II 9
Data Analysis And Modelling : Simple Analysis – Spatial Analysis – Overlay – Vector Data Analysis – Raster Data Analysis – Data Retrieval – Query –Modelling using GIS – Digital Elevation Model – Cost and path analysis – Expert Systems – Artificial Intelligence – Integration with GIS

UNIT III 9
Data Output And Error Analysis : Data Output – Types – Devices used – Raster and Vector Display Devices – Printers – Plotters – Photo write Devices – Sources of Errors – Types of Errors – Elimination – Accuracies

UNIT IV 9
GIS Applications In Resource Management: Fields of Applications – Natural Resources – Agriculture – Soil – Water Resources – Wasteland Management – Social Resources – Cadastral Records – LIS

UNIT V 9
Advanced GisApplication : AM/FM – Utility Network Management – Integration with Remote Sensing – Knowledge based techniques – Multicriteria Techniques – Introduction to Object Oriented Data base Models.

TOTAL HRS : 45

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	ıciples of GIS for Land Resources Assessment	rough P A	Oxford Publication, New York	2000
2	damentals of Geographical Information Systems, Second Edition	hael N Demers	John Wiley Publications.New York	2002

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Geographical Information Systems Volume I and II, Second Edition	Paul A Longley, Michael F Goodchild	John Wiley Publications,New York	2001

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE7E07 REMOTE SENSING TECHNIQUES AND APPLICATIONS 3 0 0 3 100

OBJECTIVE:

1. To gain a sound fundamental understanding of the GIS and remote sensing technologies
2. To understand the basic principles underlying the GIS/model-based management of water resources and environment.
3. To become familiar with the GIS-based analytical and problem-solving techniques for sustainable planning and management of water resources and environmental problems.
4. Different types of remotely sensed images and data available for water resource applications.
5. To apply the GIS-based analytical and problem-solving techniques for sustainable planning and management of water resources and environmental problems.
6. To develop a project report and can develop Water Resource Information Systems (WRIS) for regional and basin scale.

COURSE OUTCOMES

By the end of this course the students will be able to

1. Develop fundamental understanding of the GIS and remote sensing technologies
2. Understand the basic principles underlying the GIS based management of water resources and environment.
3. Apply the GIS-based analytical and problem-solving techniques for sustainable planning and management of water resources and environmental problems.
4. Understand the types of remotely sensed images and data available for water resource applications.
5. Develop a project report and can develop Water Resource Information Systems (WRIS) for regional and basin scale.
6. Understand the basic principles underlying the GIS/model-based management of water resources and environment.

UNIT I 9
Introduction: Definition – Physics of remote sensing – electromagnetic radiation (EMR) – remote sensing windows – interaction of EMR with atmosphere, earth surface, soil, water and vegetation – platform and sensor – image interpretation.

UNIT II 9Land Use
Studies: Definition of land use – land use / land cover classification – schemes and levels of classification systems with RS data – land use mapping – change detection – urban land use planning, site suitability analysis, transportation planning.

UNIT III 9Water
Resources :Area assessment of surface water bodies – Capacity survey of water bodies – mapping of snow-covered areas – flood risk zone mapping – identification of groundwater potential zones, recharge areas – droughts-definition-drought assessment and management.

UNIT IV 9
Agriculture, Soil And Forestry: Crop inventory mapping – production estimation – command area monitoring – soil mapping – crop stress detection - estimation of soil erosion – forest types and density

mapping – forest fire risk zone mapping.

UNIT V9

Earth Science: Lithology – lithological mapping – structural mapping – Geomorphology – nature and type of landforms – identification – use of remote sensing data for land slides – targeting mineral resources – Engineering geology and Environmental geology.

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	*Remote sensing methods and application*	*Michael Hord, R*	John Wiley and Sons, New York	*2004*
2	*Remote sensing principles and interpretation*	*Sabins, F.F.Jr*	W.H.Freeman &Co.New York	*2007*

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	*Remote Sensing and Image interpretation*	*Lillesand, T.M and KicterR.W*	John Willey and sons, inc. New York	*2002*
2	*Application of Remote sensing in Agriculture*	*Steven, M.D, and Cllark, J.A*	Butterworths, London	*1990*
3	Manual for Forest mapping and Damage detection using satellite data- Space Applications Centre,1990, Report No.IRS-UP/SAC/FMDD/TN/16/90,1990			
4	Manual of Remote Sensing Vol. II. American Society of Photogrammetry			

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/

INTRODUCTION TO SOIL DYNAMICS AND MACHINE
16BECE8E08 FOUNDATIONS 3 0 0 3 100

OBJECTIVE:

1. To explain the significance of dynamic load in machine foundation analysis
2. To explain theory of vibration for different field conditions
3. To explain the principles of machine foundation design for reciprocating and impact machines
4. To explain the concept and method of foundation isolation.
5. To understand foundation isolation and its significance in machine foundation.
6. To use vibration theory in soil dynamics and ascertain soil behaviour accordingly

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Understand the influence of dynamic load in the machine foundation analysis and design
2. Use vibration theory in soil dynamics and ascertain soil behviour accordingly
3. Do machine foundation analysis and design for reciprocating and impact machines.
4. Understand foundation isolation and its significance in machine foundation.
5. The principles of machine foundation design for reciprocating and impact machines

Explain the concept and method of foundation isolation

UNIT I 9

Introduction : Vibration of elementary systems-vibratory motion-single degree freedom system-free and forced vibration with and without damping

UNIT II 9

Waves and Wave Propagation: Wave propagation in an elastic homogeneous isotropic medium-Raleigh, shear and compression waves-waves in elastic half space

UNIT III 9

Dynamic Properties of Soils: Elastic properties of soils-coefficient of elastic, uniform and non-uniform compression - shear-effect of vibration dissipative properties of soils-determination of dynamic properties of soil- codal provisions

UNIT IV 9

Design Procedures: Design criteria -dynamic loads - simple design procedures for foundations under reciprocating machines - machines producing impact loads - rotary type machines

UNIT V 9

Vibration Isolation: Vibration isolation technique-mechanical isolation-foundation isolation-isolation by location-isolation by barriers- active passive isolation tests.

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	*Soil Dynamics and Machine Foundations*	*Swamisaran*	Galgotia Publications Pvt. Ltd.Chennai	*2011*

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	*Vibration Analysis and Foundation Dynamics*	*KameswaraRao*	Wheeler Publishing, New Delhi	*2002*
2	IS code of Practice for Design and Construction of Machine Foundations, McGraw-Hill,			
3	*Foundation for machines*	***S. Prakash** and T. Fennessey*	McGraw-Hill,New Delhi.	*2003*
4	*Hand book of Machine Foundations*	*Srinivasulu, P &Vaidyanathan*	McGraw-Hill New Delhi	*2007*
5	*Geotechnical Earthquake Engineering*	*KramarS.L*	Prentice Hall International series,Pearson Education (Singapore)Pvt. Ltd	*2003*
6	*Dynamics Soil Tests and Applications*	*KameswaraRao*	Wheeler Publishing,New Delhi,	*2000*

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE7E09 INDUSTRIAL WASTE MANAGEMENT 3 0 0 3 100

OBJECTIVE:

1. To impart knowledge on sources and characteristics of various industrial wastes and strategies for its prevention and control.
2. To know the Industrial waste generation patterns, as well as management and disposal techniques
3. To gain knowledge of Central and state pollution control board guidelines on industrial waste management
4. To know the schemes, incentives, policies on industrial waste management
5. To overview of product design for waste minimization
6. Cost benefit analysis of different waste management techniques

COURSE OUTCOMES

The students completing the course will have

1. An insight into the pollution from major industries including the sources and characteristics of pollutants
2. Ability to plan minimization of industrial wastes
3. Ability to design facilities for the processing and reclamation of industrial waste water.
4. Industrial waste generation patterns, as well as management and disposal techniques
5. Knowledge of Central and state pollution control board guidelines on industrial waste management.
6. To know the schemes, incentives, policies on industrial waste management

UNIT I **9**

Introduction: Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

UNIT II **9**

Cleaner Production: Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT III **9**

Pollution from Major Industries: Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts

UNIT IV **9**

Treatment Technologies: Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical oxidation – Adsorption - Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering - Disposal

UNIT V **9**

Hazardous Waste Management : Hazardous wastes - Physico chemical treatment – solidification – incineration – Secured land fills

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing

1	Wastewater Treatment	M.N.Rao&A.K.Dutta	Oxford - IBH Publication. New York	2002
2	Industrial Water Pollution Control	W.W. Eckenfelder Jr	McGraw-Hill Book Company, New Delhi	2000

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	Industrial Wastewater Systems Hand book	Stephenson R L and Blackburn J B., Jr	Lewis Publisher, New York	2000
2	Industrial Pollution Prevention Hand Book	H.M.Freeman	McGraw-Hill Inc., New Delhi	2002

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

SEMESTER VIII

16BECE8E01 INDUSTRIAL STRUCTURES 3 0 0 3 100

OBJECTIVE:

1. This course deals with some of the special aspects with respect to Civil Engineering structures in industries.
2. To Know the different classification of industrial structures.
3. To Know the functional requirement of industrial structures.
4. To design Bunkers and silos.
5. To design the RC structures like Chimneys, bunkers and silos.
6. To know the principles of roof trusses.

COURSE OUTCOMES

1. At the end of this course the student shall be able to design some of the structures used in industries.
2. Special aspects with respect to Civil Engineering structures in industries.
3. The different classification of industrial structures.
4. The functional requirement of industrial structures.
5. Design Bunkers and silos.
6. Design the RC structures like Chimneys, bunkers and silos.

UNIT I 9

Planning : Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

UNIT II 9

Functional Requirements : Lighting – Ventilation – Accounts – Fire safety – Guidelines from factories act.

UNIT III 9

Design of Steel Structures : Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos

UNIT IV 9

Design of R.C. Structures : Silos and bunkers – Chimneys – Principles of folded plates and shell roofs

UNIT V 9

Prefabrication : Principles of prefabrication – Prestressed precast roof trusses- Functional requirements for Precast concrete units

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Reinforced Concrete Structural elements*	*Purushothaman .P.*	Tata McGraw-Hill Publishing Company Ltd.New Delhi	*2000*
2	*Design of Steel Structure*	*PasalaDayaratnam*	Oxford and IBH PublishingCo. New York	2002

REFERENCES:

lo	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Buildings for Industry, vols. I and II*	*Henn W*	London Hill Books	*2000*
2	Handbook on Functional Requirements of Industrial buildings, SP32 – 1986, Bureau of Indian Standards, New Delhi			
3	Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Structural Engineering Research Centre,1982. Madras.			

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE8E02SEISMIC DESIGN OF REINFORCED CONCRETE STRUCTURES

3 0 0 3 100

OBJECTIVE:

1. To introduce the basics of Earthquake Engineering
2. To introduce the engineering seismology, building geometrics & characteristics, structural irregularities,
3. To introduce tips on earthquake engineering - do's and don'ts
4. To introduce cyclic loading behaviour of RC, steel and pre-stressed concrete elements
5. To discuss code provisions and their application on different types of structures
6. To apply codal provisions on different types of structures

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Apply the basics of Earthquake Engineering
2. Demonstrate the dynamics of structural system under earthquake load
3. Analyze the influence of the structural / geometrical design in building characteristics
4. Demonstrate the cyclic loading behaviour of RC steel and pre-stressed concrete elements
5. Apply codal provisions on different types of structures.
6. Cyclic loading behaviour of RC, steel and pre-stressed concrete elements

UNIT I **9**

Single Degree Of Freedom Systems: Formulation of equation of motion, Free and forced vibrations, Damping, Types of Damping – Damped and undamped vibrations, Response to dynamic loading. Introduction of Free and forced vibration of undamped and damped MDOF systems

UNIT II **9**

Engineering Seismology: Elements of Engineering Seismology, Characteristics of Earthquake Engineering, Earthquake History, Indian Seismicity. Performance of structures under past earthquakes, Lessons learnt from past earthquakes.

UNIT III **9**

Seismic Analysis: Seismic Design Concepts- Calculation of base shear as per IS1893- Lateral Load analysis of building frames by Portal method and Cantilever method.

UNIT IV **9**

Earthquake Resistant Design: Concept of Earthquake Resistant Design, Provisions of Seismic Code IS 1893 (Part I), Response Spectrum, Design Spectrum, Design of Buildings.

UNIT V **9**

Ductile Detailing: Ductility- Assessment of Ductility- Member/ Element ductility, Structural Ductility- Factors affecting ductility-Ductile Detailing, Provisions of IS 13920.for beams, columns and footings- Special Confining Requirements.

TOTAL HRS: 45

TEXT BOOKS:

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Earthquake Resistant Design of Structures,*	*Agarwal and Shrikhande*	Prentice Hall of India,	*2007*

REFERENCES:

Sl.No	Title of Book	Author of Book	Publisher	Year of Publishing
1	*Structural Dynamics – Theory and Computations, Third Edition*	*Mario Paz*	CBS publishers,New York	2007
2	*Design of Earthquake Resistant Buildings*	AgarwalPankaj and Shrikhande Manish	Mc- Graw Hill Book Company, New York	*2006*
3	*Dynamics of Structures*	*Humar J*	Prentice Hall, India	2012
4	*Dynamics of structures – Theory and applications to Earthquake Engineering*	*Anil K Chopra*	Prentice Hall Inc, India	*2001*
5	*Earthquake Tips*	*C V R Moorthy*	NICEE,IIT Kanpur	*2004*
6	*Dynamics of Structures, Second Edition*	*Clough R.W, and Penzien J,*	McGraw – Hill International Edition,New Delhi	*2003*

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BECE8E03 ENVIRONMENTAL IMPACT ASSESSMENT OF WATER RESOURCES DEVELOPMENT 3 0 0 3 100

OBJECTIVE:

1. To be introduced to environmental impact assessment and the current legislation covering it.
2. To understand Prediction and Assessment of Impact.
3. To learn planning for mitigation of adverse impact on environment.
4. To Analyse case studies.
5. Through case studies, learn to present and explain the components and decision-making processes involved in environmental assessment.
6. To present and explain the components and decision-making processes involved in environmental assessment through various case studies.

COURSE OUTCOMES

At the end of the course the students will be able to:

1. Review the key concepts of environmental impact assessment and the current legislation covering it
2. Understand the Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna and Socio Economics
3. Plan options for mitigation of adverse impact on environment
4. Present and explain the components and decision-making processes involved in environmental assessment through various case studies.
5. Learn planning for mitigation of adverse impact on environment.
6. Analyse case studies.

UNIT I ENVIRONMENTAL ISSUES 9

Water resources development and environmental issues – Environment in water resources project planning – Environmental regulations and requirements – The EIA (Environmental Impact Assessment) notification.

UNIT II EIA FUNDAMENTALS 9

Environmental Impact Assessment (EIA) – Environmental Impact Statement – EIA in Project Cycle – Legal and Regulatory aspects in India according to Ministry of Environment and Forests – Types and limitations of EIA – Cross sectoral issues and terms of reference in EIA –Participation of Public and Non-Governmental Organizations in environmental decision making

UNIT III ENVIRONMENTAL IMPACTS 9

Hydrological and water quality impacts – Ecological and biological impacts – Social and cultural impacts – Soil and landscape changes – Agro economic issues – Human health impacts – Ecosystem changes.

UNIT IV METHODS OF EIA 9

EIA team formation – Development of scope, mandate and study design – Base line survey – Check lists – Ad hoc procedures – Network and matrix methods – Semi-quantitative methods – ICID checklist – Economic approaches – Environmental Impact Statement (EIS) preparation.

UNIT V ENVIRONMENTAL MANAGEMENT 9

In-stream ecological water requirements **-** Public participation in environmental decision making – Sustainable water resources development – Ecorestoration – Hydrology and global climate change – Human ecology – Ecosystem services – Environmental monitoring programs.

TOTAL HRS: 45

TEXT BOOKS

Sl.No	Name of the Book	Author Name	Publisher	Year
1	*Environmental Impact Assessment*	Canter, L.W	McGraw Hill International Edition, New York	2008
2	Environmental Impact Assessment	Barathwal, R.R	New Age International Publishers, New Delhi	2002

REFERENCES:

Sl.No	Name of the Book	Author Name	Publisher	Year
1	Handbook of Environmental Impact Assessment	Petts, J	Blackwell Science London	1999
2	Environmental Impact Assessment – Practical solutions to recurrent problems	Lawrence, D.P	Wiley-Inter Science, New Jersey	2003
3	Hydrology and global environmental change	Arnel, N	Prentice Hall, Harlow	2002

WEB SITES:

1. www.springer.com
2. www.nptel.com
3. www.wikipedia.com
4. www.civil.ubc.ca
5. www.aboutcivil.com

16BECE8E04 CONSTRUCTION RESOURCE PLANNING AND MANAGEMENT

3 0 0 3 100

OBJECTIVE:

1. To explain how do optimize construction period by suing management techniques
2. To explain the role of construction planning in civil construction projects
3. To emphasis project monitoring during execution time and quality control
4. To understand different construction methods and selection of methods based on the project requirements
5. To explain role of construction equipment's in civil construction projects and selection of equipment with project specific.
6. To select proper and effective construction methods and equipment's

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Understand the importance of management techniques in civil construction
2. Do proper construction planning for effective project execution
3. Prepare tender & contract documents and project quality control as per national and international standards
4. Select proper and effective construction methods and equipment's
5. Explain the role of construction planning in civil construction projects
6. Emphasis project monitoring during execution time and quality control

UNIT I **9**

Construction Planning: Basic concepts in the development of construction plans-choice of Technology and Construction method-Defining Work Tasks- Definition- Precedence relationships among activities-Estimating Activity Durations-Estimating Resource Requirements for work activities-coding systems

UNIT II **9**

Scheduling Procedures And Techniques: Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads, lags and windows-Resource oriented scheduling-Scheduling with resource constraints and precedences -Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Crashing and time/cost trade offs -Improving the Scheduling process – Introduction to application software

UNIT III **9**

Cost Control Monitoring And Accounting: The cost control problem-The project Budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information

UNIT IV **9**

Quality Control And Safety During Construction: Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods -Statistical Quality control with Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.

UNIT V **9**

Organization And Use Of Project Information: Types of project information-Accuracy and Use of Information-Computerized organization and use of Information -Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

TOTAL HRS : 45

TEXT BOOKS

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	Construction Project Management Planning, Scheduling and Control	*Chitkara, K.K*	Tata McGraw-Hill Publishing Co., New Delhi	*2002*
2	*Project Management for Construction–Fundamentals Concepts for Owners"*	*Chris Hendrickson and Tung Au*	Prentice Hall, Pittsburgh	*2000*

REFERENCES

Sl.No	*Title of Book*	*Author of Book*	*Publisher*	*Year of Publishing*
1	*Scheduling Construction projects*	*Willis. E.M.,*	John Wiley and Sons, New York	*2000*
2	*Financial and cost concepts for construction Management*	*Halpin, D.W*	John Wiley and Sons New York	*2002*

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/

16BECE8E05 PRE-STRESSED CONCRETE STRUCTURES 3 0 0 3 100

OBJECTIVES:

1. To learn the principles, materials, methods and systems of prestressing
2. To know the different types of losses and deflection of prestressed members
3. To learn the design of prestressed concrete beams for flexural, shear and tension and to calculate ultimate flexural strength of beam
4. To learn the design of anchorage zones, composite beams, analysis and design of continuous beam
5. To learn the design of water tanks
6. To design the anchorage zone for post tensioned members.

COURSE OUTCOMES

On completion of the course, the students will be able to:

1. Design a pre-stressed concrete beam accounting for losses.
2. Design the anchorage zone for post tensioned members.
3. Design composite members.
4. Design continuous beams.
5. Design water tanks.

Design of prestressed concrete beams for flexural, shear and tension and to calculate ultimate flexural strength of beam

UNIT I 9

Introduction – Theory and Behaviour: Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of prestress – Estimation of crack width

UNIT II 9

Design : Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic concepts in selection of cross section for bending – stress distribution in end block, Design of anchorage zone reinforcement – Limit state design criteria – Partial prestressing – Applications.

UNIT III 9

Circular Prestressing: Methods of circular prestressing – types classifications - merits and demerits – effects - Design of prestressed concrete tanks – Poles and sleepers –Applications.

UNIT IV 9

Composite Construction : Various types of composite construction - beams and columns –Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members

UNIT V 9

Pre-Stressed Concrete Bridges : General aspects –Methods of pretensioning –methods of post tensioning- pretensioned slabs- pretensioned bridge decks – Post tensioned prestressed bridge decks – Principles of design only.

TEXT BOOKS:

Sl.No	Title of Book	Author of Book	Publisher	Year of

				Publishing
1	Prestressed concrete	Krishna Raju N	Tata McGraw Hill Company, New Delhi	2012
2	Prestressed concrete	Mallic S.K. and Gupta A.P.,	Oxford and IBH publishing Co. Pvt. Ltd.	2010

REFERENCES:

Sl.No	**Title of Book**	**Author of Book**	**Publisher**	**Year of Publishing**
1	Modern prestressed concrete design	Ramaswamy G.S	Arnold Heinimen, New Delhi	2003
2	Design of prestressed concrete	Raymond Ian Gilbert and Neil Mickleborough	CRC Press	2004
3	Plant Cast precast and prestressed concrete – A design guide	David.A. Sheppard, William.R..and Philips	McGraw Hill,New Delhi.	2003

WEBSITES:

- http://www.icivilengineer.com
- http://www.engineeringcivil.com/
- http://www.aboutcivil.com/
- http://www.engineersdaily.com
- http://www.asce.org/
- http://www.cif.org/
- http://icevirtuallibrary.com/
- http://www.ice.org.uk/
- http://www.engineering-software.com/ce/

16BESHOE01, 16BTSHOE01 PROBABILITY AND RANDOM PROCESS 3 0 0 3

OBJECTIVES:

1. To gain knowledge in measures of central tendency.
2. To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
3. To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
4. To understand the basic concepts of random processes which are widely used in IT fields.
5. To understand the concept of correlation and spectral densities.
6. To acquire the knowledge on random process in engineering disciplines

OUTCOMES:

1. Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
2. The students will have an exposure of various distribution functions, correlation and spectral densities.
3. To understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
4. To understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
5. To apply the concept random processes in engineering disciplines.
6. To understand and apply the concept of correlation and spectral densities.

UNIT- I MEASURES OF CENTRAL TENDENCY AND PROBABILITY (9)

Measures of central tendency – Mean, Median, Mode - Standard Deviation
Probability - Random variable - Axioms of probability - Conditional probability - Total probability – Baye’s theorem.

UNIT- II STANDARD DISTRIBUTIONS (9)

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma(one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – ***Chebyshev's inequality***.

UNIT -III TWO DIMENSIONAL RANDOM VARIABLES (9)

Joint distributions - Marginal and conditional distributions - Probability mass function - Probability density functions – Covariance - Correlation and regression

UNIT- IV CLASSIFICATION OF RANDOM PROCESS (9)

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT -VCORRELATION AND SPECTRAL DENSITIES(9)

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

Total : 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peebles Jr, P.Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Pubishers, New Delhi.	2002

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO N
1	Ross, S	A first Course in Probability	Pearson Education, New Delhi (Chap 2 to 8)	2012
2	Gupta, S.C. and Kapoor, V.K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2014
3	Veerarajan,T.	Probabilitiy, Statistics and Random process	Tata McGraw-Hill Education pvt. Ltd., New Delhi	2008
4	Henry Stark and John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002

WEBSITES:

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld. Wolfram.com

16BESHOE02, 16BTSHOE02 FUZZY MATHEMATICS 3 0 0 3

COURSE OBJECTIVES:

1. Be able to understand basic knowledge of fuzzy sets and fuzzy logic
2. Be able to apply basic knowledge of fuzzy operations.
3. To know the basic definitions of fuzzy relations
4. Be able to apply basic fuzzy inference and approximate reasoning
5. To know the applications of fuzzy Technology.
6. Be able to acquire the knowledge on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology

COURSE OUTCOME:

7. To gain the main subject of fuzzy sets.
8. To understand the concept of fuzziness involved in various systems and fuzzy set theory.
9. To gain the methods of fuzzy logic.
10. To comprehend the concepts of fuzzy relations.
11. To analyze the application of fuzzy logic control to real time systems.
12. The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

UNIT I FUZZY SETS (9)

Fuzzy Sets : Basics Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations – Level Sets – Fuzzy functions - Zadeh's Extension Principle

UNIT II OPERATIONS ON FUZZY SETS (9)

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III FUZZY RELATIONS (9)

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNIT IV FUZZY MEASURES (9)

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures vs Possibility Measures

UNIT V FUZZY INFERENCE (9)

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

Total : 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	George J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic : Theory and Applications	Prentice Hall of India, New Delhi.	2003

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Zimmermann H.J.	Fuzzy Set Theory and its Applications	Kluwer Academic publishers, USA.	2001
2	Michal Baczynski and Balasubramaniam Jayaram	Fuzzy Implications	Springer-Verlag publishers, Heidelberg	2008
3	Kevin M Passino and Stephen Yurkovich	Fuzzy Control	Addison Wesley Longman publishers, USA	1998

WEBSITES:

1. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

16BESHOE03, 16BTSHOE03 LINEAR ALGEBRA 3 0 0 3

OBJECTIVES:

1. To introduce the basic concepts of vector space
2. To know the fundamentals of linear Algebra
3. To solve system of linear equations
4. To study about the linear transformations
5. To introduce the concepts of inner product spaces
6. To give the knowledge on the importance of Linear Algebra.

COURSE OUTCOMES:

The student will be able to

1. To explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
2. To apply the fundamental concepts in their respective engineering fields
3. To visualize linear transformations as matrix form
4. To recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
5. To articulate the importance of Linear Algebra and its applications in branches of Mathematics

UNIT I VECTOR SPACES (9)

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II EIGEN VALUES AND EIGEN VECTORS (9)

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

UNIT III SYSTEM OF LINEAR EQUATIONS (9)

Direct methods, Gauss elimination method, Gauss Jordan method, Crout's method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNIT IV LINEAR TRANSFORMATIONS (9)

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNIT V INNER PRODUCT SPACES (9)

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

Total : 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES:

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com

16BESHOE04, 16BTSHOE04 ENGINEERING ACOUSTICS 3 0 0 3

OBJECTIVES:

1. To disseminate the fundamentals of acoustic waves.
2. To inculcate the characteristics of radiation and reception of acoustic waves.
3. To divulge knowledge on the basics of pipe resonators and filters.
4. To introduce the features of architectural acoustics.
5. To impart the basic knowledge of transducers and receivers.
6. To impart the basic knowledge of transducers and receivers.

COURSE OUTCOMES:

1. Develop the idea of the fundamentals of acoustic waves.
2. Apply the concepts of radiation and reception of acoustic waves.
3. Explain the basic ideas of pipe resonators and filters.
4. Illusrate the basics of architectural acoustics.
5. Illustrate the transducers and receivers and its applications in various electronic devices.
6. Apply the knowledge inputs of the course for engineering applications.

UNIT I INTRODUCTION (9)

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves - Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales.Reflection and Transmission:Transmission from one fluid to another normal and oblique incidence –method of images.

UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES (9)

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers.Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III PIPES RESONATORS AND FILTERS (9)

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

UNIT IV ARCHITECTURAL ACOUSTICS (9)

Sound in endosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design. Environmental Acoustics: Highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

UNIT V TRANSDUCTION (9)

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – oving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

Total: 45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	LawerenceE.Kinsler, Austin R.Frey,	Fundamentals of Acoustics	John Wiley & Sons	2000

REFERENCE:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	F. AltonEverest & Ken Pohlmann	Master Handbook of Acoustics	McGraw Hill Professional	2014

WEBSITES:

1. www.acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www. ocw.mit.edu

16BESHOE05, 16BTSHOE05 SOLID WASTE MANAGEMENT 3 0 0 3

OBJECTIVES:

1. To make the students conversant with basics of Solid wastes and its classification.
2. To make the student acquire sound knowledge of different treatments of solid wastes.
3. To acquaint the student with concepts of waste disposals.
4. To develop an understanding of the basic concepts of Hazardous waste managements.
5. To acquaint the students with the basics of energy generation from waste materials.
6. To get the information on energy conservation.

OUTCOMES:

1. Outline the basic principles of Solid waste and separation of wastes (K)
2. Identify the concepts of treatment of solid wastes (S)
3. Identify the methods of wastes disposals. (S)
4. Examine the level of Hazardousness and its management. (S)
5. Examine the possible of the energy production using waste materials. (S)
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I SOLID WASTE (9)

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

UNIT II WASTE TREATMENT (9)

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNIT III WASTE DISPOSAL (9)

Sanitary Land Fill Method of Solid Waste Disposal – Land Fill Classficaition, Types, Methods &Siting Consideration – Layout & Preliminary Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfill Remediation

UNIT IV HAZARDOUS WASTE MANAGEMENT (9)

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure, Remediaiton, risk assessment.

UNIT V ENERGY GENERATION FROM WASTE (9)

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, Energy recovery systems. Biological & Chemical conversion technologies – Aerobic composting, low solids. Anaerobic digestion, high solids anaerobic digestion, Energy production from biological conversion products, other biological transformation processes. Chemical transformation processes.

Total: 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dara.S.S,Mishra.D.D	A Text book of Environmental Chemistry and Pollution Control	S.Chand and Company Ltd., New Delhi.	2011

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Naomi B. Klinghoffer and Marco J. Castaldi	Waste to Energy Conversion Technology (Woodhead Publishing Series in Energy)	Woodhead Publishing Ltd., Cambridge, UK	2013
2.	Frank Kreith, George Tchobanoglous	Hand Book of Solid Waste Management- 2nd edition	McGraw Hill Publishing Ltd., Newyork	2002
3.	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall (P) Ltd., New Delhi.	1999

WEBSITES:

1.www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.
2.http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/
3.www.alternative-energy-news.info/technology/garbage-energy/
4.nzic.org.nz/ChemProcesses/environment/

16BESHOE06, 16BTSHOE06 GREEN CHEMISTRY 3 0 0 3

OBJECTIVES:

1. To make the students conversant about the green chemistry
2. To make the student acquire sound knowledge of the atom efficient process and synthesis elaborately.
3. To acquaint the student with concepts of green technology.
4. To develop an understanding of the basic concepts of renewable energy resources.
5. To acquaint the students with the basic information on catalysis.
6. To inculcate the chemical principles in the field of engineering and technology

OUTCOMES:

1. Outline the basic principles of green chemistry (K)
2. Examine the different atom efficient process and synthesis elaborately (S)
3. Apply the concepts combustion of green technology (S)
4. Identify and apply the concepts of renewable energy (S)
5. Apply the concepts of green catalysts in the synthesis (S)
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO GREEN CHEMICAL PRINCIPLES (9)

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

UNIT II ATOM EFFICIENT PROCESSES (9)

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

UNIT III BIOTECHNOLOGY AND GREEN CHEMISTRY (9)

Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

UNIT IV RENEWABLE RESOURCES (9)

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

UNIT V CATALYSIS IN GREEN CHEMISTRY (9)

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

Total: 45

TEXT BOOKS:

S. NO.	**AUTHOR(S) NAME**	**TITLE OF THE BOOK**	**PUBLISHER**	**YEAR OF PUBLICATION**
1.	Sanjay K. Sharma, AckmezMudhoo	Green Chemistry for Environmental Sustainability	CRC Press , London	2010
2.	Ahluwalia V. K. and M.Kidwai	New Trends in Green Chemistry 2nd edition	Anamaya publishers., New Delhi.	2007

REFERENCE BOOKS:

S. NO.	**AUTHOR(S) NAME**	**TITLE OF THE BOOK**	**PUBLISHER**	**YEAR OF PUBLICATION**
1.	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons., New Delhi.	2012
2.	Mukesh Doble. Ken Rollins, Anil Kumar	Green Chemistry and Engineering, 1st edition	Academic Press, Elesevier., New Delhi.	2007
3.	Desai K. R.	Green Chemistry	Himalaya Publishing House, Mumbai.	2005
4.	Matlack A. S.	Introduction to Green Chemistry	Marcel Dekker: New York	2001

WEBSITES:

1.http://www.organic-chemistry.org/topics/green-chemistry.shtm
2.http://www.essentialchemicalindustry.org/processes/green-chemistry.html
3. http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm
4. http://www.epa.gov/research/greenchemistry/
5. http://www.amazon.in/Green-Chemistry-Catalysis

16BESHOE07, 16BTSHOE07 APPLIED ELECTROCHEMISTRY 3 0 0 3

OBJECTIVES:

1. To make the students conversant with **the information on electrochemical material**.
2. To make the student acquire sound knowledge of **conducting polymers**.
3. To acquaint the student with concepts of Energy storage devices.
4. To develop energy storage devices.
5. To impart knowledge on basic principals of solar cells and its applications
6. To inculcate the chemical principles in the field of engineering and technology

OUTCOMES:

1. Outline the basic principles of chemistry in **electrochemical material (K)**
2. Examine the properties of conducting polymers (S)
3. Apply the concepts of electrochemistry in storage devices. (S)
4. Identify the concepts of storage devices and its applications. (S)
5. Apply the suitable materials for the manufacturing of storage devices. (S)
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I METAL FINISHING (9)

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electroplating for electronic industry- Alloy plating, brass plating-Electro less plating of nickel- anodizing – Electroforming – Electro winning.

UNIT II CONDUCTING POLYMERS AND ELECTROCHEMICALS (9)

lectropolymerisation- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene- Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNIT III BATTERIES AND POWER SOURCES-I (9)

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNIT IV BATTERIES AND POWER SOURCES-II (9)

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

UNIT V ELECTROCHEMICAL MATERIAL SCIENCE (9)

Solar cells- Preparation of CdS/Cu_2S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Cynthia G. Zoski	Hand Book of Electrochemistry	Academic Press, Elesevier., UK	2007
2.	D.Pletcher and F.C.Walsh	Industrial Electrochemistry	Chapman and Hall, London	1990

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M. Barak	Electrochemical Power Sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
2.	Bruno Scrosati	Applications of Electroactive Polymers	Chapman & Hall, London	1993
3.	K.L. Chopra and I. Kaur	Thin Film Devices and their Application	Plenum Press, New York.	1983
4.	M.M.Baizer	Organic Electrochemistry	Dekker Inc. New York	1983

WEBSITES:

1.http://www.anoplate.com/finishes/
2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html
3. http://inventors.about.com/od/sstartinventions/a/solar_cell.htm

16BESHOE08, 16BTSHOE08 INDUSTRIAL CHEMISTRY 3 0 0 3

OBJECTIVES:

1. To make the students conversant with **cement and lime** and its uses.
2. To make the student acquire sound knowledge of abrasives and refractories.
3. To acquaint the student with concepts of inorganic chemicals.
4. To develop an understanding of the basic concepts**explosives**.
5. To acquaint the students with the basics of **agriculture chemicals**.
6. To inculcate the chemical principles in the field of engineering and technology

OUTCOMES:

1. Outline the basic chemistry of **cement and lime (K)**
2. Examine the uses of abrasives and refractories (S)
3. Identify the usage of the inorganic chemicals. (S)
4. Identify the concepts of explosives and smoke screens (S)
5. Identify the usage of the **agriculture** chemicals (S)
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I CEMENT AND LIME (9)

Manufacture of Portland cement – settling of hardening of portland cement – regauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials- manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – magnesian lime – dolomitic lime – hydraulic lime.

UNIT II ABRASIVES AND REFRACTORIES (9)

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories – definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

UNIT IIIINORGANIC CHEMICALS (9)

Common salt and soda ash – manufacture – different grades – products – alkalis – Na_2CO_3, caustic soda and chlor-alkali industry – manufacture principles of electrolytic process – chlorine – storage. Hydrochloric acid – manufacture – absorption – uses, sulphur and sulphuric acid – extraction of sulphur – manufacture of H_2SO_4 – chamber – contact processes – industrial uses.

UNIT IV EXPLOSIVES (9)

Explosives – uses – properties and tests – explosives for war – nitrocellulose – picric acid and T.N.T. – industrial explosives – nitroglycerin and dynamites – black powder – smoke screens – incendiaries – gas mask.

UNIT V AGRICULTURE CHEMICALS (9)

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Harikrishan	Industrial Chemistry	Goel Publishing House, Meerut.	2014
2.	B.K. Sharma	Industrial Chemistry	Goel Publishing House, Meerut.	2000

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH Publishing CO. New Delhi.	1998
2.	James A. Kent	Hand Book of Industrial Chemistry, 9^{th} edition	Van Nostrand Reinhold, New York.	1992
3.	R.N. Sherve	Chemical Process Industries	McGraw-Hill, Kugakuisha Ltd., Tokyo.	1984
4.	S.D. Shukla and G.N. Pandy	A Text book of Chemical Technology	Vikas Publishing House (P) Ltd, New Delhi.	1979

WEBSITES:

1.http://en.wikipedia.org/wiki/Cement
2. http://www.hon.ch/HONselect/Selection/D01.html
3. http://fas.org/man/dod-101/navy/docs/fun/part12.htm
4. http://toxics.usgs.gov/topics/agchemicals.html

16BECSOE01	Internet Programming	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To study concepts of Internet, IP addresses and protocols
2. To explain the concept of web page development through HTML
3. To introduce the PERL and explore its current strengths and Weaknesses
4. To write working Java code to demonstrate the use of applets for client-side programming
5. To study Internet telephony and various multimedia applications
6. To Elaborate on the principles of web page development

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

1. Learn the advanced concepts& techniques of Internet and Java.
2. Analyze the requirements for and create and implement the principles of web page development
3. Understand the concepts of PERL
4. Implement client-side programming using java applets
5. Generate internet telephony based upon advanced concepts
6. Develop applications on internet programming based on java applets and scripts

UNIT I Introduction **9**

Introduction - Network of Networks, Intranet, Extranet and Internet. World Wide Web- Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. TCP/IP- Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing- Classful and Classless Addressing, Subnetting

UNIT II HTML **9**

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue. Image Maps- map, area, attributes of image area- Extensible Markup Language (XML)- Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts- Introduction- Environment Variable, GET and POST Methods.

UNIT III PERL **9**

Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling- JavaScript- Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies- Definition of cookies, Create and Store a cookie with example. Java Applets-Container Class, Components, Applet Life Cycle, Update method, Applications.

UNIT IV Client-Server programming **9**

Client-Server programming In Java - Java Socket, Java RMI. Threats - Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks- Network security techniques- Password and Authentication- VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH). Firewall- Introduction, Packet filtering, Stateful, Application layer, Proxy.

UNIT V Internet Telephony **9**

Introduction, VoIP- Multimedia Applications- Multimedia over IP: RSVP, RTP, RTCP and RTSP-Streaming media, Codec and Plugins, IPTV- Search Engine and Web Crawler- Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

Total Hours: 45

Text Books:

1. Paul Deitel, Harvey Deitel and Abby Deitel, “Internet and World Wide Web-How to Program”, 5th Edition, 2011.
2. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.

References:

1. Rahul Banerjee, Internetworking Technologies, An Engineering Perspective, PHI Learning, Delhi, 2011.
2. Robert W. Sebesta, “Programming the World Wide Web”, Pearson Education, 2016

16BECSOE02 **Multimedia and Animation**

L	T	P	C
3	**0**	**0**	**3**

COURSE OBJECTIVES:

1. To impart the fundamental concepts of Computer Animation and Multimedia
2. To study the graphic techniques and algorithms using flash
3. Explain various concepts available in 3D animation
4. Explain various devices available for animation
5. To study the multimedia concepts and various I/O technologies for concept development
6. To understand the three-dimensional graphics and their transformations

COURSE OUTCOMES

Upon completion of this course, the student will be able to:

1. Develop their creativity using animation and multimedia
2. Understand the concepts of Flash and able to develop animation using it
3. Understand about various latest interactive 3D animation concepts
4. Know the various devices and software available in motion capture
5. Understand the concept development process
6. Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.

UNIT I **Introduction** **9**

What is mean by Animation – Why we need Animation – History of Animation– Uses of Animation – Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects -Creating Animation.

UNIT II **Creating Animation in Flash** **9**

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers - Action script.

UNIT III **3D Animation & its Concepts** **9**

Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation.

UNIT IV **Motion Caption** **9**

Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage – Different Language of Script Animation Among the Software.

UNIT V **Concept Development** **9**

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

Total Hours: 45

Text Books:

1. Computer Graphics, Multimedia and Animation-Malay K. Pakhira,PHI Learning PVT Ltd,2010

References:

1. Principles of Multimedia – Ranjan Parekh, 2007, TMH. (Unit I, Unit V)
2. Multimedia Technologies – Ashok Banerji, Ananda Mohan Ghosh – McGraw Hill Publication.
3. Encyclopedia of Multimedia and Animations-Pankaj Dhaka, Anmol Publications-2011

16BECSOE03	PC Hardware and Trouble shooting	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To study the basic parts of computer in detail
2. Introduce various peripheral devices available for computer and its detailed working concepts
3. Overview of various interfaces and other hardware overview
4. Assemble/setup and upgrade personal computer systems and discuss about power supplies and the skills to trouble-shoot various power-related problems.
5. To study basic concepts and methods in troubleshooting
6. To study the installation/connection and maintenance of computer and its associated peripherals.

COURSE OUTCOME:

Upon completion of this course, the student will be able to:

1. Identify the main components for the PC, familiarize themselves with PC memories such as RAM and ROM devices and so on.
2. Identify various peripheral devices available and its working
3. Understand various concepts of hardware and its interface and control
4. Perform basic installation of PC. Importance of maintenance is understood
5. Understand Various faults and failures are identified and troubleshooting in detail
6. Understand overall PC hardware, interfacing, maintenance and troubleshooting

UNIT I Introduction 9

Introduction - Computer Organization – Number Systems and Codes – Memory – ALU – CU – Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques – Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC and User.

UNIT II Peripheral Devices 9

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices – FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNIT III PC Hardware Overview 9

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC.

UNIT IV Installation and Preventive Maintenance 9

Introduction – system configuration – pre installation planning – Installation practice – routine checks – PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery.

UNIT V Troubleshooting 9

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LSI's – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.

Total Hours: 45

Text Books:

1. B. Govindarajalu, “IBM PC Clones Hardware, Troubleshooting and Maintenance”, 2/E, TMH, 2002.

References:

1. Peter Abel, Niyaz Nizamuddin, “IMB PC Assembly Language and Programming”, Pearson Education, 2007
2. Scott Mueller, “Repairing PC's”, PHI, 1992

16BECSOE04	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To understand Object Oriented Programming concepts and basic characteristics of Java
2. To know the principles of packages, inheritance and interfaces
3. To define exceptions and use I/O streams
4. To develop a java application with threads, generics classes and swings
5. To explain the need for generic programming
6. To design and build simple Graphical User Interfaces

COURSE OUTCOMES:

Upon completion of the course, students will be able to:

1. Develop Java programs using OOP principles
2. Develop Java programs with the concepts of inheritance and interfaces
3. Build Java applications using exceptions and I/O streams
4. Develop Java applications with threads and generics classes and swings
5. Understand various aspects for motivation of generic programming
6. Develop various interactive Java programs using OOP concepts of Java

UNIT I INTRODUCTION TO JAVA

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members –constructors – finalize method

UNIT II PACKAGES

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy –polymorphism – dynamic binding – final keyword – abstract classes

UNIT III I/O STREAMS

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes.

UNIT IV EXCEPTION HANDLING

Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions – Using exceptions for debugging

UNIT V THREADS

Introduction, Creating Threads, The Life Cycle of a Thread, Thread Methods, Using Threads, Synchronization of Threads, Summary

TEXT BOOKS:

1. Cay S. Horstmann and Gary Cornell Core Java: Volume I–Fundamentals Sun Microsystems Press 2008

REFERENCE BOOKS:

1. K. Arnold and J. Gosling The JAVA programming language Third edition, Pearson Education, 2009

2. Timothy Budd Understanding Object-oriented programming with Java Updated Edition, Pearson Education 2002

3. C. Thomas Wu An introduction to Object-oriented programming with Java Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2008

WEBSITES:

http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/
http://www.winprog.org/tutorial/msvc.html
http://www.tutorialized.com/tutorials/Visual-C/1
http://www.freeprogrammingresources.com/visualcpp.html

16BEEEOE01 ELECTRIC HYBRID VEHICLE L T P C 3 0 0 3

Course Objectives

1. To understand the basic concepts of electric hybrid vehicle.
2. To gain the knowledge about electric propulsion unit.
3. To gain the concept of Hybrid Electric Drive-Trains.
4. To gain the different Energy Management Strategies.
5. To study about the efficiency manipulation in drives
6. To understand and gain the knowledge about various energy storage devices

Course Outcomes:

1. Summarize the basic concepts in bioprocess Engineering.
2. Explain the concept of Hybrid Electric Vehicles.
3. Understand the concept of Hybrid Electric Drive-Trains.
4. Identify the different Energy Management Strategies.
5. Understand the concept of different Energy Storage devices.
6. Analyze the different motor drives used in Hybrid Electric Vehicles.

UNIT I INTRODUCTION 9

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II HYBRID ELECTRIC DRIVE-TRAINS 9

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT 9

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE 9

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENT STRATEGIES 9

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press – 2nd edition	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	Standardsmedia – 2nd edition	2009
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley – 2nd edition	2012

16BEEEOE02 ENERGY MANAGEMENT & ENERGY AUDITING L T P C 3 0 0 3

Course Objectives:

1. To gain the knowledge about energy management.
2. To understand the basic concepts in economic analysis in energy management.
3. To understand the basic principles of energy audit.
4. To gain the knowledge about the basic concept of types of Energy Audit
5. To gain and Evaluate the different energy efficient motors
6. Understand the concept of Energy conservation.
7. To study about the behaviour changes of PF requirement in motor currents

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Understand the concept of Energy Management.
2. Analyze the different methods for economic analysis
3. Knowledge about the basic concept of Energy Audit and types.
4. Evaluate the different energy efficient motors
5. Understand the concept of Energy conservation.
6. Investigate the different methods to improve power factor.

UNIT I ENERGY MANAGEMENT 9

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS 9

Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worth method.

UNIT III BASIC PRINCIPLES OF ENERGY AUDIT 9

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT IV ENERGY EFFICIENT MOTORS 9

Electric Motors: Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation –over motoring – motor energy audit-

Energy conservation: Importance-energy saving measures in DG set-fans and blowers pumps- air conditioning system- energy efficient transformers.

UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS 9

Power factor - methods of improvement, location of capacitors, p.f with non linear loads, effect of harmonics on p.f,- p.f motor controllers –Energy efficient lighting system design and practice- lighting control– Measuring Instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLCs.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Murphy W.R. and G.Mckay Butter worth	Energy Management	Heinemann Publications	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John.C.Andreas	Energy Efficient Electric Motors	Marcel Dekker Inc Ltd – 3rd edition	2005
2	W.C.Turner Steve Doty	Energy Management Handbook	Lulu Enterprises, Inc. - 8th Edition Volume II	2013

16BEEEOE03 PROGRAMMABLE LOGIC CONTROLLER L T P C 3 0 0 3

Course Objectives

1. To understand the basic principles of PLC systems.
2. To gain the knowledge about data handling functions.
3. To gain the knowledge of storage techniques in PLC
4. To acquire the knowledge about how to handle the data and functions
5. To study about flow charts of ladder and spray process system
6. To understand the principles of PID.

Course Outcome

1. At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.
2. To acquire the knowledge of storage techniques in PLC
3. Students know how to handle the data and functions
4. Students known about advanced controller in PLC applications
5. Students gather real time industrial application of PLC
6. Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION 9

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING 9

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS 9

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS 9

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES 9

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	JR Hackworth	Programmable Logic	Pearson	2006

	and F.D Hackworth – Jr	Controllers – Programming Method and Applications		

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	2004
2	W.Bolton	Programmable Logic controller	Elsevier Newnes Publications, 5th Edition	2009

WEBSITE
http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logic controller

16BEEEOE04 RENEWABLE ENERGY RESOURCES L T P C 3 0 0 3

Course Objectives

1. To gain the knowledge about environmental aspects of energy utilization.
2. To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
3. To study about solar energy collectors and its storages
4. To study about the inter connected system in wind power
5. To understand the basic principles fuel cell, Geo thermal power plants.
6. To gain the knowledge about hydro energy.

Course Outcomes

At the end of this course, students will demonstrate the ability to

1. Analyze the Energy Scenario in india
2. Understand the concept of Solar Energy
3. Understand the concept of Wind Energy
4. Understand the concept of Hydro Energy
5. Analyze the different energy sources
6. Students gathered the real time inter connected system modelling in wind power

UNIT I INTRODUCTION 9

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

UNIT II SOLAR ENERGY

9

Introduction to solar energy: solar radiation, availability, measurement and estimation– Solar thermal conversion devices and storage – solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

UNIT III WIND ENERGY

9

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNIT IV HYDRO ENERGY 9

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes.Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V OTHER SOURCES 9

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rai.G.D	Non-conventional sources of energy	Khanna publishers	2011
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rao.S. &Parulekar	Energy Technology	Khanna publishers, Eleventh Reprint	2013
2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis – 3rd edition	2015

WEBSITES

1. www.energycentral.com
2. www.catelelectricpowerinfo.com

16BEECOE01 REAL TIME EMBEDDED SYSTEMS 3 0 0 3 100

Course Objectives

1. To introduce students to the embedded systems, its hardware and software.
2. To introduce devices and buses used for embedded networking.
3. To study about task management
4. To learn about semaphore management and message passing
5. To study about memory management
6. To imparts knowledge on

Course Outcomes

At the end of the course the students will be able to

1. Understand overview of embedded systems architecture
2. Acquire knowledge on embedded system, its hardware and software.
3. Gain knowledge on overview of Operating system
4. Discuss about task Management
5. Gain knowledge about semaphore management and message passing.
6. Gain knowledge about memory management.

UNIT - I INTRODUCTION TO EMBEDDED SYSTEM

Introduction - Embedded systems description, definition, design considerations & requirements - Overview of Embedded system Architecture (CISC and RISC) - Categories of Embedded Systems - embedded processor selection &tradeoffs - Embedded design life cycle - Product specifications - hardware/software partitioning - iterations and implementation - hardware software integration - product testing techniques – ARM 7

UNIT - II OPERATING SYSTEM OVERVIEW

Introduction –Advantage and Disadvantage of Using RTOS – Multitasking – Tasks - Real Time Kernels – Scheduler - Non-preemptive Kernels - Preemptive Kernels – Reentrancy- Reentrant Functions – Round Robin Scheduling - Task Priorities - Static Priorities – Mutual Exclusion – Deadlock –Intertask Communication – Message Mailboxes – Message Queues - Interrupts - Task Management – Memory Management - Time Management – Clock Ticks.

UNIT - III TASK MANAGEMENT

Introduction - μ C/OS-II Features - Goals of μ C/OS-II - Hardware and Software Architecture – Kernel Structures: Tasks –Task States – Task Scheduling – Idle Task – Statistics Task – Interrupts Under μ C/OS-II – Clock Tick - μ C/OS-II Initialization. Task Management: Creating Tasks – Task Stacks – Stack Checking – Task's Priority – Suspending Task – Resuming Task. Time Management: Delaying a Task – Resuming a Delayed Task – System Time. Event Control Blocks- Placing a Task in the ECB Wait List – Removing a Task from an ECB waits List.

UNIT - IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING

Semaphore Management: Semaphore Management Overview – Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox – Deleting Mailbox – Waiting for a Message box – Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue – Deleting a Message Queue – Waiting for a Message at a Queue – Sending Message to a Queue – Flushing a Queue.

UNIT - V MEMORY MANAGEMENT

Memory Management: Memory Control Blocks – Creating Partition- Obtaining a Memor y Block – Returning a Memor y Block .Getting Started with µ C/OS-II – Installing µ C/OS-II – Porting µ C/OS-II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with µ C/OS-II - µ C/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Anal yze the Multichannel ADC with help of µ C/OS-II.

REFERENCES

1. Jean J. Labrosse “MicroC/OS – II The Real Time Kernel”-CMP BOOKS- 2009
2. David Seal “ARM Architecture Reference Manual”-Addison-Wesley-2008
3. Steve Furbe,”ARM System-on-Chip, Architecture”-Addison-Wesley Professional California-2000

16BEECOE02 CONSUMER ELECTRONICS 3 0 0 3 100

Course Objectives

1. To study about various speakers and microphone
2. To learn the fundamental of television systems and standards
3. To learn the process of audio recording and reproduction
4. To study various telephone networks
5. To discuss about the working of home appliances
6. To familiarize with TV services like ISDN.

Course Outcomes

At the end of the course the students will be able to

1. Understand working of various type of loud speakers
2. Acquire knowledge on various types of picture tubes
3. Demonstrate the working of various optical recording systems
4. Distinguish various standards for color TV system
5. Acquire knowledge on various telecommunication networks
6. Demonstrate the working of various home appliances

UNIT I LOUDSPEAKERS AND MICROPHONES

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNIT – II TELEVISION STANDARDS AND SYSTEMS

Components of a TV system – interlacing – composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL, SECAM - Components of a Remote Control.

UNIT – III OPTICAL RECORDING AND REPRODUCTION

Audio Disc – Processing of the Audio signal –read out from the Disc – Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems.

UNIT – IV TELECOMMUNICATION SYSTEMS

Telephone services - telephone networks – switching system principles – PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellular modems

UNIT – V HOME APPLIANCES

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

Text Book:

1. S.P.Bali, “Consumer Electronics”, Pearson Education, 2005.

16BEECOE03 NEURAL NETWORKS AND ITS APPLICATIONS 3 0 0 3 100

Course Objectives

1. To introduce the basic concepts of neural networks and its applications in various domain
2. To educate how to use Soft Computing to solve real-world problems
3. To have a solid understanding of Basic Neural Network.
4. To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
5. To gain exposure in the field of neural networks and relate the human neural system into the digital world
6. To provide knowledge of computation and dynamical systems using neural networks

Course Outcomes

At the end of the course the students will be able to

1. Understand the basic concepts of neural networks and its applications in various domains
2. Gain knowledge about learning process in Neural Networks
3. Apply perception concept in design
4. Design using ART phenomena
5. Gain knowledge on SOM concepts
6. Ability to develop the use of Soft Computing to solve real-world problems

UNIT I: INTRODUCTION TO NEURAL NETWORKS

Introduction - biological neurons and their artificial models - learning, adaptation and neural network's learning rules - types of neural networks- single layer, multiple layer- feed forward, feedback networks

UNIT II LEARNING PROCESS

Error – correction learning –memory based learning - hebbian learning-competitive learning-Boltzmann learning- supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT III PERCE PTION

Single layer perception-Adaptive filtering-unconstrained optimization-Least-mean square algorithm-Leaning curve-Annealing Technique-perception convergence theorem-Relationship between perception and Baye's classifier-Back propagation algorithm

UNIT IV ATTRACTOR NEURAL NETWORK AND ART

Hopfield model-BAM model- BAM stability-Adaptive BAM -Lyapunov function-effect of gain-Hopfield design-Application to TSP problem-ART- layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP

UNIT V SELF ORGANIZATION

Self organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical vector Quantization. Applications of self-organizing maps: The Neural Phonetic Typewriter Learning Ballistic Arm Movements

REFERENCES:

1. Simon Haykin, “Neural Networks and Learning Machines” -3/E - Pearson/ Prentice Hall 2009
2. Satish Kumar- “Neural Networks : A Classroom Approach”-TMH-2008
3. Freeman J.A., SkapuraD.M.”Neural networks, algorithms, applications, and programming techniques” -Addition Wesley, 2005.
4. Laurene Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms, and Applications” - Pearson/ Prentice Hall 5. Robert J Schalkoff-“Artificial Neural Networks,McGraw Hill”-1997

16BEECOE04 FUZZY LOGIC AND ITS APPLICATIONS 3 0 0 3 100

Course Objectives

1. To introduce the basic concepts of Fuzzy logic and its applications in various domain
2. To educate how to use Fuzzy computation to solve real-world problems
3. To have a solid understanding of Basic fuzzy models.
4. Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
5. To learn about applications on Fuzzy based systems
6. To familiarize with fuzzy fiction and de fuzzy fiction procedures

Course Outcomes

At the end of the course the students will be able to

1. Understand the basic concepts of Fuzzy logic and its applications in various domain
2. Gain knowledge on theory of Reasoning
3. Develop fuzzy controllers
4. Understand concepts of adaptive fuzzy control
5. Ability to develop how to use Fuzzy computation to solve real- world problems
6. Design fuzzy based model for any application

UNIT - I

Basics Of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT – II

Theory Of Approximate Reasoning**:** Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference-fuzzy models

UNIT - III

Fuzz y Knowledge Based Controllers (Fkbc)**:** Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures – Design of Fuzz y Logic Controller

UNIT - IV

Adaptive Fuzz y Control: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

UNIT V FUZZY BASED SYSTEMS

Simple applications of FKBC -washing machines- traffic regulations -lift control-fuzz y in medical applications-Introduction to ANFIS.

TEXT BOOKS:

1. An Introduction to Fuzz y Control- D. Diankar, H. Hellendoom and M. Reinfrank- Narosa Publishers India, 1996.

2. Fuzzy Sets Uncertainty and Information- G. J. Klir and T. A. Folger- PHI IEEE, 1995.

16BTBTOE01 BIOREACTORDESIGN 3003100

Course Objectives:

1. To impart basic knowledge in bioprocess Engineering
2. To design the bioreactors for various operations.
3. To understand the principle and working of heat transfer equipments.
4. To extend the knowledge in principle of heat transfer inside a bioreactor
5. To construct the equipments used in mass transfer operations.
6. To learn the equipments used in separation process.

Course Outcomes:

1. Summarize the basic concepts in bioprocess Engineering.
2. Design the bioreactors for various operations.
3. Develop the heat transfer equipments for Bioprocess Engineering.
4. Elaborate the principle of heat transfer in bioreactor.
5. Construct the equipments used in mass transfer operations.
6. Categorize the equipments used in separation process.

UNITI ENGINEERINGPROPERTIESANDSTORAGETANK (9)

Introductiontovariousmechanicalpropertiesofmaterialtobeusedmaterialofconstruction, designofcylindricalstoragetank.

UNITII REACTORDESIGN (9)

DesignofAirliftfermentor,BubblecolumnreactorandContinuousstirredtankreactor.

UNITIII HEATTRANSFEREQUIPMENTS (9)

DesignofShellandtubeHeatexchanger,Doublepipeheatexchanger,longtube verticalevaporatorandforcedcirculationevaporator.

UNITIV MASSTRANSFEREQUIPMENTS (9)

DesignofBollmannextractor,fractionatingcolumn,packedtowerandspraytrayabsorber

UNITV SEPARATIONEQUIPMENTS (9)

Designof plate andframefilterpress,leaffilter,rotarydrumfilter,discbowlcentrifuge, rotartdrumdrierandSwenson–walkercrystallizer.

TEXTBOOKS:

S.No	Author(s)Name	Titleofthebook	Publisher	Year of Publications
1	James Edwin Bailey, DavidF.Ollis	Biochemical Engineering Fundamentals	McGraw-Hill	2007
2	DonW.Green,RobertH. Perry	Chemical Engineer Handbook	The McGraw- Hill	2008

			Companies, Inc.	

REFERENCEBOOKS

S.No	Author(s)Name	Titleofthebook	Publisher	Year of Publications
1	Pauline.M.Doran	BioprocessEngineering Principles	Academic Press	2013

16BTBTOE02 FOODPROCESSINGANDPRESERVATION 3003100

Course Objectives

1. To learn the scope and importance of food processing.
2. To impart basic knowledge in different food processing methods carried out in the food tech companies.
3. To extend the brief knowledge in food conservation operations.
4. To study the methods of food preservation by cooling.
5. To familiarize the students on the concepts of preservation methods for fruits.
6. To create deeper understanding on preservation methods for vegetables.

Course Outcomes

1. Describe the scope and importance of food processing.
2. Outline the various processing methods for foods.
3. Extend the knowledge in food conservation operations.
4. Describe the methods of food preservation by cooling.
5. Summarize the preservation methods for fruits.
6. Demonstrate the preservation methods for vegetables.

UNITI SCOPEANDIMPORTANCEOFFOODPROCESSING (9)

Properties of food- Physical, thermal, mechanical, sensory. Raw material Preparation - Cleaning,sorting,grading,peeling.

UNITII PROCESSINGMETHODS (9)

Heating- Blanching and Pasteurization. Freezing- Dehydration- canning- additives- fermentation- extrusioncooking- hydrostatic pressure cooking- dielectric heating- microwave processingandasepticprocessing–Infraredradiationprocessing- Conceptsandequipmentused.

UNITIII FOODCONVERSIONOPERATIONS (9)

Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membrane separation-filtration-equipmentandapplication.

UNITIV FOODPRESERVATIONBYCOOLING (9)

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect oflowtemperatureonfood. Water activity, methods tocontrolwateractivity.

UNITV PRESERVATIONMETHODSFORFRUITSANDVEGETABLES (9)

Preprocessing operations-preservation byreductionofwatercontent:drying/dehydration and concentration –chemicalpreservation –preservation ofvegetablesbyacidification, preservation withsugar-Heatpreservation–Foodirradiation-Combinedpreservationtechniques.

TEXTBOOKS

S.No	Author(s)Name	Titleofthebook	Publisher	Year of Publications
1	R.PaulSingh,DennisR. Heldman	Introduction to food engineering.	Academic Press	2001
2	P.Fellows.	Food Processing Technology, Principles and practice.	Woodhead Publishing Ltd	2000
3	MirceaEnachescuDauthy	Fruit and Vegetable Processing	FAO agricultural services bulletin	1995

REFERENCEBOOKS

S.No	Author(s)Name	Titleofthebook	Publisher	Year of Publications
1	M.A. Rao, SyedS.H. Rizvi,AshimK.Datta	Engineering properties offoods	CRC Press	2005
2	B.Sivasankar	Food processingand preservation	PHI Learning Pvt.Ltd	2002

16BTBTOE03 BASICBIOINFORMATICS 3003100

Course Objectives

1. To understand the available tools and databases for performing research in bioinformatics.
2. To expose students to sequence alignment tool in bioinformatics.
3. To construct the phylogenetic trees for evolution.
4. To get familiar with the 3D structure of protein and classification.
5. To acquire basic knowledge in protein secondary structure prediction.
6. To extend the brief knowledge in Micro array data analysis.

Course Outcomes

1. Summarize the basic concepts and importance of Bioinformatics in various sectors.
2. Demonstrate the sequence alignment tool in bioinformatics.
3. Construct the phylogenetic trees for evolution.
4. Analyze the three dimensional protein structure and classification using various tools.
5. Illustrate the protein secondary structure prediction by comparative modeling.
6. Extend the knowledge in micro array technology and applications of bioinformatics in various sectors.

UNITI OVERVIEWOFBIOINFORMATICS (9)

Thescopeofbioinformatics; bioinformatics&theinternet;usefulbioinformaticssites.Dataacquisition:sequencingDNA,RNA&proteins;determinationofproteinstructure;gene&proteinexpression data;proteininteractiondata. Databases–contents,structure&annotation:fileformats; annotatedsequencedatabases;miscellaneousdatabases.

UNITII RETRIEVALOFBIOLOGICALDATA (9)

DataretrievalwithEntrez&DBGET/LinkDB;dataretrievalwithSRS(sequence retrieval system).Searching sequencedatabasesbysequencesimilaritycriteria:sequencesimilarity searches;aminoacidsubstitutionmatrices;databasesearches,FASTA&BLAST;sequencefilters;iterative databasesearches&PSI-BLAST.Multiple-sequencealignment,gene&proteinfamilies:multiple-sequencealignment&familyrelationships;proteinfamilies&patterndatabases;proteindomainfamilies.

UNITIII PHYLOGENETICS (9)

Phylogenetics, cladistics &ontology; building phylogenetic trees; evolution of macromolecularsequences.Sequenceannotation:principlesofgenomeannotation;annotationtools &resources.

UNITIV STRUCTURALBIOINFORMATICS (9)

Conceptualmodelsofproteinstructure;therelationshipofproteinthree-dimensional structureto proteinfunction;theevolutionofproteinstructure&function;obtaining, viewing&analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure:CATH&SCOP;introductiontoproteinstructureprediction;structurepredictionbycomparative modeling;secondarystructureprediction;advancedproteinstructureprediction&predictionstrategies.

UNITV MICROARRAYDATAANALYSIS (9)

Microarray data,analysismethods;microarraydata,tools&resources;sequencesampling&SAGE.Bioinformatics inpharmaceuticalindustry:informatics&drugdiscovery; pharmainformaticsresources.Basicprinciplesofcomputinginbioinformatics:runningcomputer software;computeroperatingsystems;softwaredownloading&installation;databasemanagement.

TEXTBOOK

S.No.	**Author (s) Name**	**Titleofthebook**	**Publisher**	**Year of Publication**
1	Dan E. Krane, Micha L.Rayme	Fundamental Concepts of Bioinformatics	Pearsoneducation	2004
2	Andreas D. Baxevanis, B. F. Francis Ouellette	Bioinformatics: A Practical GuidetotheAnalysisofGenesandPro eins	Wiley-Interscience	2004
3	David W. Mount	SequenceandGenomeAnalysis	ColdSpringHarbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics andFunctional Genomics	Wiley-Liss	2003

REFERENCEBOOKS

S.No.	**Author (s) Name**	**Titleofthebook**	**Publisher**	**Year of Publication**
1	Michael J. Korenberg	Microarray Data Analysis: MethodsandApplications	Springer Science & BusinessMedia	2007

16BTBTOE04 FUNDAMENTALSOFNANOBIOTECHNOLOGY 3003100

Course Objectives

1. To impart the skills in the field of nano biotechnology and its applications.
2. To acquire knowledge in the nano particles and its significance in various fields.
3. To extend the knowledge in types and application of nano particles in sensors.
4. To define the concepts of biomaterials through molecular self assembly.
5. To equip students with clinical applications of nano devices.
6. To describe deeper understanding of the socio-economic issues in nanobiotechnology.

Course Outcomes

1. Develop skills in the field of nano biotechnology and its applications.
2. Summarize the nanoparticles and its significance in various fields.
3. Extend the knowledge in types and application of nano particles in sensors.
4. Define the concepts of biomaterials through molecular self assembly.
5. Outline the clinical applications of nano devices.
6. Describe the socio-economic issues in nanobiotechnology.

UNITI INTRODUCTION (9)

Introduction, ScopeandOverview,Lengthscales,ImportanceofNanoscaleandTechnology, HistoryofNanotechnology,FutureofNanotechnology:NanoTechnologyRevolution,SiliconbasedTechnology, BenefitsandchallengesinMolecularmanufacturing: TheMolecularassemblerconcept,Controversiesandconfusions,Understandingadvancedcapabilities, NanotechnologyinDifferent,Fields:Nanobiotechnology,Materials,Medicine,Dentalcare.

UNITII NANOPARTICLES (9)

Introduction, Types of Nanoparticles, Techniques to Synthesize Nanoparticles, CharacterizationofNanoparticles, Applications,ToxiceffectsofNanomaterials, Significance ofNanoparticlesNanofabrications-MEMS/NEMS,AtomicForceMicroscopy,Selfassembledmonolayers/Dip-penNanolithography, SoftLithography, PDMSMolding,NanoParticles, NanowiresandNanotubes.

UNITIII APPLICATIONS (9)

Nanomedicine,NanobiocensorandNanofludics.Nanocrystalsinbiologicaldetection, ElectrochemicalDNAsensorsandIntegratedNanolitersystems.Nano-Biodevices and Systems.FabricationofNovelBiomaterialsthroughmolecularselfassembly-Small scale systemsforinvivodrugdelivery-Futurenanomachine.

UNITIV NANOBIOTECHNOLOGY (9)

Clinicalapplicationsofnanodevices.Artificialneurons.Real-timenanosensors-Applicationsin cancerbiology.Nanomedicine.Syntheticretinylchipsbasedonbacteriorhodopsins.High throughputDNAsequencingwithnanocarbontubules.Nanosurgicaldevices.

UNITV ETHICALISSUESINNANOTECHNOLOGY (9)

Introduction,SocioeconomicChallenges,EthicalIssuesinNanotechnology: WithEspecialReferencetoNanomedicine, NanomedicineAppliedinNonmedicalContexts,SocialIssuesRelatingtoNanomedicine. SocialandEthicalIssues,EconomicImpacts,OtherIssues, NanotechnologyandFutureSocio-economicchallenges.

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Niemeyer,C.M. andMirkin,C.A	Nanobiotechnology:Concepts, Applicationsand Perspectives	Wiley-VCH	2004
2	Goodsell,D.S.	Bionanotechnology	JohnWiley andSons, Inc	2004

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Shoseyov,O. and Levy,I	Nanobiotechnology: BioinspiredDevicesand MaterialsoftheFuture	Humana Press	2007
2	Bhushan,B.	SpringerHandbookof Nanotechnology	Springer-Verlag Berlin Heidelberg	2004
3	FreitasJrR.A	Nanomedicine	Landes Biosciences	2004
4	Kohler,M.and Fritzsche,W.	Nanotechnology–An IntroductiontoNanostructuring Techniques	Wiley-VCH	2004

COMPUTER AIDED DESIGN 3 0 0 3 100

Course Objective

1. To apply basic concepts to develop construction (drawing) techniques.
2. To ability to manipulate drawings through editing and plotting techniques.
3. To understand geometric construction and Produce template drawings.
4. To understand and demonstrate dimensioning concepts and techniques.
5. To understand Section and Auxiliary Views.
6. To become familiar with Solid Modelling concepts and techniques.

Course Outcome

7. Apply basic concepts to develop construction (drawing) techniques.
8. Ability to manipulate drawings through editing and plotting techniques.
9. Understand geometric construction and Produce template drawings.
10. Understand and demonstrate dimensioning concepts and techniques
11. Understand Section and Auxiliary Views
12. Become familiar with Solid Modelling concepts and techniques.

UNIT I OVERVIEW OF CAD SYSTEMS 9

Conventional and computer aided design processes-advantages and disadvantages.Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations.Networking of CAD systems.

UNIT II INTERACTIVE COMPUTER GRAPHICS AND GRAPHICS TRANSFORMATIONS 9

Generative, cognitive and image processing graphics.Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Two- and Three – Dimensional graphics concepts, Graphical input technique, Geometric transpformations, Visual Realism, Computer animation, customizing graphics software.

UNIT III GEOMETRIC MODELING 9

Wireframe, surface, NURBS and solid modeling-applications and advantages. Creating primitive solids, sweeping solids, boolean operations. Extracting entities from a solid.Filleting of edges of solids. Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

UNIT IV PARAMETRIC DESIGN AND OBJECT REPRESENTATION 9

Types of co-ordinate systems.Parametric design - definition and advantages.Parametric representation of analytic and synthetic curves.Parametric representation of surfaces and solids - manipulations.

UNIT V PRODUCT DESIGN AND DEVELOPMENT 9

Automated 2D drafting - basics, mechanical assembly - bill of materials generation.Mass property calculations.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vera B Anand	Computer Graphics and Geometric Modeling for Engineers	John Wiley & Sons, New York	2000
2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	DhanpatRai& Sons, New Delhi	2002
2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	William M Newman and Robert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994
5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998
6	Rao S S	Optimisaiton Techniques	Wiley Eastern, New Delhi	2003

INDUSTRIAL SAFETY AND ENVIRONMENT 3 0 0 3 100

Course Objective

1. To recognize and evaluate occupational safety and health hazards in the workplace.
2. To determine appropriate hazard controls following the hierarchy of controls.
3. To analyse the effects of workplace exposures, injuries and illnesses, fatalities.
4. To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
5. To teach student the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
6. To prevent or mitigate harm or damage to people, property, or the environment.

Course Outcome

1. Recognize and evaluate occupational safety and health hazards in the workplace.
2. Determine appropriate hazard controls following the hierarchy of controls.
3. Analyse the effects of workplace exposures, injuries and illnesses, fatalities.
4. Prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
5. Understand the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
6. Prevent or mitigate harm or damage to people, property, or the environment.

UNIT I INTRODUCTION TO LOGISTICS 9

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNIT II PHASES OF SUPPLY CHAIN 9

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAIN MODELS 9

Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain with customer.

UNIT IV SUPPLY CHAIN ACTIVITIES 9

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNIT V SCM ORGANISATION AND INFORMATION SYSTEM 9

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERP Software's

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Shari.P.B and Lassen.T.S	Managing the global supply chain	Viva books, New Delhi	2000
2	Ayers.J.B	Hand book of supply chain management	The St. Lencie press	2000

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nicolas.J.N	Competitive manufacturing management - continuous improvement, Lean production, customer focused quality	McGrawHill, New York	1998
2	Steudel.H.J and Desruelle.P	Manufacturing in the nineteen - How to become a mean, lean and world class competitor	Van No strand Reinhold, New York	1992

TRANSPORT PHENOMENA 3 0 0 3 100

Course Objective

1. To generalized equations for mass, momentum and heat.
2. To understand the concepts of Reynolds and Gauss theorems.
3. To learn combined diffusive and convective transport.
4. To apply Film- and penetration models for mass and heat transfer.
5. To apply Stefan-Maxwells equations for multi-component diffusion.
6. To Solve the given set of equations either analytically or numerically.

Course Outcome

1. Generalized equations for mass, momentum and heat.
2. Understand the concepts of Reynolds and Gauss theorems.
3. Learn combined diffusive and convective transport.
4. Apply Film- and penetration models for mass and heat transfer.
5. Apply Stefan-Maxwells equations for multi-component diffusion.
6. Solve the given set of equations either analytically or numerically.

UNIT I INTRODUCTION AND BASIC CONCEPTS 9

General overview of transport phenomena including various applications, Transport of momentum, heat and mass , Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II PROPERTIES, UNITS AND OTHER PHYSICAL PARAMETERS 9

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III MOMENTUM TRANSPORT 9

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNIT IV ENERGY TRANSPORT 9

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heat transfer

UNIT V MASS TRANSPORT 9

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion- Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

TOTAL 45

Article I. REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

WEB REFERENCE

1. https://laulima.hawaii.edu/portal

INTRODUCTION TO BIOMECHANICS 3 0 0 3 100

Course Objective

1. To describe the principles of the study of human movement.
2. To describe the range of factors that influence the initiation, production and control of human movement.
3. To identify the body's lever systems and their relationship to basic joint movement and classification.
4. To distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
5. To explain joint and muscle function and the forces acting upon the human body during various sporting activities.
6. To relate the different body systems necessary for human movement to occur.

Course Outcome

1. Describe the principles of the study of human movement.
2. Describe the range of factors that influence the initiation, production and control of human movement.
3. Identify the body's lever systems and their relationship to basic joint movement and classification.
4. Distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
5. Explain joint and muscle function and the forces acting upon the human body during various sporting activities.
6. Relate the different body systems necessary for human movement to occur.

UNIT I INTRODUCTION 9

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNIT II KEY MECHANICAL CONCEPTS 9

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application ofBiomechanics

UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY 9

Gross (Whole-Body) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups - Anthropometric Data

UNIT IV ANATOMICAL DESCRIPTION 9

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNIT V MECHANICS OF THE MUSCULOSKELETAL SYSTEM 9

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit - Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle - Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control

TOTAL 45

Article II. REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Duane Knudson	Fundamentals of Biomechanics	Springer Science+ Business Media, LLC	2007
2	C. Ross Ethier Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

16BEAEOE01 AUTOMOBILE ENGINEERING 3 0 0 3 100

Course Objectives:

1. To impart knowledge on the constructional details and principle of operation of various automobile components.
2. To learn the function and working of various components in transmission and drive lines.
3. To study the concept and working of steering and suspension systems in an automobile.
4. To give knowledge on the wheels, tyres and brakes of automobiles.
5. To provide information on the current and future trends in automobiles.
6. Identify and explain the types of steering system.

Course Outcomes:

Upon successful completion of the course, the students should be able to:

1. Demonstrate the operating principles and constructional details of various automobile components.
2. Explain the function and working of components in transmission and drive lines.
3. Identify and explain the types of steering system.
4. Identify and explain the types of suspension system.
5. Classify and describe the types of wheels, tyres and brakes of automobiles.
6. Discuss the current and future trends in the automobiles.

UNIT-I ENGINE AND FUEL FEED SYSTEMS

Classification of Engine , construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburettor working principle, requirements of an automotive carburettor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNIT –II TRANSMISSION SYSTEMS

Requirements of transmission system.Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. Objective of the gearbox - Determination of gear ratios for vehicles. Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propellar Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

UNIT -III SUSPENSION SYSTEM

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension – Pneumatic suspension – Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

UNIT-IV BRAKES

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theoryBrake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System (ABS).

UNIT -V ELECTRICAL SYSTEM

Principle and construction of lead acid battery.Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.Starting System and charging system.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2.	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., New Delhi	2003
3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publishes	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
2.	Crouse.W.H	Automobile Electrical Equipment”, 3rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAE Inc	2001

16BEAEOE02 BASICS OF TWO AND THREE WHEELERS 3 0 0 3 100

Course Objectives

1. The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.
2. Construct the frames of two and three wheelers of different layouts.
3. Demonstrate the constructional details and principle of operation of various engine components.
4. Identify and explain the types of transmission systems.
5. Identify and explain the types of steering and suspension systems.
6. Classify and describe the types of wheels, tyres and brakes for two and three wheelers.

Course Outcomes

Upon successful completion of the course, the students should be able to:

1. Construct the frames of two and three wheelers of different layouts.
2. Demonstrate the constructional details and principle of operation of various engine components.
3. Identify and explain the types of transmission systems.
4. Identify and explain the types of steering and suspension systems.
5. Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
6. Explain the servicing of two and three wheelers.

UNIT I INTRODUCTION

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS

2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHES AND TRANSMISSION

Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992.
2.	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century book house.	1988.

REFERENCES:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M.M.Griffin.	Motor cycles from inside and outside.	Prentice Hall Inc, New Jersey.	1978.
2.	Bruce A. Johns, David D.Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAEOE03 AUTOMOBILE MAINTENANCE 3 0 0 3 100

Course Objectives

1. The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems inAutomobile.
2. Describe and differentiate the types of maintenance.
3. List the procedure for dismantling, servicing and assembling of engine components.
4. Demonstrate the servicing of transmission and driveline components.
5. Discuss the procedure for steering and suspension
6. Discuss the procedure for wheel and brake maintenance.

Course Outcomes

Upon successful completion of the course, the students should be able to:

1. Describe and differentiate the types of maintenance.
2. List the procedure for dismantling, servicing and assembling of engine components.
3. Demonstrate the servicing of transmission and driveline components.
4. Discuss the procedure for steering and suspension
5. Discuss the procedure for wheel and brake maintenance.
6. Explain the fault diagnosis in the electrical and air conditioner systems.

UNIT I MAINTENANCE OF RECORDS AND SCHEDULES

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE

Dismantling of engine components and cleaning, cleaning methods, visual anddimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	John Doke	Fleet Management	McGraw Hill Co	1984
2.	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011
3.	Service Manuals from Different Vehicle Manufacturers			

16BEAEOE04 INTRODUCTION TO MODERN VEHICLE TECHNOLOGY 3 0 0 3 100

Course Objectives:

1. To impart knowledge on trends in the vehicle power plants.
2. To learn the various advanced driver assistance systems.
3. To study the working of advanced suspension and braking systems in an automobile.
4. To give information about motor vehicle emission and noise pollution control.
5. To provide knowledge of the vehicle telematics.
6. To give information about the noise control techniques

Course Outcomes:

Upon successful completion of the course, the students should be able to:

1. Distinguish and describe the various modern vehicle power plant systems.
2. List and explain the various driver assistant mechanisms.
3. Identify and describe the working of advanced suspension and braking systems.
4. Apply the knowledge of motor vehicle emission and noise pollution control.
5. Describe the noise control techniques
6. Describe the vehicle telematics and its applications.

UNIT I TRENDS IN POWER PLANTS

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNIT II DRIVER ASSISTANCE SYSTEMS

Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNIT III SUSPENSION BRAKES AND SAFETY

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT IV NOISE & POLLUTION

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT VTELEMATICS

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

TEXT BOOKS

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION

1.	LjuboVlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001
2.	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems –Progress in Technology	Automotive Electronics Series,SAE, USA.	1998

REFERENCES

SL. NO	**AUTHOR(S)**	**TITLE OF THE BOOK**	**PUBLISHER**	**YEAR OF PUBLICATION**
1.	William B Riddens	“Understanding Automotive Electronics”, 5th Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold,	“Understanding Automotive Electronics”	SAE	1998
3.	Robert Bosch,	“Automotive HandBook”, 5th Edition	SAE	2000

16BECEOE01 HOUSING, PLAN AND MANAGEMENT 3 0 0 3 100

COURSE OBJECTIVES

1. To examine the role and tasks of basic housing policies and building bye laws
2. Understand the process of integrated service delivery in the context of economic, social, environmental and institutional factors
3. Analyze the Innovative construction methods and Materials
4. Analyze city management strategies and strengthen the urban governance through a problem solving approach
5. To know the Importance of basic housing policies and building bye laws
6. To use Housing Programmes and Schemes

COURSE OUTCOME

The students will be able to

1. Know the Importance of basic housing policies and building bye laws
2. Use Housing Programmes and Schemes
3. Plan and Design of Housing projects
4. Examine Innovative construction methods and Materials
5. Know Housing finance and loan approval procedures
6. Understand Construction as well as managing techniques

UNIT I INTRODUCTION TO HOUSING 9

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II HOUSING PROGRAMMES 9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems).

TOTAL : 45 HRS

TEXT BOOKS

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 2002.
2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 2001.

REFERENCES

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.
2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 2000.

16BECEOE02 BUILDING SERVICES 3 0 0 3 100

COURSE OBJECTIVES

1. Defining and identifying of eng. services systems in buildings.
2. The role of eng. services systems in providing comfort and facilitating life of users of the building.
3. The basic principles of asset management in a building & facilities maintenance environment
4. Importance of Fire safety and its installation techniques
5. To Know the principle of Refrigeration and application
6. To Understand Electrical system and its selection criteria

COURSE OUTCOME

The students will be able to

1. Machineries involved in building construction
2. Understand Electrical system and its selection criteria
3. Use the Principles of illumination & design
4. Know the principle of Refrigeration and application
5. Importance of Fire safety and its installation techniques
6. Know the principle behind the installation of building services and to ensure safety in buildings

UNIT I MACHINERIES 9

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS 9

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN 9

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS 9

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants –

Vapourcompression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION 9

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

TOTAL : 45 HRS

TEXT BOOKS

1. E.R.Ambrose, “Heat Pumps and Electric Heating”, John and Wiley and Sons, Inc., New York, 2002.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2005.

REFERENCES

1. Philips Lighting in Architectural Design, McGraw-Hill, New York, 2000.
2 A.F.C. Sherratt, “Air-conditioning and Energy Conservation”, The Architectural Press, London, 2005.
3 National Building Code.

16BECEOE03 MANAGEMENT OF IRRIGATION SYSTEMS 3 0 0 3 100

OBJECTIVES

1. To enable the students for a successful career as water management professionals.
2. To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.
3. To expose the students the need for an interdisciplinary approach in irrigation water management
4. To providing a platform to work in an interdisciplinary team.
5. To provide students an ability to understand the applications of mathematical and scientific concepts to analyse intricate technical, social and environmental problems in irrigation water management and finding solutions for them.
6. To promote student awareness for a life-long learning process and inculcate professional ethics and codes of professional practice in water management.

OUTCOME

At the end of this the students will be in a capacity to

1. Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.
2. Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management
3. Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach.
4. Gain insight on local and global perceptions and approaches to participatory water resource management
5. Learn from successes and failures in the context of both rural and urban communities of water management.
6. Exposure on the use of economic concepts in irrigation development and to impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector.

UNIT I. IRRIGATION SYSTEM REQUIREMENTS 9

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNIT II. IRRIGATION SCHEDULING 9

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III. MANAGEMENT 9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV. OPERATION 9

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V. INVOLVEMENT OF STAKE HOLDERS 9

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL : 45 HRS

TEXT BOOKS

1. Dilip Kumar Majumdar, "Irrigation Water Management – Principles and Practice", Prentice Hall of India Pvt. Ltd., New Delhi, 2000
2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi

REFERENCES

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 2000
2. Maloney, C. and Raju, K.V., "Managing Irrigation Together", Practice and Policy in India, Stage Publication, New Delhi, India, 2000

16BECEOE04 ADVANCED CONSTRUCTION TECHNOLOGY 3 0 0 3 100

OBJECTIVE:

1. To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
2. To study different methods of construction to successfully achieve the structural design with recommended specifications.
3. To involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. To study of construction equipment's, and temporary works required to facilitate the construction process
5. To provide a coherent development to the students for the courses in sector of Advanced construction technology.
6. To present the new technology of civil Engineering and concepts related Advanced construction technology.

OUTCOMES:

1. Implementation of new technology concepts which are applied in field of Advanced construction.
2. Different methods of construction to successfully achieve the structural design with recommended specifications.
3. Application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. Will gain the Knowledge of construction equipment's, and temporary works required to facilitate the construction process
5. Development to the students for the courses in sector of Advanced construction technology.
6. The new technology of civil Engineering and concepts related Advanced construction technology.

UNIT - I MODERN CONSTRUCTION METHODS 9

Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT - II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES 9

Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines

UNIT - III MODERN CONSTRUCTION EQUIPEMENTS -I 9

Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting,Tunneling and hoisting

UNIT - IV MODERN CONSTRUCTION EQUIPEMENTS -II 9

Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant

UNIT - V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES 9

Principles and Practices of Temporary structures, Shoring, and Strutting,Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipments

TOTAL : 45 HRS

TEXT BOOKS

1.Peurifoyu , R. L., , Ledbette, W.B., Construction Planning , Equipment and Methods, Mc Graw Hill Co., 2000.

2. Antill J.M., PWD, Civil Engineering Construction, Mc Graw Hill Book Co., 2005

REFERENCE

1.Varma, M Construction Equipment and its Planning & Applications, Metropoltian Book Co., 2000

2.Nunnaly, S.W., Construction Methods and Management , Prentice – Hall, 2000

3.Ataev, S.S., Construction Technology, MIR , Pub. 2000.

B.E. COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

2016 (REGULAR PROGRAMME)

Department of Computer Science and Engineering
FACULTY OF ENGINEERING

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)

(Established Under Section 3 of UGC Act 1956)

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16BECC101	COMMUNICATIVE ENGLISH	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence
- To study formal context

COURSE OUTCOMES:

- Use English language for communication: verbal & non –verbal.
- Enrich comprehension and acquisition of speaking & writing ability.
- Gain confidence in using English language in real life situations.
- Improve word power: lexical, grammatical and communication competence.
- Acquire good vocabulary for easy communication.
- Be familiar with sentence structure and sentence formation.

Unit I **(9)**

Listening– Types of listening - Listening to class reading - Video tapes/ Audio tapes.**Speaking** – Introduction on self - Introduction on one's friend.**Reading** - Reading for comprehension – Reading different kind of passages like descriptive, narrative, objective, conversational and argumentative.**Writing** – Formal and Informal letters- Free writing on any topic –My favorite place, hobbies, dreams, goals, etc- - To fill in different application forms. **Grammar** – Articles- WH questions –Yes/No Question - Subject Verb agreement. **Vocabulary** - Word Formation – Word expansion (Root word) - Prefix and Suffix.

Unit II
(10)

Listening – Understanding the passage in English –Pronunciation practice. **Speaking** – Asking and answering questions - Telephone etiquette. **Reading** – Critical reading – Finding key information in a given text (Skimming - Scanning). **Writing**– Coherence and cohesion in writing – Short paragraph writing – Writing short messages.**Grammar**– Parts of speech – Noun – Verb – Adjectives - Adverbs. **Vocabulary**– Compound Nouns/Adjectives – Irregular verbs.

Unit III
(10)

Listening – Listening for specific task – Fill in the gaps.**Speaking** – Phonemes – Syllables – Role play – Conversation Practice.**Reading** – Reading and Comprehension.**Writing** - Autobiographical writing – Biographical writing - Instruction writing. **Grammar** – Preposition – Infinitive – Gerund – Tenses. **Vocabulary** – Foreign words used in English – British and American usage.

Unit IV **(8)**

Listening – Responding to questions – Reading in class for complete understanding and for better pronunciation. **Speaking** – Debate- Presentations in seminars.**Reading** – Making inference from the reading passage – Predicting the content of reading passages.**Writing** - Interpreting visual materials (tables, graphs, charts, etc) Letters to the Editor. **Grammar** – Sentence pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

Unit V **(8)**

Listening - Listening to different accents, speeches/presentations. **Speaking**- Extempore talk – Just-a-minute talk.**Reading**-Reading strategies–Intensive reading – Text analysis.**Writing** - Creative writing – Writing circulars and notices – Writing proposal.**Grammar** – Direct and Indirect speech – Conditional sentences - Auxiliary verbs. **Vocabulary** – Abbreviations & Acronyms.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

Total Hours-45

TEXT BOOK:

1. Sangeeta Sharma , Meenakshi RamanTechnical Communication: Principles And Practice 2nd Edition OUP, New Delhi, 2015

REFERENCES:

1. Lakshminarayanan, K.R. & Murugavel, T. Communication Skills for Engineers SCITECH Publications, Chennai 2009
2. Rizvi Ashraf, M Effective Technical Communication Tata McGraw-Hill,New Delhi. 2007
3. Rutherford Andrea, J. Basic Communication Skills for Technology Pearson Education, New Delhi. 2006

WEBSITES:

1. www.learnerstv.com – Listening/ Speaking/ Presentation
2. www.usingenglish.com – Writing/ Grammar
3. www.englishclub.com – Vocabulary Enrichment/ Speaking
4. www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking
5. www.teachertube.com – Writing Technically
6. www.Dictionary.com – Semantic / Grammar

16BECC102	**ENGINEERING MATHEMATICS I**	**L**	**T**	**P**	**C**
		3	**2**	**0**	**4**

COURSE OBJECTIVES

1. To develop analyzing skills for solving different engineering problems.
2. To understand the concept of Matrices.
3. To remember the basics of differential calculus and its applications.
4. To apply the problems in differential equations.
5. To Create knowledge about functions of several variables and Sequence and Series.
6. To study the algebraic manipulation

COURSE OUTCOMES

The students will be able to

- Acquire the basic knowledge and understanding of mathematics
- Apply advanced matrix knowledge to engineering problems.
- Improve their ability in evaluating geometrical applications of differential calculus problems.
- To solve the problems by applying the differential Equations.
- Evaluating engineering problems involving functions of several variables.
- Understand the concepts of sequences and series.

UNIT I MATRICES (12)

Review of Matrix Algebra - Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction to canonical form through orthogonal reduction.

UNIT II DIFFERENTIAL CALCULUS (12)

Overview of Derivatives - Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes- Evolutes as Envelope of normals – Maxima and Minima of functions of two or more Variables – Method of Lagrangian Multipliers

UNIT III DIFFERENTIAL EQUATIONS (11)

Linear Differential equations of second and higher order with constant coefficients - Euler's form of Differential equations – Method of variation parameters.

UNITIV FUNCTIONS OF SEVERAL VARIABLES (12)

Partial derivatives – Euler's theorem for homogeneous functions – Total derivatives – Differentiation of implicit functions – Jacobians –Maxima and Minima of functions of two or more Variables - Method of Lagrangian multipliers.

UNIT V SEQUENCES AND SERIES (13)

Sequences: Definition and examples – **Series:** Types and Convergence – Series of positive terms – Tests of convergence: Comparision test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.

Total Hours : 60

TEXT BOOKS:

1. Hemamalini. P.T, Engineering Mathematics, McGraw Hill Education (India) Private Limited, New Delhi. 2014
2. Sundaram, V. Lakhminarayan,K.A. &Balasubramanian,R. Engineering Mathematics for first year. Vikas Publishing Home, New Delhi. 2006

REFERENCES:

1. Grewel . B. S.Higher Engineering Mathematics, Khanna Publications, New Delhi.2014
2. BhaskarRao. P. B, Sri Ramachary SKVS, BhujangaRao. MEngineering Mathematics IBS Publications, India.2010
3. Ramana. B.VHigher Engineering Mathematics, Tata McGraw Hill Publishing Company, New Delhi. 2007
4. ShahnazBathul Text book of Engineering Mathematics(Special Functions and Complex Variables PHI Publications, New Delhi.2009
5. Michael D. Greenberg Advanced Engineering Mathematics Pearson Education, India 2009

WEBSITES :

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.intmath.com/matrices-determinants
4. www. Intmath.com/calculus/calculus-intro.php

16BEPH103, 16BEPH203ENGINEERING PHYSICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology
- Understand the basics of laser and optical fiber with appropriate applications.
- Introduce the concepts of quantum mechanics for diverse applications.
- Impart the basic knowledge of crystal and its various crystal structures.
- Disseminate the fundamentals of nuclear physics and their applications.
- To study applications of quantum mechanics.

COURSE OUTCOMES:

- Identify the elastic nature of materials and its thermodynamic properties.
- Infer the characteristics of laser and optical fibers for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Identify the different atomic arrangements of crystals and its defects
- Make use of the concepts of sound waves for medical applications
- Illustrate the basic ideas of nuclear reactors for energy resources

UNIT I PROPERTIES OF MATTER AND THERMODYNAMICS (9)

Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniform bendingConcept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBER OPTICS (9)

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER -CO_2, Semiconductor LASER- Applications of LASER in industry and medicine.Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNIT III QUANTUM PHYSICS (9)

Introduction to quantum theory – Black body radiation-Photo electric effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electron microscope.

UNIT IV CRYSTAL PHYSICS (9)

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures- crystal defects – point, line and surface defects

UNIT V ULTRASONICS AND NUCLEAR PHYSICS (9)

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications – Sonogram Introduction – basics about nuclear fission and fusion, nuclear composition – Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

Total Hours- 45

TEXT BOOK:

1. Ganesan.S and Baskar.T Engineering Physics I GEMS Publisher, Coimbatore-641 001 2015

REFERENCES:

1. Serway and Jewett Physics for Scientists and Engineers with Modern Physics Thomson Brooks/Cole, Indian reprint, New Delhi 2010
2. Gaur, R.K. and Gupta, S.C Engineering Physics DhanpatRaiPublications,New Delhi. 2011
3. M.N. Avadhanulu and PG Kshirsagar A Text book of Engineering Physics S.Chand and company, Ltd., New Delhi 2011
4. D.C. Ghosh, N.C. Ghosh, P.K. HaldarEngineering Physics University Science, New Delhi 2011
5. P. Khare, A. SwarupEngineering Physics: Fundamentals and Modern Applications Jones & Bartlett Learning 2009

WEBSITES:

1. www.nptel.ac.in
2. www.physicsclassroom.com
3. www. oyc.yale.edu
4. www.physics.org

***common to semester 1 & 2**

16BECH103, 16BECH203ENGINEERING CHEMISTRY L TPC 3 0 0 3

COURSE OBJECTIVES:

- To gain knowledge on adsorption phenomena.
- To make the students conversant with basics of water technology.
- To make the student acquire sound knowledge of electrochemistry and storage devices.
- To acquaint the student with concepts of fuels and rocket propellants.
- To develop an understanding of the basic concepts of corrosion science.
- To acquaint the students with the basics of surface chemistry.

COURSE OUTCOMES:

- Outline the basic principles of chemistry for water treatment (K)
- Examine the electrochemical properties to design non – conventional energy storage devices (S)
- Apply the concepts combustion of different fuels (S)
- Identify the concepts of corrosion and its protection in the engineering field (S)
- Apply the concepts of surface chemistry in the field of engineering (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I WATER TECHNOLOGY (9)

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverse osmosis.

UNIT II ELECTROCHEMISTRY AND STORAGE DEVICES (9)

Electrochemical cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - Fe^{2+}vs dichromate) –Electrolytic conductance-application (conductometric titration)-Batteries- Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H_2-O_2 Fuel Cell.

UNIT III FUELS AND COMBUSTION (9)

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method - Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, Combustion of fuel-Introduction-GCV-NCV-Flue gas analysis.

UNIT IV CORROSION SCIENCE (9)

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings – Organic coatings-Paints - Constituents and functions –Inorganic coatings- Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating - Hot dipping.

UNIT V SURFACE CHEMISTRY AND PHASE RULE
(9)

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm-Role of adsorbents in industries (catalysis and water softening).

Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

Total Hours: 45

TEXT BOOKS:

1. Dr. Vairam.SEngineering ChemistryGems Publishers, Coimbatore.2014
2. Dr.Ravikrishnan.AEngineering Chemistry I & IISri Krishna Hi tech Publishing Company (P) Ltd., Chennai.2012

REFERENCES:

1. Raman Sivakumar Engineering Chemistry I &II McGraw-Hill Publishing Co.Ltd., 3rd Reprint NewDelhi. 2013
2. Kuriakose. J.C. and Rajaram Chemistry in Engineering and Technology. Vol. I & II 5th edition.
3. Tata McGraw Hill Publishing Company, New Delhi. 2010
4. Jain, P.C. and Monika Jain Engineering Chemistry. DhanpatRai Publishing Company (P) Ltd., New Delhi. 2009
5. Dara.S.S Text book of Engineering Chemistry. S.Chand&Co.Ltd., New Delhi 2008
6. Sharma.B. K Engineering Chemistry Krishna Prakasam Media (P) Ltd., Meerut 2001

WEBSITES:

1. http://www.studynotes.ie/leaving-cert/chemistry/
2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html
3. http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
4. http://ocw.mit.edu/courses/#chemistry
5. http://www.chem.qmul.ac.uk/surfaces/sec

***common to semester 1 & 2**

		L	**T**	**P**	**C**
16BECS104	**PROBLEM SOLVING TECHNIQUES**	**3**	**0**	**0**	**3**

COURSE OBJECTIVE:

- Identify and understand the working of key components of a computer system.
- Identify and understand the various kinds of input-output devices and different types of storage media commonly associated with a computer
- Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in 'C' language
- Write small programs related to simple/ moderate mathematical and logical problems in 'C'.
- Study, analyze and understand simple data structures and how to use it in C language

COURSE OUTCOMES:

- Develop algorithms for mathematical and scientific problems
- Explore alternate algorithmic approaches to problem solving
- Understand the components of computing systems
- Choose the structures to solve mathematical and scientific problem

- Write programs to solve real world problems using object-oriented features
- Use different data structures and create / manipulate basic data files and developing applications for real world problems.

UNIT I INTODUCTION (9)

General problem solving concepts, approaches and challenges, problem solving with computers, problem solving tools: flowcharts, algorithms, data structures, Pseudo code. Various Approaches: Solve by analogy, Decompose the task into smaller subtasks, Building block approach, Merging solutions, Algorithmic thinking, Choice of appropriate data structures, Implementation of the Pseudo-code, implementing the code, Testing the solution

UNIT II FUNDAMENTAL ALGORITHMS (9)

Exchanging the Values – Counting – Summation of Set of Number – Factorial Computation – Sine Computation – Fibonacci Sequence – Reversing the Digits of an Integer – Base Conversion

– Character to Number Conversion- Algorithm Comparison

UNIT III FACTORING METHODS (9)

Finding the Square Root of a Number – Smallest Divisor of an Integer – GCD of Two Integers – Generating Prime Numbers – Computing the Prime Factors of an Integer – Generation of Pseudo-Random Numbers – Raising a Number to a Large Power – Computing the Nth Fibonacci Number- Algorithm Comparison

UNIT IV ARRAY TECHNIQUES (9)

Array Order Reversal – Array Counting or Histogramming – Finding the Maximum Number in a Set – Removal of Duplicates from an Ordered Array – Partitioning an Array – Finding the kth Smallest Element– Longest Monotone Subsequence- Algorithm Comparison

UNIT V MERGING, SORTING AND SEARCHING (9)

Two Way Merge - Sorting by Selection, Exchange, Insertion, and Partitioning - Binary Search – Hash Searching- Algorithm Comparison

Total Hours: 45

TEXTBOOK

1. Dromey R G, "How to Solve it by Computer", Pearson India, 1st Edition, 2007

REFERENCES

1. Michael Schneider, Steven W. Weingart, David M. Perlman, "An Introduction to Programming and Problem Solving with Pascal", Wiley Eastern Limited, New Delhi, 1982.

2. Harold Abelson and Gerald Sussman with Julie Sussman, "Structure and Interpretation of Computer Programs", MIT Press, 1985.

16BECS105BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To impart the basic knowledge about the Electric circuits.
- To understand the working of various Electrical Machines.
- To know about various measuring instruments.
- To understand the basic concepts in semiconductor devices and digital electronics.
- Highlight the importance of transformers in transmission and distribution of electric power.
- To study the applications of basic of power system

COURSE OUTCOMES:

On completion of the course students will be able to

- Predict the behavior of any electrical and magnetic circuits.
- Formulate and solve complex AC, Dc circuits.
- Identify the type of electrical machine used for that particular application.
- Realize the requirement of transformers in transmission and distribution of electric power and other applications.
- Function on multi-disciplinary teams
- The students shall develop an intuitive understanding of the circuit analysis, basic concepts of electrical machines, basics of electronics and be able to apply them in practical situation.

UNIT I ELECTRIC CIRCUITS & MEASUREMENTS (9)

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase balanced Circuits.

UNIT II ELECTRICAL MACHINES (9)

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III MEASURING INSTRUMENTS (9)

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT IV SEMICONDUCTOR DEVICES AND APPLICATIONS (9)

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics

UNIT V DIGITAL ELECTRONICS (9)

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems- simplification of Boolean expression - implementation of Boolean expressionsusing logic gates - standard forms of Boolean expression.

Total Hours: 45

TEXT BOOKS

1. Mittle, V.MBasic Electrical EngineeringTata McGraw Hill Edition, New Delhi2004
2. Sedha R.S Applied Electronics S. Chand & Co 2006

REFERENCES

1. Muthusubramanian R, and Muraleedharan K A Basic Electrical, Electronics and Computer Engineering Tata McGraw Hill, Second Edition 2006
2. Nagsarkar T K and Sukhija M S Basics of Electrical Engineering Oxford press 2005
3. MahmoodNahvi and Joseph A. Edminister Electric Circuits Schaum' Outline Series, McGraw Hill 2002
4. Premkumar N Basic Electrical Engineering Anuradha Publishers 2003

	L	T	P	C
16BEPH111, 16BEPH211ENGINEERING PHYSICS LABORATORY	**0**	**0**	**4**	**2**

COURSE OBJECTIVES:

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To prepare for the lab experiment and perform individually a wide spectrum of experiments.
- To present experimental data in various appropriate forms like tabulation, and plots.
- To analyze, Interpret and Summarize experimental results.
- To communicate clearly understanding of various experimental principles, instruments/setup, and procedure
- To learn the band gap of semiconductor

COURSE OUTCOME:

Upon completion of this course the students will be able to:

- The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- Prepare for the lab experiment and perform individually a wide spectrum of experiments.
- Present experimental data in various appropriate forms like tabulation, and plots.
- Analyze, Interpret and Summarize experimental results.
- Communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- Prepare to develop the skills for understanding basic electric circuits.

LIST OF EXPERIMENTS – PHYSICS

1. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
2. Determination of wavelength of mercury spectrum – spectrometer grating.
3. Determination of Young’s modulus of the material – Non uniform bending (or) Uniform bending.
4. Determination of Viscosity of liquid – Poiseuille’s method.
5. Spectrometer Dispersive power of a prism.
6. Torsional pendulum – Determination of Rigidity modulus.
7. Particle size determination using Diode Laser
8. Determination of Laser parameters – Wavelength, and angle of divergence.
9. Determination of acceptance angle in an optical fiber.
10. Determination of thickness of a thin wire – Air wedge method
11. Determination of Band Gap of a semiconductor material.
12. Determination of Specific resistance of a given coil of wire – Wheatstone Bridge

Total Hours: 45

***common to semester 1 & 2**

	L	T	P	C
16BECH111, 16BECH211 ENGINEERING CHEMISTRY LABORATORY	**0**	**0**	**4**	**2**

COURSE OBJECTIVE

- To provide students with practical knowledge of quantitative analysis of materials
- Provide details of analysis done by classical and instrumental methods
- Study concepts of developing experimental skills in building technical competence.
- Study various conductometric and potentiometric titrations on various chemicals
- Determination of molecular weight and degree of polymerization
- Determination of corrosion rate by weight loss method.

COURSE OUTCOMES

Upon completion of this course, the students will be able to:

- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity
- Determine conductance of solutions, redox potentials, chloride content of water, etc
- Synthesize a small drug molecule and analyse a salt
- Understand all the concepts of developing experimental skills in building technical competence.
- Understand various conductometric and potentiometric titrations on various chemicals

LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of alkalinity of Water sample.
2. Estimation of hardness of Water by EDTA
3. Estimation of chloride in Water sample (Argentometric method)
4. Determination of corrosion rate by weight loss method.
5. Conductometric Titration (Simple acid base).
6. Conductometric Titration (Mixture of weak and strong acids).
7. Conduct metric Titration using $BaCl_2$vs Na_2 SO_4.
8. pH Titration (acid & base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$).
10. Estimation of Ferric ion by Spectrophotometry.
11. Determination of water of crystallization of a crystalline salt (Copper sulphate).
12. Determination of molecular weight and degree of polymerization using Viscometry.
13. Determination of chemical oxygen demand.

Total Hours: 45

***common to semester 1 & 2**

16BECS112	ENGINEERING WORKSHOP PRACTICES LAB	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
- To provide knowledge on arc welding of butt joints, lap joints and tee joints.
- To provide demonstration on Smithy operations, Foundry operations, Plumbing Works and Carpentary Works
- To discuss about various electrical symbols and electrical equipments
- To explain general electronics components and concepts
- To prepare students for handling the tools in engineering and furnace division

COURSE OUTCOMES:

- Sketch general workshop layout.
- To identify different Tools required for Wood working.
- Ability to fabricate carpentry components and pipe connections including plumbing works.
- Ability to use welding equipments to join the structures
- Ability to fabricate electrical and electronics circuits
- Select appropriate fitting tools for the required application.
- Prepare the simple jobs as per specification using fitting tools.

PART – A (CIVIL & MECHANICAL)

1. **WELDING** **(6)**
   i. Preparation of arc welding of butt joints, lap joints and tee joints.
2. **BASIC MACHINING** **(6)**
   i. Simple Turning and Taper turning
   ii. Drilling and Tapping
3. **SHEET METAL WORK** **(6)**
   i. Model making – Trays, funnels, etc.
4. **DEMONSTRATION ON** **(4)**
   i. Smithy operations
   ii. Foundry operations
   iii. Plumbing Works
   iv. Carpentary Works

PART –B (ELECTRICAL & ELECTRONICS)

5. **ELECTRICAL ENGINEERING** **(10)**
   i. Study of electrical symbols and electrical equipments.
   ii. Construct the wiring diagram for Stair case wiring and Fluorescent lamp wiring.

iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energy meter.
iv. Measurement of electrical quantities – voltage, current, power & power factor in R load.
v. Measurement of energy using single phase energy meter.

6. ELECTRONICS ENGINEERING (13)

i. Study of Electronic components– Resistor (color coding), capacitors and inductors.
ii. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
iii. Study of logic gates AND, OR, NOT, NOR and NAND.
iv. Study of HWR and FWR.

Total Hours: 45

REFERENCES

1. Jeyachandran, K. and Balasubramanian, S A Premier on Engineering Practices LaboratoryAnuradha Publications, Kumbakonam 2007
2. Jeyapoovan, T., Saravanapandian, M Engineering Practices Lab Manual VikasPuplishing House Pvt. Ltd, Chennai 2006
3. Bawa, H.S Workshop Practice Tata McGraw – Hill Publishing Company Limited, New Delhi 2007

16BECS113	ENGINEERING GRAPHICS	L	T	P	C
		1	0	3	3

COURSE OBJECTIVES:

- To understand the importance graphics in engineering
- To learn basic engineering drawing formats
- To develop the graphical skills for communication of concepts, ideas and design of engineering products through technical drawings.
- To learn to take data and transform it into graphic drawings.
- To prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice
- To study applications of the theory of projection.

COURSE OUTCOMES:

Upon completion of this course the students will be able to:

- Know and understand the conventions and the method of engineering drawing.
- Interpret engineering drawings using fundamental technical mathematics.
- Construct basic and intermediate geometry.
- Improve their visualization skills so that they can apply these skill in developing new products.
- Improve their technical communication skill in the form of communicative drawings.
- Comprehend the theory of projection.

UNIT I INTRODUCTION (9)

Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

UNIT II SCALES AND PLANE CURVES (8)

SCALES:Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

UNIT III FREE HAND SKETCHING (9)

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT IV PROJECTION OF POINTS, LINES AND PLANE SURFACES (8)

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT V PROJECTION OF SOLIDS (8)

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

Introduction to Drafting Software/Package (Not for Exam) **(3)**

Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

Total Hours: 45

TEXT BOOKS

1. Venugopal K and Prabhu Raja V Engineering Graphics New Age International Publishers 2007
2. VTU A Primer on Computer Aided Engineering Drawing Belgaum 2006

REFERENCES

1. Kumar M S Engineering Graphics D D Publications, Chennai 2007
2. Bureau of Indian Standards Engineering Drawing Practices for Schools and Colleges SP 46-2003 BIS, New Delhi 2003
3. Luzadder W J Fundamentals of Engineering Drawing Prentice Hall Book Co., New York 1998

WEBSITES

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

16BECC201A BUSINESS COMMUNICATION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To help students comprehend the role of listening skills in effective communication.
- To familiarize students with verbal and non-verbal communication.
- To expose students to neutral accent.
- To develop emotional intelligence skills in them for enhancing their self-esteem.
- To assist them in setting goals and developing positive attitude.
- To enable students to acquire decision making skills, problem solving skills and assertive skills.

COURSE OUTCOMES:

Students undergoing this course will be able to

- Design and deliver a persuasive presentation that convinces the audience of the topic's relevance
- Have overcome resistance, using appropriate visual support and adhering to a specified time limit.
- Use a strategic communication model and critical thinking to identify objectives, analyze audiences, and choose the most effective structure and style for delivering strategically sound written and spoken messages.
- Practice principles of effective business writing and document design in all written documents.
- Build an understanding of different organizational cultures, business practices, and social norms to communicate more effectively in domestic and cross-cultural business contexts.
- Develop their soft skills and inter personal skills, which will make the transition from college to workplace smoother and help them excel in their job.

UNIT I **(9)**

What is Business Communication? - Types of Communication – Formal and informal communication – Process of Communication- modes of Communication – Barriers to communication.

UNIT II **(9)**

Written Business Communication – Style- word-usage- organisation of Ideas – mechanics of writing and fill up of forms - Cover Letter- Letter for Job Application- Letter of Complaint - Memos - Resumes - Email- Reports Revising and proofreading- Advertising slogans- jargons- Description of Graphics and visual aids - interpretation of graphs using expressions of comparison and contrast .

UNIT III **(9)**

Reading and Understanding the news articles - Oral Business Communication - First Impressions - Attire – Effective Presentation strategies- Nuances of delivery – Controlling nervousness and stage fright- Visual aids Presentations- Capturing Audience - Tone - Behavior - Telephone Etiquette- Non - verbal communication - Eye contact - Facial expressions - Posture - Gestures - Body langage – Etiquette- Organization of presentation – brain storming- Negotiations.

UNIT - IV **(9)**

Difference between goals and dreams - SMART goal setting - 3 Ds of goal setting- Determination, Discipline and Direction - Developing the right attitude - Motivation - Intrinsic and Extrinsic motivation - Dealing with change - Dedication - Taking responsibilities - Decision making.

UNIT – V **(9)**

Intrapersonal skills - Self-analysis - Thought process – Interpersonal skills - Confidence building -Resolving conflicts- Analytical skills - Team Building - Leadership skills - Planning/organizing - Ability to work independently - Professional ethics - Communicating via e-mail. Ethical perspectives and their implications for responsible communication - Proposal Presentation

Total Hours: 45

TEXT BOOK:

1. Meenakshi Raman ; Prakash Singh **Business Communication** Oxford University Press 2012

REFERENCES:

1. Murthy, G .R. K. Soft Skills for Success**.** The ICFAI University Press, Hyderabad. 2008
2. Jagadeesan, G &Santanakrishnan,R. Soft Skills Development:Training and Evaluation. The ICFAI University Press, Hyderabad.2008
3. Sherfield, Robert M., Rhonda J. Montgomery, & Patricia G. MoodyDeveloping Soft Skills. Pearson Education, New Delhi.2005

WEBSITES:

1. http://tribehr.com/social-hr-software/talent-management/skills-tracking
2. www.ispeakyouspeak.blogspot.com
3. https://alison.com/subjects/6/Personal-Development-Soft-Skills
4. www.learning-development.hr.toolbox.com
5. http://www.niit.com/solution/soft-skill-training
6. http://mybcommlab.com to test your understanding of the concepts presented in each chapter and
explore additional materials that will bring the ideas to life in videos, activities, and an online multimedia e-book.

16BECC201B **TECHNICAL ENGLISH**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To motivate learners to acquire listening & speaking skills in both formal and informal context.
- To focus on question forms & to make them understand the importance of using question tags and also the functional use of transformation of sentences.
- To improve their reading habit and to train them in critical and analytical reading.
- To equip them to write for academic as well as work place context.
- To enable students to face interviews.
- To study the receptive and productive skill

COURSE OUTCOMES:

Students undergoing this course will be able to

- Acquire second language: speaking convincingly
- Able to express their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- Enhance them reading texts critically and analytically.
- Develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument
- Be able to perfoem creative, critical, analytical and evaluative writing.
- Enrich the ability to face interviews with confidence.

UNIT-1 **(10)**

Listening - Difference between Hearing & Listening –Listening to informal conversation. **Speaking** - Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., **Reading** – Extensive and Intensive reading. **Writing** – Report writing - Writing a covering letter. **Grammar** – Regular & Irregular verbs - Kinds of sentences - Question tags. **Vocabulary** – Homonyms and Homophones.

UNIT-II **(8)**

Listening – Note Taking- Improving grasping ability. **Speaking** – Welcome address - Vote of thanks - Master of ceremony. **Reading** – Active and Passive reading - Reading for vocabulary- Reading for a purpose. **Writing** - Writing a review (Film review) - Summary of a story. **Grammar** - Modal verbs – Conjunction - Expression of cause and effect. **Vocabulary** - Phrasal verbs - Idioms.

UNIT – III **(9)**

Listening - Barriers to listening (Physical, Psychological, Linguistic & Cultural). **Speaking** – Stress, Pause and Intonation. **Reading** – Rapid reading – Skimming, Scanning and Surveying. (SQ3R)**Writing** - Essay writing -Minutes of meeting - Agenda – **Grammar** - Active and Passive voice - Purpose expression. **Vocabulary** - Same words used as noun and verb - Often misspelt and confused words.

UNIT-IV **(8)**

Listening – Listening to telephone conversation - Viewing model interviews. **Speaking** – Group Discussion - Correlation between verbal & non - verbal communication. **Reading** – Reading comprehension (short & long text) - Reading job advertisements and profile of a company. **Writing** – Job application - Resume writing - Checklist preparation. **Grammar** - Numerical expressions – Collocations - **Vocabulary** - Singular and Plural (Nouns)

UNIT- V **(10)**

Listening – Types of listening- Improving listening comprehension**. Speaking** - Oral presentation - Vocal communication techniques - Voice, quality, volume, pitch etc., **Reading** - Note making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation writing – Short essays writing- **Grammar**- Transformation of sentences (Simple, Compound & Complex). **Vocabulary** - Collection of Technical Vocabularies with their meanings.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

Total Hours: 45

TEXT BOOK:

1. Sangeeta Sharma , Meenakshi RamanTechnical Communication: Principles And Practice 2nd Edition OUP, New Delhi. 2015

REFERENCES:

1. Lakshminarayanan, K.R. & Murugavel, T. Communication Skills for Engineers SCITECH Publications, Chennai 2008
2. Rizvi Ashraf, M Effective Technical Communication Tata McGraw-Hill, New Delhi.
3. 2007
4. Rutherford Andrea, J. Basic Communication Skills for Technology Pearson Education, New Delhi. 2006

WEBSITES:

1. www.learnerstv.com – Listening/ Speaking/ Presentation
2. www.usingenglish.com – Writing/ Grammar
3. www.englishclub.com – Vocabulary Enrichment/ Speaking
4. www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking
5. www.teachertube.com – Writing Technically
6. www.Dictionary.com – Semantic / Grammar

16BECC202 ENGINEERING MATHEMATICS II

L	T	P	C
3	**2**	**0**	**4**

COURSE OBJECTIVES:

- To understand the concepts and applications of partial differential equations
- To have knowledge in integral calculus and Vector calculus
- To expose to the concept of Analytical function and Complex integration.
- To introduce sequence and series and Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
- To understand the concept of functions of several variables and vector identities.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage

COURSE OUTCOMES:

The student will be able to

- Solve problems in Fluid Dynamics, Theory of Elasticity, heat and mass transfer etc.
- Find the areas and volumes using multiple integrals
- Improve their ability in Vector calculus
- Expose to the concept of Analytical function.
- Apply Complex integration in their Engineering problems
- To understand the ideas of limits and continuity and an ability to calculate with them and apply them and also to calculate grad, div and curl in Cartesian and other simple coordinate systems.

UNIT-I MULTIPLE INTEGRALS (11)

Double integral – Cartesian coordinates – Polar coordinates – Change of order of integration – Triple integration in Cartesian co-ordinates – Area as double integrals.

UNIT-II VECTOR CALCULUS (13)

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem, Gauss divergence theorem and Stoke's theorems (Statement Only)- Surfaces : hemisphere and rectangular parallelopipeds.

UNIT- III PARTIAL DIFFERENTIAL EQUATIONS (11)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constantcoefficients.

UNIT-IV ANALYTIC FUNCTIONS (12)

Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms – Sufficient condition for an analytic function (Statement Only) - Properties of analytic functions – Constructions of an analytic function - Conformal mapping: w = z+a, az, 1/z and bilinear transformation.

UNIT-V COMPLEX INTEGRATION (13)

Complex Integration - Cauchy's integral theorem and integral formula (Statement Only) – Taylor series and Laurent series - Residues – Cauchy's residue theorem (Statement Only) - Applications of Residue theorem to evaluate real integrals around unit circle and semi circle (excluding poles on the real axis).

Total Hours: 60

TEXT BOOKS:

1. Hemamalini. P.T Engineering Mathematics I & II McGraw-Hill Education Pvt.Ltd, New Delhi 2014
2. Grewal, B.S. Higher Engineering Mathematics Khanna Publishers, Delhi. 2014

REFERENCES:

1. Erwin Kreyszig Advanced Engineering Mathematics. John Wiley & Sons. Singapore 2011
2. Venkataraman, M. K. Engineering Mathematics. The National Publishing Company, Chennai 2005
3. Narayanan. S, Manicavachagampillay.T.K and Ramaniah.G Advanced Mathematics for Engineering Students. Viswanathan S.(Printers and Publishers) Pvt. Ltd. Chennai. 2002
4. Michael D. Greenberg Advanced Engineering Mathematics Pearson Education, India 2009

WEBSITES:

1.www.efunda.com
2. www.mathcentre.ac.uk
3. www.sosmath.com/diffeq/laplace/basic/basic.html
4. www.mathworld.wolframe.com

16BECC204	ENVIRONMENTAL SCIENCE	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- To give a comprehensive insight into natural resources.
- To impart knowledge on ecosystem and biodiversity.
- To educate the ways and means of the environment.
- To protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures.
- To motivate public to participate in environment protection and improvement.

COURSE OUTCOMES:

- Recognize the importance of natural resources (S).
- Associate themselves with the various ecosystems (S).
- Describe the importance of biodiversity (S).
- Identify and minimize the difference pollutions (S).
- Prioritize and analyses the social issues (S).
- Integrate the environmental principles in the projects undertaken in field of engineering and technology (A).

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL ESOURCES (9)

Definition, Scope and Importance – Need for public awareness -Forestresources: Useandover-exploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources- role of an individual in conservation of natural resources.

UNITII ECOSYSTEM(9)

Chemistry and Environment- Environmental segments, Composition and Structure of atmosphere- Concept of an ecosystem- Structure, components and function of an ecosystem Energy flow in the ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marine ecosystem)

UNIT III BIODIVERSITY(9)

Introduction to biodiversity, Definition-
Geneticdiversity, Speciesdiversity and Ecosystem diversity,Biogeographical classification of India, Importance of biodiversity-Value of biodiversity - Hot Spots of biodiversity-Threats to biodiversity - Endangered and Endemic Species of India – Conservation of biodiversity- In-Situ and Ex-Situ conservation of biodiversity.

UNIT IV ENVIRONMENTAL POLLUTION(9)

Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control measures of urban and industrial wastes– Role of an individual in prevention of pollution–Disaster management-earthquake, tsunami, cyclone and landslides.

UNIT V SOCIAL ISSUES AND ENVIRONMENT (9)

From Unsustainable to Sustainable development,Urban problems related to energy sources, Water conservation, Rain water harvesting and Watershed management, Resettlement and rehabilitation of people, its problems and concerns, Environmental ethics- Issues and possible solutions- Climate change- Green house effect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation- Environment Protection Act- Human Rights- Value education, Role of Information Technology in Environment and Human health-Population growth, Variation of population among nations-Population explosion.

Total Hours: 45

TEXT BOOKS:

1. Dr. Ravikrishnan, A Environmental Science Sri Krishna Hi tech Publishing Company Private Ltd., Chennai 2012
2. AnubhakaushikC.P. Kaushik Environmental Science and EngineeringNew Age nternational (P) Ltd., New Delhi.2010

REFERENCES:

1. William P.Cunningham Principles of Environmental Science Tata McGraw -Hill Publishing Company, New Delhi. 2008
2. Linda D. Williams Environmental Science Demystified Tata McGraw -Hill Publishing Company Ltd., New Delhi. 2005
3. BharuchaErach Environmental Science Demystified Mapin Publishing (P) Ltd., Ahmedabad. 2005
4. Tyler Miller G. Jr Environmental Science Thomson & Thomson Publishers, New Delhi. 2004
5. Trivedi, R.K. and Goel, P.K Introduction to Air Pollution Techno-Science Publications, Jaipur.2003

WEBSITES:

1. http://people.eku.edu/ritchisong/envscinotes1.html
2. http://nptel.ac.in/courses.php?disciplineId=120
3. www.newagepublishers.com/samplechapter/001281.
4. www.unesco.org/ext/field/beijing/scienceb.htm,www.infinitepower.org/education.htm
5. http://www.sciencedaily.com/news/top/environment/

	L	T	P	C
16BECS205 ELECTRON DEVICES	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the fundamentals of material science and their applications.
- To inculcate the characteristics of conducting materials
- To divulge knowledge on the basics of semiconducting materials for diode applications.
- To introduce the features of magnetic and superconducting materials.
- To impart the basic knowledge of new semiconducting materials for engineering applications.
- To discuss the features new semiconducting materials for engineering applications.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

- Develop the idea of quantum mechanics through applications.
- Apply the concepts of quantum theory for various methodologies.
- Explain the basic ideas of classical electron theory and energy band structures.
- Illustrate the basics of semiconductor physics and its applications in various electronic devices.
- Identify the basic properties and functioning of dielectric materials and advances materials.
- Summarize the features new semiconducting materials for engineering applications.

UNIT I SEMICONDUCTORS (9)

Motion of Charged particle in electric, magnetic and combined fields- Semiconductor fundamentals - Fermi Level - Energy Band diagram - Intrinsic and Extrinsic Semiconductors-Carrier Concentration -Drift and Diffusion currents - Space charge effect.

UNIT II CHARACTERISTICS OF DIODES (9)

Working and description of a PN diode- Diode Equation - Minority carrier Concenteration - Varactor Diode -Avalanche and Zener Breakdown - Zener diode - Tunnel Diode -PIN diode - Photo diode - Photo voltaic cell - Light emitting diode - Liquid crystal display - Light dependant resistor- Thermistors.

UNIT III TRANSISTORS (9)

Principle of transistor action - Current Components - Cut off, Active and saturation regions of a transistor - CE,CB,CC Configurations - Ebers Moll model of a BJT - Evaluation of H-parameters - Hybrid pi model - Charge control approach of Hybrid pi model - Transistor as a switch - Use of a heat sink

UNIT IV FIELD EFFECT TRANSISTORS (9)

Constructional features of a field effect transistor - theory of operation and current equations - VVR operation of a FET - MOSFET -Working and V-I Characteristics - Depletion and enhancement types -Threshold Voltage - Gate capacitance - MOS as a charge transferring Device - CCD, BBD -Power MOSFET-characteristics of UJT.

UNIT V THYRISTORS AND IC FABRICATION (9)

Working and V-I characteristics features of Silicon Controlled Rectifier, DIAC, TRIAC, GTO - Device Technology - Planar process -Diffusion - Ion Implantation - Vapour Deposition - NMOS, PMOS Fabrication - Twin Tub Process of CMOS - Thick film and thin film Technology.

Total Hours: 45

TEXT BOOKS:

1. S.SalaivahananElectronic devices and CircuitsTata McGraw Hill International2012
2. G.K.MithalElectronic Devices and CircuitsKhanna Publishers1999

REFERENCES:

1. Street Man SolidState Electronic Devices' Prentice Hall Of India 1995
2. David A.Bell Electron Devices and Circuits Prentice Hall Of India 1995
3. MathurKulshrestha and Chadha Electron devices and Applications and Integrated circuits' Umesh Publications 1986
4. Thomas L. Floyd Electron Devices Charles and Messil Publications 1989

16BECS206 C PROGRAMMING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To Identify and understand the working of key components of a computer program.
- To Identify and understand the various kinds of keywords and different data types of C programming
- To Understand, analyze and implement software development tools like algorithm,
- To develop pseudo codes and programming structures.
- To Study, analyze and understand logical structure of a computer program, and different constructs to develop a program in "C" language.
- To discuss the methods of using file system in C

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Formulate simple algorithms for arithmetic and logical problems
- Translate the algorithms to programs (in C language)
- Test and execute the programs and correct syntax and logical errors
- Implement conditional branching, iteration and recursion
- Decompose a problem into functions and synthesize a complete program using divide and conquer approach
- Preform programs using file system in C

UNIT I INTRODUCTION TO C LANGUAGE (8)

Character Set, Variables And Identifiers, Keywords- Built-In Data Types- Arithmetic Operators And Expressions, Constants And Literals, Simple Assignment Statement- Basic Input/Output Statement-Simple 'C' Programs, usage of const keyword

UNIT II CONDITIONAL STATEMENTS AND LOOPS (8)

Logical and Relational Operators- If Statement, If-Else Statement- Loops: While Loop, Do While, For Loop- Nested Loops, Infinite Loops- Switch Statement

UNIT III ARRAYS (9)

One Dimensional Arrays- Array Manipulation; Searching, Insertion, Deletion Of An Element From An Array- Finding The Largest/Smallest Element In An Array- Two Dimensional Arrays, -Addition / Multiplication Of Two Matrices- Strings As Array Of Characters.

UNIT IV POINTERS AND FUNCTIONS (10)

Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays Example Problems-Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion.

UNIT V USER DEFINED DATATYPES AND FILES (10)

Structures – initialization - nested structures – structures and arrays – structures and pointers - union – typedef and enumeration types - bit fields - File Management in C – Files and Streams – File handling functions – Sequential access file- Random access file – Command line arguments.

Total Hours: 45

REFERENCES:

1. E. Balagurusamy, " Computing Fundamentals and C Programming", TMH Education, 5th Edition, 2014
2. YashavantKanetkar, " Let us C", BPB Publications, 13th Edition, 2013
3. H. M. Deitel and D. J. Deitel, „C: How to Program‟, Prentice Hall, 7th Edition, 2012
4. E. Balagurusamy, " Programming in ANSI C", TMH Education, 6th edition, 2012

	L	T	P	C
16BECS212 C PROGRAMMING LAB	**0**	**0**	**3**	**2**

COURSE OBJECTIVES:

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving
- To understand the concept of Array and pointers dealing with memory management.
- To understand the concept of structures and unions through which derived data types can be formed
- To discuss the application of pointers, memory allocation techniques and use of files for dealing with variety of problems.

COURSE OUTCOMES:

- Able to understand the basic terminology used in computer programming
- Able to write, compile and debug programs in C language.
- Able to use different data types in a computer program.
- Able to design programs involving decision structures, loops and functions.
- Able to understand the dynamics of memory by the use of pointers.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.

List of Experiments

1. Write a C program to find Factorial of a given number using do while loop.
2. Write a C Program to print Fibonacci series using while loop.
3. Write a C Program to check a given number is Prime or Not.
4. Write a C Program to compute the sum of even numbers for a given n value.
5. Write a C Program to check the given string is Palindrome or Not.
6. Write a C Program to check the given number is Armstrong or Not using functions.
7. Write a C Program to count the number of vowels from the given string using switch case.
8. Write a C Program to read a line of text from keyboard and print the number of characters, words and spaces.
9. Write a C Program to print the student's record using structure.
10. Write a C Program to find factorial of a number using recursion function.

Total Hours: 45

		L	**T**	**P**	**C**
16BECS301	**DISCRETE STRUCTURES**				
		3	**2**	**0**	**4**

COURSE OBJECTIVES:

- To acquire the knowledge needed to test the logic of a program.
- To gain knowledge in the applications of expert system, in data base.
- To gain understanding on set theory and functions
- To provide understanding on various mathematical logics
- To provide adequate knowledge in class of functions, lattices and Boolean algebra
- To explain about Number theory and graph theory.

COURSE OUTCOMES:

- The student will gain the fundamentals about the logic of a programme.
- Be able to construct simple mathematical proofs
- Enrichment of the knowledge in applications of expert system, in data base.
- Gaining the adequate concepts in class of functions, lattices and Number theory
- Incrementally build sophisticated programs by a systematic design process based on discrete mathematics.
- Permutations and combinations and Graph Theory.

UNIT- I SET THEORY AND FUNCTIONS (13)

Basic concepts – Notation – Subset –The power set – Ordered pairs and Cartesian product – Relations on sets – Types of relations and their properties – Relation matrix and the graph of a relation – Equivalence relations – Composition of binary relations - Functions – Injective, Surjective, Bijective, Composition, Identity, Inverse and Characteristic function of a set – Permutation functions.

UNIT -II MATHEMATICAL LOGIC (13)

Basic connectives and truth tables – Tautologies – Logical equivalence and Implications – Propositional logic and First order Logic – Laws of logic – Rules of inference – The Predicate calculus – The Statement Function, Variables and Quantifiers – Predicate Formulas – Free and Bound Variables – The Universe of discourse.

UNIT- III LATTICES AND BOOLEAN ALGEBRA (12)

Lattices as Partially ordered sets – Hasse diagram – Some Properties of Lattices – Sublattices, Direct product and Homomorphism – Some Special Lattices - Boolean algebra – Definition and Examples.

UNIT -IV NUMBER THEORY (12)

Theory of Numbers – Prime – Composite – Perfect amicable numbers – The Sieve of Eratosthenes – Number of primes is infinite – Resolution of composite numbers in to prime factors – Divisor of a given number – Euler's function $\phi(N)$ – Highest power of prime p

contained in $n!$ – Congruence – Fermat's theorem – Generalization of Fermat's theorem – Wilson's theorem – Lagrange's theorem. (Statements and simple problems only)

UNIT – V GRAPH THEORY (10)

Graphs and graph models –Graph terminology and special types of graphs– Representation graphs and graph-isomorphism – Connectivity – Matrix Representation of Graphs – Trees.

Total Hours: 60

TEXT BOOKS:

1. Tremblay, J. P. and Manohar, R Discrete Mathematical Structures with Applications to Computer Science Tata McGraw–Hill Pub. Co. Ltd, New Delhi. 2008
2. Kenneth H Rosen Discrete Mathematics and its Applications with Combinations and Graph theory Tata McGraw - Hill Pub. Co. Ltd, New Delhi. 2012

REFERENCES:

1. Bernard Kolman, Robert, C., Busby and Sharan Cutler Ross Discrete Mathematical Structures
2. Pearson Education Pvt. Ltd, New Delhi, Fifth Edition. 2006
3. Ralph P Grimaldi Discrete and Combinatorial Mathematics – An Applied Introduction Addison Wesley Publishing Company, USA, Fifth Edition 2006
4. Thomas Koshy Discrete Mathematics with Applications Elsevier Academic Press, New Delhi. 2012
5. NarsinghDeoGraph Theory with Applications to Engineering and Computer Science PHI Learning Pvt. Ltd., New Delhi. 2004
6. Krishnan V. K. Elementary Number Theory: A Collection of Problems With Solutions Universities Press, Hydrabad. 2012

WEBSITES:

1. www.dmtcs.org/dmtcs-ojs/index.php/dmtcs
2. www. mathworld.wolfram.com
3. www.nptel.com

16BECS302	**Data Structures**	**L**	**T**	**P**	**C**
		2	**2**	**0**	**3**

COURSE OBJECTIVES:

- Understand the properties of various data structures
- Identify the strengths and weaknesses of different data structures
- Design and employ appropriate data structures for solving computing problems
- Possess the knowledge of various existing algorithms
- Analyze and compare the efficiency of algorithms
- Possess the ability to design efficient algorithms for solving computing problems

COURSE OUTCOMES:

- An understanding of the basic data structures.
- Able to identify the strength and weakness of data structures
- Able to implement Linear data structures for singly linked list, stack and Queue
- Design and implement the basic search and sorting algorithms
- Able to implement non-linear data structures for Binary Trees
- Design and employ non-linear data structure for solving graph application

UNIT-1 Introduction to Data Structures and Algorithms (7)

Arrays, Structures, Pointers to structures and Strings- Algorithm Development- Complexity Analysis-Recursion

UNIT-II Linear Data Structures (9)

Abstract Data Type(ADT)-Definition- List ADT – Linked List- Operations-Creation-Insertion-Deletion-Doubly Linked List- Stack ADT-Definition-Implementation - Operations and Applications-Queue ADT-Definition-Implementation, Operations and Applications

UNIT-III Sorting and Searching (10)

Bubble sort-Selection Sort-Insertion Sort-Merge Sort-Quick Sort- Running Time analysis of each sort – Linear Search-Binary Search-Hash Search Table

UNIT-IV Non Linear Data Structures-I (10)

Trees-terminologies- binary Tree-Applications-Tree Traversals-Search Trees- Binary Search Tree- AVL Trees- Operations and Applications- B-Trees

UNIT-V Non Linear Data Structures-II (9)

Graph-Definition-Terminologies- Graph Representations- Graph Traversals- Basic Algorithms-Shortest Path Algorithm- Minimum Spanning Tree Construction Algorithms-Prim‟s and Kruskal‟s- Bi-connectivity- Graph Applications

Total Hours: 45

TEXT BOOKS:

1. Mark Allen Weiss, " Data Structures and Algorithm Analysis in C", Pearson Education, 2^{nd}

   Edition,2011

REFERENCES:

1. Richard.F., Gilberg A, Behrouz A., Forouzan, "Data Structures- A Pseudocode Approach with C",
   Thomson Brooks, 2^{nd} Edition,2008
2. AhoHopcroft and Ullman, " Data Structures and Algorithms, Pearson Education, 4^{th} Edition,2009

WEBSITES:

1. http://www.cs.auckland.ac.nz/software/AlgAnim/trees.html
2. http://www.itl.nist.gov/div897/sqg/dads/HTML/graph.htmlhttp://www.cmpe.boun.edu.tr/~akin/cm
   pe223/chap2.htm

16BECS303	**DIGITAL PRINCIPLES AND SYSTEMS DESIGN**	**L**	**T**	**P**	**C**
		2	**2**	**0**	**3**

COURSE OBJECTIVES:

- To introduce basic postulates of Boolean algebra and shows the correlation between boolean expressions.
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of synchronous and asynchronous sequential circuits
- To study, analyze and design sequential circuits.

COURSE OUTCOMES:

- Understand number systems and codes
- Understand basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- Understand the methods for simplifying Boolean expressions
- Understand the formal procedures for the analysis and design of combinational circuits and sequential circuits
- Understand the concept of memories and programmable logic devices.
- Possess the ability to design an efficient digital circuit for simple real time applications

UNIT -I BOOLEAN ALGEBRA AND LOGIC GATES (9)

Review of binary number systems - Binary arithmetic – Binary codes – Boolean algebra and theorems - Boolean functions – Simplifications of Boolean functions using Karnaugh map and tabulation methods – Logic gates

UNIT- II COMBINATIONAL LOGIC (9)

Combinational circuits – Analysis and design procedures - Circuits for arithmetic operations - Code conversion – Introduction to Hardware Description Language (HDL)

UNIT -III DESIGN WITH MSI DEVICES (9)

Decoders and encoders - Multiplexers and demultiplexers - Memory and programmable logic - HDL for combinational circuits

UNIT- IV SYNCHRONOUS SEQUENTIAL LOGIC (9)

Sequential circuits – Flip flops – Analysis and design procedures - State reduction and state assignment - Shift registers – Counters - HDL for sequential logic circuits, Shift registers and counters.

UNIT -V ASYNCHRONOUS SEQUENTIAL LOGIC (9)

Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables – Race-free state assignment – Hazards.

Total Hours: 45

TEXT BOOKS:

1. Morris Mano.M Digital Design (3rd Edition) Pearson Education, New Delhi. 2002
2. Godse.A.P Digital Design (3rd Edition) Tata McGraw-Hill,New Delhi 2003

REFERENCES:

1. Charles H.Roth Fundamentals of Logic Design (4th Edition) Jaico Publishing House, New Delhi. 2000
2. Donald D.Givone Digital Principles and Design(4th Edition) Tata McGraw- HillNew ,Delhi 2003

WEBSITES:

1. http://www.allaboutcircuits.com/vol_2/chpt_9/2.html
2. http://www.educypedia.be/electronics/digital.htm

16BECS304 **Object-Oriented Programming with Java**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Understand the concepts of object-oriented, event driven, and concurrent Programming paradigms .
- Develop skills in using these paradigms using Java.
- Analyze and compare the efficiency of algorithms.
- Possess the ability to design efficient algorithms for solving computing problems.
- Explain simple Java programming environment, compile programs and interpret compiler errors.
- Explain syntax and use of the fundamental data types.

COURSE OUTCOMES:

- Able to use a simple Java programming environment, compile programs and interpret compiler errors
- Able to understand and use the fundamental data types.
- Able to design classes and organize them into packages.
- Able to test programs to ensure that they perform as intended.
- Able to identify the objects and classes and apply in the suitable context.
- Able to develop a program from a given design

UNIT I Fundamentals of Object-Oriented Programming with JAVA (9)

Introduction to Object oriented programming – Benefits and Applications of OOP- structural programming versus object oriented programming - Simple Java Program - Data Types – Operators – Expressions - Decision Making and Loop control Statements - The? : Operator - Arrays-Strings – Getting input in java.

UNIT II Classes, Objectsand Methods (9)

Defining a Class-Creating Objects-Accessing Class Members-Constructors-Methods Overloading-Static Members-Nesting of Methods-Final Variables and Methods- Final Classes-Finalize Methods-Visibility Control

UNIT IIIInheritance and Interfaces (9)

Motivation -Inheritance: Extending a Class– Types of Inheritance -Overriding Methods-Interfaces in Java (Interface and Implement) -Multiple inheritance – Examples

UNIT IVManaging Errors andException Handling (9)

Motivation – Exception handling – Exceptionhierarchy – Throwing and Catching exceptions - Syntax of Exception Handling Code - Types of Errors -Multiple Catch Statements-Using Finally Statement -User defined Exceptions -Using Exceptions for Debugging.

UNIT V Input /Output Streams (9)

Motivation - I/OStreams - Concept of Streams-Stream Classes-Byte Stream Classes-Character Stream Classes-Using Streams-Other Useful I/O Classes-Using the File Class-Input/Output Exceptions-Creation of Files-Reading/Writing Characters-Reading/Writing Bytes-Handling Primitive Data Types-Concatenating and Buffering Files-Random Access Files-Interactive Input and Output-Other Streamclasses.

Total Hours: 45

TEXT BOOKS:

1. Herbert Schildt "Java: The Complete Reference", 9th Edition,Mcgraw-Hill, 2014.
2. D.T. Editorial Services ,"Java 8 Programming: Black Book",Dreamtech Press, 2015.
3. YashawantKanetkar, "Let Us Java", 1st Edition, PBP Publications, 2012 .
4. C. Thomas Wu, "An Introduction to Object-Oriented programming with Java", 5th Edition Tata McGraw-Hill Publishing company Ltd 2010.

REFERENCES:

1. Cay S. Horstmann and Gary Cornel, "Core Java: Volume I – Fundamentals", 8th Edition, Sun Microsystems Press, 2011
2. Timothy Budd "Understanding Object-oriented programming with Java" Pearson Education,2nd edition, 2006
3. Herbert Schildt, "Java The Complete Reference", Oracle Press, 8th edition, 2011

WEBSITES:

1. http://java.sun.com.

16BECS305A **SYSTEM SOFTWARE**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To have an understanding of foundations of design of assemblers, loaders, linkers, and macro processors
- To understand the relationship between system software and machine architecture.
- To know the design and implementation of assemblers
- To know the design and implementation of linkers and loaders.
- To have an understanding of macro processors.
- To discuss the functions of Operating Systems and usage of system software tools

COURSE OUTCOMES:

- To have an understanding of foundations of design of assemblers, loaders, linkers, and macro processors
- To understand the relationship between system software and machine architecture.
- To know the design and implementation of assemblers
- To know the design and implementation of linkers and loaders.
- To have an understanding of macro processors.
- To understand the functions of Operating Systems and usage of system software tools

UNIT- I Introduction
(9)

System software and machine architecture – The Simplified Instructional Computer (SIC) - XE - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming.

UNIT- II Assemblers
(9)

Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example - MASM assembler.

UNIT- III Loaders and Linkers **(9)**

Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features - Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker.

UNIT-IV Macro Processors
(9)

Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro-Implementation example - MASM Macro Processor – ANSI C Macro language.

UNIT- V Operating system and system software tools
(9)

Basic Operating System Functions-Machine Dependent Operating System Features:Interrupt Processing-Process Scheduling-I/O Supervision- Machine Independent Operating System Features: File Processing, Operating System Design Options: Multiprocessor Operating Systems-Distributed Operating Systems-Object Oriented Operating Systems. Text editors - Editor Structure. - Interactive debugging systems

Total Hours: 45

TEXT BOOKS:

1. Leland L. Beck, "System Software – An Introduction to Systems Programming ", Pearson
   Education Asia.3rd edition,2011

REFERENCES:

1. Dhamdhere.D.M, "Systems Programming and Operating Systems ", Tata McGraw-Hill, New Delhi, 2009
2. John J. Donovan, "Systems Programming ", Tata McGraw-Hill , New Delhi, 2002

WEBSITES:

1. http://www.omninerd.com/articles/PC_Bootstrap_Loader_Programming_Tutorial_in_ASM
2. www.tenouk.com/ModuleW.html

16BECS305B **Programming with Java Script**

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- Understand and use basic programming syntax using JavaScript
- Understand and use JavaScript to enhance HTML documents.
- Understand the Java Scripts Object Model.
- Understand and use predefined JavaScript objects
- Explain various concepts of Javascript and webpages behavior
- Discuss about advanced libraries in JavaScript

COURSE OUTCOMES:

- Describe the origins of JavaScript and list its key characteristics.
- Communicate with users using JavaScript.
- Identify and use the JavaScript language objects.
- Use JavaScript with HTML form controls.
- Define and utilize cookies.
- Create custom JavaScript objects.

UNIT I Programming Fundamentals (9)

What is JavaScript? Brief history-Common use-cases-Runtime environments-Overview of language features-Running JavaScript in the browser and at the command line-Debugging JavaScript in the browser- Authoring and debugging code -The roles and relationships between HTML, CSS and Javascript

UNIT II The Javascript Language (9)

Basic data types, variables, objects, and mathematical operations- Control structures, conditionals, looping, functions- Data and data structures : Objects -Arrays - Dates and other built-in data objects- More data structures :Functions, objects, and data -JSON - Advanced control structures

UNIT III Javascript and the behavior of Web pages (9)

Making Web pages behave: manipulating the DOM- Working with Browser Events • Script loading, responding to keyboard input or mouse activity, scrolling- Forms and AJAX- Using Javascript Libraries for Advanced Behavior :JQuery and others • Animations, AJAX, form and data handling

UNIT IV Javascript Libraries and Advanced Applications (9)

Understanding How Libraries Work -Library Architecture and design patterns -Writing a JQuery plugin- Other kinds of libraries-Media players, layout managers -Writing your own library-Javascript and multimedia

UNIT V Security (9)

Same-origin policy. Cross-site scripting attacks (reflected and persisted). Cookie theft and forgery. Whitelisting and blacklisting.

Total Hours: 45

TEXT BOOKS:

1. Modern Javascript: Develop and Design by Larry Ullman,Peachpit Press,2012

REFERENCES:

1. Javascript Bible, 7th Edition, Danny Goodman Michael Morrison Paul Novitski Tia GustaffRayl, Wiley India Pvt Ltd 2014
2. Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Kogent Learning Solutions Inc, Dreamtech Press 2014

WEBSITES:

1. http://proquest.safaribooksonline.com.ezpprod1.hul.harvard.edu/book/programming/javascript/9780132905848

16BECS311	Java Programming Lab	L	T	P	C
		0	0	3	2

COURSE OBJECTIVES:

- A competence to design, write, compile, test and execute straightforward programs using a high level language;
- An awareness of the need for a professional approach to design and the importance of good documentation to the finished programs.
- Be able to implement, compile, test and run Java programs
- Developing Java programs comprising more than one class, to address a particular software problem.
- Demonstrate the ability to use simple data structures like arrays in a Java program.
- Explain simple Java programming environment, compile programs and interpret compiler errors.

COURSE OUTCOMES:

1. Understand the principles of OOP;
2. Be able to demonstrate good object-oriented programming skills in Java;
3. Understand the capabilities and limitations of Java;
4. Be able to describe, recognise, apply and implement selected design patterns in Java;
5. Be familiar with common errors in Java and its associated libraries.
6. Develop various Multithreaded GUI application using Java

LIST OF EXPERIMENTS

1. Create Java package with simple stack and queue class
2. Write a Java program to perform Complex number manipulation
3. Write a Java program for Date class similar to java.util package
4. Write a Java program for implementing dynamic polymorphism in java
5. Write a Java program for ADT stack using Java interface
6. Write a Java program for DNA file creation
7. Develop a simple paint like program using applet
8. Develop a scientific calculator using java
9. Developing a template for linked list
10. Develop a multi threaded producer consumer Application
11. Write a Java program for generating prime numbers and Fibonacci series
12. Write a Java program for Multithreaded GUI application

Total Hours: 45

		L	**T**	**P**	**C**
16BECS312	**DIGITAL ELECTRONIC LAB**				
		0	**0**	**3**	**2**

COURSE OBJECTIVES:

- To learn and understand basic digital design techniques.
- To learn and understand design and construction of combinational and sequential circuits.
- To understand the digital logic and create various systems by using these logics.
- Explain analysis and design digital combinational circuits like decoders, encoders, multiplexers, and de-multiplexers including arithmetic circuits (half adder, full adder, multiplier).
- Explain how to analyze sequential digital circuits like flip-flops, registers, counters.
- Understand the importance and need for verification, testing of digital logic and design for testability

COURSE OUTCOMES

- Learn the basics of gates.
- Construct basic combinational circuits and verify their functionalities
- Apply the design procedures to design basic sequential circuits
- Able to analyze and design digital combinational circuits like decoders, encoders, multiplexers, and de-multiplexers including arithmetic circuits (half adder, full adder, multiplier).
- Able to analyze sequential digital circuits like flip-flops, registers, counters.
- Understand the importance and need for verification, testing of digital logic and design for testability.

LIST OF EXPERIMENTS

1.Verification of Boolean theorems using digital logic gates
2.Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters, etc.
3.Design and implementation of 4-bit binary adder / subtractor using basic gates and MSI devices
4.Design and implementation of parity generator / checker using basic gates and MSI devices
5.Design and implementation of magnitude comparator
6.Design and implementation of application using multiplexers
7.Design and implementation of Shift registers
8.Design and implementation of Synchronous and Asynchronous counters
9.Coding combinational circuits using Hardware Description Language (HDL software required)
10.Coding sequential circuits using HDL (HDL software required)

Total Hours: 45

16BECS313 **Data Structures Lab**

L	T	P	C
0	0	3	2

COURSE OBJECTIVES:

- Analyze performance of algorithms.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Determine which algorithm or data structure to use in different scenarios
- Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs
- Demonstrate understanding of various sorting algorithms, including bubble sort,selection sort, heap sort and quick sort.
- Understand and apply fundamental algorithmic problems including Tree traversals,Graph traversals, and shortest paths.

COURSE OUTCOMES:

- Able to understand the importance of structure and abstract data type, and their basic usability indifferent applications through different programming languages.
- Able to analyze and differentiate different algorithms based on their time complexity.
- Able to understand the linked implementation
- Able to understand uses of both linear and non-lineardata structure.
- Able to understand various data structure such as stacks, queues, trees, graphs, etc.
- Able to solve various computing problems

LIST OF EXPERIMENTS

1. Implementation of List using Arrays
2. Implementation of Singly Linked List
3. Implementation of Linked Stack

4. Implementation of Linked Queue
5. Implementation of any two stack applications
6. Implementation of Insertion Sort
7. Implementation of Merge Sort
8. Implementation of Quick Sort
9. Implementation of Insertion operation in Binary Search Tree
10. Implementation of Tree Traversals
11. Implementation of Hashing with any one collision resolution method

12. Implementation of Dijkstra‟s Shortest Path Algorithm

Total Hours: 45

16BECS401 **Database Management Systems**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- Learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram.
- Be able to explain a database and report on the process.
- Be able to teach how to write query in databases
- Know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
- Possess the knowledge about the emerging trends in the area of distributed DB- OO DB- Data mining and Data Warehousing and XML.

COURSE OUTCOMES:

On successful completion of this module, the student should:

- Have gained knowledge and understanding of what is involved in the design of a database.
- Have gained knowledge and understanding of the models used for structuring data in database systems.
- Be able to implement a database and report on the process.
- Be able to query a database.
- Apply the database knowledge to avoid the concurrency and deadlock problems
- Able to apply the database knowledge in the upcoming current trends.

UNIT-I Introduction and Conceptual Modeling (9)

Introduction to File and Database systems- Database system structure –Introduction and concept Modeling-Database user Data Models – Introduction to Network and Hierarchical Models – ER model – Relational Model – Relational Algebra and Calculus.

UNIT-II Relational Model (9)

SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design-Relational Models-Design issues – Functional dependences and Normalization for Relational Databases (up to BCNF).

UNIT- III Data Storage and Query Processing (9)

Record storage and Primary file organization- Secondary storage Devices- Operations on Files- Heap File-Sorted Files- Hashing Techniques – Index Structure for files –Different types of Indexes- B-Tree - B+Tree– Query Processing. Record storage and Primary file organization- Secondary storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index Structure for files –Different types of Indexes- B-Tree - B+Tree – Query Processing.

UNIT- IVTransaction Management (9)

Transaction Processing – Introduction- Need for Concurrency control- Desirable properties of Transaction- Schedule and Recoverability- Serializability and Schedules – Concurrency Control

– Types of Locks- Two Phases locking- Deadlock- Time stamp based concurrency control – Recovery Techniques
– Concepts- Immediate Update- Deferred Update - Shadow Paging.

UNIT- V Current Trends (9)
Object Oriented Databases – Need for Complex Data types- OO data Model- Nested relations- Complex Types- Inheritance Reference Types - Distributed databases- Homogenous and Heterogenous- Distributed data Storage – XML – Structure of XML- Data- XML Document- Schema- Querying and Transformation.– Data Mining and Data Warehousing.

Total Hours: 45

TEXT BOOKS:

1. Abraham Silberschatz, Henry F.Korth and S.Sudarshan" Database System Concepts",
   McGraw-Hill, 6^{th} edition,2011.
2. Raghuramakrishnan and Johannes Gehrke, "Database Management Systems", 3^{rd} Edition, McGraw Hill, 2002

3. Ramesh Elmasri, ShamkantB.Navathe, "Fundamentals of Database Systems", 5^{th} Edition, Pearson Education, 2008

REFERENCES:

1. Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom" Database System Implementation" Pearson Education, 2^{nd} Edition,2013

2. Peter Rob and Corlos Coronel "Database System, Design Implementation and Management",
   Thompson Learning Course Technology, 11^{th} Edition,2014.

WEBSITES:

1. http://www.tutorialized.com/tutorial/DB2-Tutorial/
2. http://www.techtutorials.info/datadb2.html
3. http://www.firstsql.com/tutor.htm
4. http://sqlzoo.net/

	L	T	P	C
	3	0	0	3

16BECS402 **Computer Architecture**

COURSE OBJECTIVES:

- To discuss the basic structure of a digital computer and basic operational concepts
- To study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.
- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms
- To discuss implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study in detail the different types of control and the concept of pipelining.

COURSE OUTCOMES:

The main goal of the course is for students to:

- Be able to understand simple circuits from logic formula.
- Understand the basics of assembly language.
- Understand the main concepts of computer architecture
- Be able to explain how the various parts of a modern computer function and cooperate.
- Be able to exploit the advantages of an advanced computer memory having virtual memory and Cache
- Implement assembly programs that accomplish basic computational and I/O operations

UNIT- I Basic structure of computers (9)

Functional units - Basic operational concepts - Bus structures - Software performance – Memory locations and addresses – Memory operations – Instruction and instruction sequencing – Addressing modes – Assembly language – Basic I/O operations – Stacks and queues.

UNIT- II Arithmetic unit (9)

Addition and subtraction of signed numbers – Design of fast adders – Multiplication of positive numbers - Signed operand multiplication and fast multiplication – Integer division – Floating point numbers and operations.

UNIT- III Basic processing unit (9)

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Microprogrammed control - Pipelining – Basic concepts – Data hazards – Instruction hazards – Influence on Instruction sets – Data path and control consideration – Superscalar operation.

UNIT- IV Memory system and i/o organization **(9)**

Basic concepts – Semiconductor RAMs - ROMs – Speed - size and cost – Cache memories - Performance consideration – Virtual memory- Memory Management requirements – Secondary storage. Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface circuits-Serial Communication

UNIT- V Multiprocessor architecture (9)

Forms of Parallel Processing:Array Processors-Multiprocessors-Interconnection Networks :Single Bus-Crossbar NetworksMultistage Networks-Hypercube NetworksMesh Networks-Tree Networks Ring Networks-Memory Organization in Multiprocessors- Program Parallelism and Shared Variables-Performance Consideration: Amdahl's Law –Performance Indicators-Intel connection structure, intel connection arbitration

Total Hours: 45

TEXT BOOKS:

1. Computer Organization and Architecture Designing for Performance, William Stallings, Pearson Education, New Delhi. 2013
2. Computer System Architecture , M. Morris Mano (3rd Edition), Prentice Hall, 2013

REFERENCES:

1. Computer Organization, Carl Hamacher, ZvonkoVranesic and SafwatZaky, McGraw-Hill,2012
2. Computer Organization and Design: The hardware / software interface, David A.Patterson and John L.Hennessy, Morgan Kaufmann, Pune.2011
3. Computer Architecture and Organization, John P.Hayes, McGraw Hill ,New Delhi , 2012

WEBSITES:

1. www.eastaughs.fsnet.co.uk/cpu/structure-alu.htm
2. http://e-articles.info/e/a/title/Types-of-Memory/www.comptechdoc.org/hardware/pc/begin/hw memory.html

16BECS403A	Microprocessors And Microcontrollers	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the architecture and programming of 8085 microprocessor.
- To introduce the interfacing of peripheral devices with 8085 microprocessor.
- To introduce the architecture and programming of 8086 microprocessor.
- To introduce the architecture, programming and interfacing of 8051 micro controller.
- Explain various analysis using assembly language programs
- Describe various assembly language programs

COURSE OUTCOMES:

- Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's and Microcontroller's internal architecture and its operation within the area of manufacturing and performance.
- Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller.
- Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) and Microcontroller to meet specified performance requirements.
- Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor and microcontroller.
- Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.
- Evaluate assembly language programs and download the machine code that will provide solutions real-world control problems

UNIT -I THE 8085 MICROPROCESSOR (9) Introduction to 8085 – Microprocessor architecture – Instruction set – Programming the 8085 – Code conversion.

UNIT- II 8086 SOFTWARE ASPECTS (9)

Intel 8086 microprocessor – Architecture – Instruction set and assembler directives – Addressing modes – Assembly language programming – Procedures – Macros – Interrupts and interrupt service routines.

UNIT- III 8086 SYSTEM DESIGN (9)

8086 signals and timing – MIN/MAX mode of operation – Addressing memory and I/O – Multiprocessor configurations – System design using 8086

UNIT- IV I/O INTERFACING (9)

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications.

UNIT- V MICROCONTROLLERS (9)

Architecture of 8051 – Signals – Operational features – Memory and I/O addressing – Interrupts – Instruction set – Applications.

Total Hours: 45

TEXT BOOKS:

1. Ramesh S.Gaonkar Microprocessor– Architecture Programming and Applications with the 8085 Penram International publishing private limited. 2008
2. Ray A.K &K.M.Bhurchandi Advanced Microprocessors and peripherals- Architectures Programming and Interfacing TMH 2006

REFERENCES:

1. Douglas V.Hall Microprocessors and Interfacing Programming and Hardware TMH
2. 2003
3. Yu-cheng Liu Glenn A.Gibson Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design, PHI 2008
4. Mohamed Ali Mazidi, Janice Gillispie Mazidi The 8051 microcontroller and embedded systems, Pearson education 2007

WEBSITES:

1. http://www.8052.com/tut8051http://www.eastaughs.fsnet.co.uk/cpu/index.htm
2. http://www.webphysics.davidson.edu/faculty/dmb/py310/**8085**.pdf
3. http://www.aust.edu/cse/moinul/8086_lectures.pdf
4. http://www.cache.com.hk/datasheetC8255ovview.html

16BECS403B Information Storage and Management LT P C

3 0 03

COURSE OBJECTIVES:

- Evaluate storage architectures and key data center elements in classic, virtualized and cloud environments
- Explain physical and logical components of a storage infrastructure including storage subsystems, RAID and intelligent storage systems
- Describe storage networking technologies such as FC-SAN, IP-SAN, FCoE, NAS and object- based, and unified storage
- Understand and articulate business continuity solutions – backup and replications, along with archive for managing fixed content
- Explain key characteristics, services, deployment models, and infrastructure components for a cloud computing
- Discuss the management of virtual servers and storage between remote locations

COURSE OUTCOMES:

- Describe and apply storage technologies
- Identify leading storage technologies that provide cost-effective IT solutions for medium tolarge scale businesses and data centers
- Describe important storage technologies‟ features such as availability, replication,scalability and performance
- Work in project teams to install, administer and upgrade popular storage solutions
- Identify and install current storage virtualization technologies
- Manage virtual servers and storage between remote locations

UNIT I Storage System (9)

Introduction to information storage, Virtualization and cloud computing, Key data center elements, Compute, application, and storage virtualization, Disk dive & flash drive components and performance, RAID, Intelligent storage system and storage provisioning (including virtual provisioning)

UNIT II Storage Networking Technologies and Virtualization (9)

Fibre Channel SAN components, FC protocol and operations, Block level storage virtualization, iSCL and FCIP as an IP-SAN solutions, Converged networking option – FcoE, Network Attached Storage (NAS) – components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.

UNIT III Backup, Archive and Replication (9)

Business continuity terminologies, planning and solutions, Clustering and multipathing to avoid single points of failure, Backup and recovery – methods, targets and topologies, data deduplication and backup in virtualized environment, fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.

UNIT IV Cloud Computing (9)

Characteristics and benefits**,** Services and deployment models, Cloud infrastructure components, Cloud migration considerations.

UNIT V Securing and Managing (9)

Storage Infrastructure Security threats, and countermeasures in various domains, Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments, Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle Management (ILM) and storage tiering.

Total Hours:45

TEXT BOOKS:

1. Information Storage and Management: Storing, Managing and Protecting Digital Information in classic, Virtualized and Cloud Environments, 2nd Edition, EMC Educations Services, Wiley, May 2012.

REFERENCES:

1. Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein ,"Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS, iSCSI, InfiniBand and FCoE, 2nd Edition, Wiley, July 2009

2. Information Storage and Management: Storing, Managing, and Protecting Digital Information, EMC Education Services, Wiley, January 2010

16BECS404	Design and Analysis of Algorithms	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Learn the algorithm analysis techniques.
- Become familiar with the different algorithm design techniques.
- Understand the limitations of Algorithm power.
- Develop a base for advanced study in Computer Science.
- To explain applications of the algorithms and design techniques to solve problems
- To describe the complexities of various problems in different domains.

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Design algorithms for various computing problems.
- Analyze the time and space complexity of algorithms.
- Critically analyze the different algorithm design techniques for a given problem.
- Ability to decide the appropriate data type and data structure for a given problem.
- Ability to select the best algorithm to solve a problem
- Considers various problem characteristics, such as the data size, the type of operations, etc.

UNIT I INTRODUCTION (9)

Fundamentals of Algorithmic Problem Solving – Performance Analysis- Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms, Ex: Fibonacci Series-Probabilistic analysis-Amortized Analysis.

UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER (9)

Brute Force – Closest-Pair and Convex-Hull Problems-Bubble Sort-Sequential Search –Divide and conquer methodology – Merge sort – Quick sort-Strassen's Matrix Multiplication.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE (9)

Dynamic Programming – Warshall's and Floyd' algorithm – Optimal Binary Search Trees – Greedy Techniques-Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees.

UNIT IV BACK TRACKING AND BRANCH AND BOUND (9)

Backtracking – n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem-graph colouring-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem

UNIT V NP HARD AND NP COMPLETE (9)

Basic Concepts- Non Deterministic algorithms-NP Hard and NP Complete Classes-Cool's Theorem

Total Hours:45

TEXT BOOK:

1. AnanyLevitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2012.

REFERENCES:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
3. Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008.
4. http://nptel.ac.in/

16BECS405 **Formal Languages and Automata**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To have an introductory knowledge of automata, formal language theory and computability.
- To have an understanding of finite state and pushdown automata.
- To have a knowledge of regular languages and context free languages.
- To know the relation between regular language, context free language and corresponding recognizers.
- To study the Turing machine and classes of problems
- To teach methods of writing a very simple code generator

COURSE OUTCOMES:

Upon completion of the course, the students should be able to :

- Design a finite automaton for a specific language.
- Design a Turing machine.
- Select appropriate grammar for the implementation of compiler phases
- Design a lexical analyzer
- Design a simple parser
- Design and implement techniques used for optimization by a compiler.
- Write a very simple code generator

UNIT- I Introduction To Automata (9)

Basics of String and Alphabets - Finite Automata (FA) – Deterministic Finite Automata (DFA)– Non-deterministic Finite Automata (NFA) – Conversion of NFA to DFA- Finite Automata with Epsilon transition-Equivalence and Minimization of Automata

UNIT- II Regular Expressions And Languages (9)

Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Pumping lemma for regular sets - Closure properties of regular languages- Decision Properties of Regular Languages

UNIT- III Context-Free Grammar And Languages (9)

Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Definition of the Pushdown automata – Languages of a Pushdown Automata – Equivalence of Pushdown automata and CFG, Deterministic Pushdown Automata- Pumping Lemma for CFL - Closure Properties of CFL- Context Sensitive Grammar (CSG) & Languages

UNIT IV Properties of Context Free Grammar (9)

Normal forms for Context Free Grammar- Chomsky Normal Form- The Pumping lemma for Context free Languages- Closure properties of Context Free Languages-Inverse Homomorphism-Decision Properties of CFL

UNIT- V Turing Machine (9)

Turing Machines – Introduction- Definition – Turing machine construction- Storage in Finite control-Multiple tracks- Subroutines-Checking of Symbols – Two way infinite tape-Undecidability .

Total Hours: 45

TEXT BOOKS:

1. Hopcroft J.E, R.Motwani and J.D.Ullman, Introduction to Automata Theory, Languages and Computations, Pearson Education, 2011.

REFERENCES:

1. Lewis H.R and C.H.Papadimitriou, Elements of The theory of Computation, Pearson Education, PHI, 2009.

2. Martin J, Introduction to Languages and the Theory of Computation, TMH, 2010

3. MichealSipser, Introduction of the Theory and Computation, Edition,Thomson Brokecole,2012.

4. An Introduction to Formal Languages and Automata, 5th Edition, Peter Linz, 2011

WEBSITES:

1. http://www.regular-expressions.info/tutorial.html
2. http://www.cs.duke.edu/csed/jflap/tutorial/fa/nfa2dfa/index.html
3. http://web.cecs.pdx.edu/~harry/compilers/slides/LexicalPart3.pdf

16BECS411 **Advanced Java Programming Laboratory**

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- Understand the concepts of object-oriented, event driven, and concurrent programming paradigms
- Develop skills in using these paradigms using Java.
- To understand and implement the concepts of interfaces and packages
- To implement a multithreaded program
- Explain how to manage exceptions for real time applications
- Explain how to design an event driven program using applet

COURSE OUTCOMES:

After completion of this course, the students would be able to

- Understand programming language concepts, particularly Java and object-oriented concepts.
- Write, debug, and document well-structured Java applications and Implement Java classes from specifications.
- Effectively create and use objects from predefined class libraries.
- Understand the behavior of primitive data types, object references, and arrays.
- Apply decision and iteration control structures to implement algorithms.
- Implement interfaces, inheritance, and polymorphism as programming techniques and apply exceptions handling.

Theory:

Creating Threads-Extending the Thread Class- Thread states -Stopping and Blocking a Thread-Life Cycle of a Thread- Thread Exceptions- Thread Priority- Synchronization
The Object class – Reflection – interfaces – object cloning – inner classes – generic classes – generic methods – inheritance and generics – reflection and generics
Preparing to Write Applets-Building Applet Code-Applet Life Cycle-Creating an Executable Applet-Designing a Web Page-Applet Tag-Adding Applet to HTML File-Running the Applet-Getting Input from the User-Event Handling-The Graphics Class
Sockets – secure sockets – custom sockets –Java Messaging services
JUnit – Overview - Environment Setup - Test Framework - JUnit Basic Usage - API's of JUnit - Writing Test – Executing Tests - Suite Test - Ignore Test - Time Test - Exceptions Test - Parameterized Test - Plug with Eclipse – Extensions

List of Experiments

- Write a java program to implement the concept of threading by extending Thread Class
- Write a java program to implement the concept of thread priority.
- Write a java program to implement the methods of thread States.
- Write a java program to implement the concept of thread Synchronization.

- Write a java program to implement the concept of Object Cloning.
- Write a java program to implement the concept of Reflection.
- Write a java program to implement the concept of inner Classes.
- Write a java program to implement the concept of Generic Classes and Generic Methods.
- Write a Java Program to demonstrate Keyboard event in Applet
- Write a Java Program to demonstrate Mouse events in Applet.
- Write a Java Program to draw different shapes using Graphics Class in Applet
- Write a Java program to create Client-Server network for Chatting between Client and Server.
- Write a java program and test that program using JUnit Testing in Eclipse

TEXT BOOKS:

1.Herbert Schildt "Java: The Complete Reference", 9th Edition,Mcgraw-Hill, 2014.
2.Harold Elliotte Rusty "Java Network Programming" 4 Edition, 2014.
3.Yashawant Kanetkar, "Let Us Java", 1st Edition, PBP Publications, 2012

REFERENCES:

1. Cay S. Horstmann and Gary Cornel, "Core Java: Volume I – Fundamentals", 8th Edition, Sun
Microsystems Press, 2011
2. Timothy Budd "Understanding Object-oriented programming with Java" Pearson Education,2nd edition, 2006
3.C. Thomas Wu, "An Introduction to Object-Oriented programming with Java", 5th Edition Tata McGraw-Hill Publishing company Ltd 2010
4.E. Balagurusamy, "Programming with Java", 4th Edition, Tata McGraw Hill, 2010

WEBSITES:

1. http://java.sun.com.

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Total Hours: 45

16BECS412	Database Management Systems Lab	L	T	P	C
		0	0	3	2

COURSE OBJECTIVES:

- Master the basic concepts and appreciate the applications of database systems.
- Master the basics of SQL and construct queries using SQL.
- Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.
- Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.
- Mater sound design principles for logical design of databases, including the E-R method and normalization approach.
- Master the basics of query evaluation techniques and query optimization.

COURSE OUTCOMES:

After completion of this course, the students would be able to

- Understand, appreciate and effectively explain the underlying concepts of database technologies
- Design and implement a database schema for a given problem-domain Normalize a database
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS
- Programming PL/SQL including stored procedures, stored functions, cursors, packages.
- Design and build a GUI application.

LIST OF EXPERIMENTS

1. Data Definition Language (DDL) commands in RDBMS.
2. Data Manipulation Language (DML) and Data Control Language (DCL) commands in RDBMS.
3. High-level language extension with Cursors.
4. High level language extension with Triggers
5. Procedures and Functions.
6. Embedded SQL.
7. Database design using E-R model and Normalization.
8. Design and implementation of Payroll Processing System.
9. Design and implementation of Banking System.
10. Design and implementation of Library Information System.
11. Database connectivity using JDBC
12. Database connectivity using ODBC

Total Hours: 45

		L	**T**	**P**	**C**
16BECS413	**Embedded Computing Systems**				
		1	**0**	**2**	**3**

COURSE OBJECTIVES:

- The student should be made to:
- Introduce ALP concepts and features
- Explain to write a program for 8085 Microprocessor
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors

COURSE OUTCOMES

- Ability to write a program for 8085 Microprocessor
- Ability to write a program for 8086 Microprocessor
- Ability to determine the program for Interfacing
- Ability to write a program for 8051 Microcontroller
- Design and implement 8051 microcontroller based systems
- To Understand the concepts related to I/O and memory interfacing

List of Experiments

1. Use of 8-bit and 32-bit Microcontrollers (such as 8051 Microcontroller, ARM2148 / ARM2378, LPC 2141/42/44/46/48), Microcontroller and C –compiler (Keil), Arduino IDE :
   I) Interface Input – Output and other units such as: Relays, LEDs, LCDs, Switches, keypads, Stepper Motors, Sensors, ADCs, Timers.
   II) Demonstrate Communications: RS232, IIC and CAN protocols,
   II) Develop Control Applications such as: Temperature controller, Elevator controller, Traffic Controller.

2. Development and Porting of Real time applications on to Target machines such as Intel or other Computers using any RTOS.
   I) Understanding Real Time Concepts using any RTOS through demonstration of:
      a)Timing
      b)Multi-tasking
      c)Semaphores
      d)Message Queues
      e)Round-Robin Task Scheduling
      f)Preemptive Priority based Task Scheduling
      g)Priority Inversion
      h)Signals
   II) Applications development using any RTOS:
      a)Any RTOS Booting.
      b)Application Development under any RTOS.

TEXT BOOKS:

1. Wayne Wolf: Computers as Components, Principles of Embedded Computing Systems Design, 2nd Edition, Elsevier, 2008.
2. Shibu K V: Introduction to Embedded Systems, Tata McGraw Hill, 2009 (Chapters 10, 13)

REFERENCES:

1. James K. Peckol: Embedded Systems, A contemporary Design Tool, Wiley India, 2008
2. Tammy Neorgaard: Embedded Systems Architecture, Elsevier, 2005.

16BECS501	Operating Systems	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To have a thorough knowledge of processes, scheduling concepts, memory management, I/O andfile systems in an operating system
- To have an overview of different types of operating systems
- To know the components of an operating system.
- To have a thorough knowledge of process management
- To have a thorough knowledge of storage management
- To know the concepts of I/O and file systems.

COURSE OUTCOMES:

- Understand device and I/O management functions in operating systems as part of a uniform
  device abstraction.
- Have an understanding of disk organization and file system structure.
- Be able to give the rationale for virtual memory abstractions in operating systems.
- Understand the main principles and techniques used to implement processes and threads as well as the different algorithms for process scheduling.
- Understand the main mechanisms used for inter-process communication.
- Understand the main problems related to concurrency and the different synchronization mechanisms available.

UNIT- I Introduction (9)

Introduction – OS Concepts- OS Structures- kernel, shell-Evolution of OS- Mainframe systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time Systems – Handheld Systems - Hardware Protection - System Components – Operating System Services – System Calls – System Programs - Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter-process Communication.

UNIT –II Scheduling (9)

Threads – Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors.

UNIT- III Deadlocks (9)

System Model – Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks - Storage Management – Swapping– Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging.

UNIT- IV Virtual Memory **(9)**

Virtual Memory – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing - File Concept – Access Methods – Directory Structure – File Sharing – Protection

UNIT- V File Systems **(9)**

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management. Kernel I/O Subsystems - Disk Structure – Disk Scheduling – Disk Management– Swap-Space Management. Case Study: The Linux System, Windows 2000 –Introduction -UNIX

Total Hours: 45

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne“ Operating Systems Concepts” John Wiley & Sons (ASIA) Pvt. Ltd.2011
2. Andrew S. Tanenbaum, Albert S Woodhull, “The MINIX Book- Operating Systems Design and Implementation,” 3rd Edition, Pearson Education Pvt Ltd., 2006.

REFERENCES:

1. Harvey M. Deitel, “Operating Systems” Pearson Education Pvt. Ltd, 2009.
2. Andrew S. Tanenbaum.” Modern Operating Systems”, Prentice Hall of India Pvt. Ltd, NewDelhi, 4th edition, 2014.

3. William Stallings, “Operating System”, Prentice Hall of India, 8th edition, 2014.

WEBSITES:

1. http://courses.cs.vt.edu/~csonline/OS/Lessons/index.html
2. www.ee.surrey.ac.uk/Teaching/Unix/

16BECS502	Computer Networks	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Understand the division of network functionalities into layers.
- Be familiar with the components required to build different types of networks
- Be exposed to the required functionality at each layer
- Learn the flow control and congestion control algorithms
- To introduce the concepts, terminologies and technologies used in modern days data communication and computer networking.
- To understand the concepts of data communications.

COURSE OUTCOMES:

- To understand the division of network functionalities into layers
- To understand the concepts of data communications
- To understand the working of router
- Able to identify the ports used for transferring and receiving data
- Able to identify the flow control mechanism to be adopted in transport layer
- Able to understand the functions of application layer

UNIT- I Fundamentals & Link layer (9)

Building a network - ISO / OSI model - Requirements - Layering and protocols - Internet Architecture - Network software - Performance ; Link layer Services - Framing - Error Detection - Flow control

UNIT –II Media access & Internetworking (9)

Media access control - Ethernet (802.3) - Wireless LANs - 802.11 - Bluetooth - Switching and bridging - Basic Internetworking (IP, CIDR, ARP, DHCP,ICMP)

UNIT –III Routing (9)

Routing (RIP, OSPF, metrics) - Switch basics - Global Internet (Areas, BGP, IPv6), Multicast - addresses - multicast routing (DVMRP, PIM)

UNIT- IV Transport layer (9)

Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission - TCP Congestion control - Congestion avoidance (DECbit, RED) - QoS - Application requirements

UNIT –V Application layer (9)

Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) - HTTP - Web Services - DNS – SNMP

Total Hours: 45

TEXT BOOKS:

1. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw
– Hill, 2011.
2. Andrew S. Tanenbaum, "Computer Networks", Fifth Edition, 2011
3. William Stallings, "Data and Computer Communication", Tenth Edition, Pearson Education, 2013

REFERENCES:

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.

2. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.

3. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.

4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.

WEBSITES:

1. http://www.freeprogrammingresources.com/tcp.html
2. http://www.mcmcse.com/cisco/guides/osi.shtml
3. http://compnetworking.about.com/od/vpn/a/vpn_tunneling.htm

16BECS503	Software Engineering	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the methodologies involved in the development and maintenance of software over its entire life cycle.
- To be aware of Different life cycle models and requirement dictation process
- To explain the various effective software engineering processes
- To explain design, cost and principles in a software engineering describe different projects of software testing
- To discuss ways of back tracking effectively to improve the current functionalities using appropriate software measures

COURSE OUTCOMES:

- Plan and deliver an effective software engineering process, based on knowledge of widely used development lifecycle models.
- Employ group working skills including general organization, planning and time management and inter-group negotiation.
- Translate a requirements specification into an implementable design, following a structured and organised process.
- Formulate a testing strategy for a software system, employing techniques such as unit testing, test driven development and functional testing.
- Evaluate the quality of the requirements, analysis and design work done during the module.
- Able to back track effectively to improve the current functionalities using appropriate software measures

UNIT –I Software Process (9)

Introduction –S/W Engineering Paradigm – life cycle models (water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented) - system engineering – computer based system – verification – validation – life cycle process – development process –system engineering hierarchy.

UNIT- II Software Requirements (9)

Functional and non-functional - user – system –requirement engineering process – feasibility studies – requirements – elicitation – validation and management – software prototyping – prototyping in the software process – rapid prototyping techniques – user interface prototyping - S/W document. Analysis and modelling – data, functional and behavioural models – structured analysis and data dictionary.

UNIT- III Design Concepts and Principles (9)

Design process and concepts – modular design – design heuristic – design model and document. Architectural design – software architecture – data design – architectural design – transform and transaction mapping – user interface design – user interface design principles. Real time systems – Real time software design – system design – real time executives – data acquisition system –

monitoring and control system.

UNIT- IV Testing (9)

Taxonomy of software testing – levels – test activities – types of s/w test – black box testing – testing boundary conditions – structural testing – test coverage criteria based on data flow mechanisms – regression testing – testing in the large. S/W testing strategies – strategic approach and issues - unit testing– integration testing – validation testing – system testing and debugging.

UNIT- V Software Project Management (9)

Measures and measurements – S/W complexity and science measure – size measure – data and logic structure measure – information flow measure. Software cost estimation – function point models – COCOMO model- Delphi method. - Defining Task Network – Scheduling – Earned Value Analysis – Error Tracking - Software changes- program evolution dynamics- software maintenance – Risk management -Architectural evolution.

Total Hours: 45

TEXT BOOKS:

1. Roger S.Pressmen, "Software Engineering : A Practitioner's Approach", McGraw-Hill International Edition,4th edition,2014
2. Ian Sommerville, "Software engineering", Pearson education Asia,9th edition,2011

REFERENCES:

1. Fundamentals of software engineering, Rajib Mall Phi learning pvt. Ltd,4th edition,2014
2. PankajJalote," An Integrated Approach to Software Engineering", Springer Verlag,3rd edition,2010
3. James F Peters and WitoldPedryez," Software Engineering – An Engineering Approach", John Wiley and Sons, New Delhi,2007

WEBSITES:

1. http://www.testingbrain.com/WHITEBOX/WHITE_BOX_Testing.html
2. http://www.cs.drexel.edu/~spiros/teaching/CS576/slides/control-testing.pdf

		L	T	P	C
16BECS511	**Computer Networks Lab**	**0**	**0**	**3**	**2**

COURSE OBJECTIVES:

- Understand fundamental underlying principles of computer networking
- Understand details and functionality of layered network architecture
- Apply mathematical foundations to solve computational problems in computer networking

- Utilizing Network tools and simulator
- Explain computer networking concepts and vocabulary
- Explain the concept of protocols

COURSE OUTCOMES:

- Understand fundamental underlying principles of computer networking
- Understand details and functionality of layered network architecture
- Apply mathematical foundations to solve computational problems in computer networking
- Understands computer networking concepts and vocabulary
- Understands the concept of protocols
- Utilizing Network tools and simulator

LIST OF EXPERIMENTS

1. Implementation of Sliding Window Protocol.
2. Study of Socket Programming and Client - Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands
5. Create a socket for HTTP for web page upload and download.
6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting .
8. Applications using TCP Sockets like Echo client and echo server
9. Applications using TCP and UDP Sockets like File Transfer
10. Study of Network simulator (NS3), Wireshark

Total Hours: 45

16BECS512 **Operating Systems Lab**

L	T	P	C
0	0	3	2

COURSE OBJECTIVE:

- Grasp a fundamental understanding of computer and operating systems
- Explain various Identify the services provided by operating system
- Learn basic shell programming
- Understand memory management
- Understand process concurrency and synchronization
- Learn the scheduling policies of operating systems

COURSE OUTCOMES:

- Identify the services provided by operating system
- Able to write programs on Shell Script
- Understand the internal structure of an operating system and be able to write programs
- Understand and solve problems involving key concepts and theories in operating systems
- Able to implement scheduling algorithms
- Able to understand the memory management concepts

LIST OF EXPERIMENTS

(Implement the following on LINUX platform. Use C for high level language implementation)

1. Shell programming
    - command syntax
    - write simple functions
    - basic tests
2. Shell programming
    - loops
    - patterns
    - expansions
    - substitutions
3. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
5. Write C programs to simulate UNIX commands like ls, grep, etc.
6. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time
7. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time
8. Implement the Producer – Consumer problem using semaphores.
9. Implement some memory management schemes – I
10. Implement some memory management schemes – II
11. Case study: “awk” Scripting Language

Total Hours: 45

16BECS513	**Case Tools Lab**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**2**

COURSE OBJECTIVES:

- Practicing the different types of case tools such as Rational Rose / other Open Source to beused for all the phases of Software development life cycle.
- Learn the basics of OO analysis and design skills.
- Be exposed to the UML design diagrams.
- Learn to map design to code.
- Be familiar with the various testing techniques
- To discuss definition, formulation and analysis of a problem

COURSE OUTCOMES:

- The students understands the process to be followed in the software development life Cycle
- find practical solutions to the problems
- solve specific problems alone or in teams
- manage a project from beginning to end
- work independently as well as in teams
- define, formulate and analyze a problem

LIST OF EXPERIMENTS

1. Implementation of Student Marks Analyzing System
2. Implementation of Quiz System
3. Implementation of Online Ticket Reservation System
4. Implementation of Payroll System
5. Implementation of Course Registration System
6. Implementation of Expert Systems
7. Implementation of ATM Systems
8. Implementation of Stock Maintenance

Total Hours: 45

16BECS601	Compiler Design	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- At the end of the course the student will be able to design and implement a simple compiler.
- To understand, design and implement a lexical analyzer.Explain how to build lexical analyzers and use them in the construction of parsers;
- To understand, design and implement a parser.
- To understand various grammars of a programming langugage
- To understand, design code generation schemes
- To discuss methods to design and Implement a simple compiler

COURSE OUTCOMES:

On completion of the course, the students will be able to:

- build lexical analyzers and use them in the construction of parsers;
- express the grammar of a programming language;
- build syntax analyzers and use them in the construction of parsers;
- perform the operations of semantic analysis;
- discuss the merits of different optimization schemes.
- Able to design and Implement a simple compiler

UNIT- I Introduction to compiling (9)

Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens.

UNIT- II Syntax Analysis (9)

Role of the parser –Writing Grammars –Context-Free Grammars – Top Down parsing – Recursive Descent Parsing – Predictive Parsing – Bottom-up parsing – Shift Reduce Parsing – Operator Precedent Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser.

UNIT –III Intermediate code generation (9)

Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – Procedure calls.

UNIT- IV Code generation (9)

Issues in the design of code generator – The target machine – Runtime Storage management – Basic Blocks and Flow Graphs – Next-use Information – A simple Code generator – DAG representation of Basic Blocks – Peephole Optimization.

UNIT- V Code optimization and run time environments (9)

Introduction– Principal Sources of Optimization – Optimization of basic Blocks – Introduction to Global Data Flow Analysis – Runtime Environments – Source Language issues – Storage Organization – Storage Allocation strategies – Access to non-local names – Parameter Passing.

Total Hours: 45

TEXT BOOKS:

1. Compilers Principles, Techniques and Tools, Alfred Aho, Ravi Sethi, Jeffrey D Ullman, Pearson Education Asia, 2nd edition,2013

2. Compiler Design in C, Allen I. Holub, Prentice Hall of India, 2006.

REFERENCES:

1. Engineering a Compiler, Keith Cooper and Linda Torczon, 2nd Edition, 2011.
2. Introduction to Compiler Techniques, Bennet.J.P, Tata McGraw-Hill, 2007

3. Lex&Yacc , John R. Levine, Tony Mason, Doug Brown, 2nd edition (October 1992) O'Reilly & Associates.

4. Compiler Construction: Principles and Practice, Kenneth C. Louden, Thompson Learning. 2006

WEBSITES:

1. http://www.tenouk.com/ModuleW.html
2. http://www.mactech.com/articles/mactech/Vol.06/06.04/LexicalAnalysis /index.html

16BECS602A	Network Security	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Information Security and its model.
- To learn the legal, ethical and professional issues in Information Security
- To understand the need of risk management and risk control.
- To study the critical need for ensuring Information Security in Organizations.
- To learn the security policy, standards and security analyzing tools.
- To discuss about the CIA triad of Confidentiality, Integrity and Availability

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Analyze the appropriate techniques to tackle and solve problems in the discipline of information security management.
- Gain the knowledge of security and its management for any modern organization.
- Develop an understanding of security policies to implement, such policies in the form of message exchanges.
- Develop security management system should be planned, documented, implemented and improved, according to the security standard on information security management.
- Use and Examine the threats by security analysis tools
- Understand the CIA triad of Confidentiality, Integrity and Availability

UNIT I Conventional and Modern Encryption **(9)**

Model of network security – Security attacks, services and attacks – OSI security architecture – Classical encryption techniques – SDES – Block cipher Principles- DES – Strength of DES - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – RC5 - Differential and linear crypto analysis – Placement of encryption function – traffic confidentiality

UNIT II Public Key Encryption **(9)**

Number Theory – Prime number – Modular arithmetic – Euclid‟s algorithm – Fermet‟s and Euler‟s theorem – Primality – Chinese remainder theorem – Discrete logarithm – Public key cryptography and RSA – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve cryptography

UNIT III Authentication **(9)**

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – MD5 – SHA - HMAC – Digital signature and authentication protocols – DSS

UNIT IV Security Practice **(9)**

Authentication applications – Kerberos – X.509 Authentication services - E-mail security – IP security - Web security

UNIT V System Security **(9)**

Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security

Total Hours: 45

TEXT BOOKS:

1. William Stallings, "Cryptography & Network Security", Pearson Education, 4th Edition 2010.

REFERENCES:

1. Charlie Kaufman, Radia Perlman, Mike Speciner, " Network Security, Private communication in public world" PHI 2nd edition 2002
2. Bruce Schneier, Neils Ferguson, "Practical Cryptography", Wiley Dreamtech India Pvt Ltd, 2003
3. Douglas R Simson "Cryptography – Theory and practice", CRC Press 1995 India Pvt. Ltd., 2006

16BECS602B **Mobile and Pervasive Computing** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Understand the advanced concepts of wireless mobile networks
- Apply transactions for complex model
- Explore the modern design structures of pervasive computing
- Analyze various advanced mobile network models
- Discuss the pervasive computing application device
- Discuss the process to propose solutions with comparisons for problems related to pervasive computing system through investigation.

COURSE OUTCOMES:

- Outline the basic problems, performance requirements of pervasive computing applications
- Understand the trends of pervasive computing and its impacts on future computing applications and society.
- Analyze and compare the performance of different data dissemination techniques
- Understand the algorithms for mobile real-time applications
- Analyze the performance of different sensor data management and routing algorithms for sensor networks.
- Develop an attitude to propose solutions with comparisons for problems related to pervasive computing system through investigation.

UNIT I Introduction to Mobile Computing (9)

obility of bits and bytes – Wireless the beginning – Mobile computing- Dialogue control- Networks– Middleware and gateways- Application and services- Developing mobile computing applications-Security- Standards- Players in wireless space- Architecture for mobile computing- Three tier architecture- Design considerations-Mobile computing through internet-Making existing applications mobile enabled-Developing IVR application.

UNIT II Mobile Technologies (9)

Emerging technologies: Bluetooth-Radio frequency identification- Wireless broadband-Mobile IP-Internet protocol version 6-Java card- GSM- Short message services- General packet radio services: Packet data network Architecture-Operations-Data services-Application for GPRS-Limitations of GPRS-Wireless application protocol CDMA and 3G.

UNIT III Mobile Networking Wireless (9)

LAN advantage-Standards-Architecture-Mobility-Deploying-Mobile Ad Hoc networks and sensor networks-Security- Wi Fi verses 3G-Internet networks and interworking: Fundamentals of call processing – Intelligence in the networks-SS #7 signaling-IN conceptual model-Soft switch-Programmable networks-Client programming.

UNIT IV Introduction to Pervasive Computing (9)

Introduction to pervasive computing: Scenarios–Roaming environment-Pervasive computing infrastructure Personalized services – Pervasive computing market- m-business- Applications examples-Hardware - Human - Machine interfaces biometrics and Operating systems-Java for pervasive devices.

UNIT V Pervasive Computing Application Device (9)

Connectivity – Protocols, security and device management - Pervasive web application architecture– Transcoding –Client authentication via internet- WAP and beyond - Voice technology: Speech application–Personal digital assistants: Device- Operating systems-Characteristics-Software components-Standards-Mobile applications.

Total Hours - 45

TEXT BOOKS:

1. Asoke K Talukder and Poopa R Yavagal, Mobile Computing,Tata McGraw-Hill,2nd edition,2010.
2. JochenBuekhardt, Horst Henn, Stefan Hepper, Klaus Rintdorff and Thomas Schack, Pervasive Computing:Technology and architecture of mobile internet applications,Pearson Education,2009.

REFERENCES:

1. Reza B Fat and Roy T Fielding, Mobile Computing Principles, Cambridge University Press, 2010.
2. HansmannUwe, MerkLothar and Nicklous Mart, Pervasive Computing: The Mobile World, Springer Professional, 2011.
3. Chimay J, Anumba and Xiangyu Wang, Mobile and Pervasive Computing,

Springer Professional, 2012.

		L	**T**	**P**	**C**
16BECS603	**Artificial Intelligence**				
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- Artificial Intelligence aims at developing computer applications, which encompasses
- perception, reasoning and learning and to provide an in-depth understanding of majortechniques used to simulate intelligence.
- To provide a strong foundation of fundamental concepts in Artificial Intelligence
- To provide a basic exposition to the goals and methods of Artificial Intelligence
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning.
- To discuss the techniques based on probability theory and possibility theory

COURSE OUTCOMES:

- Understand the history, development and various applications of artificial intelligence
- Familiarize with propositional and predicate logic and their roles in logic programming;
- Understand the programming language Prolog and write programs in declarativeprogramming style;
- Learn the knowledge representation and reasoning techniques in rule-based systems, case based systems, and model-based systems;
- Appreciate how uncertainty is being tackled in the knowledge representation and reasoningprocess, in particular,
- Interpreted the techniques based on probability theory and possibility theory (fuzzylogic);

UNIT I Introduction and Problem Solving (9)

Introduction – Foundations of AI – History of AI – Intelligent agent – Types of agents - Structure – Problem solving agents – Uninformed search strategies – Breadth first search – Uniform cost search– Depth first search –Depth limited search – Bidirectional search – Searching with partial Information.

UNIT II Informed Search and Game Playing (9)

Informed search – Strategies – A* Heuristic function – Hill Climbing – Simulated Annealing – Constraint Specification problem – Local Search in continuous space – Genetic algorithm – Optimal decisions in games - Pruning- Imperfect decisions –Alpha-Beta pruning – Games that include an element of chance.

UNIT III Knowledge and Reasoning (9)

Knowledge based agent – The Wumpus world environment – Propositional logic – Inference rules – First-orderlogic – Syntax and semantics – Situation calculus – Buliding a knowledge base – Electronic circuit domain – Ontology– Forward and backward chaining – Resolution – Truth maintenance system.

UNIT IV Acting Logically (9)

Planning – Representation of planning – Partial order planning –Planning and acting in real world – Acting under uncertainty – Bayes's rules – Semantics of Belief networks – Inference in Belief networks – Making simple decisions – Making complex decisions.

UNIT V Learning and Communication (9)

Learning from observation – Learning decision trees –Ensemble learning – Learning general logical descriptions – Computational learning theory – Neural networks – Applications – Reinforcement learning– Passive reinforcement – Active reinforcement – Communication as action – Types of communicating agents – Parsing – DCG – Semantic interpretation.

Total hours:45

TEXT BOOKS:

1. Stuart J.Russel, Peter Norvig, "Artificial Intelligence A Modern Approach", Pearson Education, 2010.

REFERENCES:

1. Elaine Rich, Kevin Knight, "Artifical Intelligence", 2nd Edition, Tata McGraw Hill, 2001.

16BECS604A	Data Warehousing and Data Mining	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To serve as an introductory course to under graduate students with an emphasis on the design aspects of Data Mining and Data Warehousing
- To introduce the concept of data mining with in detail coverage of basic tasks, metrics, issues, and implication.
- To introduce the concept of data warehousing with special emphasis on architecture and design.
- Core topics like classification, clustering and association rules are exhaustively dealt with.
- Various association rules are to be discussed.
- Discuss recent trends in data mining

COURSE OUTCOMES:

- Understand why there is a need for data warehouse in addition to traditional operational database system
- Identify components in typical data warehouse architectures
- Understand why there is a need for data mining and in what ways it is different fromtraditional statistical techniques
- Understand the details of different algorithms
- Solve real data mining problems to find interesting patterns
- Understand a typical knowledge discovery process

UNIT I DATA WAREHOUSING (9)

Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

UNIT II BUSINESS ANALYSIS (9)

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools–OLAP Tools and the Internet.

UNIT III DATA MINING (9)

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.

UNIT IV ASSOCIATION RULE MINING AND CLASSIFICATION (9)

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Backpropagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction - Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range using WEKA

UNIT V CLUSTERING AND APPLICATIONS AND TRENDS IN DATA MINING (9)

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods - K- means – Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications.Use WEKA for cleaning and integration

Total hours:45

TEXT BOOKS:

1.Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2.Jiawei Han and MichelineKamber, "Data Mining Concepts and Techniques", Second Edition, Elsevier, 2007.

REFERENCES:

1.Pang-Ning Tan, Michael Steinbach and Vipin Kumar, " Introduction To Data Mining", Person Education, 2007.
2.K.P. Soman, ShyamDiwakar and V. Ajay ", Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3.G. K. Gupta, " Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4.Daniel T.Larose, "Data Mining Methods and Models", Wile-Interscience, 2006.

16BECS604B	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamentals of object modeling
- To understand and differentiate Unified Process from other approaches.
- To design with static UML diagrams.
- To design with the UML dynamic and implementation diagrams.
- To improve the software design with design patterns.
- To test the software against its requirements specification

COURSE OUTCOMES:

- At the end of the course, the students will be able to:
- Express software design with UML diagrams
- Design software applications using OO concepts.
- Identify various scenarios based on software requirements
- Transform UML based software design into pattern based design using design patterns
- Understand the various testing methodologies for OO software

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UNIT- I INTRODUCTION (9)

An Overview of Object Oriented Systems Development - Object Basics – Object Oriented Systems Development Life Cycle.

UNIT- II OBJECT ORIENTED METHODOLOGIES (9)

Rumbaugh Methodology - Booch Methodology - Jacobson Methodology - Patterns – Frameworks – Unified Approach – Unified Modeling Language – Use case - class diagram - Interactive Diagram - Package Diagram - Collaboration Diagram - State Diagram - Activity Diagram.

UNIT- III OBJECT ORIENTED ANALYSIS (9)

Identifying use cases - Object Analysis - Classification – Identifying Object relationships - Attributes and Methods.

UNIT- IV OBJECT ORIENTED DESIGN (9)

Design axioms - Designing Classes – Access Layer - Object Storage - Object Interoperability.

UNIT- V SOFTWARE QUALITY AND USABILITY (9)

Designing Interface Objects – Software Quality Assurance – System Usability - Measuring User Satisfaction

Total hours:45

TEXT BOOKS:

1. Ali Bahrami Object Oriented Systems Development Tata McGraw- Hill 2008
2. Martin Fowler Martin Fowler PHI/Pearson Education 2007

REFERENCES:

1. Stephen R. Schach Introduction to Object Oriented Analysis and Design Tata McGraw-Hill 2003
2. James Rumbaugh, Ivar Jacobson, Grady Booch The Unified Modeling Language Reference Manual Addison Wesley 2005
3. Hans-Erik Eriksson, Magnus Penker, Brain Lyons, David Fado UML Toolkit OMG Press Wiley Publishing Inc 2004

16BECS611	PYTHON PROGRAMMING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To learn how to use and manipulate several core data structures: Lists, Dictionaries, Tuples, and Strings.
- To study decision structures and loops
- To understand the process and skills necessary to effectively deal with problem solving in relation to writing programs.
- To understand the process and skills necessary to effectively deal with problem solving
- To discuss in relation to writing programs.
- To study various program object and graphics based on python

COURSE OUTCOMES:

Upon completion of the course, students will be able to:

- Develop algorithmic solutions to simple computational problems Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries
- Read and write data from/to files in Python Programs.
- Understand various program object and graphics based on python

Theory Introduction and overview (10)

Introduction, What is Python, Origin, Comparison, Comments, Operators, Variables and Assignment, Numbers, Strings, Lists and Tuples, Dictionaries, if Statement, while Loop, for Loop and the range() Built-in Function, Files and the open() Built-in Function, Errors and Exceptions, Functions, Classes, Modules. Syntax and Style Statements and Syntax, Variable Assignment, Identifiers, Basic Style Guidelines, Memory Management, Python Application Examples.

LIST OF EXPERIMENTS:

1. Create a calculator program.
2. Explore String functions.
3. Implement sequential search.
4. Implement Selection sort.
5. Implement Stack.
6. Creating a CSV File based on user input.
7. Reading a CSV File already created and check for a specific pattern.

Total Hours: 45

REFERENCES:

1. Mark Lutz, “Programming Python”, O'Reilly Media, 4th edition, 2010.
2. Mark Lutz, “Learning Python”, O'Reilly Media, 5th Edition, 2013.
3. Tim Hall and J-P Stacey, “Python 3 for Absolute Beginners”, Apress, 1st edition, 2009.
4. Magnus Lie Hetland, “Beginning Python: From Novice to Professional”, Apress, Second Edition, 2005.
5. ShaiVaingast, “Beginning Python Visualization Crafting Visual Transformation Scripts”, Apress, 2nd edition, 2014.

16BECS612	**Artificial Intelligence Lab**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**2**

COURSE OBJECTIVES:

- Use various symbolic knowledge representations to specify domains
- To discuss reasoning tasks of a situated software agent.
- Use different logical systems for inference over formal domain representations
- To trace how a particular inference algorithm works on a given problem specification.
- Use key logic-based techniques in a variety of research settings
- To enable the student to apply these techniques in applications which involve perception, Reasoningand learning.

LEARNING OUTCOME:

Upon completion of the course, students will be able to:

- Communicate scientific knowledge at different levels of abstraction
- Implement Decision tree and Regression models
- Implement Ada Boosting
- Implement multi-layer perceptron, SVM and Random forests
- Implement PCA, Factor analysis and K-nearest neighbor
- Implement Hidden Markov modeling

LIST OF EXPERIMENTS:

1. Implementation of Decision tree
2. Implementation of Regression Models
3. Implementation of Multi-Layer Perceptron
4. Classification using SVM
5. Implementation of Ada Boosting
6. Bagging using Random forests
7. Implementation of PCA for Dimensionality Reduction
8. Implementation of Factor Analysis
9. Implementation of K-Nearest Neighbor
10. Implementation of Hidden Markov modeling

Total Hours: 45

16BECC701 PROFESSIONAL ETHICS, PRINCIPLES OF MANAGEMENTAND ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
	3	0	0	3

COURSE OBJECTIVE:

- To enable the students to create an awareness on engineering ethics, to install moral and social values and loyalty and to appreciate the rights of others
- To develop managerial and entrepreneurial skills our Culture and Ethics
- Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations.
- After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling.
- Student should understand concepts of directing and controlling
- To create an awareness and practice through Engineering Ethics and Human Values.

COURSE OUTCOMES:

- To Discuss and communicate the management evolution and how it will affect future managers.
- Identify and evaluate social responsibility and ethical issues involved in business situations and logically articulate own position on such issues.
- To Practice the process of management's four functions: planning, organizing, leading, and controlling.
- To evaluate leadership styles to anticipate the consequences of each leadership style.
- To understand the nature of professional responsibility and be able to identify the ethical elements in decisions.
- To develop critical thinking skills and professional judgment and understand practical difficulties of bringing about change.

UNIT I ENGINEERING ETHICS (9)

Senses of 'Engineering Ethics' – variety of moral issued – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – Models of Professional Roles – theories about right action – Self–interest – customs and religion – uses of ethical theories.

UNIT II FACTORS OF CHANGES (9)

Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws. Social changes – Meaning and nature – Theories.

UNIT III HISTORICAL DEVELOPMENT, PLANNING, ORGANISING (9)

Definition of Management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies and Planning Premises– Forecasting – Decision–making – Formal and informal organization – Organization Chart –.

UNIT IV DIRECTING AND CONTROLLING (9)

Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment –Process of Communication – System and process of Controlling – Requirements for effective control – Control of Overall Performance – Direct and Preventive Control – Reporting

UNIT V ENTREPRENEURSHIP AND MOTIVATION (9)

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

TEXT BOOKS:

1. Harold Koontz & Heinz Weihrich Essentials of Management Tata McGraw-Hill, New Delhi. 2008
2. Khanka S.S Entrepreneurial Development S.Chand& Co. Ltd. Ram Nagar, NewDelhi. 1999
3. Mike Martin and Roland Schinzinger Ethics in Engineering McGraw-Hill, NewYork. 2005

REFERENCES:

1. Tripathy P.C and Reddy P.N, Principles of Management Tata McGraw-Hill, New Delhi. 2007
2. Rabindra N Kanungo Entrepreneurship and innovation Sage Publications, New Delhi. 1998
3. Charles E Harris, Michael S. Protchard and Michael J Rabins Engineering Ethics – Concepts and Cases Wadsworth Thompson Learning, (Indian Reprint now available), New Delhi. 2000

WEBSITES:

1. http://www.managementstudyguide.com/taylor_fayol.htm
2. http://tutor2u.net/business/gcse/people_motivation_theories.htm
3. http://lfkkb.tripod.com/eng24/gilliganstheory.html
4. http://www.developingeyes.com/five-types-of-entrepreneurs/

16BECS702Internet and Web Technology

	L	T	P	C
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To learn the basic web concepts and Internet protocols.
- To understand CGI Concepts & CGI Programming.
- To familiarize with Scripting Languages.
- To discuss the concepts of DHTML
- To study XML, SERVELETS AND JSP.
- To discuss web pages based on various concepts of scripting, DHTML, XML, SERVELETS AND JSP.

COURSE OUTCOMES:

- Demonstrate an understanding of the components of a computer information networked system,
- To learn about application and software, communication protocols, and networking hardware and software.
- Create, install and update sophisticated web sites.
- Install and manage server software and other server side tools.
- Demonstrate critical thinking in the understanding, evaluation and application of technology solutions to a variety of real-life situations.
- Articulate ethical and professional standards as they apply to the use of the computer systems and computer based data.

UNIT-IIntroduction (9)

Internet Principles – Basic Web Concepts – Client/Server model – retrieving data from Internet – HTML and Scripting Languages – Standard Generalized Mark –up languages – Next Generation – Internet – Protocols and Applications.

UNIT-II Common gateway interface programming (9)

CGI Concepts – HTML tags Emulation – Server – Browser Communication – E-mail generation – CGI client Side applets – CGI server applets – authorization and security.

UNIT-III Scripting languages (9)

HTML – forms – frames – tables – web page design- XML - JavaScript introduction – control structures – functions – arrays – objects – simple web applications

UNIT-IV Dynamic HTML (9)

Dynamic HTML – introduction – cascading style sheets – object model and collections – event model – filters and transition – data binding – data control – ActiveX control – handling of multimedia data

UNIT-VServlets and JSP **(9)**

JSP Technology Introduction-JSP and Servelets- Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files- Support for the Model-View- Controller Paradigm- Case Study-Related Technologies.

Total Hours: 45

TEXT BOOKS:

1. Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", PearsonInternational, 2012, 4th Edition. (Ch-1,4,5,6,12,14,26,27)
2. UttamK.Roy, "Web Technologies", Oxford University Press, 2011.

REFERENCES:

1. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2011.(Ch- 1 to 11)
2. Paul Dietel and Harvey Deitel,"Java How to Program", Prentice Hall of India, 8th Edition.(Ch-29),2012
3. Mahesh P. Matha, "Core Java A Comprehensive study", Prentice Hall of India, 2011.
4. Thomno A. Powell," The Complete Reference HTML and XHTML", Tata McGraw Hill, 2008.

WEBSITES:

1. www.wileyindia.com/web-technologies-html-javascript-php-java-jsp-xml
2. www.comptechdoc.org/

16BECS711	Web Technology Lab	L	T	P	C
		0	0	3	2

COURSE OBJECTIVES:

- To learn the basic web concepts and Internet protocols.
- To develop web page using HTML
- To familiarize with Scripting Languages.
- To study DHTML, XML, SERVELETS AND JSP.
- Create, install and update sophisticated web sites.
- Install and manage server software and other server side tools.

COURSE OUTCOMES:

- The students will be able to design Web pages using HTML/XML and style sheets
- Able to use XML to store and forwarding data.
- Students will find the ease of implementation of a website and the role of servlets in creating the dynamic websites
- The students will be able to write Client Server applications
- The students will be able to create dynamic web pages using server side scripting.
- Able to create a complete Web Application with all the required modules.

LIST OF EXPERIMENTS

1. Develop a web page using HTML with containing map with hot spots that hyperlinks to related information.
2. Develop a web page and use various CSS formatting options on the text.
3. Develop a web page and use external CSS formatting with different formatting options than the ones" used in the previous experiment.
4. Develop a XSL parser for an XML document for data display.
5. Using CSS to format an XML Document
6. Develop a mechanism to validate user input at the client side using JavaScript.
7. Program to set a cookie using JavaScript
8. Develop a computer program that utilizes Java Applet technology to demonstrate some functions.
9. Developing a Java Applet that utilizes the Sound function and is included in the HTML document
10. Develop a mini web application of your choosing.

Total Hours: 45

16BECS801	Software Testing	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explain the basics of software testing
- To highlight the strategies for software testing
- To stress the need and conduct of testing levels
- To identify the issues in testing management
- To bring out the ways and means of controlling and monitoring testing activity
- To identify and write the test plan, design test cases, document test cases using an open source test management tool.

COURSE OUTCOMES:

- Understand complete software testing life cycle.
- Demonstrate understanding of various terms and technologies used in testing domain.
- Demonstrate understanding of usage of testing framework, process and test management.
- Demonstrate understanding of generating test plan and designing test cases
- Demonstrate understanding of test management process.
- Given a business scenario, identify and write the test plan, design test cases, document test cases using an open source test management tool.

UNIT- I Introduction (9)

Introduction to Testing – why and what,Why is testing necessary? What is testing? Role of Tester, Testing and Quality, Overview of STLC**,** Software Testing Life Cycle - V model**,** SDLC vs STLC, different stages in STLC, document templates generated in different phases of STLC, different levels of testing, different types of testing

UNIT -II Static Testing (9)

Static Testing**,** Static techniques, reviews, walkthroughs**,** Basics of test design techniques**,** various test categories, test design techniques for different categories of tests. Designing test cases using MS-Excel.

UNIT-III Test Management (9)

Test management**,** Documenting test plan and test case, effort estimation, configuration management, project progress management. Use of Testopia for test case documentation and test management.Defect management**,** Test Execution, logging defects, defect lifecycle, fixing / closing defects. Use of Bugzilla for logging and tracing defects.

UNIT- IVTest Data Management (9)

Test Data Management**,** Test Data Management –Overview, Why Test Data Management, Test Data Types, Need for Test Data Setup, Test Data Setup Stages, Test data management Challenges. Creating sample test data using MS-Excel**,** Basics of Automation testing**,** Introduction to automation testing, why automation, what to automate, tools available for automation testing

UNIT- V Basics of Automation Testing Using Selenium (9)

Basics of Automation testing using Selenium**,** Introduction to Selenium, using Selenium IDE for automation testing, using Selenium Web driver for automation testing, understanding TestNG framework with Selenium Web driver for automation testing

Total Hours: 45

TEXT BOOKS:

1. Rex Black, Managing the Testing Process (3rd edition), Wiley India Pvt Ltd (2009)

REFERENCES:

1. Rex Black, Erik Van Veenendaal, Dorothy Graham, Foundations of software testing (3rd Edition),Cengage Learning (2015)
2. Gauf Garrett Dustin, Implementing Automated Software Testing: How to Save Time and Lower Costs While Raising Quality (3rd edition), Addison-Wesley Professional (2009)

WEBSITES

1. http://docs.seleniumhq.org/docs/
2. http://www.seleniumhq.org/download/

VALUE ADDED COURSES

16BECC151HUMAN VALUES

L	T	P	C
1	0	0	-

Course Objectives

- To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
- To know the value of being a human being.
- To provide a much needed orientational input in value education to the young enquiring minds.
- To study the value of being a useful citizen.

Course Outcomes

- To involves a systematic and rational study of the human being vis-à-vis the rest of existence.
- To make free from any dogma or value prescriptions.
- To analysis process of self-investigation and self-exploration, and not of giving sermons.
- This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
- This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.
- To Educate the values and meaning of life in the young minds and to transform them as responsible citizens

(3)

UNIT I

Human life on Earth - Concept of Human Values - Value Education - Aim of education and value education - Types of values - Components of values – Attitudes – types of attitudes

UNIT II **(3)**

Self Development : Self analysis – Goal Setting - Thought Analysis – Guarding against Anger - Respect to age, experience, maturity, family members, neighbors, co-workers

UNIT III **(3)**

Individual Qualities – Truthfulness – Constructivity – Sacrifice – Sincerity - Self Control – Altruism – Tolerance - Scientific Vision – Regulating Desire

UNIT IV **(3)**

Mind Culture - Modern Challenges of Adolescent - Emotions and behavior - Sex and spirituality - Adolescent Emotions - Meditation

UNIT V **(3)**

Body and Mind Fitness : (a) Physical Exercises (b) Activities: (i) Moralization of Desires (ii) Neutralization of Anger (iii) Eradication of Worries (iv) Benefits of Blessings

Total hours: 15

REFERENCES

1. Subramanian. R Professional Ethics Oxford, New Delhi 2013
2. Govindarajan. M, Natarajan. S, Engineering Ethics Prentice Hall of India, New Delhi 2004
3. Tripathi. A.N Human Values New Age International 2009
4. Pope. G. U. Thirukkural with English Translation Uma Publication, Thanjavur. 2002

16BECS251INTRODUCTION TO PROGRAMMING WITH SCRATCH TOOL

	L	T	P	C
	2	0	0	-

COURSE OBJECTIVES:

- Study various tools like Text editor, Spread sheet and Power point presentation
- Determine methods to draw flowcharts and write Algorithms
- Provide methods to design and develop C problem solving skills
- Determine methods to trace and debug a program
- Determine methods to write C programs using functions and arrays
- Determine to use concepts of pointers,structures and files to write C programs

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Ability to use Text editor, Spread sheet and Power point presentation
- Ability to draw flowcharts and write Algorithms
- Ability to design and develop C problem solving skills
- Ability to trace and debug a program
- Ability to write C programs using functions and arrays
- Ability to use concepts of pointers,structures and files to write C programs

LIST OF EXPERIMENTS

1. Programming in Scratch:

   Practicing fundamental concepts of programming like sequence, selection decision statements, working of loops.

2. Practicing programs to get exposure Conditional statements, Switch Case, Control structures, function. event driven programming.

Total Hours: 30

16BECS351	PC Hardware Assembly and Trouble shooting	L	T	P	C
		1	1	0	-

COURSE OBJECTIVES:

- To study the basic parts of computer in detail
- Introduce various peripheral devices available for computer and its detailed working concepts
- Overview of various interfaces and other hardware overview
- Assemble/setup and upgrade personal computer systems and discuss about power supplies and the skills to trouble-shoot various power-related problems.
- To study basic concepts and methods in troubleshooting
- To study the installation/connectionand maintenance of computer and its associated peripherals.

COURSE OUTCOME:

Upon completion of this course, the student will be able to:

- Identify the main components for the PC, familiarize themselves with PC memories such as RAM and ROM devices and so on.
- Identify various peripheral devices available and its working
- Understand various concepts of hardware and its interface and control
- Perform basic installation of PC. Importance of maintenance is understood
- Understand Various faults and failures are identified and troubleshooting in detail
- Install or connect and maintain computer and its associated peripherals.

UNIT I Introduction **(6)**

Introduction - Computer Organization – Number Systems and Codes – Memory – ALU – CU – Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques– Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC and User.

UNIT II Peripheral Devices **(6)**

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices – FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNIT III PC Hardware Overview(6)

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC.

UNIT IV Installation and Preventive Maintenance **(6)**

Introduction – system configuration – pre installation planning – Installation practice – routine checks – PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery.

UNIT V Troubleshooting (6)

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LSI‶s – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.

Total Hours: 30

TEXT BOOK:

1. B. Govindarajalu, "IBM PC Clones Hardware, Troubleshooting and Maintenance", 2/E, TMH, 2002.

REFERENCES:

1. Peter Abel, NiyazNizamuddin, "IMB PC Assembly Language and Programming", Pearson

   Education, 2007
2. Scott Mueller, "Repairing PC's", PHI, 1992

16BECS451 **Mobile Application Development**

L	T	P	C
1	1	0	-

COURSE OBJECTIVES:

- Describe those aspects of mobile programming that make it unique from programming for other platforms
- Explain installation and working of Android
- Critique mobile applications on their design pros and cons
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
- Program mobile applications for the Android operating system that use basic and advanced phone features
- Deploy applications to the Android marketplace for distribution.

COURSE OUTCOMES:

- Ability to install Android in Eclipse
- Understanding of the Android environment to develop projects
- Ability to develop simple Android projects
- Understanding of the android widgets and inclusion of it in projects
- Ability to create android application for playing audio and video files
- Ability to deploy application to the android market place for distribution

LIST OF EXPERIMENTS

1. Installation of Android in eclipse and study of Android Development Tools, Components and Architecture.
2. Creating and Running Android Virtual Device (AVD)
3. Running Hello World Android Project
4. Working with different Android User Interface
5. A simple android application to study various android widgets like text box, buttons, toggle Buttons and Images
6. Working with Android Activity life cycle
7. Working with intents
8. Working with fragments

9. Working with TTS engine in Android
10. A simple android application for playing audio and video files

Total Hours: 30

16BECS561	SOFT SKILLS	L	T	P	C
		0	1	0	-

COURSE OBJECTIVES:

- To bring out behavioral changes among the trainees so that they develop interpersonal
- To inculcate communication, team building skills and leadership skills.
- It helps the min enhancing productivity and performance at the workplace.
- The training helps them to acquire employability skills so that they can get employment easily.
- The objective of this course is to enhance the problem solving skills in the areas of 'Quantitative Aptitude' and 'Reasoning' which will enable the students to achieve in Campus Placements and competitive examinations.
- To enable the students to give better presentation and explanation on their projects, posters and assignments – this makes them industry ready.

COURSE OUTCOMES:

- To solve basic and complex mathematical problems in short time.
- To perform well in various competitive exams and placement drives.
- To communicate with more confidence using better spoken and written English
- To give better presentation and explanation with the use of digital inventions
- During class time the students are expected to engage in group & pair work
- To perform well during Campus Drives and different Interviews

UNIT I **(4)**

Overview to communication, self introduction, Presentation on their own topic, Extempore, Group Activity

UNIT II **(3)**

Group Discussion, Do's and Don'ts of Group Discussion, Body language, Grooming and Resume, Resume correction

UNIT III **(4)**

Introduction to HRM – Questions - Do's and Don't's - Interview - Mock GD - Stress Management

UNIT IV **(4)**

Personality Development - Presentation skills, Interpersonal skills, Critical thinking, Confidence building and Stress management.

Total Hours:15

REFERENCES

1. Barun K Mitra Personality Development and Soft Skills Oxford University Press-New Delhi 2012
2. Rajiv K. Mishra Personality Development Rupa& Co. 2012

16BECS651 CCNA- Introduction to Networks

L	T	P	C
0	0	1	-

COURSE OBJECTIVES:

- To describe how networks impact our daily lives.
- To describe the role of data networking in the human network.
- To identify the key components of any data network.
- To describe network access, ethernet and network layers concept
- To describe the characteristics of network architectures: fault tolerance, scalability, quality of service and security.
- To devices that make up the network.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

- Identify and describe internet architecture, structure, functions, components, and models;
- Describe the use of OSI and TCP layered models;
- Identify and describe the nature and roles of protocols and services at the application, network, data link, and physical layers;
- Describe principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations;
- Build simple LAN topologies by applying basic principles of cabling, device configuration, and IP subnetting
- To develop the applications of networks

UNIT-1(3)

Exploring the Network: Globally Connected-LANs, WANs, and the Internet -The Network as a Platform-The Changing Network Environment, **Configuring a Network Operating System:** Introduction-IOS Bootcamp-Getting Basic-Addressing Schemes**, Network Protocols and Communications:** Rules of Communication-Network Protocols and Standards-Moving Data in the Network

UNIT-2(4)

Network Access: Physical Layer Protocols-Network Media-Data Link Layer Protocols-Media Access Control**, Ethernet:** Introduction-Ethernet Protocol -Address Resolution Protocol -LAN Switches, **Network Layer-** Network Layer Protocols- Routing-Routers-Configuring a Cisco Router

UNIT-3(4)

Transport Layer: Introduction-Transport Layer Protocols-TCP and UDP**, IP Addressing:** Introduction-IPv4 Network Addresses -IPv6 Network Addresses -Connectivity Verification, **Subnetting IP Networks:** Introduction-Subnetting IPv4 Network-Addressing Schemes-Design Considerations for IPv6

UNIT-4(4)

Application Layer: Introduction-Application Layer Protocols -Well-Known Application Layer Protocols and Service -The Message Heard around the World**, It's a Network:** Introduction-Create and Grow-Keeping the Network Safe-Basic Network Performance-Managing IOS Configuration Files-Integrated Routing Services

Total Hours:15

REFERENCES:

1. Todd Lammle , CCNA Routing and Switching Study Guide, Wiley; 1 edition, 2013.
2. Wendell Odom , Cisco Ccnet/CCNA Icnd1 100 - 101 Official Cert Guide, Pearson Education; 1 edition, 2013
3. Wendell Odom, Cisco CCNA Routing and Switching Icnd2 200 - 101 Official Cert Guide, Pearson Education; 1 edition, 2013.
4. Kevin Wallace, CCNP Routing and Switching ROUTE 300-101 Official Cert Guide, Cisco Press, 2014.

	L	T	P	C
16BECS751 CCNA–Routing and Switching Essentials	**0**	**0**	**1**	**-**

COURSE OBJECTIVES:

- To discuss the concepts of basic switched networks and configuration
- To describe the concepts of VLAN and routing concepts
- To describe Inter-VLAN Routing and static routing concepts
- To describes the architecture, components, and operation of routers, and explains the principles of routing and routing protocols.
- To analyze, configure, verify, and troubleshoot the primary routing protocols RIPv1, RIPv2, EIGRP, and OSPF.
- To Recognize and correct common routing issues and problems. Model and analyze routing processes.

LEARNING OUTCOMES:

Upon completion of this course the student will be able to:

- Describe the purpose, nature, and operations of a router; describe the purpose and nature of routing tables;
- Describe the purpose and procedure of configuring static routes;
- Develop Inter-VLAN Routing and static routing based applications
- Design and implement a classless IP addressing scheme for a given network;
- Describe the basis features and concepts of link-state routing protocols;
- Configure and verify basic RIPv1, RIPv2, single area OSPF, and EIGRP operations in a small routed network.

UNIT-1
(3)

Introduction to Switched Networks-Objectives-Key Terms-Introduction-LAN Design The Switched Environment. **Basic Switching Concepts and Configuration**-Objectives-Key Terms-Introduction-Basic Switch Configuration-Configure Switch Ports-Switch Security: Management and Implementation

UNIT-2 (3)

VLANs Objectives-Key Terms-Introduction-VLAN Segmentation-VLANs in a Multiswitched Environment-VLAN Implementations-VLAN Trunks-Dynamic Trunking Protocol-Troubleshoot VLANs and Trunks-VLAN Security and Design-Design Best Practices for VLANs **Routing Concepts**-Objectives-Key Terms-Introduction-Functions of a Router Connect Devices-Basic Settings on a Router-Verify Connectivity of Directly Connected-Networks Switching Packets Between Networks-Path Determination-Analyze the Routing Table-Directly Connected Routes-Statically Learned Routes- Dynamic Routing Protocols

UNIT-3 (3)

Inter-VLAN Routing-Objectives-Key Terms-Introduction-Inter-VLAN Routing Configuration-Configure Legacy Inter-VLAN Routing-Configure Router-on-a-Stick Inter-VLAN Routing Troubleshoot Inter-VLAN Routing-Layer 3 Switching-Troubleshoot Layer 3 Switching. **Static Routing**-Objectives-Key Terms-Introduction-Static Routing-Types of Static Routes-Configure IPv4 Static Routes-Configure IPv4 Default Routes-Configure IPv6 Static Routes -Configure IPv6 Default Routes-Review of CIDR and VLSM-CIDR-VLSM-Configure IPv6

UNIT-4 **(3)**

Routing Dynamically-Routing Dynamically-Dynamic Routing Protocol-Operation Dynamic Versus Static Routing-Routing Protocol Operating Fundamentals-Types of Routing Protocols - Distance Vector Routing Protocol Operation-Types of Distance Vector Routing Protocols-RIP and RIPng Routing-Configuring the RIPng Protocol-Link-State Dynamic Routing

Single-Area OSPF-Characteristics of OSPF-OSPF Messages-OSPF Operation-Configuring Single-Area-OSPFv2

UNIT-5 **(3)**

Access Control Lists-IP ACL Operation-Standard Versus Extended IPv4 ACLS-Wildcard Masks in ACLs-Guidelines for ACL Creation- Securing VTY Ports with a Standard IPv4 ACL-IPv6 ACLs.**DHCP**-Dynamic Host Configuration Protocol v4-Configuring a Basic DHCPv4 Server-Configure DHCPv4 Client-Troubleshoot DHCPv4. **Network Address Translationfor IPv4** - NAT Operation-Types of NAT-Benefits of NAT-Configuring NAT- Configuring Dynamic NAT Configuring- Port Address Translation (PAT)-Port Forwarding

Total Hours:15

REFERENCES:

1. Todd Lammle , CCNA Routing and Switching Study Guide, Wiley; 1 edition, 2013.
2. Wendell Odom , Cisco Ccnet/CCNA Icnd1 100 - 101 Official Cert Guide, Pearson Education; 1 edition, 2013
3. Wendell Odom, Cisco CCNA Routing and Switching Icnd2 200 - 101 Official Cert Guide, Pearson Education; 1 edition, 2013.
4. Kevin Wallace, CCNP Routing and Switching ROUTE 300-101 Official Cert Guide, Cisco Press, 2014

COMPUTER SCIENCE AND ENGINEERING

PROFESSIONAL ELECTIVES

16BECS5E01 **Advanced Data Structures**

L	T	P	C
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COURSE OBJECTIVES:

- To enhance the students' knowledge of advanced data structures and algorithmic analysis
- To enhance their expertise in designing and analyzing implementations of data structures for different kinds of problems using heap structures.
- To increase the ability to summarize advanced tree concepts.
- To understand problem solving and applications of Set & Graph Algorithms
- To learn and compute advanced geometric algorithms.
- To explain applications of advanced data structures

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Understand the advanced concepts of data structures and algorithms
- Apply data structures to design and analyze and to solve problems using heap structures.
- Solve problems using the classical algorithms and tree data structures.
- Develop various problem solving applications using Set & Graph Algorithms.
- Interpret and apply various advanced geometric algorithms
- Design and Implement advanced datastructure applications.

UNIT I Fundamentals (9)

Asymptotic Notations – Properties of Big-oh Notation –Conditional Asymptotic Notation – Algorithm Analysis – Amortized Analysis – Introduction to NP-Completeness/NP-Hard – Recurrence Equations – Solving Recurrence Equations

UNIT II Heap Structures (9)

Priority Queues-Min/Max heaps – Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps– lazy Binomial Heaps.

UNIT III Trees (9)

Counting Binary Trees-Huffman coding – Red-Black trees – Multi-way Search Trees –B-Trees – Splay Trees – Tries.

UNIT IV Set & Graph Algorithms (9)

Set ADT- Union & Find data structure and Applications- Graph traversals-DFS, BFS, Bi connected components, Cut vertices, Graph Matching, Network flow Problems

UNIT V Geometric Algorithms(9)

Segment Trees – 1-Dimensional Range Searching - k-d Trees – Line Segment Intersection – Convex Hulls - Computing the Overlay of Two Subdivisions - Range Trees – Voronoi Diagram.

Total Hours: 45

TEXT BOOKS:

1. T. Cormen, C. Leiserson, R. Rivest, C. Stein, Introduction to Algorithms, Prentice-Hall India, 2009.

2. Ellis Horowitz, SartajSahni, Susan Anderson Freed, Fundamentals of Data Structures in C, Second Edition, University Press, 2008

REFERENCES:

1. YedidyahLangsam, Moshe J. Augenstein, Aaron M. Tenenbaum, Data Structures using C and C++, Second Edition, PHI Learning Private Limited, 2010
2. AnanyLevitin, Introduction to The Design & Analysis of Algorithms, Pearson Education, 3rd Edition, New Delhi, 2014.
3. AhoHopcroft and Ullman, "Data Structures and Algorithms, Pearson Education,

   4th Edition,2009.

16BECS5E02 **Advanced Computer Architecture**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the advanced concepts of computer, its design and the design of computer design.
- To elaborate advanced concepts of computer architecture, Parallel Processing, inter-processor communication and synchronization.
- To learn various concepts of the Instruction Level parallelism and its issues.
- To understand the different multiprocessor and multi-core architectures.
- To explain multi- core architecture and memory hierarchy design
- To study the Memory and I/O systems and its optimization.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Demonstrate concepts of parallelism in hardware/software
- Understand the Concept of Parallel Processing and its applications
- Analyze the performance of different multiprocessor and multi-core architectures
- Develop the Pipelining Concept for a given set of Instructions
- Discuss memory organization and mapping techniques
- Describe architectural features of advanced processors.

UNIT I Pipelining and ILP (9)

Fundamentals of Computer Design - Measuring and Reporting Performance - Instruction Level Parallelism and Its Exploitation - Concepts and Challenges - Overcoming Data Hazards with Dynamic Scheduling – Dynamic Branch Prediction - Speculation - Multiple Issue Processors – Case Studies.

UNIT II Advanced Techniques for Exploiting ILP (9)

Compiler Techniques for Exposing ILP - Limitations on ILP for Realizable Processors - Hardware versus Software Speculation - Multithreading: Using ILP Support to Exploit Thread-level Parallelism - Performance and Efficiency in Advanced Multiple Issue Processors - Case Studies.

UNIT IIIMultiprocessors (9)

Symmetric and distributed shared memory architectures – Cache coherence issues - Performance Issues – Synchronization issues – Models of Memory Consistency - Interconnection networks – Buses, crossbar and multi-stage switches.

UNIT IV Multi-Core Architectures
(9)

Software and hardware multithreading – SMT and CMP architectures – Design issues – Case studies
– Intel Multi-core architecture – SUN CMP architecture – IBM cell architecture.- hp architecture.

UNIT V Memory Hierarchy Design
(9)

Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

Total Hours: 45

TEXT BOOKS:

1. John L. Hennessey and David A. Patterson, Computer Architecture A Quantitative Approach, Morgan Kaufmann, New York 2006

REFERENCES:

1. Sima D, Fountain.T, and Kacsuk.P, Advanced Computer Architectures A Design Space Approach, Addison Wesley, New York. 2005

2. Kai Hwang, Advanced computer architecture Parallelism Scalability Programmability, Tata McGraw Hill, New Delhi2004

3. Vincent P.Heuring, Harry F.Jordan, Computer System Design and Architecture, Addison Wesley, New York. 2008

4. William Stallings, Computer Organization and Architecture – Designing for Performance, Pearson Education, Seventh Edition 2006

16BECS5E03 **DESIGN PATTERNS** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- To Understand the concept of Design patterns and their importance
- To explain various kinds of design patterns
- To Understand the behavioral knowledge of the patterns
- To explain about catalogs
- To Relate the Creational, Structural , behavioral Design patterns
- To Apply the suitable design patterns to refine the basic design for given context

COURSE OUTCOMES:

Upon Completion of this course the student will be able to

- Identify the appropriate design patterns to solve object-oriented design problems
- Develop design solutions using creational patterns
- Able to design various types of patterns design
- Apply structural patterns to solve design problems using catalogs
- Construct design solutions using advanced patterns
- Construct a design consisting of a collection of modules.

UNIT I INTRODUCTION
(9)

History and Origin of Patterns – Applying Design Patterns – Prototyping –Testing.

UNIT II DESIGN PATTERNS
(9)

Kinds of Pattern – Quality and Elements – Patterns and Rules – Creativity and Patterns– Creational Patterns – Structural Patterns – Behavioral Patterns, Factory Patterns

UNIT III FRAMEWORKS
(9)

State and Strategy of Patterns. Singleton, Composite, Functions and the Command Patterns, Adaptor, Proxy Pattern, Decorator Pattern – Pattern Frameworks and Algorithms.

UNIT IV CATALOGS
(9)

Pattern Catalogs and Writing Patterns, Patterns and Case Study

UNIT V ADVANCED PATTERNS
(9)

Anti-Patterns - Case Studies In UML and CORBA, Pattern Community

Total Hours: 45

TEXT BOOKS:

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design Patterns: Elements of Reusable Object-oriented Software, Pearson Education, 2015
2. James W- Cooper, Java Design Patterns – A Tutorial, Addison-Wesley, 2015

REFERENCES:

1. Craig Larman, Applying UML and Patterns: An Introduction to object-oriented Analysis and Design and the unified, Process, Pearson Education India, 2014

2. Mowbray, Inside CORBA, Pearson Education India, 2014

16BECS5E04	Advanced Databases	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Introduce and describe current and emerging database models and technologies.
- To Design and implement relational database solutions for general applications.
- To Explain the query processing and techniques involved in query optimization
- To Explain common database administration tasks, such as database monitoring, performance tuning, data transfer, and security.
- explain tools required for current issues in databases
- To Understand the concepts, current practices and issues of data warehouses and databases.

COURSE OUTCOMES:

Upon Completion of this course the student will be able to

- Know recent developments and current trend in database models.
- Develop applications for various relational databases
- Learn and optimize query processing techniques
- Evaluate designs and architectures for databases and data warehouses
- Analyze and develop tools for current issues in databases
- Organize strategic data in an enterprise and build a data Warehouse

UNIT I Relational Model Issues (9)

ER Model – Normalization – Query processing – Query optimization – Transaction processing – Concurrency control – Recovery – Database tuning.

UNIT II Distributed Databases (9)

Parallel databases – Inter and intra query parallelism – Distributed database features – Distributed database architecture – Fragmentation – Distributed query processing – Distributed transactions processing – Concurrency control – Recovery – Commit protocols

UNIT III Object Oriented Databases (9)

Introduction to object oriented databases – Approaches – Modeling and design – Persistence – Query languages – Transaction – Concurrency – Multi version locks – Recovery – POSTGRES – JASMINE– GEMSTONE – ODMG model.

UNIT IV Emerging Systems (9)

Enhanced data models – Client/Server model – Data warehousing and data mining – Web databases – Mobile databases – XML and web databases.

UNIT V Current Issues

(9)

Rules – Knowledge bases – Active and deductive databases – Multimedia databases – Multimedia data structures – Multimedia query languages – Spatial databases.

Total Hours: 45

TEXT BOOKS:

1. Thomas Connolly and CarlolynBegg, "Database Systems, A Practical Approach to Design, Implementation and Management", Pearson Education 2009.

REFERENCES:

1. R. Elmasri, S.B.Navathe, "Fundamentals of Database Systems", 6thEdition,Pearson Education, 2011.

2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6 Edition, Tata McGraw Hill, 2010.

3. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", 8 Edition, Pearson Education, 2006.

		L	**T**	**P**	**C**
16BECS5E05	**Distributed Computing**				
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the fundamentals and acquire knowledge of the architectures of distributed systems.
- To gain knowledge of various remote procedure call models.
- To understand concepts of distributed shared memory systems.
- To make students aware about synchronization and management mechanism for distributed environment.
- To learn features of distributed file systems.
- To discuss the security aspects of distributed systems

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

- Understand the principles and desired properties of distributed systems based on different application areas.
- Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving.
- Learn the concepts of distributed shared memory systems.
- Analyze various synchronization and management techniques for distributed environment.
- Identify the features of distributed file systems.
- An ability to understand the security aspect of distributed systems.

UNIT I Fundamentals (9)

What is distributed computing systems – Evolution of distributed computing systems – Distributed computing system models – What is distributed operating system – Issues in designing distributed operating systems. Message passing – Features of a good message-passing system – Issues in IPC by message passing – Synchronization –Buffering – Multidatagram messages – Encoding and decoding of message data – Failure handling – Group communication.

UNIT II Remote Procedure Calls (9)

RPC Models –Transparency of RPC – Implementing RPC mechanism – Stub generation – RPC messages –Marshaling arguments & results – Server Management – Parameter-passing semantics – Call semantics – Communication protocols for RPCs – Complicated RPCs – Client server binding – Security – Special types of RPCs – Light weight RPC.

UNIT III Distributed Shared Memory (9)

General architecture of DSM systems – Design & implementation issues of DSM – Granularity –

Structure of shared memory space – Consistency models – Replacement strategy – Thrasing – Hetrogenous DSM – Advantages of DSM.

UNIT IV Synchronization and Management (9)

Synchronization – Clock synchronization – Mutual exclusion – Election algorithms – Deadlocks.-Resource Management – Task assignment approach – Load balancing approach – Load sharing approach - Process Management – Process migration – Threads.

UNIT V Distributed File Systems (9)

Desirable features of a good distributed file system – File models – File accessing models – File sharing semantics – File caching schemes – File replications – Fault tolerance – Atomic transaction.

Total Hours: 45

TEXT BOOK:

1. Andrew S.Tanenbaum, and Steen, Maarten van, “Distributed Systems”, 2nd Edition, Prentice Hall of India, 2007

REFERENCES:

1. Pradeep K Sinha, ”Distributed Operating Systems, Concepts & Design”, Prentice Hall of India, 2009.
2. Andrew S.Tanenbaum, ”Distributed Operating Systems”, Prentice Hall of India, 2005.

16BECS5E06	C# and .NET	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Learn the technologies of the .NET framework
- To Know the object oriented aspects of C#
- To Understand concepts of assemblies, interfaces and collections
- To apply application development in ADO.NET
- Learn web based applications on .NET(ASP.NET)
- To discuss about applications based on C# and .NET in Mobile Application Development.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to:

- List the major elements of .NET framework
- Explain how C# fits into the .NET platform
- Analyze and apply the concepts of assemblies, interfaces and collections
- Develop, debug, compile and run simple applications of C#
- Implement applications in ADO.NET
- To develop Assemblies and Deployment in .NET, Mobile Application Development.

UNIT I Introduction (9)

Overview of .NET – Advantages of .NET over the other languages – Overview of .NET binaries – Intermediate Language – Metadata – .NET Namespaces – Common language runtime – Common type system – Common language specification – C# fundamentals – C# class – object – string formatting – Types – scope – Constants – C# iteration – Control flow – Operators –

Array – String – Enumerations – Structures – Custom namespaces – Object oriented programming concepts –Class – Encapsulation – Inheritance – Polymorphic – Casting.

UNIT II Assemblies
(9)

Assemblies – Versioning – Attributes – Reflection – Viewing metadata – Type discovery – Reflecting on a type –Marshaling – Remoting – Understanding server object types – Specifying a server with an interface – Building a server – Building the client – Exception handling – Garbage collector.

UNIT III Interfaces and Collections
(9)

Interfaces and collections – Enumerator – Cloneable objects – Comparable objects – Collections – Indexes – Delegates – Events – Multithreaded programming. Programming with windows form controls – Windows form control Hierarchy – Adding controls – TextBox – CheckBoxes – RadioButtons – GroupBoxes – ListBoxes – ComboBoxes – TrackBar – Calender – Spin Control – Panel – ToolTips –ErrorProvider – Dialog Boxes.

UNIT IVIO Namespace and ADO .NET **(9)**

Input and output – Introduction to System. IO .namespace – File and folder operations – Stream class

– Introduction to ADO .NET – Building data table – Data view – Data set – Data relations
– ADO.NET managed providers – OleDb managed provider – SQL.

UNIT V ASP .NET and Web Services (9)

Web development and ASP.NET – Web applications and web servers – HTML form development – Client side scripting – GET and POST – ASP.NET application – ASP.NET namespaces – creating sample C# web Applications. Understanding Web Security – Windows authentication – Forms authentication – Web services – Web services – Web service clients – The City View application.

Total Hours: 45

TEXT BOOK:

1. Andrew Troelsen, "C# and the .NET Platform", A! Press, 6th edition, 2012.

REFERENCE:

1. Herbert Schildt, "The Complete Reference: C#", Tata McGraw-Hill, 3rd edition,2008.

16BECS5E07SERVLETS AND JSP

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Write servlets using the Java programming language (Java servlets)
- Understand and manage HTTP sessions in a web application
- Create servlet filters and listeners
- Write pages created with Java Server Pages technology (JSP pages)
- Create easy-to-maintain JSP pages using the Expression Language and the JSP Standard Tag Library (JSTL)
- Use integrated development environments (IDEs) and application servers for Java EE development and deployment

COURSE OUTCOMES:

- Construct and deploy small-to-medium scale web applications found in intranet and low-volume commercial sites by using JavaServer Page (JSP page) technology and servlets.
- Apply Model-View-Controller (MVC) architecture to projects in EE environments.
- Create servlet filters and listeners.
- Understand and manage HTTP sessions in a web application.
- Create easy-to-maintain JSP pages using Expression Language and the JSP Standard Tag Library (JSTL).
- Analyze, design, develop and deploy web applications with Java EE 6 SDK and the application server Oracle WebLogic Server

UNIT I SERVLETS (9)

Web Application - Java Servlets - Servlet Lifecycle - Servlet Context - Session management - Building the first Servlet - Deploying the Servlet

UNIT II INTRODUCTION TO JSP (9)

Introduction to Java Server Pages - Features of JSP - Basic HTML Tags - JSP Tag library - JSP Page Life cycle - Developing a Simple Java server Page - - JSP Processing Model - Comments and Character Coding - MVC architecture - 3-tier architecture - Advantages of JSP over competing technologies

UNIT III JSP SCRIPTING ELEMENTS AND DIRECTIVES (9)

Forms of Scripting Elements - Predefined Variables - Examples using Scripting Elements - JSP Directives - JSP Page Directive - JSP Include Directive

UNIT IV JSP ACTIONS AND CUSTOM TAGS (9)

JSP Actions - include Action - forward Action - plugin Action - Java Beans - Bean Related – Actions - Custom Tag - Types of Tags - Creating Custom Tags

UNIT V ADVANCE CUSTOM TAGS AND JSTL (9)

Introduction - Using Simple Tag - Using tag files - JSP Standard Tag Library – purpose JSTL - Using Expression Language - Using JSTL

Total Hours: 45

TEXT BOOKS:

1. Mahesh P. Matha, "JSP and Servlets: A Comprehensive Study", Prentice-Hall of India Pvt.Ltd, 2013.
2. Joel Murach and Michael Urban," Murachs Java Servlets & JSP ", 3rd Edition, 2014.
3.Giulio Zambon" Beginning JSP, JSF and Tomcat: Java Web Development", Apress Kindle edition, 2012.

REFERENCES:

1. Santosh Kumar K , "Jdbc, Servlets, And Jsp Black Book", Dreamtech Press , New edition 2008.
2. Panduranga, S.N., Goyal, "Beginning Jsp 2", Springer/A Press ,Edition1,2004.
3. Phil Hanna, "The Complete reference JSP 2.0", Tata McGraw-Hill Education, 2003.

WEBSITES:

1. www.jsptut.com/
2. www.**tutorial**spoint.com/**jsp**/
3. www.javatpoint.com/**jsp-tutorial**

16BECS5E08 **User Interface Design**

COURSE OBJECTIVES:

- To study the concept of menus, windows, interfaces.

- To study about business functions.
- To study the characteristics and components of windows.
- To study the various controls for the windows.
- To study about various problems in windows design with color, text, graphics
- To implement the basics and in-depth knowledge about UID. It enables the students to take upthe design the user interface, design, menu creation and windows creation and connection between menu and windows

COURSE OUTCOMES:

Upon Completion of the course, the students will be able:

- To demonstrate knowledge of some theories of design of user interfaces
- To demonstrate knowledge of different interaction styles
- To analyze a user interface from a communication perspective
- To demonstrate an awareness of the relation between interaction design and user expectations.
- To design the user interface, design, menu creation and windows creation and connection between menu and windows.
- To study the Testing Methods.

UNIT- I Introduction

Introduction- Importance-Human-Computer interface-characteristics of graphics interface-Direct manipulation graphical system - web user interface-popularity-characteristic & principles.

UNIT- II UI Design Process
(9)

User interface design process- obstacles-usability-human characteristics in design - Human interaction speed-business functions-requirement analysis-Direct-Indirect methods-basic business functions-Design standards-system timings - Human consideration in screen design - structures of menus - functions of menus-contents of menu-formatting -phrasing the menu - selecting menu choice-navigating menus-graphical menus.

UNIT- III UI Controls
(9)

Windows: Characteristics-components-presentation styles-types-managements-organizations-operations-web systems-device-based controls: characteristics-Screen -based controls: operate control - text boxes-selection control-combination control-custom control-presentation control.

UNIT- IVWeb Page Designing (9)

Text for web pages - effective feedback-guidance & assistance-Internationalization-aaccessibility-Icons-Image-Multimedia -coloring.

UNIT- V UI Tests
(9)

Windows layout-test: prototypes - kinds of tests - retest - Information search - visualization - Hypermedia - www - Software tools.

Total Hours: 45

TEXT BOOKS:

1. Wilbent. O. Galitz, The Essential Guide to User Interface Design, John Wiley& Sons, 2007

REFERENCES:

1. Ben Sheiderman, Design the User Interface, Pearson Education, 5th edition,2010
2. Alan Cooper, The Essential of User Interface Design, Wiley – Dream Tech Ltd,2002

16BECS6E01	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Internet of Things
- To get an idea of some of the application areas where Internet of Things can be applied
- To understand the middleware for Internet of Things
- To understand the concepts of Web of Things
- To understand the concepts of Cloud of Things with emphasis on Mobile cloud computing
- To understand the IOT protocols

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

- Understand the concepts of Internet of Things
- Identify and design the new models for various applications using IoT
- Design business intelligence and information security for WoB (Web of Things)
- Analyze various protocols for IoT
- Design a middleware for IoT
- Analyze and design different models for network dynamics

UNIT I INTRODUCTION
(**10)**

Definitions and Functional Requirements –Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT –IoT Information Security

UNIT II IOT PROTOCOLS
(8)

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols –
Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus – KNX – Zigbee Architecture – Network layer – APS layer – Security

UNIT III WEB OF THINGS (10)

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards

– Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture

UNIT IV INTEGRATED
(9)

Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things - Network Dynamics: Population Models – Information Cascades - Network Effects - Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small-World Phenomenon

UNIT V APPLICATIONS
(8)

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging

Total Hours: 45

TEXT BOOK:

1. The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press – 2012

REFERENCES:

1. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Eds.) – Springer – 2011

2. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press - 2010
3. The Internet of Things: Applications to the Smart Grid and Building Automation by - Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley -2012
4. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012

16BECS6E02 NETWORK ROUTING ALGORITHMS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To expose the students to the layered architecture for communication networks
- To explain about Internet Routing protocols
- To discuss specific functionality of the network layer.
- To enable the student to understand the basic principles of routing and implementation in conventional networks and the evolving routing algorithms based on Internetworking requirements, optical backbone and the wireless access part of the network.
- Explain about mobile ad –hoc networks
- To enable the student to understand the different routing algorithms existing and their performance characteristics.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

- Understand layered architecture and its significance.
- Learn network layer and various routing techniques available.
- Apply knowledge for identifying a suitable routing algorithm ,implementing it and analyzing its performance for any given network and user requirements and the type of channel over which the network has to operate,
- Design a new algorithm or modify an existing algorithm to satisfy the evolving demands in the network and by the user applications.
- Compare Routing techniques and protocols.
- Acquire the knowledge of how data transfer happen in conventional networks.

UNIT I Introduction
(7)

ISO OSI Layer Architecture, TCP/IP Layer Architecture, Functions of Network layer, General Classification of routing, Routing in telephone networks, Dynamic Non hierarchical Routing (DNHR), Trunk status map routing (TSMR), real-time network routing (RTNR), Distance vector routing, Link staterouting, Hierarchical routing.

UNIT II Internet Routing
(10)

Interior protocol : Routing Information Protocol (RIP), Open Shortest Path First(OSPF), Bellman Ford Distance Vector Routing. Exterior Routing Protocols: Exterior Gateway Protocol (EGP) and Border Gateway Protocol (BGP). Multicast Routing: Pros and cons of Multicast and Multiple Unicast Routing, Distance Vector Multicast Routing Protocol (DVMRP), Multicast

Open Shortest Path First (MOSPF), MBONE, Core Based Tree Routing.

UNIT III Routing In Optical Wdm Networks
(10)

Classification of RWA algorithms, RWA algorithms, Fairness and Admission Control, Distributed Control Protocols, Permanent Routing and Wavelength Requirements,Wavelength Rerouting-Benefits and Issues, Lightpath Migration, Rerouting Schemes, Algorithms- AG, MWPG.

UNIT IV Mobile - IP Networks
(9)

Macro-mobility Protocols, Micro-mobility protocol:Tunnel based : Hierarchical Mobile IP, Intra domain Mobility Management, Routing based: Cellular IP, Handoff Wireless Access Internet Infrastructure (HAWAII).

UNIT V Mobile Ad –Hoc Networks
(9)

Internet-based mobile ad-hoc networking communication strategies, Routing algorithms – Proactive routing: destination sequenced Distance Vector Routing (DSDV), Reactive routing: Dynamic Source Routing (DSR), Ad hoc On-Demand Distance Vector Routing (AODV), Hybrid Routing: Zone Based Routing (ZRP).

Total Hours: 45

TEXT BOOKS:

1. William Stallings, „High speed networks and Internets Performance and Quality of Service", 2nd Edition, Pearson Education Asia. Reprint India 2002

2. M. Steen Strub, „Routing in Communication network, Prentice –Hall International, Newyork, 1995.

REFERENCES:

1. S. Keshav, „An engineering approach to computer networking" Addison Wesley 1999.

2. William Stallings, „High speed Networks TCP/IP and ATM Design Principles, Prentice-Hall, New York, 1995

3. C.E Perkins, „Ad Hoc Networking", Addison – Wesley, 2001

4. Ian F. Akyildiz, Jiang Xie and ShantidevMohanty, “A Survey of mobility Management in Next generation-All IP- Based Wireless Systems”, IEEE Wireless

Communications
Aug.2004, pp 16-27.

5. A.T Campbell et al., “Comparison of IP Micro mobility Protocols,” IEEE Wireless Communications Feb.2002, pp 72-82.

6. C.Siva Rama Murthy and Mohan Gurusamy, “ WDM Optical Networks – Concepts, Design and Algorithms”, Prentice Hall of India Pvt. Ltd, New Delhi –2002.

16BECS6E03 **ADVANCED OPERATING SYSTEMS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To learn the advance concepts of Operating Systems
- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- To gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
- To know the components and management aspects of Real timeand Mobile operating systems
- To explain case studies in Linux, iOS and Android systems
- To explain real time operating systems

LEARNING OUTCOME:

Upon Completion of the course, the students will be able to:

- Discuss the various synchronization, scheduling and memory management issues
- Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
- Discuss the various resource management techniques for distributed systems components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
- Identify the different features of real time and mobile operating systems
- Install and use available open source kernel in Linux, iOS and Android systems
- Modify existing open source kernels in terms of functionality or features used.

UNIT I FUNDAMENTALS OF OPERATING SYSTEMS (9)

Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

UNIT II DISTRIBUTED OPERATING SYSTEMS (9)

Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT III DISTRIBUTED RESOURCE MANAGEMENT (9)

Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol – Security and Protection.

UNIT IV REAL TIME AND MOBILE OPERATING SYSTEMS (9)

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems – Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management – File system.

UNIT V CASE STUDIES (9)

Linux System: Design Principles - Kernel Modules - Process Management Scheduling – Memory Management - Input-Output Management - File System - Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer – File System.

Total Hours: 45

TEXT BOOK:

1. MukeshSinghal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.

REFERENCES:

1. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.
2. Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
3. Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2006.
4. Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media,

16BECS6E04 **VIDEO ANALYTICS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce big data & data analysis concepts
- To learn various techniques for mining data streams.
- To understand the models used for recognition of objects in videos.
- To learn Event Modeling for different applications.
- To acquire the knowledge of extracting information from surveillance videos.
- Discuss identification, analysis and applications of algorithm for developing real world problems

COURSE OUTCOMES:

- Work with big data platform and its analysis techniques.
- Understand the approaches for identifying and tracking objects and person with motion based algorithms.
- Understand the algorithms available for searching and matching in video content.
- Analyze approaches for action representation and recognition.
- Identify, Analyze and apply algorithms for developing solutions for real world problems.
- Design video analytic algorithms for business intelligence

UNIT I INTRODUCTION TO BIG DATA & DATA ANALYSIS(9)

Introduction to Big Data Platform – Challenges of Conventional systems – Web data- Evolution of Analytic scalability- analytic processes and tools- Analysis Vs Reporting- Modern data analytic tools- Data Analysis: Regression Modeling- Bayesian Modeling- Rule induction.

UNIT II MINING DATA STREAMS (9)

Introduction to Stream concepts- Stream data model and architecture – Stream Computing-Sampling data in a Stream- Filtering Streams- Counting distinct elements in a Stream-Estimating moments- Counting oneness in a window- Decaying window- Real time Analytics platform(RTAP) applications- case studies.

UNIT III VIDEO ANALYTICS (9)

Introduction- Video Basics - Fundamentals for Video Surveillance- Scene Artifacts - Object Detection and Tracking: Adaptive Background Modelling and Subtraction- Pedestrian Detection and Tracking-Vehicle Detection and Tracking- Articulated Human Motion Tracking in Low-Dimensional Latent Spaces

UNIT IV BEHAVIOURAL ANALYSIS & ACTIVITY RECOGNITION (9)

Event Modelling- Behavioural Analysis- Human Activity Recognition-Complex Activity Recognition- Activity modelling using 3D shape, Video summarization, shape based activity models- Suspicious Activity Detection

UNIT V HUMAN FACE RECOGNITION & GAIT ANALYSIS (9)

Introduction: Overview of Recognition algorithms – Human Recognition using Face: Face Recognition from still images, Face Recognition from video, Evaluation of Face Recognition

Technologies- Human Recognition using gait: HMM Framework for Gait Recognition, View Invariant Gait Recognition, Role of Shape and Dynamics in Gait Recognition

Total Hours: 45

TEXT BOOK:

1. Michael Berthold, David J.Hand, Intelligent Data Analysis, Springer, 2007.

REFERENCES:

1. AnandRajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
2. Yunqian Ma, Gang Qian, “Intelligent Video Surveillance: Systems and Technology”, CRC Press (Taylor and Francis Group), 2009.
3. Rama Chellappa, AmitK.Roy-Chowdhury, Kevin Zhou.S, “Recognition of Humans and their Activities using Video”, Morgan&Claypool Publishers, 2005.

16BECS6E05	Ad-Hoc Network	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn Ad-Hoc Wireless Networks, Issues, and Classification of MAC Protocols.
- To understand the different types of AdHoc Routing Protocols and TCP over AdHoc Protocol.
- To understand about Sensor Network Architecture, its Applications and MAC Protocols for sensor networks.
- To learn the Different Issues in Wireless Sensor Routing and also Indoor and outdoor Localization and Quality of Service in WSN.
- To learn Mesh Networks, IEEE 802.11s Architecture and different types of Mesh Networks.
- Investigation of different protocols and mobile/wireless networks.□□□

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Gain the knowledge of Ad-Hoc Network and its issues.
- Identify the basic problems, limitations, strengths and current trends of mobile computing
- Analyze the current wireless networking mechanisms for mobile computing
- Analyze and critique the performance of different networks and algorithms for mobile Computing
- Develop an attitude to propose solutions with comparisons for problems related to mobile computing
- Investigation of different protocols and mobile/wireless networks

UNIT I Ad-Hoc MAC (9)

Issues in Ad-Hoc Wireless Networks. MAC Protocols – Issues, Classifications of MAC protocols, Multi channel MAC & Power control MAC protocol.

UNIT II Ad-Hoc Network Routing & TCP (9)

Issues – Classifications of routing protocols – Hierarchical and Power aware. Multicast routing – Classifications, Tree based, Mesh based. Ad Hoc Transport Layer Issues. TCP Over Ad Hoc – Feedback based, TCP with explicit link, TCP-Bus, Ad Hoc TCP, and Split TCP.

UNIT III WSN –MAC (9)

Introduction – Sensor Network Architecture, Data dissemination, Gathering. MAC Protocols – self-organizing, Hybrid TDMA/FDMA and CSMA based MAC.

UNIT IVWSN Routing, Localization & QOS (9)

Issues in WSN routing – OLSR, AODV. Localization – Indoor and Sensor Network Localization. QoS in WSN.

UNIT V Mesh Networks (9)

Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture – Opportunistic routing – Self configuration and Auto configuration – Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks.

Total Hours: 45

TEXT BOOK:

1. C.Siva Ram Murthy and B.Smanoj, " Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2011.

REFERENCES:

1. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks”, Morgan Kaufman Publishers, 2004.
2. C.K.Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.

3. Thomas Krag and SebastinBuettrich, “Wireless Mesh Networking”, O‟Reilly Publishers, 2007

		L	T	P	C
16BECS6E06	Cloud Computing				
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basic concepts of cloud computing.
- To learn types of cloud services and its applications.
- To understand the key components of Amazon Web Services.
- To collaborate with real time cloud services.
- To understand the security risk and application of cloud computing.
- Discuss the assess the risks, opportunities, costs and steps towards migrating existing systems to service and cloud computing

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Define basic concepts of cloud computing.
- Use and Examine different cloud computing services.
- Understand and appreciate the technological impact of service and cloud computing for
- future enterprises, and the technologies underpinning it.
- Describe importance of virtualization along with their technologies
- Analyze the key components of Amazon web Service
- Review and assess the risks, opportunities, costs and steps towards migrating existingsystems to service and cloud computing.

UNIT- I Cloud Introduction (9)

Cloud Computing Fundamentals: Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing , usage scenarios and Applications, Business models around Cloud – Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus – Open Nebula, CloudSim.

UNIT-II Cloud Services and File System (9)

Types of Cloud services **:** Software as a Service - Platform as a Service – Infrastructure as a Service - Database as a Service - Monitoring as a Service – Communication as services. Service providers - Google App Engine, Amazon EC2, Microsoft Azure, Sales force. Introduction to MapReduce, GFS, HDFS, Hadoop Framework.

UNIT-IIICollaborating with Cloud **(9)**

Collaborating on Calendars, Schedules and Task Management – Collaborating on Event Management, Contact Management, Project Management – Collaborating on Word Processing ,Databases – Storing and Sharing Files- Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Collaborating via Social Networks – Collaborating via Blogs and Wikis.

UNIT-IV Virtualization for Cloud
(9)

Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.

UNIT-VSecurity, Standards, and Applications
(9)

Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

Total Hours: 45

TEXT BOOK:

1. John Rittinghouse& James Ransome, "Cloud Computing Implementation Management and Strategy", CRC Press, 2010.

REFERENCES:

1. Bloor R., Kanfman M., Halper F. Judith Hurwitz "Cloud Computing for Dummies" (Wiley India Edition), 2010.
2. Antohy T Velte , Cloud Computing : "A Practical Approach", McGraw Hill,2009.
3. Michael Miller, Cloud Computing: "Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, August 2008.
4. James E Smith, Ravi Nair, "Virtual Machines", Morgan Kaufmann Publishers, 2006.

		L	T	P	C
16BECS6E07	**Software Project Management**				
		3	0	0	3

L **T P C**

COURSE OBJECTIVES:

- understand the concepts of software process and its models
- To understand software metrics and measurement.
- To learn quality assurance and various tools used in quality management.
- To learn in detail about various quality assurance models.
- To understand the audit and assessment procedures to achieve quality.
- To discuss construction of a quality model for a software development project.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Understand in the context of software development projects, what approaches exist to manage the issues
- Identify the fundamental issues that a project manager has to consider, and describe, chiefly

  in the context of software development projects, what approaches exist to manage these issues

- Identify and analyze software project activities using contemporary work breakdown techniques

- Identify and apply selected techniques for estimating the effort and duration of project activities
- Construct a schedule of project activities using contemporary planning techniques

- Construct a quality model for a software development project, including identification of

  suitable quality attributes, suitable metrics for measuring these, and suitable threshold values for these metrics to indicate acceptable quality

UNIT I Software Process and People Management **(9)**

Process Maturity – Capability Maturity Model (CMM) – Variations in CMM - Productivity improvement process. Organization structure – Difficulties in people management - Effective team building – Role of Project manager - Team structures – Comparison of different team structures.

UNIT IISoftware Metrics **(9)**

Role of metrics in software development - Project metrics – Process metrics – Data gathering - Analysis of Data for measuring correctness, integrity, reliability and maintainability of Software products.

UNIT III Project Management **(9)**

Project initiation – Feasibility study - Planning - Estimation - Resource allocation
- RootCause Analysis.

UNIT IVRisk Management **(9)**

Risk analysis and management - Types of Risk involved - RMM plan.

UNIT VProject Scheduling and Tracking Software Configuration Management **(9)**

Scheduling - Critical path – Tracking - Timeline chart – Earned value chart. Baselines - Software configuration items - The SCM process- Version control- Change control -Configuration audit - SCM standards.

Total Hours:45

TEXT BOOK:

1. PankajJalote, "Software Project Management in practice", Pearson Education, New Delhi,
   2002.

REFERENCES:

1. Roger S Pressman, "Software Engineering, A Practitioner‟s Approach" McGraw Hill Edition,

   New Delhi, 8th edition, 2014.
2. Watts Humphrey, "Managing the Software Process ", Pearson Education, New Delhi, 2000.

16BECS6E08 **TCP / IP DESIGN AND IMPLEMENTATION**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the IP addressing schemes.
- To learn the fundamentals of network design and implementation
- To understand the design and implementation of TCP/IP networks
- To learn the network management issues
- To understand the design and implement network applications.
- Able to solve network management issues.

COURSE OUTCOME:

Upon completion of this course, the students will be able to:

- Design and implement TCP/IP networks.
- Explain network management issues.
- Develop data structures for basic protocol functions of TCP/IP.
- Apply the members in the respective structures.
- Design and implement data structures for maintaining multiple local and global timers.
- Able to solve network management issues.

UNIT- I INTRODUCTION
(9)

Internetworking concepts and architectural model- classful Internet address – CIDR-Subnetting and Supernetting –ARP- RARP- IP – IP Routing –ICMP – Ipv6

UNIT- II TCP
(9)

Services – header – connection establishment and termination- interactive data flow- bulk data flow-timeout and retransmission – persist timer - keepalive timer- futures and performance

UNIT- III IP IMPLEMENTATION
(9)

IP global software organization – routing table- routing algorithms-fragmentation and reassembly-error processing (ICMP) –Multicast Processing (IGMP)

UNIT- IV TCP IMPLEMENTATION I
(9)

Data structure and input processing – transmission control blocks- segment format- comparison-finite state machine implementation-Output processing- mutual exclusion-computing the TCP data length

UNIT- V TCP IMPLEMENTATION II (9)

Timers-events and messages- timer process- deleting and inserting timer event- flow control and adaptive retransmission-congestion avoidance and control – urgent data processing and push function.

Total Hours:45

TEXT BOOK:

1. Douglas E.Comer, Internetworking with TCP/IP Principles Protocols and Architecture (4^{th} edition), Pearson Education Asia, 2006

REFERENCES:

1. Forouzan, TCP/IP protocol suite (2^{nd} Edition), TMH, 2005
2. W.Richard Stevens, TCP/IP illustrated, Pearson Education, 2003

16BECS7E01	Managing Big Data	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explore the fundamental concepts of big data analytics □□
- To learn and analyze big data like Hadoop, NoSql MapReduce. □□□
- To understand the various search methods and visualization techniques. □□□
- To learn the techniques and principles in achieving big data analytics with scalability and streaming capability
- To learn Hive and Pig scripts in the Hadoop environment.
- To explain the challenges and solutions in Big Data.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Gain knowledge of Big Data and Hadoop ecosystem
- Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.
- Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
- Design and implement MapReduce programs and implementing HBase
- Implement Hive and Pig scripts in the Hadoop Environment.
- Discuss the Challenges and Solutions in Big Data.

UNIT I Introduction to Big Data (9)

Introduction to BigData Platform –Challenges of Conventional Systems -Intelligent data analysis – Nature of Data -Analytic Processes and Tools -Analysis vs Reporting-Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions -Re-Sampling -Statistical Inference -Prediction Error.

UNIT II Mining Data Streams (9)

Introduction To Streams Concepts –Stream Data Model and Architecture -Stream Computing -Sampling Data in a Stream –Filtering Streams –Counting Distinct Elements in a Stream –Estimating Moments –Counting Oneness in a Window –Decaying Window -Real time Analytics Platform(RTAP)Applications -Case Studies -Real Time Sentiment Analysis, Stock Market Predictions.

UNIT III Hadoop (9)

History of Hadoop-The Hadoop Distributed File System –Components of Hadoop-Analyzing the Data with Hadoop-Scaling Out-Hadoop Streaming-Design of HDFS-Java interfaces to

HDFSBasics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort –Task execution -Map Reduce Types andFormats-Map Reduce Features

UNIT IV Hadoop Environment
(9)

Setting up a Hadoop Cluster -Cluster specification -Cluster Setup and Installation –Hadoop Configuration-Security in Hadoop -Administering Hadoop –HDFS -Monitoring-Maintenance-Hadoop bench marks-Hadoop in the cloud

UNIT V Frameworks
(9)

Applications on Big Data Using Pig and Hive–Data processing operators in Pig –Hive services –HiveQL –Querying Data in Hive-fundamentals of HBase and ZooKeeper -IBM InfoSphereBigInsights and Streams. Visualizations-Visual data analysis techniques, interaction techniques;Systems and applications.

Total Hours: 45

TEXT BOOKS:

1. Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoopand Streaming Data, Tata McGraw Hill Publications, 2011

2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill

   Publishing,2012

REFERENCES:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.

2. Tom White, " Hadoop: The Definitive Guide", Third Edition, O‟reilly Media, 2012.

3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", JohnWiley& sons, 2012.

4. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007

5. PeteWarden, "Big Data Glossary", O‟Reilly, 2011.

6. Paul Zikopoulos ,Dirk deRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles David Corrigan , Harness the Power of Big Data -The IBM Big Data Platform, Tata McGraw HillPublications, 2012

7. Michael Minelli, Michele Chambers, AmbigaDhiraj, Big Data, BigAnalytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses,WileyPublications,2013

16BECS7E02 **Wireless Sensor Networks**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the concepts of wireless sensor networks.
- To learn how to program sensor nodes
- To understand the medium access protocol and address the physical layer issues.
- To learn network and transport layer protocols for sensor networks and design requirements.
- To learn the efficient routing algorithm
- To understand the middleware and security issues of wireless sensor networks.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Apply knowledge of wireless sensor networks to various application areas.
- Design, implement and maintain wireless sensor networks.
- Define medium access layer issues.
- Address the transport protocol design issues.
- Design the efficient routing algorithm
- Analyze the security issues in wireless sensor networks

UNIT I Fundamentals of Sensor Networks
(9)

Introduction and Overview - Overview of sensor network protocols, architecture, and applications, Challenges, Main features of WSNs; Research issues and trends, Platforms-Standards and specifications-IEEE802.15.4/Zigbee, Hardware: Telosb, Micaz motes ,Software: Overview of Embedded operating systems-Tiny OS, Introduction to Simulation tools- TOSSIM, OPNET, Ns-2.

UNIT II Communication Characteristics and Deployment Mechanisms
(9)

Wireless Communication characteristics - Link quality, fading effects, Shadowing, Localization, Connectivity and Topology - Sensor deployment mechanisms, Coverage issues, Node discovery protocols.

UNIT III Mac Layer
(9)

Fundamentals of Medium access protocol- Medium access layer protocols - Energy efficiency, Power allocation and Medium access control issues.

UNIT IV Network Layer and Transport Layer
(9)

Network layer protocols-Data dissemination and processing, multichip and cluster based routing protocols- Energy efficient routing- Geographic routing, Transport layer- Transport protocol Design issues- Performance of Transport Control Protocols.

UNIT V Middleware and Security Issues
(9)

Middleware and Application layer -Data dissemination, Data storage, Query processing, Security - Privacy issues, Attacks and Countermeasures

Total Hours :45

TEXT BOOKS:

1. WaltenegusDargie, Christian Poellabauer , “Fundamentals of Wireless Sensor Networks, Theory and Practice”, Wiley Series on wireless Communication and Mobile Computing,

   2010.

2. KazemSohraby, Daniel manoli , “Wireless Sensor networks- Technology, Protocols and Applications”, Wiley InderScience Publications, 2010.

REFERENCES:

1. BhaskarKrishnamachari , “ Networking Wireless Sensors”, Cambridge University Press, 2011.

2. C.S Raghavendra, Krishna M.Sivalingam, Taiebznati , “Wireless Sensor Networks”, Springer Science, 2006.

16BECS7E03 **HUMAN COMPUTER INTERACTION**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the concepts relating to the design of human-computer interfaces in ways making computer-based systems comprehensive, friendly and usable.
- To understand the design and evaluation of interactive systems
- To understand various universal design principles and multimodal systems
- To understand the theoretical dimensions of human factors involved in the acceptance of computer interfaces.
- To understand the important aspects of implementation of human-computer interfaces.
- To identify the various tools and techniques for interface analysis, design, and evaluation.

COURSE OUTCOMES:

- Understand key aspects of human psychology which can determine user actions at and satisfaction of the interface.
- Describe the key design principles for user interfaces.
- Set up and carry out a process to gather requirements for, engage in iterative design of, and evaluate the usability of a user interface.
- Describe how user interface development can be integrated into an overall software development process.
- Understanding of the ethical issues involved in testing user interfaces.
- □pply Human Computer Interface in real time applications

UNIT I Design Process
(9)

Humans – Information Process – Computer – Information Process – Differences and Similarities – Need for Interaction – Models – Ergonomics – Style – Context – Paradigms – Designing of Interactive Systems – Usability – Paradigm shift – Interaction Design Basics – Design Process – Scenarios – Users Need –Complexity of Design

UNIT II Design and Evaluation of Interactive Systems
(9)

Software Process – Usability Engineering – Issue based Information Systems – Iterative Design Practices – Design Rules – Maximum Usability – Principles – Standards and Guidelines – Design Patterns – Programming Tools – Windowing Systems – Interaction Tool Kit – User Interface Management System – Evaluation Techniques – Evaluation Design – Evaluating Implementations – Observational Methods.

UNIT III Models
(9)

Universal Design Principles – Multimodal Systems – User Support – Presentation and Implementation Issues – Types – Requirements – Approaches – Cognitive Model – Hierarchical Model – Linguistic Model – Physical and Device Models – Socio technical Models – Communication and Collaboration Models – Task Models – Task Analysis And Design.

UNIT IVExperimental Design and Statistical Analysis of HCI
(9)

Basic Design Structure – Single Independent Variable – Multiple Independent Variable – Factorial Design – Split-Plot Design – Random Errors – Experimental Procedure – Statistical Analysis – T Tests – Analysis of Variance Test – Regression – Chi-Square Test – Survey – Probabilistic Sampling
– Non-Probabilistic Sampling – Developing Survey Questions.

UNIT V Theories
(9)

Dialogue Notations and Design – Dialogue Need – Dialogue Design Notations – Graphical – Textual - Representing Dialogue – Formal Descriptions – Dialogue Analysis – System Models – Interaction Models – Relationship with Dialogue – Formalisms – Formal Notations – Interstitial Behavior – Virtual Reality – Modeling Rich Interaction – Status Event Analysis – Properties – Rich Contexts – Sensor-based Systems – Groupware – Applications – Ubiquitous Computing – Virtual Reality

Total Hours:45

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", Third Edition, Prentice Hall, 2004.

REFERENCES:

1. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, "Research Methods in Human Computer Interaction", Wiley, 2010.

2. Ben Shneiderman and Catherine Plaisant, "Designing the User Interface: Strategies for

   Effective Human-Computer Interaction", Fifth Edition, Addison-Wesley Publishing Co, 2010.

16BECS7E04 INFORMATION SECURITY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Information Security and its model.
- To learn the legal, ethical and professional issues in Information Security
- To understand the need of risk management and risk control.
- To study the critical need for ensuring Information Security in Organizations.
- To learn the security policy, standards and security analyzing tools.
- Discuss the CIA triad of Confidentiality, Integrity and Availability

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Analyze the appropriate techniques to tackle and solve problems in the discipline of information security management.
- Gain the knowledge of security and its management for any modern organization.
- Develop an understanding of security policies to implement, such policies in the form of message exchanges.
- Develop security management system should be planned, documented, implemented and improved, according to the security standard on information security management.
- Use and Examine the threats by security analysis tools
- Understand the CIA triad of Confidentiality, Integrity and Availability

UNIT I Introduction (9)

History, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.

UNIT II Security Investigation (9)

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

UNIT III Security Analysis (9)

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

UNIT IV Logical Design (9)

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

UNIT VPhysical Design
(9)

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

Total Hours: 45

TEXT BOOK:

1. Michael E Whitman and Herbert J Mattord. "Principles of Information Security", Second Edition, Vikas Publishing House, New Delhi, 2003.

REFERENCES:

1. Micki Krause, Harold F. Tipton," Handbook of Information Security Management", Auerbach Publications, 4^{th} edition,2012.

2. Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, 7^{th} edition, 2012.

16BECS8E01 **SEMANTIC WEB**

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

- To understand the basic concepts and layers of semantic web.
- To learn RDF data models and querying the semantic web using SPARQL
- To learn Ontology Engineering, construction and reusing.
- To understand the description logics and monotonic rules.
- To learn Social Network Analysis and semantic web
- Discuss the Semantic web technologies for real world applications.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Describe the rationale behind Semantic Web.
- Model ontologies using Resource Description Framework (RDF).
- Design RDF Schemas for ontologies.
- Model and design ontologies using Web Ontology Language (OWL).
- Query ontologies using SPARQL.
- Apply Semantic web technologies to real world applications.

UNIT IINTRODUCTION (9)

History – Semantic web layers –Semantic web technologies – Semantics in semantic web – XML: Structuring – Namespaces – Addressing – Querying-Processing XML.

UNIT II Rdf and Querying the Semantic Web (9)

RDF data model-syntaxes-Adding semantics -RDF schema-RDF and RDF schema in RDF schema-An axiomatic semantics for RDF and RDF schema-Querying the semantic web-SPARQL-Basics-Filters-Constructs-Organizing result sets-Querying schemas.

UNIT III Ontology (9)

Introduction – Ontology movement – OWL – OWL specification - OWL elements – OWL constructs: Simple and complex – Ontology engineering: Introduction – Constructing ontologies – Reusing ontologies – On-To-Knowledge semantic web architecture

UNIT IV Logic and Inference (9)

Logic – Description logics - Rules – Monotonic rules: syntax, semantics and examples – Non-monotonic rules – Motivation, syntax, and examples – Rule markup in XML: Monotonic rules - Non-Monotonic rules

UNIT V Applications of Semantic Web Technologies (9)

Good relations-BBC artists-BBC world cup 2010 website-Government data, Newyork times-Sigma and sindiceopen Calais-schema.org-Future of semantic web

Total Hours - 45

TEXT BOOKS:

1. Grigorous Antoniou and Van Hermelen, A Semantic Web Primer. New Delhi: The MIT Press, 2012.

2. James Hendler, Henry Lieberman and Wolfgang Wahlster, Spinning the Semantic Web: Bringing the World Wide Web to its full potential. New Delhi: The MIT Press, 2005.

REFERENCES:

1. Shelley Powers, Practical RDF. Mumbai: O‟reilly publishers, 2009

2. Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, Chapman & Hall/CRC, 2009

16BECS8E02 **E-COMMERCE**

COU RSE

OBJECTIVES:

- To understand the basic concepts of E-commerce and its values.
- To learn key features of Internet, Intranets and Extranets and explain how they relate to each other
- To understand web servers, protocol and EC software.
- To obtain the knowledge of online security issues to assess existing websites.
- To understand the web-based marketing and its advantages
- To discuss the use of a social media technology in a business or government application

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Demonstrate an understanding of the foundations and importance of E-commerce.
- Describe the infrastructure required for E-commerce.
- Describe the key features of Internet, Intranets and Extranets and explain how they relate to each other.
- Analyze the online threats and strategies for marketing.
- Discuss legal issues and privacy in E-Commerce.
- Demonstrate the use of a social media technology in a business or government application

UNIT I INTRODUCTION (9)

Traditional commerce and E commerce – Internet and WWW – role of WWW – value chains – strategic business and Industry value chains – role of E commerce.

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UNIT II INFRASTRUCTURE FOR E COMMERCE (9)

Packet switched networks – TCP/IP protocol script – Internet utility programmes – SGML, HTML and XML – web client and servers – Web client/server architecture – intranet and extranets.

UNIT III WEB BASED TOOLS FOR E COMMERCE (9)

Web server – performance evaluation - web server software feature sets – web server software and tools – web protocol – search engines – intelligent agents –EC software – web hosting – cost analysis

UNIT IV SECURITY (9)

Computer security classification – copy right and Intellectual property – electronic commerce threats – protecting client computers – electronic payment systems – electronic cash – strategies for marketing – sales and promotion – cryptography – authentication.

UNIT V INTELLIGENT AGENTS (9)

Definition and capabilities – limitation of agents – security – web based marketing – search engines and Directory registration – online advertisements – Portables and info mechanics – website design issues.

Total Hours - 45

TEXT BOOKS:

1. Ravi Kalakota, “ Electronic Commerce”, Pearson Education,
2. Gary P Schneider “Electronic commerce”, Thomson learning & James T Peny Cambridge USA, 2001.
3. Manlyn Greenstein and Miklos “Electronic commerce” McGraw-Hill, 2002.

REFERENCES:

1. EfraimTurvanJ.Lee, David kug and chung, “Electronic commerce” Pearson Education Asia 2001.
2. Brenda Kienew E commerce Business Prentice Hall, 2001.

16BECS8E03 **SERVICE ORIENTED ARCHITECTURE**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To gain knowledge of the basic concepts of SOA, comparison with older architectures and principles of service orientation.
- To learn about web services, messaging with SOAP and different layers of SOA.
- To learn about advanced concepts such as Orchestration and Choreography.
- To learn about various service-oriented analysis and design.
- To know about various WS- specification standards.
- To discuss the concept of Standards and Security on SOA.

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Obtainknowledge on basic concepts of SOA and how it differs with other architectures.
- Gain knowledge on advanced concepts of service composition, Orchestration and Choreography.
- Understand web service framework with respect to SOA.
- Acquireknowledge on various open standards available for developing SOA compliant web services.
- Design and implement Web based services using ASP.NET
- Appreciate the concept of Standards and Security on SOA.

UNIT I Introduction **(9)**

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate - Principles of service orientation

UNIT II Services
(9)

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration – Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer

UNIT III Analysis
(9)

Service oriented analysis – Business-centric SOA – Deriving business services - service modeling - Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Task- centric business service design

UNIT IVSOA (9)

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in.NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE)

UNIT V WS(9)

WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WS- Security

Total Hours: 45

TEXT BOOKS:

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2nd edition, 2016.
2. Judith Hurwitz, Robin Bloor, "Service Oriented Architecture for Dummies", Willey Publications, 2nd edition, 2009

REFERENCES:

1. Nicolai M. Josuttis, " SOA-The Art of Distributed System Design", O"Reily Publications, 2009.

2. Douglas K. Barry, " Web Services, Service Oriented Architecture and Cloud Computing", Elsevier Publicaions, 2nd Edition, 2013.

16BECS8E04	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand Overview and Language Modeling
- To understand the various levels of analysis involved in NLP.
- To learn language modeling.
- To gain knowledge in automated natural language generation and machine translation.
- To understand the concepts of information Retrieval and Lexical resource.
- To discuss concepts of Natural Language Processing in real time application

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Compose key NLP elements to develop higher level processing chains
- Assess / Evaluate NLP based systems
- Choose appropriate solutions for solving typical NLP sub problems (tokenizing, tagging, parsing)
- Describe the Machine translation approaches.
- Gain knowledge in design features in information retrieval and lexical analysis techniques.
- Analyze Natural Language Processing in real time application

UNIT I Overview and Language Modeling (9)

OVERVIEW**:** Origins and challenges of NLP- Language and Grammar- Processing Indian Languages-NLP Applications-Information Retrieval.

LANGUAGE MODELING: Introduction-Various Grammar-based Language Models-Statistical Language Model.

UNIT II Word Level and Syntactic Analysis (9)

WORD LEVEL ANALYSIS: Introduction- Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. SYNTACTIC ANALYSIS: Introduction-Context-free Grammar-Constituency-Parsing-Probabilistic Parsing.

UNIT III Semantic Analysis and Discourse Processing (9)

SEMANTIC ANALYSIS: Introduction- Meaning Representation-Lexical Semantics-Ambiguity-Word Sense Disambiguation. DISCOURSE PROCESSING: Introduction- cohesion-Reference Resolution- Discourse Coherence and Structure.

UNIT IV Natural Language Generation and Machine Translation (9)

NATURAL LANGUAGE GENERATION**:** Introduction-Architecture of NLG Systems-Generation Tasks and Representations-Application of NLG.MACHINE TRANSLATION: Introduction-Problems in Machine Translation- Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.

UNIT V Information Retrieval and Lexical Resources (9)

INFORMATION RETRIEVAL**:** Introduction -Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – Evaluation. LEXICAL RESOURCES**:** Introduction-WordNet-FrameNet-Stemmers-POS Tagger- Research Corpora.

Total Hours: 45

TEXT BOOKS:

1. TanveerSiddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

REFERENCES:

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008.
2. James Allen, Bejamin/cummings, "Natural Language Understanding", 2nd edition, 1995.

OPEN ELECTIVES OFFERED BY COMPUTER SCIENCE AND ENGINEERING

16BECSOE01	**INTERNET PROGRAMMING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To study concepts of Internet, IP addresses and protocols
- To explain the concept of web page development through HTML
- To introduce the PERL and explore its current strengths and Weaknesses
- To write working Java code to demonstrate the use of applets for client side programming
- To study Internet telephony and various multimedia applications
- To Elaborate on the principles of web page development

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Learn the advanced concepts& techniques of Internet and Java.
- Analyze the requirements for and create and implement the principles of web page development
- Understand the concepts ofPERL
- Implement client side programming using java applets
- Generate internet telephony based upon advanced concepts
- Develop applications on internet programming based on java applets and scripts

UNIT I Introduction
(9)

Introduction - Network of Networks, Intranet, Extranet and Internet. World Wide Web- Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. TCP/IP- Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing- Classful and Classless Addressing, Subnetting

UNIT IIHTML (9)

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue. Image Maps- map, area, attributes of image area- Extensible Markup Language (XML)- Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts- Introduction-Environment Variable, GET and POST Methods.

UNIT III PERL (9)

Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling- JavaScript- Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies- Definition of cookies, Create and Store a cookie with example. Java Applets-Container Class, Components, Applet Life Cycle, Update method, Applications.

UNIT IV Client-Server programming (9)

Client-Server programming In Java - Java Socket, Java RMI. Threats - Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks- Network security techniques- Password and Authentication- VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH). Firewall- Introduction, Packet filtering, Stateful, Application layer, Proxy.

UNIT VInternet Telephony (9)

Introduction, VoIP- Multimedia Applications- Multimedia over IP: RSVP, RTP, RTCP and RTSP-Streaming media, Codec and Plugins, IPTV- Search Engine and Web Crawler- Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

Total Hours: 45

TEXT BOOKS:

1. Paul Deitel, Harvey Deitel and Abby Deitel, “Internet and World Wide Web- How to Program”, 5th Edition, 2011.

2. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.

REFERENCES:

1. Rahul Banerjee, Internetworking Technologies, An Engineering Perspective, PHI Learning, Delhi, 2011.

2. Robert W. Sebesta, “Programming the World Wide Web”, Pearson Education, 2016

		L	T	P	C
16BECSOE02	**MULTIMEDIA AND ANIMATION**				
		3	0	0	3

COURSE OBJECTIVES:

- To impart the fundamental concepts of Computer Animation and Multimedia
- To study the graphic techniques and algorithms using flash
- Explain various concepts available in 3D animation
- Explain various devices available for animation
- To study the multimedia concepts and various I/O technologies for concept development
- To understand the three-dimensional graphics and their transformations

COURSE OUTCOMES

Upon completion of this course, the student will be able to:

- Develop their creativity using animation and multimedia
- Understand the concepts of Flash and able to develop animation using it
- Understand about various latest interactive 3D animation concepts
- Know the various devices and software available in motion capture
- Understand the concept development process
- Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.

UNIT I Introduction (9)

What is mean by Animation – Why we need Animation – History of Animation– Uses of Animation

– Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects -Creating Animation.

UNIT II Creating Animation in Flash (9)

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers - Action script.

UNIT III 3D Animation & its Concepts (9)

Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation.

UNIT IV Motion Caption (9)

Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage

– Different Language of Script Animation Among the Software.

UNIT V Concept Development (9)

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

Total Hours: 45

TEXT BOOK:

1. Computer Graphics, Multimedia and Animation-Malay K. Pakhira,PHI Learning PVT Ltd,2010

REFERENCES:

1. Principles of Multimedia – Ranjan Parekh, 2007, TMH. (Unit I, Unit V)
2. Multimedia Technologies – Ashok Banerji, Ananda Mohan Ghosh – McGraw Hill Publication.
3. Encyclopedia of Multimedia and Animations-Pankaj Dhaka, Anmol Publications-2011

16BECSOE03 **PC HARDWARE AND TROUBLE SHOOTING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To study the basic parts of computer in detail
- Introduce various peripheral devices available for computer and its detailed working concepts
- Overview of various interfaces and other hardware overview
- Assemble/setup and upgrade personal computer systems and discuss about power supplies and the skills to trouble-shoot various power-related problems.
- To study basic concepts and methods in troubleshooting
- To study the installation/connection and maintenance of computer and its associated peripherals.

COURSE OUTCOME:

Upon completion of this course, the student will be able to:

- Identify the main components for the PC, familiarize themselves with PC memories such as RAM and ROM devices and so on.
- Identify various peripheral devices available and its working
- Understand various concepts of hardware and its interface and control
- Perform basic installation of PC. Importance of maintenance is understood
- Understand Various faults and failures are identified and troubleshooting in detail
- Understand overall PC hardware, interfacing, maintenance and troubleshooting

UNIT I Introduction (9)

Introduction - Computer Organization – Number Systems and Codes – Memory – ALU – CU – Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques– Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC and User.

UNIT II Peripheral Devices (9)

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices – FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNIT III PC Hardware Overview (9)

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC.

UNIT IV Installation and Preventive Maintenance (9)

Introduction – system configuration – pre installation planning – Installation practice – routine checks – PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery.

UNIT V Troubleshooting (9)

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LSI's – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.

Total Hours: 45

TEXT BOOK:

1. B. Govindarajalu, "IBM PC Clones Hardware, Troubleshooting and Maintenance", 2/E, TMH, 2002.

REFERENCES:

1. Peter Abel, NiyazNizamuddin, "IMB PC Assembly Language and Programming", Pearson

   Education, 2007
2. Scott Mueller, "Repairing PC's", PHI, 1992

16BECSOE04	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads, generics classes and swings
- To explain the need for generic programming
- To design and build simple Graphical User Interfaces

COURSE OUTCOMES:

Upon completion of the course, students will be able to:

- Develop Java programs using OOP principles
- Develop Java programs with the concepts inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generics classes and swings
- Understand various aspects for motivation of generic programming
- Develop various interactive Java programs using OOP concepts of Java

UNIT I INTRODUCTION TO JAVA (9)

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members –constructors – finalize method

UNIT II PACKAGES (9)

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy –polymorphism – dynamic binding – final keyword – abstract classes

UNIT III I/O STREAMS (9)

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes.

UNIT IV EXCEPTION HANDLING

(9)

Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View-Controller design pattern –buttons – layout management – Swing Components – exception handling – exception hierarchy – throwing and catching exceptions.

UNIT V MOTIVATION FOR GENERIC PROGRAMMING (9)

Motivation for generic programming – generic classes – generic methods – generic code and virtual machine – inheritance and generics – reflection and generics - Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – Executors – synchronizers.

TEXT BOOK:

1.Cay S. Horstmann and Gary Cornell Core Java: Volume I–Fundamentals Sun Microsystems

Press 2008

REFERENCES:

1. K. Arnold and J. Gosling The JAVA programming language Third edition, Pearson Education, 2009
2. Timothy Budd Understanding Object-oriented programming with Java Updated Edition, Pearson Education 2002
3. C. Thomas Wu An introduction to Object-oriented programming with Java Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2008

WEBSITES:

1. http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/
2. http://www.winprog.org/tutorial/msvc.html
3. http://www.tutorialized.com/tutorials/Visual-C/1
4. http://www.freeprogrammingresources.com/visualcpp.html

LIST OF OPEN ELECTIVES

LIST OF OPEN ELECTIVES OFFERED BY OTHER DEPARTMENTS SCIENCE AND HUMANITIES

16BESHOE01 PROBABILITY ANDRANDOMPROCESS **L T P C 3 0 0 3 Co**

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.
- To study statistical methods of the sample data.

Course Outcomes

1. Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
2. The students will have an exposure of various distribution functions, correlation and spectral densities.
3. To understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
4. To understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
5. To apply the concept random processes in engineering disciplines.
6. To understand and apply the concept of correlation and spectral densities

UNIT-I MEASURES OF CENTRAL TENDENCYANDPROBABILITY 9

Measures of central tendency – Mean, Median, Mode - Standard Deviation Probability - Random variable - Axioms of probability - Conditional probability - Total probability – Baye's theorem.

UNIT-II STANDARDDISTRIBUTIONS 9

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma(one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – Chebyshev's inequality.

UNIT-III TWO DIMENSIONALRANDOMVARIABLES 9

Joint distributions - Marginal andconditionaldistributions - Probability mass function - Probability density functions – Covariance - Correlation andregression

UNIT-IV CLASSIFICATION OFRANDOM PROCESS **9**

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT-V CORRELATION ANDSPECTRAL DENSITIES **9**

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input andoutput.

TOTAL : 45 HOURS

TEXT BOOK

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATI
1	Peebles Jr, P.Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Publishers, New Delhi.	2002

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATI
1	Ross, S	A first Course in Probability	Pearson Education, New Delhi (Chap 2 to 8)	2012
2	Gupta, S.C. and Kapoor, V.K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2014
3	Veerarajan,T.	Probability, Statistics and Random process	Tata McGraw-Hill Education pvt. Ltd., New Delhi	2008

4	Henry Stark and John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002

WEBSITES

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld.Wolfram.com

16BESHOE02 **FUZZYMATHEMATICS** **L T P C 3 0 0**

Course Outcomes

- To gain the main subject of fuzzy sets.
- To understand the concept of fuzziness involved in various systems and fuzzy set theory.
- To gain the methods of fuzzy logic.
- To comprehend the concepts of fuzzy relations.
- To analyze the application of fuzzy logic control to real time systems.
- The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.
- To know the applications of fuzzy Technology.
- To study and acquire the knowledge to comprehend the concepts of fuzzy relations

UNITI FUZZYSETS **9**

Fuzzy Sets : Basics Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations – Level Sets – Fuzzy functions - Zadeh's Extension Principle

UNITII OPERATIONS ONFUZZYSETS **9**

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNITIII FUZZYRELATIONS **9**

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNITIV FUZZYMEASURES **9**

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures vs Possibility Measures

UNITV FUZZYINFERENCE **9**

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

TOTAL : 45 HOURS

TEXT BOOK

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO
1	George J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic : Theory and Applications	Prentice Hall of India, New Delhi.	2003

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO
1	Zimmermann H.J.	Fuzzy Set Theory and its Applications	Kluwer Academic publishers, USA.	2001
2	Michal Baczynski and Balasubramaniam Jayaram	Fuzzy Implications	Springer-Verlag publishers, Heidelberg	2008
3	Kevin M Passino and Stephen Yurkovich	Fuzzy Control	Addison Wesley Longman publishers, USA	1998

WEBSITES

1. www.mathcentre.ac.uk
2. www.mathworld.Wolfram.com
3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

16BESHOE03 **LINEARALGEBRA** **L T P C 3 0 0 3 C**

Course Outcomes

The student will be able to

- To introduce the basic concepts of vector space
- To know the fundamentals of linear Algebra
- To solve system of linear equations
- To study about the linear transformations
- To introduce the concepts of inner product space

- To explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- To describe the fundamental concepts of Eigen values and Eigen vectors by using Power method.
- To apply the fundamental concepts in their respective engineering fields
- To visualize linear transformations as matrix form
- To recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
- To articulate the importance of Linear Algebra and its applications in branches of Mathematics

UNITI VECTORSPACES **9**

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II EIGEN VALUES ANDEIGENVECTORS **9**

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

UNIT III SYSTEM OFLINEAREQUATIONS **9**

Direct methods, Gauss elimination method, Gauss Jordan method, Crout's method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNIT IVLINEARTRANSFORMATIONS **9**

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigen values and Eigenvectors Eigen values and Eigen vectors – Diagonalization

UNIT V INNERPRODUCT SPACES **9**

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

TOTAL : 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	Y PU

1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	
2	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and ComplexVariables)	PHI Publications, New Delhi.	

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATI
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com

16BESHOE04 **ENGINEERINGACOUSTICS** **L T P C 3 0 0 3 Co**

- To disseminate the fundamentals of acoustic waves. (K)
- To inculcate the characteristics of radiation and reception of acoustic waves. (K)
- To divulge knowledge on the basics of pipe resonators and filters.(S)
- To introduce the features of architectural acoustics
- To impart the basic knowledge of transducers and receivers.(K)
- To study about the pipes resonant and filters

Course Outcomes

- Develop the idea of the fundamentals of acoustic waves.
- Apply the concepts of radiation and reception of acoustic waves.
- Explain the basic ideas of pipe resonators and filters.
- Illustrate the basics of architectural acoustics..
- Illustrate the transducers and receivers and its applications in various electronic devices.
- Apply the knowledge inputs of the course for engineering applications.

UNITI INTRODUCTION **9**

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves - Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales. Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence –method of images.

UNIT II RADIATION AND RECEPTION OFACOUSTICWAVES **9**

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers. Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III PIPES RESONATORSANDFILTERS **9**

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – fundamental properties of hearing – loudness level and loudness – pitch and frequency –voice.

UNIT IVARCHITECTURALACOUSTICS **9**

Sound in endosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design. Environmental Acoustics: Highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design ofportions.

UNITV TRANSDUCTION **9**

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

TOTAL : 45 HOURS

TEXTBOOK

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lawerence E.Kinsler, Austin R.Frey,	Fundamentals of Acoustics	John Wiley & Sons	2000

REFERENCE

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	F. AltonEverest&	Master Handbook of Acoustics	McGraw Hill Professional	2014

WEBSITES

1. www.acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www.ocw.mit.edu

16BESHOE05 SOLIDWASTEMANAGEMENT L T P C 3 0 0 3 Cou

- To make the students conversant with basics of Solid wastes and its classification.
- To make the student acquire sound knowledge of different treatments of solid wastes.
- To acquaint the student with concepts of waste disposals.
- To develop an understanding of the basic concepts of Hazardous waste managements.
- To acquaint the students with the basics of energy generation from waste materials.
- To understand about the solid waste and to get the information on energy conservation.

Course Outcomes:

- Outline the basic principles of Solid waste and separation of wastes (K)
- Identify the concepts of treatment of solid wastes (S)
- Identify the methods of wastes disposals. (S)
- Examine the level of Hazardousness and its management. (S)
- Examine the possible of the energy production using waste materials. (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNITI SOLIDWASTE **9**

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

UNIT IIWASTE TREATMENT **9**

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due toIncineration

UNIT IIIWASTE DISPOSAL **9**

Sanitary Land Fill Method of Solid Waste Disposal – Land Fill Classification, Types, Methods & Siting Consideration – Layout & Preliminary Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfill Remediation

UNIT IV HAZARDOUSWASTE MANAGEMENT **9**

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure, Remediation, risk assessment.

UNITV ENERGY GENERATIONFROMWASTE **9**

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, Energy recovery systems. Biological & Chemical conversion technologies – Aerobic composting, low

solids. Anaerobic digestion, high solids anaerobic digestion, Energy production
from biological conversion products, other biological transformation processes.
Chemical transformation processes.

TOTAL : 45 HOURS

TEXT BOOK

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR O PUBLICAT
1.	Dara.S.S,Mishra.D.D	A Text book of Environmental Chemistry and Pollution Control	S.Chand and Company Ltd., New Delhi.	2011

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR O PUBLICAT
1.	Naomi B. Klinghoffer and Marco J. Castaldi	Waste to Energy Conversion Technology (Woodhead Publishing Series in Energy)	Woodhead Publishing Ltd., Cambridge, UK	2013
2.	Frank Kreith, GeorgeTchobanoglous	Hand Book of Solid Waste Management- 2ndedition	McGraw Hill Publishing Ltd., Newyork	2002
3.	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall (P) Ltd., New Delhi.	1999

WEBSITES

1.www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.
2.http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/
3.www.alternative-energy-news.info/technology/garbage-energy/

4.nzic.org.nz/ChemProcesses/environment/

16BESHOE06 GREENCHEMISTRY L T P C 3 0 0 3 Co

1. To make the students conversant about the green chemistry
2. To make the student acquire sound knowledge of the atom efficient process and synthesis elaborately.
3. To acquaint the student with concepts of green technology.
4. To develop an understanding of the basic concepts of renewable energy resources.
5. To acquaint the students with the basic's information on catalysis.
6. To gain knowledge on the green technology and renewable energyresources

Course Outcomes

- Outline the basic principles of green chemistry (K)
- Examine the different atom efficient process and synthesis elaborately (S)
- Apply the concepts combustion of green technology (S)
- Identify and apply the concepts of renewable energy (S)
- Apply the concepts of green catalysts in the synthesis (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO GREENCHEMICALPRINCIPLES 9

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

UNIT II ATOMEFFICIENT PROCESSES 9

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

UNIT III BIOTECHNOLOGY ANDGREENCHEMISTRY 9

Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e- green propellants and bio catalysts.

UNIT IVRENEWABLE RESOURCES 9

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

UNIT V CATALYSIS INGREENCHEMISTRY 9

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

TOTAL : 45

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Sanjay K. Sharma, Ackmez Mudhoo	Green Chemistry for Environmental Sustainability	CRC Press , London	2010
2.	Ahluwalia V. K. and M.Kidwai	New Trends in Green Chemistry 2nd edition	Anamaya publishers., New Delhi.	2007

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons., New Delhi.	2012
2.	Mukesh Doble. Ken Rollins, Anil Kumar	Green Chemistry and Engineering, 1st edition	Academic Press, Elesevier., New Delhi.	2007
3.	Desai K. R.	Green Chemistry	Himalaya Publishing House, Mumbai.	2005
4.	Matlack A. S.	Introduction to Green Chemistry	Marcel Dekker: New York	2001

WEBSITES

1. http://www.organic-chemistry.org/topics/green-chemistry.shtm
2. http://www.essentialchemicalindustry.org/processes/green-chemistry.html
3. http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm
4. http://www.epa.gov/research/greenchemistry/

5. http://www.amazon.in/Green-Chemistry-Catalysis

16BESHOE07 APPLIED ELECTROCHEMISTRY L T P C 3 0 03

Course Objectives

- To get the information on electrochemical material.
- To study about the conducting polymers.
- To acquaint the student with concepts of Energy storage devices.
- To gain knowledge on the batteries and power sources.
- To develop energy storage devices.
- To study and identify the concepts of storage devices and its applications. (S)

Course Outcomes

1. Outline the basic principles of chemistry in **electrochemical material (K).**
2. Examine the properties of conducting polymers (S).
3. Apply the concepts of electrochemistry in storage devices. (S)
4. Identify the concepts of storage devices and its applications. (S)
5. Apply the suitable materials for the manufacturing of storage devices. (S)
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNITI METALFINISHING 9

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electroplating for electronic industry- Alloy plating, brass plating- Electro less plating of nickel- anodizing – Electroforming – Electro winning.

UNIT II CONDUCTING POLYMERSANDELECTROCHEMICALS 9

Electro polymerisation- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene- Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNIT III BATTERIES ANDPOWERSOURCES-I 9

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNIT IV BATTERIES ANDPOWERSOURCES-II 9

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

UNIT V ELECTROCHEMICAL MATERIAL SCIENCE **9**

Solar cells- Preparation of CdS/Cu_2S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

TOTAL : 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR O PUBLICAT
1.	Cynthia G. Zoski	Hand Book of Electrochemistry	Academic Press, Elesevier.,UK	2007
2.	D.Pletcher and F.C.Walsh	Industrial Electrochemistry	Chapman and Hall, London	1990

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR O PUBLICAT
1.	M. Barak	Electrochemical Power Sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
2.	Bruno Scrosati	Applications of Electroactive Polymers	Chapman & Hall, London	1993
3.	K.L. Chopra and I. Kaur	Thin Film Devices and their Application	Plenum Press, New York.	1983
4.	M.M.Baizer	Organic Electrochemistry	Dekker Inc. New York	1983

WEBSITES

1. http://www.anoplate.com/finishes/

2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html

3. http://inventors.about.com/od/sstartinventions/a/solar_cell.htm

16BESHOE08 **INDUSTRIALCHEMISTRY** **L T P C 3 0 0 3 Co**

- To make the students conversant with **cement and lime** and its uses.
- To make the student acquire sound knowledge of abrasives and refractories.
- To acquaint the student with concepts of inorganic chemicals.
- To develop an understanding of the basic concepts **explosives**.
- To acquaint the students with the basics of **agriculture chemicals**.
- To study the concepts of explosives and smoke screens(S)

Course Outcomes

- Outline the basic chemistry of **cement and lime (K)**
- Examine the uses of abrasives and refractories (S)
- Identify the usage of the inorganic chemicals. (S)
- Identify the concepts of explosives and smoke screens (S)
- Identify the usage of the **agriculture** chemicals (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I CEMENTANDLIME **9**

Manufacture of Portland cement – settling of hardening of portland cement – regauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials-manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – magnesium lime – dolomitic lime – hydraulic lime.

UNIT II ABRASIVESANDREFRACTORIES **9**

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories
– definition – classification – acid refractories – basic refractories – neutral refractories – properties –uses.

UNIT IIIINORGANICCHEMICALS **9**

Common salt and soda ash – manufacture – different grades – products – alkalis – Na_2CO_3, caustic soda and chlor-alkali industry – manufacture principles of electrolytic process – chlorine – storage. Hydrochloric acid – manufacture – absorption – uses, sulphur and sulphuric acid – extraction of sulphur – manufacture of H_2SO_4 – chamber – contact processes – industrialuses.

UNITIVEXPLOSIVES **9**

Explosives – uses – properties and tests – explosives for war – nitrocellulose – picric acid and T.N.T. – industrial explosives – nitroglycerin and dynamites – black powder – smoke screens – incendiaries – gas mask.

UNIT VAGRICULTURE CHEMICALS **9**

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmentalimpacts.

TOTAL : 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR O PUBLICAT
1.	Harikrishan	Industrial Chemistry	Goel Publishing House, Meerut.	2014
2.	B.K. Sharma	Industrial Chemistry	Goel Publishing House, Meerut.	2000

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR O PUBLICA
1.	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH Publishing CO. New Delhi.	1998
2.	James A. Kent	Hand Book of Industrial Chemistry, 9th edition	Van Nostrand Reinhold, New York.	1992
3.	R.N. Sherve	Chemical Process Industries	McGraw-Hill, Kugakuisha Ltd., Tokyo.	1984
4.	S.D. Shukla and G.N. Pandy	A Text book of Chemical Technology	Vikas Publishing House (P) Ltd, New Delhi.	1979

WEBSITES

1. http://en.wikipedia.org/wiki/Cement

2. http://www.hon.ch/HONselect/Selection/D01.html

3. http://fas.org/man/dod-101/navy/docs/fun/part12.htm

4. http://toxics.usgs.gov/topics/agchemicals.html

ELECTRONICS AND COMMUNICATION ENGINEERING

16BEECOE01 REAL TIMEEMBEDDEDSYSTEMS L T P C 3 0

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing
- To study about memory management
- To imparts knowledge on

Course Outcomes

At the end of the course the students will be able to

- Understand overview of embedded systems architecture
- Acquire knowledge on embedded system, its hardware and software.
- Gain knowledge on overview of Operating system
- Discuss about task Management
- Gain knowledge about semaphore management and message passing.
- Gain knowledge about memory management

UNIT - I INTRODUCTION TOEMBEDDEDSYSTEM

Introduction - Embedded systems description, definition, design considerations & requirements - Overview of Embedded system Architecture (CISC and RISC) - Categories of Embedded Systems - embedded processor selection &tradeoffs - Embedded design life cycle - Product specifications - hardware/software partitioning - iterations and implementation - hardware software integration - product testing techniques – ARM7

UNIT - II OPERATINGSYSTEMOVERVIEW

Introduction –Advantage and Disadvantage of Using RTOS – Multitasking – Tasks - Real Time Kernels – Scheduler - Non-preemptive Kernels - Preemptive Kernels – Reentrancy- Reentrant Functions – Round Robin Scheduling - Task Priorities - Static Priorities – Mutual Exclusion – Deadlock – Intertask Communication – Message Mailboxes – Message Queues - Interrupts - Task Management – Memory Management - Time Management – ClockTicks.

UNIT - IIITASK MANAGEMENT

Introduction - µ C/OS-II Features - Goals of µ C/OS-II - Hardware and Software Architecture – Kernel Structures: Tasks –Task States – Task Scheduling – Idle Task – Statistics Task – Interrupts Under µ C/OS-II – Clock Tick - µ C/OS-II Initialization. Task Management: Creating Tasks – Task Stacks – Stack Checking – Task's Priority – Suspending Task – Resuming Task. Time Management: Delaying a Task – Resuming a Delayed Task – System Time. Event Control Blocks- Placing a Task in the ECB Wait List – Removing a Task from an ECB waits List.

UNIT - IV SEMAPHORE MANAGEMENT ANDMESSAGEPASSING

Semaphore Management: Semaphore Management Overview – Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox – Deleting Mailbox – Waiting for a Message box – Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue – Deleting a Message Queue – Waiting for a Message at a Queue – Sending Message to a Queue – Flushing a Queue.

UNIT - VMEMORYMANAGEMENT

Memory Management: Memory Control Blocks – Creating Partition- Obtaining a Memory Block – Returning a Memory Block .Getting Started with µ C/OS-II – Installing µ C/OS-II – Porting µ C/OS- II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with µ C/OS-II - µ C/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Analyze the Multichannel ADC with help of µ C/OS-II.

TOTAL: 45 HOURS

REFERENCES

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATI
1	Jean J. Labrosse	MicroC/OS – II The Real Time Kernel	CMP BOOKS	2009
2	David Seal	ARM Architecture Reference Manual	Addison-Wesley	2008
3	Steve Furbe	ARM System-on-Chip, Architecture	Addison-Wesley Professional California	2000

16BEECOE02 CONSUMERELECTRONICS L T P C 3

- To study about various speakers and microphone
- To learn the fundamental of television systems and standards
- To learn the process of audio recording and reproduction
- To study various telephone networks
- To discuss about the working of home appliances
- To familiarize with TV services like ISDN.

Course Outcomes

- Understand working of various type of loud speakers
- Acquire knowledge on various types of picture tubes
- Demonstrate the working of various optical recording systems
- Distinguish various standards for color TV system
- Acquire knowledge on various telecommunication networks
- Demonstrate the working of various home appliances

UNIT I LOUDSPEAKERSANDMICROPHONES 9

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNIT – II TELEVISION STANDARDSANDSYSTEMS 9

Components of a TV system – interlacing – composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL, SECAM - Components of a Remote Control.

UNIT – III OPTICAL RECORDINGANDREPRODUCTION 9

Audio Disc – Processing of the Audio signal –read out from the Disc – Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems.

UNIT – IVTELECOMMUNICATIONSYSTEMS 9

Telephone services - telephone networks – switching system principles – PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellular modems

UNIT – VHOME APPLIANCES 9

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

TOTAL: 45 HOURS

TEXT BOOK

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR O PUBLICAT

1	S.P.Bali	Consumer Electronics	Pearson Education	2005

16BEECOE03 NEURAL NETWORKS AND ITS APPLICATIONS L T P C 3 0 0 3

Course Objectives

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.
- To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
- To gain exposure in the field of neural networks and relate the human neural system into the digital world
- To provide knowledge of computation and dynamical systems using neural networks

Course Outcomes:

At the end of the course the students will be able to

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks
- Apply perception concept in design
- Design using ART phenomena
- Gain knowledge on SOM concepts

UNIT I INTRODUCTION TONEURALNETWORKS **9**

Introduction - biological neurons and their artificial models - learning, adaptation and neural network's learning rules - types of neural networks- single layer, multiple layer- feed forward, feedback networks

UNIT IILEARNING PROCESS **9**

Error – correction learning – memory based learning - hebbian learning-competitive learning- Boltzmann learning- supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT IIIPERCEPTION **9**

Single layer perception-Adaptive filtering-unconstrained optimization-Least-mean square algorithm- Leaning curve-Annealing Technique-perception convergence theorem-Relationship between perception and Baye's classifier-Back propagation algorithm

UNIT IV ATTRACTOR NEURAL NETWORKANDART **9**

Hopfield model-BAM model- BAM stability-Adaptive BAM -Lyapunov function-effect of gain- Hopfield design-Application to TSP problem-ART- layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP

UNIT VSELFORGANIZATION **9**

Self organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical vector Quantization. Applications of self-organizing maps: The Neural Phonetic Typewriter Learning Ballistic Arm Movements

TOTAL: 45 HOURS

TEXT BOOKS

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR O PUBLICAT
1	Simon Haykin	Neural Networks and Learning Machines	3/E - Pearson/ Prentice Hall	2009
2	Satish Kumar	Neural Networks : A Classroom Approach	TMH	2008
3	Freeman J.A., Skapura D.M.	Neural networks, algorithms, applications, and programming techniques	Addition Wesley	2005
4	Laurene Fausett	Fundamentals of Neural Networks: Architectures, Algorithms, and Applications	Pearson/ Prentice Hall	
5	Robert J Schalkoff	Artificial Neural Networks	McGraw Hill	1997

16BEECOE04 FUZZY LOGIC ANDITSAPPLICATIONS **L T P C 3 0 0 3**

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.
- Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
- To learn about applications on Fuzzy based systems
- To familiarize with fuzzy fiction and de fuzzy fiction procedures

Course Outcomes:

At the end of the course the students will be able to

- Understand the basic concepts of Fuzzy logic and its applications invarious domain
- Gain knowledge on theory of Reasoning
- Develop fuzzy controllers
- Understand concepts of adaptive fuzzy control
- Ability to develop how to use Fuzzy computation to solve real- world problems
- Design fuzzy based model for any application

UNIT– I **9**

Basics Of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT– II **9**

Theory Of Approximate Reasoning**:** Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference-fuzzy models

UNIT– III **9**

Fuzz y Knowledge Based Controllers (Fkbc**):** Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures – Design of Fuzz y Logic Controller

UNIT– IV **9**

Adaptive Fuzz y Control: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

UNIT V FUZZYBASEDSYSTEMS **9**

Simple applications of FKBC -washing machines- traffic regulations - lift control-fuzz y in medical applications-Introduction to ANFIS.

TOTAL: 45 HOURS

TEXT BOOKS

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR O PUBLICAT

1	D. Diankar, H. Hellendoom and M. Reinfrank	An Introduction to Fuzz y Control	Narosa Publishers India	1996
2	G. J. Klir and T. A. Folger	Fuzzy Sets Uncertainty and Information	PHI IEEE	1995

BIO TECHNOLOGY

16BTBTOE01 **BIOREACTORDESIGN** **L T P C**
3 0 03

Course Objectives

- To impart basic knowledge in bioprocess Engineering
- To design the bioreactors for various operations.
- To understand the principle and working of heat transfer equipments.
- To extend the knowledge in principle of heat transfer inside a bioreactor
- To construct the equipments used in mass transfer operations.
- To learn the equipments used in separation process.

Course Outcomes

- Summarize the basic concepts in bioprocess Engineering.
- Ability to design the bioreactors for various operations.
- Ability to develop the heat transfer equipments for Bioprocess Engineering.
- Ability to construct the equipments used in mass transfer operations.
- To acquire the knowledge of regulatory constraints in bioprocess
- Categorize the equipments used in separation process

UNITI ENGINEERING PROPERTIES ANDSTORAGETANK **9**

Introduction to various mechanical properties of material to be used material of construction, design of cylindrical storage tank.

UNITII REACTORDESIGN **9**

Design of Airlift fermentor, Bubble column reactor and Continuous stirred tank reactor.

UNITIII HEATTRANSFEREQUIPMENTS **9**

Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulation evaporator.

UNITIV MASSTRANSFEREQUIPMENTS **9**

Design of Bollmann extractor, fractionating column, packed tower and spray tray absorber

UNITV SEPARATIONEQUIPMENTS **9**

Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rotart drum drier and Swenson –walker crystallizer.

TOTAL: 45 HOURS

TEXT BOOKS

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	James Edwin Bailey, David F.Ollis	Biochemical Engineering Fundamentals	McGraw - Hill	2007

2	Don W. Green, Robert H. Perry	Chemical Engineer Hand book	The McGraw- Hill Companies,	2008

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Pauline. M. Doran	Bioprocess Engineering Principles	Academic Press	2013

16BTBTOE02 FOOD PROCESSINGANDPRESERVATION L T P C 3 0 03

Course Objectives

- To understand the importance of foodprocessing
- To impart basic knowledge in different food processing methods carried out in the food tech companies.
- To extend the brief knowledge in food conservation operations.
- To study the methods of food preservation by cooling.
- To familiarize the students on the concepts of preservation methods for fruits.
- To create deeper understanding on preservation methods for vegetables.

Course Outcomes

- Describe the scope and importance of food processing.
- Outline the various processing methods for foods.
- Extend the knowledge in food conservation operations.
- Describe the methods of food preservation by cooling.
- Summarize the preservation methods for fruits.
- Demonstrate the preservation methods for vegetables.

UNIT I SCOPE AND IMPORTANCE OFFOODPROCESSING 9

Properties of food- Physical, thermal, mechanical, sensory. Raw material Preparation - Cleaning, sorting, grading,peeling.

UNIT IIPROCESSINGMETHODS 9

Heating- Blanching and Pasteurization. Freezing- Dehydration- canning- additives- fermentation- extrusion cooking- hydrostatic pressure cooking- dielectric heating- micro wave processing and aseptic processing – Infra red radiation processing- Concepts and equipmentused.

UNIT III FOODCONVERSIONOPERATIONS 9

Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membrane separation- filtration- equipmentand application.

UNIT IV FOOD PRESERVATIONBYCOOLING 9

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Water activity, methods to control wateractivity.

UNITV PRESERVATION METHODS FOR FRUITS AND VEGETABLES9

Pre processing operations - preservation by reduction of water content: drying / dehydration and concentration – chemical preservation – preservation of vegetables by acidification, preservation with sugar - Heat preservation– Food irradiation- Combined preservation techniques.

TOTAL: 45 HOURS

TEXTBOOKS

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	R. Paul Singh, Dennis R.Heldman	Introduction to food engineering.	Academic Press	2001
2	P.Fellows.	Food Processing Technology, Principles and practice.	Wood head Publishing Ltd	2000
3	Mircea Enachescu Dauthy	Fruit and Vegetable Processing	FAO agricultural services bulletin	1995

REFERENCES

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR PUBLICATION
1	M.A. Rao, Syed S.H. Rizvi, Ashim K.Datta	Engineering properties of foods	CRC Press	2005
2	B. Sivasankar	Food processing and preservation	PHI Learning Pvt. Ltd	2002

16BTBTOE03 **BASICBIOINFORMATICS** **L T P C 3 0 0**

- To enable the students to get aware of available tools and databases for performing research in bioinformatics.
- Toprovidethethoroughunderstandingofproteinstructureindetail.
- To construct the phylogenetic trees for evolution.
- To get familiar with the 3D structure of protein and classification.
- To acquire basic knowledge in protein secondary structure prediction.
- To extend the brief knowledge in Micro array data analysis.

Course Outcomes

- Summarize the basic concepts and importance of Bioinformatics in various sectors.
- Demonstrate the sequence alignment tool in bioinformatics.
- Construct the phylogenetic trees for evolution.
- Analyze the three dimensional protein structure and classification using various tools.
- Illustrate the protein secondary structure prediction by comparative modeling.
- Extend the knowledge in micro array technology and applications of bioinformatics in various sectors.

UNIT I OVERVIEWOFBIOINFORMATICS **9**

The scope of bioinformatics; bioinformatics & the internet; useful bioinformatics sites. Data acquisition: sequencing DNA, RNA & proteins; determination of protein structure; gene & protein expression data; protein interaction data. Databases – contents, structure & annotation: file formats; annotated sequence databases; miscellaneous databases.

UNIT II RETRIEVAL OFBIOLOGICALDATA **9**

Data retrieval with Entrez & DBGET/ LinkDB; data retrieval with SRS (sequence retrieval system).Searching sequence databases by sequence similarity criteria:sequencesimilarity searches; amino acid substitution matrices; database searches, FASTA & BLAST; sequence filters; iterative database searches & PSI-BLAST. Multiple-sequence alignment, gene & protein families: multiple-sequence alignment & family relationships; protein families & pattern databases; protein domainfamilies.

UNITIII PHYLOGENETICS **9**

Phylogenetics, cladistics & ontology; building phylogenetic trees; evolution of macromolecular sequences. Sequence annotation: principles of genome annotation; annotation tools & resources.

UNIT IVSTRUCTURALBIOINFORMATICS **9**

Conceptual models of protein structure; the relationship of protein three-dimensional structure to protein function; the evolution of protein structure & function; obtaining, viewing & analyzing structural data;

structural alignment; classification of proteins of known three-dimensional structure: CATH & SCOP; introduction to protein structure prediction; structure prediction by comparative modeling; secondary structure prediction; advanced protein structure prediction & prediction strategies.

UNITV MICROARRAYDATAANALYSIS

Microarray data, analysis methods; microarray data, tools & resources; sequence sampling & SAGE. Bioinformatics in pharmaceutical industry: informatics & drug discovery; pharma informatics resources. Basic principles of computing in bioinformatics: running computer software; computer operating systems; software downloading & installation; database management.

TOTAL: 45 HOURS

TEXTBOOK

S. NO.	AUTHOR (S)NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dan E. Krane,Micha L. Rayme	Fundamental Concepts of Bioinformatics	Pearson education	2004
2	Andreas D. Baxevanis,B. F. Francis Ouellette	Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins	Wiley-Interscience	2004
3	David W. Mount	Sequence and Genome Analysis	Cold Spring Harbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

REFERENCE BOOKS

S. NO.	AUTHOR (S)NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Michael J. Korenberg	Microarray Data Analysis: Methods andApplications	Springer Science & Business Media	2007

16BTBTOE04 FUNDAMENTALSOFNANOBIOTECHNOLOGY L T P C 3 0 0 3

Course Objectives

- To develop skills of the students in the field of nano biotechnology and its applications in variousfields.
- The course will serve as an effective course to understand Socio-economic issues of nano biotechnology.
- To extend the knowledge in types and application of nano particles in sensors.
- To define the concepts of biomaterials through molecular self assembly.
- To equip students with clinical applications of nano devices.
- To describe deeper understanding of the socio-economic issues in nanobiotechnology

Course Outcomes

- Develop skills in the field of nano biotechnology and its applications.
- Summarize the nanoparticles and its significance in various fields.
- Extend the knowledge in types and application of nano particles in sensors.
- Define the concepts of biomaterials through molecular self assembly.
- Outline the clinical applications of nano devices.
- Describe the socio-economic issues in nanobiotechnology.

UNITIINTRODUCTION **9**

Introduction, Scope and Overview, Length scales , Importance of Nanoscale and Technology, History of Nanotechnology, Future of Nanotechnology: Nano Technology Revolution, Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concept, Controversies and confusions, Understanding advanced capabilities, Nanotechnology in Different, Fields: Nanobiotechnology, Materials, Medicine, Dentalcare.

UNIT IINANOPARTICLES **9**

Introduction, Types of Nanoparticles, Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Applications, Toxic effects of Nanomaterials, Significance of Nanoparticles Nanofabrications- MEMS/NEMS, Atomic Force Microscopy, Self assembled monolayers/ Dip- pen Nanolithography, Soft Lithography, PDMS Molding, Nano Particles, Nano wires and Nanotubes.

UNITIIIAPPLICATIONS **9**

Nanomedicine, Nanobiocensor and Nanofludics. Nanocrystals in biological detection, Electrochemical DNA sensors and Integrated Nanoliter systems. Nano-Biodevices and Systems.Fabrication of Novel Biomaterials through molecular self assembly- Small scale systems for in vivo drug delivery- Future nanomachine.

UNITIVNANOBIOTECHNOLOGY **9**

Clinical applications of nanodevices. Artificial neurons. Real-time nanosensors- Applications in cancer biology.Nanomedicine. Synthetic retinyl chips based on bacteriorhodopsins. High throughput DNA sequencing with nanocarbon tubules.Nanosurgical devices.

UNIT V ETHICAL ISSUESINNANOTECHNOLOGY **9**

Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology: With Especial Reference to Nanomedicine, Nanomedicine Applied in Nonmedical Contexts, Social Issues Relating to Nanomedicine. Social and Ethical Issues, Economic Impacts, Other Issues, Nanotechnology and Future Socio-economicchallenges.

TEXT BOOKS

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Niemeyer, C.M. and Mirkin, C.A	Nanobiotechnology:Concepts, Applicationsand Perspectives	Wiley-VCH	2004
2	Goodsell, D.S.	Bionanotechnology	John Wiley and Sons, Inc	2004

REFERENCE BOOKS

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Shoseyov, O. and Levy, I	Nanobiotechnology: Bioinspired Devices and Materials of the Future	Human aPress	2007
2	Bhushan, B.	Springer Handbook of Nanotechnology	Springer-Verlag Berlin Heidelberg	2004
3	FreitasJr R.A	Nanomedicine	Landes Biosciences	2004
4	Kohler, M. and Fritzsche, W.	Nanotechnology – An Introduction to Nanostructuring Techniques	Wiley-VCH	2004

MECHANICAL ENGINEERING

16BEMEOE01 **COMPUTERAIDEDDESIGN** **L T P C 3 0**

Course Objective

1. To apply basic concepts to develop construction (drawing) techniques.
2. To ability to manipulate drawings through editing and plotting techniques.
3. To understand geometric construction and Produce template drawings.
4. To understand and demonstrate dimensioning concepts and techniques.
5. To understand Section and Auxiliary Views.
6. To become familiar with Solid Modelling concepts and techniques.

Course Outcomes

Upon completion of the course, the students will be able to

1. Apply basic concepts to develop construction (drawing) techniques.
2. Ability to manipulate drawings through editing and plotting techniques.
3. Understand geometric construction and Produce template drawings.
4. Understand and demonstrate dimensioning concepts and techniques
5. Understand Section and Auxiliary Views
6. Become familiar with Solid Modelling concepts and techniques.

UNITI OVERVIEW OFCADSYSTEMS 9

Conventional and computer aided design processes-advantages and disadvantages. Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations. Networking of CAD systems.

UNITII INTERACTIVE COMPUTER GRAPHICS ANDGRAPHICS TRANSFORMATIONS

Generative, cognitive and image processing graphics. Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Two- and Three – Dimensional graphics concepts, Graphical input technique, Geometric transformations, Visual Realism, Computer animation, customizing graphics software.

UNIT III GEOMETRICMODELING

Wireframe, surface, NURBS and solid modeling-applications and advantages. Creating primitive solids, sweeping solids, boolean operations. Extracting entities from a solid. Filleting of edges of solids. Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

UNIT IV PARAMETRIC DESIGN ANDOBJECTREPRESENTATION

Types of co-ordinate systems. Parametric design - definition and advantages. Parametric representation of analytic and synthetic curves. Parametric representation of surfaces and solids - manipulations.

UNIT V PRODUCT DESIGNANDDEVELOPMENT

Automated 2D drafting - basics, mechanical assembly - bill of materials generation. Mass property calculations.

TOTAL:45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICA T ION
1	Vera B Anand	Computer Graphics and Geometric Modelingfor Engineers	John Wiley & Sons, New York	2000
2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLIC A TION
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	Dhanpat Rai & Sons, New Delhi	2002
2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	William M Newman and Robert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994
5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998
6	Rao S S	Optimisaiton Techniques	Wiley Eastern, New Delhi	2003

16BEMEOE02 INDUSTRIAL SAFETYANDENVIRONMENT **L T P C 3 0 0 3**

Course Objective

1. To recognize and evaluate occupational safety and health hazards in the workplace.
2. To determine appropriate hazard controls following the hierarchy of controls.
3. To analyses the effects of workplace exposures, injuries and illnesses, fatalities.
4. To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
5. To teach student the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
6. To prevent or mitigate harm or damage to people, property, or the environment.

Course Outcome

At the end of the course, student will be able to

1. Recognize and evaluate occupational safety and health hazards in the workplace.
2. Determine appropriate hazard controls following the hierarchy of controls.
3. Analyse the effects of workplace exposures, injuries and illnesses, fatalities.
4. Prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
5. Understand the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
6. Prevent or mitigate harm or damage to people, property, or the environment.

UNITI INTRODUCTIONTO LOGISTICS

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNITII PHASES OFSUPPLYCHAIN

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNITIII EVOLUTION OF SUPPLYCHAINMODELS

Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chainredesign
- Linking supply chain withcustomer.

UNITIV SUPPLYCHAINACTIVITIES

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNITV SCM ORGANISATION ANDINFORMATIONSYSTEM

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERP Software's

TOTAL:45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICA T ION
1	Shari.P.B and Lassen.T.S	Managing the global supply chain	Viva books, New Delhi	2000
2	Ayers.J.B	Hand book of supply chain management	The St. Lencie press	2000

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICA T ION
1	Nicolas.J.N	Competitive manufacturing management - continuous improvement, Lean production, customer focused quality	McGrawHill, New York	1998
2	Steudel.H.J and Desruelle.P	Manufacturing in the nineteen - How to become a mean, lean and world class competitor	Van No strand Reinhold, New York	1992

16BEMEOE03 TRANSPORTPHENOMENA L T P C 3 0 0 3

Course Objective

1. To generalized equations for mass, momentum and heat.
2. To understand the concepts of Reynolds and Gauss theorems.
3. To learn combined diffusive and convective transport.
4. To apply Film- and penetration models for mass and heat transfer.
5. To apply Stefan-Maxwells equations for multi-component diffusion.
6. To Solve the given set of equations either analytically or numerically.

Course Outcomes

Upon completion of this course, the students can be able to

1. Generalized equations for mass, momentum and heat.
2. Understand the concepts of Reynolds and Gauss theorems.
3. Learn combined diffusive and convective transport.
4. Apply Film- and penetration models for mass and heat transfer.
5. Apply Stefan-Maxwells equations for multi-component diffusion.
6. Solve the given set of equations either analytically or numerically.

UNIT I INTRODUCTION ANDBASICCONCEPTS

General overview of transport phenomena including various applications, Transport of momentum, heat and mass , Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II PROPERTIES, UNITS AND OTHERPHYSICALPARAMETERS

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT IIIMOMENTUMTRANSPORT

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidizedbed

UNIT IVENERGYTRANSPORT

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heattransfer

UNIT VMASS TRANSPORT

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion- Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

TOTAL: 45 HOURS

REFERENCE

S. N O.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLIC A TION
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

WEBSITES

1.https://laulima.hawaii.edu/portal

16BEMEOE04 INTRODUCTIONTOBIOMECHANICS L T P C 3

Course Objective

1. To describe the principles of the study of human movement.
2. To describe the range of factors that influence the initiation, production and control of human movement.
3. To identify the body's lever systems and their relationship to basic joint movement and classification.
4. To distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
5. To explain joint and muscle function and the forces acting upon the human body during various sporting activities.
6. To relate the different body systems necessary for human movement to occur.

Course Outcomes

Upon completion of this course, the students will be able to,

1. Describe the principles of the study of human movement.
2. Describe the range of factors that influence the initiation, production and control of human movement.
3. Identify the body's lever systems and their relationship to basic joint movement and classification.
4. Distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
5. Explain joint and muscle function and the forces acting upon the human body during various sporting activities.
6. Relate the different body systems necessary for human movement to occur.

UNITI INTRODUCTION 9

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNITII KEYMECHANICAL CONCEPTS 9

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

UNITIII HUMAN ANATOMY AND SOMEBASICTERMINOLOGY 9

Gross (Whole-Body) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups - Anthropometric Data

UNITIV ANATOMICAL DESCRIPTION 9

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNITV MECHANICS OF THEMUSCULOSKELETALSYSTEM 9

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit - Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle - Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control

TOTAL: 45 HOURS

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICA T ION
1	Duane Knudson	Fundamentals of Biomechanics	Springer Science+ Business Media, LLC	2007
2	C. Ross Ethier Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

16BEAEOE01 AUTOMOBILEENGINEERING L T P C 3 0 0 3

Course Objectives:

- To impart knowledge on the constructional details and principle of operation of various automobile components.
- To learn the function and working of various components in transmission and drive lines.
- To study the concept and working of steering and suspension systems in an automobile.
- To give knowledge on the wheels, tyres and brakes of automobiles.
- To provide information on the current and future trends in automobiles.
- Identify and explain the types of steering system.

Course Outcomes:

Upon successful completion of the course, the students should be able to:

- Demonstrate the operating principles and constructional details of various automobile components.
- Explain the function and working of components in transmission and drive lines.
- Identify and explain the types of steering system.
- Identify and explain the types of suspension system.
- Classify and describe the types of wheels, tyres and brakes of automobiles.
- Discuss the current and future trends in the automobiles.

UNITI ENGINE AND FUELFEED SYSTEMS **9**

Classification of Engine, construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburettor working principle, requirements of an automotive carburettor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNIT IITRANSMISSION SYSTEMS **9**

Requirements of transmission system.Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. **Course Objectives** of the gearbox - Determination of gear ratios for vehicles.Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propeller Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

UNITIIISUSPENSION SYSTEM **9**

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension – Pneumatic suspension – Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

UNITIV BRAKES **9**

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theory, Brake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System(ABS).

UNITV ELECTRICALSYSTEM **9**

Principle and construction of lead acid battery. Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.Starting System and chargingsystem.

TOTAL: 45 HOURS

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2.	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., New Delhi	2003
3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publisher	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
2.	Crouse.W.H	Automobile Electrical Equipment, 3rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAEInc	2001

16BEAEOE02 BASICS OF TWO ANDTHREE WHEELERS L T P C 3 0 0 3

Course Objectives

- The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.
- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.

Course Outcomes

Upon successful completion of the course, the students should be able to:

- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
- Explain the servicing of two and three wheelers.

UNIT I INTRODUCTION 9

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNITII POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS 9

2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHESANDTRANSMISSION 9

Types of clutches for 2 and 3 wheelers.Design of clutch system.Gears for two and three wheelers.Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELSANDTYRES 9

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS 9

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TOTAL: 45 HOURS

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992
2.	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century bookhouse.	1988

REFERENCES:

SL. NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Griffin.M.M	Motor cycles from inside and outside.	Prentice Hall Inc, NewJersey.	1978
2.	Bruce A. Johns, David D. Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAEOE03 AUTOMOBILEMAINTENANCE **L T P C 3 0 0 3**

Course Objectives

- The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems in Automobile.
- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.

Course Outcomes

Upon successful completion of the course, the students should be able to:

- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.
- Explain the fault diagnosis in the electrical and air conditioner systems.

UNITI MAINTENANCE OF RECORDSAND SCHEDULES **9**

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT IIENGINE MAINTENANCE **9**

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT IIICHASSIS MAINTENANCE **9**

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheelbalancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE
9

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY
9

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TOTAL: 45 HOURS

TOTAL: 45 HOURS

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	John Doke	Fleet Management	McGraw Hill Co	1984
2.	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011
3.	Service Manuals from Different Vehicle Manufacturers			

16BEAEOE04 INTRODUCTION TO MODERN VEHICLE TECHNOLOGY
L T P C 3 0 0 3

Course Objectives:

- To impart knowledge on trends in the vehicle power plants.
- To learn the various advanced driver assistance systems.
- To study the working of advanced suspension and braking systems in an automobile.
- To give information about motor vehicle emission and noise pollution control.
- To provide knowledge of the vehicle telematics.
- To give information about the noise control techniques

Course Outcomes:

Upon successful completion of the course, the students should be able to:

- Distinguish and describe the various modern vehicle power plant systems.
- List and explain the various driver assistant mechanisms.
- Identify and describe the working of advanced suspension and braking systems.
- Apply the knowledge of motor vehicle emission and noise pollution control.
- Describe the noise control techniques
- Describe the vehicle telematics and its applications.

UNITI TRENDS IN POWERPLANTS 9

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNITII DRIVER ASSISTANCE SYSTEMS 9

Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNITIII SUSPENSION BRAKES AND SAFETY 9

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNITIV NOISE &POLLUTION 9

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNITV TELEMATICS 9

Global positioning systems, geographical information systems,

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	LjuboVlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001
2.	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems –Progress in Technology	Automotive Electronics Series,SAE, USA.	1998

navigation systems, automotive vision system, road recognition

TOTAL: 45 HOURS

TEXT BOOKS

REFERENCES

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William B Riddens	Understanding Automotive Electronics, 5th Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold,	Understanding Automotive Electronics	SAE	1998
3.	Robert Bosch	Automotive HandBook, 5th Edition	SAE	2000

CIVIL ENGINEERING

16BECEOE01 **HOUSING, PLANANDMANAGEMENT**
L T P C 3 0 03

COURSE OBJECTIVES

1. To examine the role and tasks of basic housing policies and building bye laws
2. Understand the process of integrated service delivery in the context of economic, social, environmental and institutional factors
3. Analyze the Innovative construction methods and Materials
4. Analyze city management strategies and strengthen the urban governance through a problem solving approach
5. To know the Importance of basic housing policies and building bye laws
6. To use Housing Programmes and Schemes

COURSE OUTCOME

The students will be able to

1. Know the Importance of basic housing policies and building bye laws
2. Use Housing Programmes and Schemes
3. Plan and Design of Housing projects
4. Examine Innovative construction methods and Materials
5. Know Housing finance and loan approval procedures
6. Understand Construction as well as managing techniques

UNITI INTRODUCTIONTO HOUSING **9**

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, **Course Objectives** and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Locallevels

UNIT IIHOUSINGPROGRAMMES **9**

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNIT III PLANNING AND DESIGN OFHOUSINGPROJECTS **9**

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V HOUSING FINANCE ANDPROJECTAPPRAISAL **9**

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow

Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems).

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Meera Mehta and Dinesh Mehta	Metropolitan Housing Markets	Sage Publications Pvt. Ltd., New Delhi	2002
2	Francis Cherunilam and Odeyar D Heggade	Housing in India Communication	Himalaya Publishing House, Bombay.	2001

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	-	Development Control Rules for Chennai Metropolitan Area	CMA, Chennai	2002
2	-	UNCHS, National Experiences with Shelter Delivery for the Poorest Groups	UNCHS (Habitat), Nairobi	2000

16BECEOE02 BUILDINGSERVICESL T P C 3 0 03

COURSE OBJECTIVES

1. Defining and identifying of eng. services systems in buildings.
2. The role of eng. services systems in providing comfort and facilitating life of users of the building.
3. The basic principles of asset management in a building & facilities maintenance environment
4. Importance of Fire safety and its installation techniques
5. To Know the principle of Refrigeration and application
6. To Understand Electrical system and its selection criteria

COURSE OUTCOME

The students will be able to

1. Machineries involved in building construction
2. Understand Electrical system and its selection criteria
3. Use the Principles of illumination & design
4. Know the principle of Refrigeration and application
5. Importance of Fire safety and its installation techniques
6. Know the principle behind the installation of building services and to ensure safety in buildings

UNITIMACHINERIES 9

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMSINBUILDINGS 9

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION&DESIGN

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES&APPLICATIONS 9

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid –

Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

UNIT V FIRESAFETYINSTALLATION **9**

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non- combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	E.R.Ambrose	Heat Pumps and Electric Heating	John and Wiley and Sons, Inc., New York	2002
2	-	Handbook for Building Engineers in Metric systems	NBC, New Delhi	2005

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	-	Philips Lighting in Architectural Design	McGraw-Hill, New York	2000
2	A.F.C. Sherratt	Air-conditioning and Energy Conservation	The Architectural Press, London	2005

16BECEOE03 MANAGEMENT OFIRRIGATIONSYSTEMS

L T P C 3 0 0 3

OBJECTIVES

- To enable the students for a successful career as water management professionals.
- To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.
- To expose the students the need for an interdisciplinary approach in irrigation water management
- To providing a platform to work in an interdisciplinary team.
- To provide students an ability to understand the applications of mathematical and scientific concepts to analyse intricate technical, social and environmental problems in irrigation water management and finding solutions for them.
- To promote student awareness for a life-long learning process and inculcate professional ethics and codes of professional practice in water management.

OUTCOME

At the end of this the students will be in a capacity to

1. Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.
2. Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management
3. Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach.
4. Gain insight on local and global perceptions and approaches to participatory water resource management
5. Learn from successes and failures in the context of both rural and urban communities of water management.
6. Exposure on the use of economic concepts in irrigation development and to impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector.

UNITI IRRIGATIONSYSTEMREQUIREMENTS 9

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNITII IRRIGATIONSCHEDULING 9

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNITIII MANAGEMENT 9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNITIV OPERATION 9

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNITV INVOLVEMENT OFSTAKE HOLDERS **9**

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dilip Kumar Majumdar	Irrigation Water Management – Principles and Practice	Prentice Hall of India Pvt. Ltd., New Delhi	2000
2	R.T. Gandhi, et. al.	Hand book on Irrigation Water Requirement	Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi	-

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Maloney, C. and Raju, K.V	Managing Irrigation Together", Practice and Policy in India	Stage Publication, New Delhi, India	2000
2	-	Hand Book on Irrigation System Operation Practices	Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi	2000

16BECEOE04 ADVANCED CONSTRUCTION TECHNOLOGY **L T P C**
3 0 0 3

OBJECTIVE:

1. To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
2. To study different methods of construction to successfully achieve the structural design with recommended specifications.
3. To involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. To study of construction equipment's, and temporary works required to facilitate the construction process
5. To provide a coherent development to the students for the courses in sector of Advanced construction technology.
6. To present the new technology of civil Engineering and concepts related Advanced construction technology.

OUTCOMES:

1. Implementation of new technology concepts which are applied in field of Advanced construction.
2. Different methods of construction to successfully achieve the structural design with recommended specifications.
3. Application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. Will gain the Knowledge of construction equipment's, and temporary works required to facilitate the construction process

UNIT-I MODERN CONSTRUCTION METHODS 9
Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT-II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES 9
Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines

UNIT-III MODERN CONSTRUCTION EQUIPEMENTS-I 9
Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting,Tunneling and hoisting

UNIT-IV MODERN CONSTRUCTION EQUIPEMENTS-II 9
Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant

UNIT-V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES **9**

Principles and Practices of Temporary structures, Shoring, and Strutting,Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipments

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peurifoyu , R. L., , Ledbette, W.B	Construction Planning , Equipment and Methods	Mc Graw Hill Co	2000
2	Antill J.M	PWD, Civil Engineering Construction	Mc Graw Hill Book Co	2005

REFERENCE

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Varma.M	Construction Equipment and its Planning & Applications	, Metropolitan Book Co	2000
2	Nunnaly.S.W	Construction Methods and Managemen t	Prentice – Hall	2000
3	Ataev, S.S	Construction Technology	MIR , Pub	2000

16BECC 101 **COMMUNICATIVE ENGLISH** **L T P C**

3 0 0 3

OBJECTIVES:

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

INTENDED OUTCOMES:

Students undergoing this course will be able to

- Use English language for communication: verbal & non –verbal.
- Enrich comprehension and acquisition of speaking & writing ability.
- Gain confidence in using English language in real life situations.
- Improve word power: lexical, grammatical and communication competence.
- Acquire good vocabulary for easy communication.
- Be familiar with sentence structure and sentence formation

Unit I **(9)**

Listening– Types of listening - Listening to class reading - Video tapes/ Audio tapes. **Speaking** – Introduction on self - Introduction on one's friend. Reading - Reading for comprehension – Reading different kind of passages like descriptive, narrative, objective, conversational and argumentative.**Writing** – Formal and Informal letters- Free writing on any topic –My favorite place, hobbies, dreams, goals, etc- - To fill in different application forms. Grammar – Articles- WH questions –Yes/No Question - Subject Verb agreement. Vocabulary - Word Formation – Word expansion (Root word) - Prefix and Suffix.

Unit II **(10)**

Listening – Understanding the passage in English –Pronunciation practice. **Speaking** – Asking and answering questions - Telephone etiquette. **Reading** – Critical reading – Finding key information in a given text (Skimming - Scanning). **Writing**– Coherence and cohesion in writing – Short paragraph writing – Writing short messages. **Grammar**– Parts of speech – Noun – Verb – Adjectives - Adverbs. **Vocabulary**– Compound Nouns/Adjectives – Irregular verbs.

Unit III **(10)**

Listening – Listening for specific task – Fill in the gaps. **Speaking** – Phonemes – Syllables – Role play – Conversation Practice. **Reading** – Reading and Comprehension. **Writing** - Autobiographical writing – Biographical writing - Instruction writing. **Grammar** – Preposition – Infinitive – Gerund – Tenses. **Vocabulary** – Foreign words used in English – British and American usage.

Unit IV **(8)**

Listening – Responding to questions – Reading in class for complete understanding and for better pronunciation. **Speaking** – Debate- Presentations in seminars. **Reading** – Making inference from the reading passage – Predicting the content of reading passages. **Writing** - Interpreting visual materials (tables, graphs, charts, etc) Letters to the Editor. **Grammar** – Sentence pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

Unit V **(8)**

Listening - Listening to different accents, speeches/presentations. **Speaking**- Extempore talk –Just-a-minute talk. **Reading**-Reading strategies–Intensive reading – Text analysis. **Writing** - Creative writing – Writing circulars and notices – Writing proposal. **Grammar** – Direct and Indirect speech – Conditional sentences - Auxiliary verbs. **Vocabulary** – Abbreviations & Acronyms.
Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

Total-45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Sangeeta Sharma , Meenakshi Raman	Technical Communication: Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2009
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES:

www.learnerstv.com – Listening/ Speaking/ Presentation
www.usingenglish.com – Writing/ Grammar
www.englishclub.com – Vocabulary Enrichment/ Speaking
www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking
www.teachertube.com – Writing Technically
www.Dictionary.com – Semantic / Grammar

16BECC102 **ENGINEERING MATHEMATICS -I** **L T P C**
3 2 0 4

OBJECTIVES:

- To develop analyzing skills for solving different engineering problems.
- To understand the concept of Matrices.
- To remember the basics of differential calculus and its applications.
- To apply the problems in differential equations.
- To Create knowledge about functions of several variables and Sequence and Series.

INTENDED OUTCOMES:

The student will be able to

- Acquire the basic knowledge and understanding of mathematics
- Apply advanced matrix knowledge to engineering problems.
- Improve their ability in evaluating geometrical applications of differential calculus problems.
- To solve the problems by applying the differential Equations.
- Evaluating engineering problems involving functions of several variables.
- Understand the concepts of sequences and series.

UNIT I MATRICES (12)

Review of Matrix Algebra - Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction to canonical form through orthogonal reduction.

UNIT II DIFFERENTIAL CALCULUS (12)

Overview of Derivatives - Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes- Evolutes as Envelope of normals – Maxima and Minima of functions of two or more Variables – Method of Lagrangian Multipliers

UNIT III DIFFERENTIAL EQUATIONS (11)

Linear Differential equations of second and higher order with constant coefficients - Euler's form of Differential equations – Method of variation parameters.

UNIT -IV FUNCTIONS OF SEVERAL VARIABLES (12)

Partial derivatives – Euler's theorem for homogeneous functions – Total derivatives – Differentiation of implicit functions – Jacobians –Maxima and Minima of functions of two or more Variables - Method of Lagrangian multipliers.

UNIT V SEQUENCES AND SERIES (13)

Sequences: Definition and examples – **Series:** Types and Convergence – Series of positive terms – Tests of convergence: Comparision test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.

Total : 60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics	McGraw Hill Education (India) Private Limited, New Delhi.	2014
2	Sundaram, V. Lakhminarayan,K.A. & Balasubramanian,R.	Engineering Mathematics for first year.	Vikas Publishing Home, New Delhi.	2006

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Grewel . B. S.	Higher Engineering Mathematics	Khanna Publications, New Delhi.	2014
2	Bhaskar Rao. P. B, Sri Ramachary SKVS, Bhujanga Rao. M	Engineering Mathematics I	BS Publications, India.	2010
3	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
4	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009
5	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES :

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.intmath.com/matrices-determinants
4. www. Intmath.com/calculus/calculus-intro.php

16BEPH103 16BEPH203	ENGINEERING PHYSICS	L T P C 3 0 0 3

OBJECTIVE:

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology
- Understand the basics of laser and optical fiber with appropriate applications.
- Introduce the concepts of quantum mechanics for diverse applications.
- Impart the basic knowledge of crystal and its various crystal structures.
- Disseminate the fundamentals of nuclear physics and their applications

INTENDED OUTCOME:

- Identify the elastic nature of materials and its thermodynamic properties.
- Infer the characteristics of laser and optical fibers for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Identify the different atomic arrangements of crystals and its defects
- Make use of the concepts of sound waves for medical applications.
- Illustrate the basic ideas of nuclear reactors for energy resources

UNIT I PROPERTIES OF MATTER AND THERMODYNAMICS (9)

Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniform bending

Concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBER OPTICS (9)

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER -CO_2, Semiconductor LASER- Applications of LASER in industry and medicine.

Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNIT III QUANTUM PHYSICS (9)

Introduction to quantum theory – Black body radiation-Photo electric effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electron microscope.

UNIT IV CRYSTAL PHYSICS (9)

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures- crystal defects – point, line and surface defects

UNIT V ULTRASONICS AND NUCLEAR PHYSICS (9)

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications – SonogramIntroduction – basics about nuclear fission and fusion, nuclear composition –Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

Total- 45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Serway and Jewett	Physics for Scientists and Engineers with Modern Physics	Thomson Brooks/Cole, Indian reprint, New Delhi	2010
2	Gaur, R.K. and Gupta, S.C	Engineering Physics	Dhanpat Rai Publications,New Delhi.	2011
3	M.N. Avadhanulu and PG Kshirsagar	A Text book of Engineering Physics	S.Chand and company, Ltd., New Delhi	2011
4	D.C. Ghosh, N.C. Ghosh, P.K. Haldar	Engineering Physics	University Science, New Delhi	2011
5	P. Khare, A. Swarup	Engineering Physics: Fundamentals and Modern Applications	Jones & Bartlett Learning	2009

WEBSITES:

- www.nptel.ac.in
- www.physicsclassroom.com
- www. oyc.yale.edu
- www.physics.org

16BECH103 ENGINEERING CHEMISTRY L T P C
16BECH203 3 0 0 3

OBJECTIVES:

- To gain knowledge on adsorption phenomena.
- To make the students conversant with basics of water technology.
- To make the student acquire sound knowledge of electrochemistry and storage devices.
- To acquaint the student with concepts of fuels and rocket propellants.
- To develop an understanding of the basic concepts of corrosion science.
- To acquaint the students with the basics of surface chemistry.

INTENDED OUTCOME:

- Outline the basic principles of chemistry for water treatment (K)
- Examine the electrochemical properties to design non – conventional energy storage devices (S)
- Apply the concepts combustion of different fuels (S)
- Identify the concepts of corrosion and its protection in the engineering field (S)
- Apply the concepts of surface chemistry in the field of engineering (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I WATER TECHNOLOGY (9)

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverse osmosis.

UNIT II ELECTROCHEMISTRY AND STORAGE DEVICES (9)

Electrochemical cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode –

Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - Fe^{2+}vs dichromate) –Electrolytic conductance-application (conductometric titration)-Batteries- Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H_2-O_2 Fuel Cell.

UNIT III FUELS AND COMBUSTION (9)

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method - Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, Combustion of fuel-Introduction-GCV-NCV-Flue gas analysis.

UNIT IV CORROSION SCIENCE (9)

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings – Organic coatings-Paints - Constituents and functions –Inorganic coatings-Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating - Hot dipping.

UNIT V SURFACE CHEMISTRY AND PHASE RULE (9)

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm- Role of adsorbents in industries (catalysis and water softening).
Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company (P) Ltd., Chennai.	2012

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3rd Reprint NewDelhi.	2013
2.	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5th edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010
3.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009
4.	Dara.S.S	Text book of Engineering Chemistry.	S.Chand & Co.Ltd., New Delhi	2008

5.	Sharma.B. K	Engineering Chemistry	Krishna Prakasam Media (P) Ltd., Meerut	2001

WEBSITES:

1.http://www.studynotes.ie/leaving-cert/chemistry/
2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html
3.http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
4. http://ocw.mit.edu/courses/#chemistry
5. http://www.chem.qmul.ac.uk/surfaces/sec

16BEEC104 BASIC ELECTRICAL ENGINEERING **L T P C**
3 0 0 3

Course Objectives

The goal of this course for students is :

- To impart the basic knowledge about the Electric circuits.
- To understand the concept of Electro Mechanical Energy Conversion and Transformers.
- To understand the working of Semiconductor devices and Measuring Instruments.
- To impart the basic knowledge of Digital Circuits.
- To understand the fundamentals of mutual inductance and self inductance.
- To imparts a good knowledge about mesh analysis and nodal analysis.

Course Outcomes

At the end of this course, students will be able to

- Attributing the electric circuits with DC and AC excitation by applying various circuit laws.
- Attributing the magnetic circuits and transformer.
- Reproduce the two port networks.
- Evaluate the various digital circuits in real time applications.
- Analysis various semiconductor devices in real time applications.
- Reproduce the Measuring Instruments.

UNIT I – FUNDAMENTALS OF DC CIRCUITS

Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor, Kirchhoff's laws, Mesh analysis, Nodal analysis –equivalent resistor, current division, voltage division

UNIT II – MAGNETIC CIRCUITS

Introduction to magnetic circuits-Simple magnetic circuits-Faraday's laws, Lenz law-Flemings rules - induced emfs and inductances-self and mutual inductance.

UNIT III – AC CIRCUITS (Elementary treatment only)
Generation of AC, Average and RMS values, Form and peak factors, concept of phasor representation, J operator – representation of AC in rectangular and polar form – power and power factor - Introduction to three phase systems - types of connections, relationship between line and phase values.

UNIT IV–ELECTRICAL MACHINES (Elementary treatment only)
Working principle, construction, types and applications of DC machines and AC machines -single phase transformers - single phase induction motors: capacitor start and capacitor start & run motors

UNIT V–ELECTRICAL SAFETY, WIRING AND INTRODUCTION TO POWER SYSTEM
Safety measures in electrical system- types of wiring- wiring accessories staircase,
Fluorescent lamps & corridor wiring- Basic principles of earthing- Types of earthing- protection devices MCB - fuses and its types – calculation of fuses.

TEXT BOOK
1. Dash.S.S,Subramani.C,Vijayakumar.K, ”Basic Electrical Engineering”, First edition, Vijay Nicole Imprints Pvt.Ltd,2013

REFERENCES
1. SmarajtGhosh, “Fundamentals of Electrical & Electronics Engineering”,Second edition, PHI Learning, 2007.
2. Metha.V.K, RohitMetha, “Basic Electrical Engineering”, Fifth edition,Chand.S& Co, 2012.
3. Kothari.D.P and Nagrath.I.J, “Basic Electrical Engineering”, Second edition,Tata McGraw - Hill, 2009.
4. Bhattacharya.S.K, “Basic Electrical and Electronics Engineering”, Firstedition, Pearson Education, 2011.

16BEEC105 BASIC ELECTRONICS ENGINEERING L T P C
3 0 0 3

UNIT I- ELECTRONIC COMPONENTS

Passive components – resistors, capacitors and inductors -properties, common types, I-V relationship and uses.

UNIT II- SEMICONDUCTOR DEVICES

Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET.

UNIT III – OPTOELECTRONIC DEVICES

LED, LCD, LDR, Photodiode, Phototransistor, Solar cell, Opto couplers

UNIT IV- TRANSDUCERS

Transducers - Instrumentation – general aspects, classification of transducers,basic requirements of transducers, passive transducers - strain gauge, thermistor,Hall-Effect transducer, LVDT, and active transducers – piezoelectric andthermocouple.

UNIT V- DIGITAL ELECTRONICS

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems- simplification of Boolean expression - implementation of Boolean expressionsusing logic gates - standard forms of Boolean expression.

TEXT BOOKS

1. Thyagarajan.T, SendurChelvi.K.P, Rangaswamy.T.R, “Engineering Basics:Electrical, Electronics and Computer Engineering”, New Age International,Third Edition, 2007.
2. SomanathanNair.B, Deepa.S.R, “Basic Electronics”, I.K. International Pvt.Ltd., 2009.

REFERENCES

1. Thomas L. Floyd, “Electronic Devices”, Pearson Education, 9th Edition, 2011.
2. Rajput.R.K, “Basic Electrical and Electronics Engineering”, LaxmiPublications, First Edition, 2007.

16BEPH111 ENGINEERING PHYSICS LABORATORY L T P C
16BEPH211 0 0 4 2

OBJECTIVES:

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To prepare for the lab experiment and perform individually a wide spectrum of experiments.
- To present experimental data in various appropriate forms like tabulation, and plots.
- To analyze, Interpret and Summarize experimental results.
- To communicate clearly understanding of various experimental principles, instruments/setup, and procedure.

OUTCOMES:

- The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- Prepare for the lab experiment and perform individually a wide spectrum of experiments.
- Present experimental data in various appropriate forms like tabulation, and plots.
- Analyze, Interpret and Summarize experimental results.
- Communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- Prepare to develop the skills for understanding basic electric circuits.

LIST OF EXPERIMENTS – PHYSICS

1. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
2. Determination of wavelength of mercury spectrum – spectrometer grating.
3. Determination of Young’s modulus of the material – Non uniform bending (or) Uniform bending.
4. Determination of Viscosity of liquid – Poiseuille’s method.
5. Spectrometer Dispersive power of a prism.
6. Torsional pendulum – Determination of Rigidity modulus.
7. Particle size determination using Diode Laser
8. Determination of Laser parameters – Wavelength, and angle of divergence.
9. Determination of acceptance angle in an optical fiber.
10. Determination of thickness of a thin wire – Air wedge method
11. Determination of Band Gap of a semiconductor material.
12. Determination of Specific resistance of a given coil of wire – Wheatstone Bridge

16BECH111 ENGINEERING CHEMISTRY LABORATORY L T P C
16BECH211 0 0 4 2

OBJECTIVES:

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To estimate the amount of alkalinity ions, hardness, chloride in water sample
- To make the student acquire practical skills in the determination of conductance of solutions, EMF etc
- To acquaint the students with the determination of molecular weight of a polymer by viscometry
- To carried out different types of titrations for estimation of concerned in materials

OUTCOMES:

- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
- Estimate the amount of alkalinity ions, hardness, chloride in water sample
- Measure molecular/system properties of conductance of solutions, EMF etc
- Acquaint the students with the determination of molecular weight of a polymer by visocometry
- Determine the corrosion rate of steel by weight loss method.
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more qualities and quantities of materials involved for accurate results.

LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of alkalinity of Water sample.
2. Estimation of hardness of Water by EDTA
3. Estimation of chloride in Water sample (Argentometric method)
4. Determination of corrosion rate by weight loss method.
5. Conductometric Titration (Simple acid base).
6. Conductometric Titration (Mixture of weak and strong acids).
7. Conduct metric Titration using $BaCl_2$ vs Na_2 SO_4.
8. pH Titration (acid & base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$).
10. Estimation of Ferric ion by Spectrophotometry.
11. Determination of water of crystallization of a crystalline salt (Copper sulphate).
12. Determination of molecular weight and degree of polymerization using Viscometry.

13. Determination of chemical oxygen demand.

16BEEC112 ENGINEERING WORKSHOP PRACTICE L T P C
0 0 4 2

Course Objectives

- To prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- To prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice
- Prepare the student for future Engineering positions.
- To divulge the basics of metal casting.
- To make the students familiar with welding and brazing.
- To learn about the CNC machining.

Course Outcomes

- Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
- Students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.
- Gain good knowledge of various manufacturing methods.
- Clear idea about fitting operations and its power tools.

PART – A (MECHANICAL)

i. **WELDING**
   i. Preparation of arc welding of butt joints, lap joints and tee joints.

ii. **BASIC MACHINING**
   i. Simple Turning and Taper turning
   ii. Drilling and Tapping
   iii. Sheet Metal Work
   iv. Model making – Trays, funnels, etc.

iii. **DEMONSTRATION ON**
   i. Smithy operations
   ii. Foundry operations
   iii. Plumbing Works
   iv. Carpentary Works

PART –B (ELECTRICAL & ELECTRONICS)

i. **ELECTRICAL ENGINEERING**
   i. Study of electrical symbols and electrical equipments.
   ii. Construct the wiring diagram for Stair case wiring and Fluorescent lamp wiring.
   iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energy meter.
   iv. Measurement of electrical quantities – voltage, current, power & power factor in R load.
   v. Measurement of energy using single phase energy meter.

ii. **ELECTRONICS ENGINEERING**
   i. Study of Electronic components– Resistor (color coding), capacitors and inductors.
   ii. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
   iii. Study of logic gates AND, OR, NOT, NOR and NAND.
   iv. Study of HWR and FWR.

REFERENCES

1. Jeyachandran, K., Natarajan, S. and Balasubramanian, S, “A Premier on Engineering Practices Laborator y”, Anuradha Publications, Kumbakonam, 2007.
2. Jeyapoovan, T., Saravanapandian, M, “Engineering Practices Lab Manual”, Vikas Puplishing House Pvt. Ltd, Chennai, 2006.
3. Bawa, H.S, “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, New Delhi, 2007.

16BEEC113	ELECTRICAL ENGINEERING LABORATORY	L T P C
		0 0 3 2

OBJECTIVES

- To introduce the basic electrical equipments in the lab.
- To enable the students to understand the DC circuit analysis and network theorems.
- To understand the measurement of three phase power by using two wattmeter method.
-

INTENDED OUTCOMES

- At the end of this course Students are able to deal with some of the frequently used instruments and equipments like the digital multimeter and DC Power supply and are able to deal with some Network Theorems.

LIST OF EXPERIMENTS

1. Study of Electrical Measurements and the Oscilloscope.
2. Study of Potentiometers and Rheostats.
3. Study and verification of Series Circuits, Parallel Circuits in DC Circuits.
4. Study and verification of Series-Parallel Circuits in DC Circuits.
5. Study and verification of Ohm’s Law and Kirchoff’s law.
6. Study and verify of Mesh Analysis.
7. Study and verify of Nodal Analysis.
8. Study of V-I Characteristics of Incandescent lamp.
9. Measurement of three phase power by using two wattmeter method.

16BECC151	**HUMAN VALUES**	**L T P C**
		1 0 0 -

Course Objectives

1.To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
4.To know the value of being a human being.
5.To provide a much needed orientational input in value education to the young enquiring minds.
6.To study the value of being a useful citizen.

Course Outcomes

1.To involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. To make free from any dogma or value prescriptions.
3. To analysis process of self-investigation and self-exploration, and not of giving sermons.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.
6. To Educate the values and meaning of life in the young minds and to transform them as responsible citizens

UNIT I **3**

Human life on Earth - Concept of Human Values - Value Education - Aim of education and value education - Types of values - Components of values – Attitudes – types of attitudes

UNIT II **3**

Self Development : Self analysis – Goal Setting - Thought Analysis – Guarding against Anger - Respect to age, experience, maturity, family members, neighbors, co-workers

UNIT III **3**

Individual Qualities – Truthfulness – Constructivity – Sacrifice – Sincerity - Self Control – Altruism – Tolerance - Scientific Vision – Regulating Desire

UNIT IV **3**

Mind Culture - Modern Challenges of Adolescent - Emotions and behavior - Sex and spirituality - Adolescent Emotions - Meditation

UNIT V **3**

Body and Mind Fitness : (a) Physical Exercises (b) Activities: (i) Moralization of Desires (ii) Neutralization of Anger (iii) Eradication of Worries (iv) Benefits of Blessings

TOTAL **15**

REFERENCE BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Subramanian. R	Professional Ethics	Oxford, New Delhi	2013
2	Govindarajan. M, Natarajan. S, Senthil Kumar. V.S	Engineering Ethics	Prentice Hall of India, New Delhi	2004
3	Tripathi. A.N	Human Values	New Age International	2009
4	Pope. G. U.	Thirukkural with English Translation	Uma Publication, Thanjavur.	2002

16BECC201A **BUSINESS COMMUNICATION** **L T P C**
3 0 0 3

OBJECTIVES:

- To help students comprehend the role of listening skills in effective communication.
- To familiarize students with verbal and non-verbal communication.
- To expose students to neutral accent.
- To develop emotional intelligence skills in them for enhancing their self-esteem.
- To assist them in setting goals and developing positive attitude.
- To enable students to acquire decision making skills, problem solving skills and assertive skills.

INTENDED OUTCOMES:

Students undergoing this course will be able to

- Design and deliver a persuasive presentation that convinces the audience of the topic's relevance and overcomes resistance, using appropriate visual support and adhering to a specified time limit.
- Use a strategic communication model and critical thinking to identify objectives, analyze audiences, and choose the most effective structure and style for delivering strategically sound written and spoken messages.
- Practice principles of effective business writing and document design in all written documents.
- Build an understanding of different organizational cultures, business practices, and social norms to communicate more effectively in domestic and cross-cultural business contexts.
- Develop their soft skills and inter personal skills, which will make the transition from college to workplace smoother and help them excel in their job.

UNIT I

What is Business Communication? - Types of Communication – Formal and informal communication – Process of Communication- modes of Communication – Barriers to communication.

UNITII

Written Business Communication – Style- word-usage- organisation of Ideas – mechanics of writing and fill up of forms - Cover Letter- Letter for Job Application- Letter of Complaint - Memos - Resumes - Email- Reports Revising and proofreading- Advertising slogans- jargons- Description of Graphics and visual aids - interpretation of graphs using expressions of comparison and contrast .

UNIT III

Reading and Understanding the news articles - Oral Business Communication - First Impressions - Attire – Effective Presentation strategies- Nuances of delivery – Controlling nervousness and stage fright- Visual aids Presentations- Capturing Audience - Tone - Behavior - Telephone Etiquette- Non - verbal communication - Eye contact - Facial expressions - Posture - Gestures - Body langage – Etiquette- Organization of presentation – brain storming- Negotiations.

UNIT - IV

Difference between goals and dreams - SMART goal setting - 3 Ds of goal setting- Determination, Discipline and Direction - Developing the right attitude - Motivation - Intrinsic and Extrinsic motivation - Dealing with change - Dedication - Taking responsibilities - Decision making.

UNIT - V

Intrapersonal skills - Self-analysis - Thought process – Interpersonal skills - Confidence building - Resolving conflicts- Analytical skills - Team Building - Leadership skills - Planning/organizing - Ability to work independently - Professional ethics - Communicating via e-mail. Ethical perspectives and their implications for responsible communication - Proposal Presentation

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Meenakshi Raman ; Prakash Singh	Business Communication	Oxford University Press	2012

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Murthy, G .R. K.	Soft Skills for Success**.**	The ICFAI University Press, Hyderabad.	2008
2	Jagadeesan, G & Santanakrishnan,R.	Soft Skills Development:Training and Evaluation.	The ICFAI University Press, Hyderabad.	2008
3	Sherfield, Robert M., Rhonda J. Montgomery, & Patricia G. Moody	Developing Soft Skills.	Pearson Education, New Delhi.	2005

WEBSITES

http://tribehr.com/social-hr-software/talent-management/skills-tracking
www.ispeakyouspeak.blogspot.com
https://alison.com/subjects/6/Personal-Development-Soft-Skills
www.learning-development.hr.toolbox.com
http://www.niit.com/solution/soft-skill-training
http://mybcommlab.com to test your understanding of the concepts presented in each chapter and explore additional materials that will bring the ideas to life in videos, activities, and an online multimedia e-book.

16BECC201B **TECHNICAL ENGLISH** **L T P C**
3 0 0 3

OBJECTIVES:

- To motivate learners to acquire listening & speaking skills in both formal and informal context.
- To focus on question forms & to make them understand the importance of using question tags and also the functional use of transformation of sentences.
- To improve their reading habit and to train them in critical and analytical reading.
- To equip them to write for academic as well as work place context.

- To enable students to face interviews.

INTENDED OUTCOMES:

Students undergoing this course will be able to

- Acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- Enhance them reading texts critically and analytically.
- Develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Enrich the ability to face interviews with confidence.

UNIT-1 **(10)**

Listening - Difference between Hearing & Listening –Listening to informal conversation. Speaking - Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., **Reading** – Extensive and Intensive reading. **Writing** – Report writing - Writing a covering letter. **Grammar** – Regular & Irregular verbs - Kinds of sentences - Question tags. **Vocabulary** – Homonyms and Homophones.

UNIT-II **(8)**

Listening – Note Taking- Improving grasping ability. **Speaking** – Welcome address - Vote of thanks - Master of ceremony. **Reading** – Active and Passive reading - Reading for vocabulary- Reading for a purpose. **Writing** - Writing a review (Film review) - Summary of a story. **Grammar** - Modal verbs – Conjunction - Expression of cause and effect. **Vocabulary** - Phrasal verbs - Idioms.

UNIT – III **(9)**

Listening - Barriers to listening (Physical, Psychological, Linguistic & Cultural). **Speaking** – Stress, Pause and Intonation. **Reading** – Rapid reading – Skimming, Scanning and Surveying. (SQ3R)**Writing** - Essay writing -Minutes of meeting - Agenda – **Grammar** - Active and Passive voice - Purpose expression. **Vocabulary** - Same words used as noun and verb - Often misspelt and confused words.

UNIT-IV **(8)**

Listening – Listening to telephone conversation - Viewing model interviews. **Speaking** – Group Discussion - Correlation between verbal & non - verbal communication. **Reading** – Reading comprehension (short & long text) - Reading job advertisements and profile of a company. **Writing** – Job application - Resume writing - Checklist preparation. **Grammar** - Numerical expressions – Collocations - **Vocabulary** - Singular and Plural (Nouns)

UNIT- V **(10)**

Listening – Types of listening- Improving listening comprehension**. Speaking** - Oral presentation - Vocal communication techniques - Voice, quality, volume, pitch etc., **Reading** -Note making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation writing – Short essays writing- **Grammar**- Transformation of sentences (Simple, Compound & Complex). **Vocabulary** - Collection of Technical Vocabularies with their meanings.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

Total-45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Sangeeta Sharma , Meenakshi Raman	Technical Communication: Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2008
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES :

www.learnerstv.com – Listening/ Speaking/ Presentation
www.usingenglish.com – Writing/ Grammar
www.englishclub.com – Vocabulary Enrichment/ Speaking
www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking
www.teachertube.com – Writing Technically
www.Dictionary.com – Semantic / Grammar

16BECC202 **ENGINEERING MATHEMATICS- II** **L T P C**
3 2 0 4

OBJECTIVES:

- Determine mathematical tools needed in evaluating multiple integrals and their usage.
- Utilize Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.
- To understand the concepts and applications of partial differential equations

- Apply the knowledge of Mathematics in various Engineering fields by making them to identify the functions in engineering problems as analytic function and their analyze as a function of a complex variables.
- Develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, to specify some difficult integration that appear in applications can be solved by complex integration in application areas such as fluid dynamics and flow of the electric current.

OUTCOMES:

- The students will be able to understand mathematical tools needed in evaluating multiple integrals and their usage. Find the areas and volumes using multiple integrals

- To calculate with them and apply them and also to calculate grad, div and curl in Cartesian and other simple coordinate systems.

- Improve their ability in Vector calculus
- The student will be able to Understand how to solve the given standard partial differential equations.
- To find the Analytic functions using the Cauchy Riemann equations and they will learn mapping properties of elementary functions and mapping properties of some special transcendental functions. They will understand relations between conformal mappings and quadratic differentials and how geometric structures are changing under conformal mappings.
- To Evaluate complex integrals using the Cauchy integral formula and the residue Theorem and to appreciate how complex methods can be used to prove some important theoretical results.

UNIT-I MULTIPLE INTEGRALS (11)

Double integral – Cartesian coordinates – Polar coordinates – Change of order of integration – Triple integration in Cartesian co-ordinates – Area as double integrals.

UNIT-II VECTOR CALCULUS (13)

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem, Gauss divergence theorem and Stoke's theorems (Statement Only)- Surfaces : hemisphere and rectangular parallelopipeds.

UNIT- III PARTIAL DIFFERENTIAL EQUATIONS (11)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT-IV ANALYTIC FUNCTIONS (12)

Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms – Sufficient condition for an analytic function (Statement Only) - Properties of analytic functions – Constructions of an analytic function - Conformal mapping: w = z+a, az, 1/z and bilinear transformation.

UNIT-V COMPLEX INTEGRATION (13)

Complex Integration - Cauchy's integral theorem and integral formula (Statement Only) – Taylor series and Laurent series - Residues – Cauchy's residue theorem (Statement Only) - Applications of Residue theorem to evaluate real integrals around unit circle and semi circle (excluding poles on the real axis).

Total : 60

TEXT BOOKS:

S. No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics I & II	McGraw-Hill Education Pvt.Ltd, New Delhi	2014
2	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2014

REFERENCES:

S. No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Erwin Kreyszig	Advanced Engineering Mathematics.	John Wiley & Sons. Singapore	2011
2	Venkataraman, M. K.	Engineering Mathematics.	The National Publishing Company, Chennai	2005
3	Narayanan. S, Manicavachagam pillay.T.K and Ramaniah.G	Advanced Mathematics for Engineering Students.	Viswanathan S.(Printers and Publishers) Pvt. Ltd. Chennai.	2002
4	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES:

1.www.efunda.com
2. www.mathcentre.ac.uk
3. www.sosmath.com/diffeq/laplace/basic/basic.html
4. www.mathworld.wolframe.com

16BECC204 **ENVIRONMENTAL SCIENCES** **L T P C**
3 0 0 3

OBJECTIVES:

- To give a comprehensive insight into natural resources, ecosystem and biodiversity.
- To educate the ways and means of the environment
- To protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures.

INTENDED OUTCOME:

- Students will prepare themselves to go ecofriendly and help preserving the nature and environment.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **(9)**

Definition, Scope and Importance – Need for public awareness -Forestresources: Useandover-exploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources-role of an individual in conservation of natural resources.

UNIT II ECOSYSTEM **(9)**

Chemistry and Environment- Environmental segments, Composition and Structure of atmosphere- Concept of an ecosystem- Structure, components and function of an ecosystem Energy flow in the ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marine ecosystem)

UNIT III BIODIVERSITY **(9)**

Introduction to biodiversity, Definition- Genetic diversity, Species diversity and Ecosystem diversity, Biogeographical classification of India, Importance of biodiversity-Value of biodiversity - Hot Spots of biodiversity-Threats to biodiversity - Endangered and Endemic Species of India – Conservation of biodiversity- In-Situ and Ex-Situ conservation of biodiversity.

UNIT IV ENVIRONMENTAL POLLUTION (9)

Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control measures of urban and industrial wastes– Role of an individual in prevention of pollution–Disaster management-earthquake, tsunami, cyclone and landslides.

UNIT V SOCIAL ISSUES AND ENVIRONMENT (9)

From Unsustainable to Sustainable development, Urban problems related to energy sources, Water conservation, Rain water harvesting and Watershed management, Resettlement and rehabilitation of people, its problems and concerns, Environmental ethics- Issues and possible solutions- Climate change- Green house effect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation- Environment Protection Act- Human Rights- Value education, Role of Information Technology in Environment and Human health-Population growth, Variation of population among nations-Population explosion.

Total: 45

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Ravikrishnan, A	Environmental Science	Sri Krishna Hi tech Publishing Company Private Ltd., Chennai	2012
2.	Anubha kaushik C.P. Kaushik	Environmental Science and Engineering	New Age International (P) Ltd., New Delhi.	2010

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William P.Cunningham	Principles of Environmental Science	Tata Mc Graw -Hill Publishing Company, New Delhi.	2008
2.	Linda D. Williams	Environmental Science Demystified	Tata Mc Graw -Hill Publishing Company Ltd., New Delhi.	2005
3.	Bharucha Erach	Environmental Science Demystified	Mapin Publishing (P) Ltd., Ahmedabad.	2005
4.	Tyler Miller G. Jr	Environmental Science	Thomson & Thomson Publishers, New Delhi.	2004
5.	Trivedi, R.K. and Goel, P.K	Introduction to Air Pollution	Techno-Science Publications, Jaipur.	2003

WEBSITES:

1. http://people.eku.edu/ritchisong/envscinotes1.html
2.http://nptel.ac.in/courses.php?disciplineId=120
3.www.newagepublishers.com/samplechapter/001281.

ELECTIVE PAPER
(COMMON TO ALL UG COURSES AND PG COURSES 2015 – 2016)

16BEEC205	**CIRCUIT THEORY**	**L T P C**
		3 1 0 4

OBJECTIVES

- To understand the concept of circuit elements lumped circuits, waveforms, circuit laws and network reduction. To solve the electrical network using mesh and nodal analysis by applying network theorems.
- To understand the concept of active, reactive and apparent powers, power factor and resonance in series and parallel circuits
- To know the basic concepts of coupled circuits, three phase loads and power measurement.
- To analyze the transient response of series and parallel A.C. circuits and to solve problems in time domain using Laplace Transform

INTENDED OUTCOMES:

- To become familiar with various network theorems
- To analyze circuits
- To understand various resonant, coupled circuits and transient response

UNIT- I DC CIRCUIT ANALYSIS
Basic components and electric circuits – Charge – Current – Voltage and Power– Voltage and Current Sources – Ohms Law – Voltage and Current laws – Kirchoff's Current Law – Kirchoff's voltage law – The single Node – Pair Circuit – Series and Parallel Connected Independent Sources – Resistors in Series and Parallel – Voltage and Current division – Basic Nodal and Mesh anal ysis – Nodal analysis – Mesh anal ysis.

UNIT- II NETWORK THEOREM AND DUALITY
Useful Circuit Analysis techniques – Linearity and superposition – Thevenin and Norton Equivalent Circuits – Maximum Power Transfer – Delta – Wye Conversion – Duality – Dual circuits.

UNIT –III SINUSOIDAL STEADY STATE ANALYSIS
Sinusoidal Steady – State analysis – Characteristics of Sinusoids– The Complex Forcing Function– The Phasor– Phasor relationship for R– L – C – impedance and Admittance – Nodal and Mesh Anal ysis– Phasor Diagrams – AC Circuit Power Anal ysis – Instantaneous Power – Average Power – apparent Power and Power Factor – Complex Power.

UNIT -IV TRANSIENTS AND RESONANCE IN RLC CIRCUITS
Basic R L and RC Circuits – The Source – Free R L Circuit – The Source–Free RC Circuit – The Unit- Step Function – Driven R L Circuits – Driven RC Circuits – R LC Circuits – Frequency Response – Parallel Resonance – Series Resonance – Quality Factor.

UNIT- V COUPLED CIRCUITS AND TOPOLOGY

Magnetically coupled circuits – Mutual inductance – the Linear Transformer – the Ideal Transformer – An introduction to Network Topology – Trees and General Nodal analysis – Links and Loop analysis.

TEXT BOOKS :

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	William .H.Hayt,Jack. Jr , Kemmerl y. E, Steven .Durbin .M.	Engineering Circuit Anal ysis.	Tata McGraw-Hill, New Delhi.	2006
2	David .A. Bell.	Electric Circuits.	PHI, New Delhi.	2006

REFERENCES :

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Nilson,Reidal.	Electric Circuits.	Pearson Education.	2008
2	Charles .K. Alexander & Mathew,N.O.Sadiku.	Fundamentals of Electric Circuits.	McGraw- Hill.	2003
3	Sudhakar and Shyammohan .S. Palli.	Electric Circuits.	Tata Mc Graw – Hill.	2007
4	Cunningham .D.R., Stuller .J.A.	Basic Circuit Anal ysis.	Jaico Publishing House.	2002
5	David.E.Johnson, John y .R. Johnson, John.L.Hilburn.	Electric Circuit Anal ysis.	Prentice-Hall.	2012

16BEEC212 ELECTRIC CIRCUIT LABORATORY L T P C
0 0 3 2

LIST OF EXPERIMENTS

1. Verification of Kirchoff's voltage and Current Laws
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem & Norton's Theorem
4. Verification of Maximum Power Transfer Theorem
5. Verification of Tellegen's and Reciprocity Theorem
6. Time domain response of R L Transient Circuit.
7. Time domain response of RC Transient Circuit.
8. Series R LC Resonance Circuits (Frequency response& resonant frequency)
9. Parallel R LC Resonance Circuits (Frequency response & resonant frequency)
10. Simulation experiments using PSP ICE or MultiSim.

16BEEC213 ENGINEERING GRAPHICS L T P C
1 0 4 3

OBJECTIVES

1.	To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
2.	To expose them to existing national standards related to technical drawings.

UNIT I INTRODUCTION **9**

Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

UNIT II SCALES AND PLANE CURVES **8**

SCALES: Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

UNIT III FREE HAND SKETCHING **9**

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT IV PROJECTION OF POINTS, LINES AND PLANE SURFACES **8**

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT V PROJECTION OF SOLIDS **8**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

Introduction to Drafting Software/Package (Not for Exam) **3**

Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

TOTAL **45**

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venugopal K and Prabhu Raja V	Engineering Graphics	New Age International Publishers	2007
2	VTU	A Primer on Computer Aided Engineering Drawing	Belgaum	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kumar M S	Engineering Graphics	D D Publications, Chennai	2007
2	Bureau of Indian Standards	Engineering Drawing Practices for Schools and	BIS, New Delhi	2003

		Colleges SP 46-2003		
3	Luzadder W J	Fundamentals of Engineering Drawing	Prentice Hall Book Co., New York	1998

WEB REFERENCES

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

16BEEC251 HANDS ON TRAINING IN ELECTRONIC WORKSHOP **L T P C**
1 0 0 -

1. Study of Electronics Components
   - i. Resistor Colour Coding
   - ii. Pin Configutration Details
   - iii. Basic IC pin Configuration
2. Study of Measuring Instruments(Analog and Digital)
   - i. Ammeter
   - ii. Voltmeter
   - iii. Multimeter
3. Study and Trouble Shooting of Function Generator
4. Study of CRO and waveform patterns from CRO
5. Study of PCB
6. Design of Simple circuit using PCB
7. Trouble shooting PCB
8. De soldering from Trouble shooted PCB
9. Refix Component from De solder place
10. Quality Control PCB
    - i. Placing of Components in board
    - ii. Dip soldering
    - iii. Dry soldering
    - iv. Improper soldering

16BEEC301A OPTIMIZATION AND CALCULUS OF VARIABLES **L T P C**
3 2 0 4

OBJECTIVES:

- To develop analytical skills for solving engineering problems
- To teach the students the basic concepts of LPP, Transportation and Assignment problems
- To make the students to study about the Integer Programming and Network Analysis

INTENDED OUTCOMES:

• Be able to solve problems in different environments and develop critical thinking • Be able to build and solve Transportation Models, Assignment Models, integer programming and Non linear programming

UNIT I LINEAR PROGRAMMING PROBLEM (12)

Formulation of LPP - Graphical Method - Simplex Method - Artificial variable technique and two phase simplex method. Duality - Dual and simplex method - Dual Simplex Method .

UNIT II TRANSPORTATION AND ASSIGNMENT PROBLEM (12)

Transportation Model- finding initial basic feasible solutions- moving towards optimality-Degeneracy.Solution of an Assignment problem - Hungarian Algorithm.

UNIT III INTEGER PROGRAMMING (11)

Integer Programming Problem – Gromory's fractional cut Method – Branch Bound Method

UNIT IV NETWORK ANALYSIS (11)

PERT & CPM- network diagram-probability of achieving completion date- crash time- cost analysis.

UNIT V CALCULUS OF VARIABLES (14)

Calculus of Variations covering, Basic definition, Simplest problem, Isoperimetric problem, Problems with Higher order derivatives, Euler Lagrange Equation, Weierstrass-Erdmann conditions; Pontryagin Maximum Principle; Transversality condition; Applications

Total : 60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hamdy Taha. A.	Operations Research	Prentice – Hall of India Private Limited, New Delhi .	2013
2	Dr. Grewal B.S.	Higher Engineering Mathematics	Khanna Publishers, New Delhi.	2013

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Natarajan A.M., Balasubramani P., Thamilarasi A	Operations Research	Pearson Education, New Delhi.	2005
2	Srinivasan G	Operations Research: Principles and Applications	PHI Private Limited, New Delhi.	2007
3	Winston	Operations Research, Applications and Algorithms	Cengage Learning India Pvt. Ltd, New Delhi.	2004
4	Kanti Swarup, Manmohan, Gupta	Operations Research	Sultan Chand & Sons, New Delhi.	2010

WEBSITES:

1. www.mathworld. Wolfram.com
2. www.mit.edu
3. www.nptel.com

16BEEC301B LINEAR ALGEBRA AND SPECIAL FUNCTIONS **L T P C**

3 2 0 4

OBJECTIVES:

- To develop analytical skills for solving engineering problems.
- To make the students to study about linear algebra and some useful special functions.
- To understand the concepts of vector space, linear transformations and diagonalization.
- To apply the concept of inner product spaces in orthogonalization.
- To understand the procedure to solve partial differential equations.
- To give an integrated approach to number theory and abstract algebra, and provide a firm

.

INTENDED OUTCOMES:

- Be able to acquire basic knowledge on vector spaces and linear transformations.
- Be able to build and solve the special functions.
- Illustrate accurate and efficient use of advanced algebraic techniques.
- Demonstrate their expertise by solving non - trivial problems related to the concepts

and by proving simple theorems about the statements proven by the text.

- Gain the capability to solve Bessel Function equations.
- Ability to clarify engineering problems using Fourier series.

UNIT I VECTOR SPACES (12)

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II LINEAR TRANSFORMATIONS (12)

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNIT III INNER PRODUCT SPACES (12)

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

UNIT IV HYPERBOLIC FUNCTIONS, BETA AND GAMMA FUNCTIONS (12)

Hyperbolic functions: Hyperbolic functions and Inverse Hyperbolic functions – Identities – Real and imaginary parts – solving problems using hyperbolic functions.

Beta And Gamma Functions : Definitions – Properties – Relation between beta and gamma integrals – Evaluation of definite integrals in terms of beta and gamma functions.

UNIT V BESSEL FUNCTIONS (12)

Bessel Functions – Preliminaries – Definitions – Bessel Differential Equation – Differential recurrence relations – the pure recurrence relation – A generating function – Bessel's integral – Index half and odd integer.

Total : 60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dr. Grewal B.S.	Higher Engineering Mathematics	Khanna Publishers, New Delhi.	2013
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra	Tata McGraw-Hill, New Delhi.	2008

		with Application		

WEBSITES:

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com

16BEEC302 ELECTRONIC DEVICES AND CIRCUITS **L T P C**

3 0 0 3

OBJECTIVES

- To understand the operational characteristics of a Semiconductor in Equilibrium and Non-Equilibrium conditions.
- To understand the working of PN junction diodes and special purpose diodes.

- To understand the basic working physics of BJT and FET both in ideal and non- ideal conditions.
- To understand the working of Rectifiers and Voltage regulators.
- To understand the fabrication process of Monolithic Ics
- To expose the students about the construction working and applications of basic electronic devices essential for subsequent courses on Analog electronics, Analog & digital communication and CMOS design.

INTENDED OUTCOMES

- Understand the fundamental concepts
- Logically analyze any electronic circuit
- Ability to construct DC power supply for given specification.
- Gain knowledge on construction and applications of Diodes
- Understand MOS transistors for circuits and systems
- Gain knowledge on Construction and working of Field effect Transistors

UNIT I-SEMICONDUCTOR DIODES AND SPECIAL PURPOSE DIODES

Overview on Physics and Properties of Semiconductors: Intrinsic semiconductor – extrinsic semiconductor – Fermi level in an intrinsic semiconductor – conductivit y of a metal, intrinsic semiconductor and extrinsic semiconductor – drift – diffusion – recombination – carrier life time. Semiconductor diodes : Formation of PN junction – working principle – VI characteristics – PN diode currents – diode current equation – diode resistance – transition and diffusion capacitance – diode models – voltage breakdown in diodes.

Special purpose diodes : Zener diode – point-contact diode – backward diode – varactor diode – step- recover y diode – schottky diode, PNPN diode – RF diode.

UNIT II-BIPOLAR TRANSISTORS

Bipolar Transistors: Construction – working – transistor currents –transistor configurations and input- output characteristics – Earl y effect (base width modulation) – Ebers Moll model – transistor as an amplifier –Transistor as a switch.

UNIT III-FIELD EFFECT TRANSISTORS

Field-Effect Transistors: construction, working and VI characteristics of JFET – comparison of BJT and JFET – MOSFET – enhancement MOSFET, depletion MOSFET, their working principle and VI characteristics, comparison of MOSFET with JFET, comparison of D MOSFET with E MOSFET, CMOS, MESFET, CCD.

UNIT IV-DC POWER SUPPLIES

Rectifiers and Filters: Block schematic of a t ypical DC power suppl y, single phase HWR, FWR, full- wave bridge rectifier, power suppl y filters (ripple factor and efficiency anal ysis), bleeder resistor, voltage dividers.

Voltage regulators: voltage regulation, Zener diode shunt regulator, transistor series regulator, transistor shunt regulator, switching regulators, design of complete DC power suppl y circuit.

UNIT V-INTEGRATE D CIRCUIT FABRICATION

Integrated circuit – advantages and drawback of ICs – scale of integration –classification of ICs – definition of linear IC and digital IC with examples –manufacturing process of monolithic ICs – fabrication of components (diode, capacitor, bipolar transistor and resistor) on monolithic IC – comparison of MOS ICs and bipolar ICs.

TEXT BOOKS:

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Millman and Halkias	Electronic devices and Circuits	Tata McGraw Hill International	2010
2	David A.Bell	Fundamental of electronic devices and circuits	Oxford press	2009

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Street Man	Solid State Electronic Devices'	Prentice Hall Of India,6th edition	2005
2	Mathur Kulshrestha and Chadha	Electron devices and Applications and Integrated circuits'	Umesh Publications	2005
3	Thomas L. Flo yd	Electron Devices	Charles and Messil Publications	2012
4	G.K.Mithal	Electronic Devices and Circuits	Khanna Publishers	2013
5	Robert L. Bo ylestad and Louis Nashelsk y	Electronic Devices and Circuit Theor y	Pearson Education, 9th Edition,	2009.
6	B. Somanathan Nair	Electronic Devices and Applications	PHI,	2006

16BEEC303 DIGITAL ELECTRONICS L T P C
3 0 0 3

OBJECTIVES

- To introduce basic postulates of Boolean algebra and shows the correlation between boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of s ynchronous and as ynchronous sequential circuits
- To imparts the knowledge of memory devices like FPGA

INTENDED OUTCOMES:

- Understand number systems and codes
- Understand basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- Understand the methods for simplifying Boolean expressions
- Understand the formal procedures for the analysis and design of combinational circuits and sequential circuits
- Understand the concept of memories and programmable logic devices.
- Gain knowledge about various memory devices and implement using PLAs

UNIT-I NUMBER SYSTEMS AND BOOLEAN ALGEBRA

Binar y, Octal, Decimal, Hexadecimal-Number base conversions – complements – signed Binar y numbers. Binar y Arithmetic- Binar y codes: Weighted –BCD-2421-Gra y code-Excess 3 code-ASCII – Error detecting code – conversion from one code to another-Boolean postulates and laws –De-Morgan's Theorem- Principle of Dualit y- Boolean expression – Boolean function- Minimization of Boolean expressions – Sum of Products (SOP) –Product of Sums (POS)-Minterm- Maxterm- Canonical forms – Conversion between canonical forms –Karnaugh map Minimization – Don't care conditions.

UNIT-II LOGIC GATES AND COMBINATIONAL CIRCUITS

LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR-Implementations of Logic Functions using gates, NAND –NOR implementations –Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates.

COMBINATIONAL CIRCUITS: Design procedure – Adders-Subtractors – Serial adder/ Subtractor - Parallel adder/ Subtractor- Carr y look ahead adder- BCD adder- Magnitude Comparator- Multiplexer/ Demultiplexer- encoder / decoder – parit y checker – code converters. Implementation of combinational logic using MUX.

UNIT-III SEQUENTIAL CIRCUIT

Flip flops SR, JK, T, D and Master slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering –Realization of one flip flop using other flip flops –As ynchronous / Ripple counters – S ynchronous counters –Modulo – n counter –Classification of sequential circuits – Moore and Meal y -Design of S ynchronous counters: state diagram- State table –State minimization –State assignment- ASM-Excitation table and maps-Circuit implementation - Register – shift registers- Universal shift register – Shift counters – Ring counters.

UNIT-IV ASYNCHRONOUS SEQUENTIAL CIRCUITS

Design of fundamental mode and pulse mode circuits – primitive state / flow table – Minimization of primitive state table –state assignment – Excitation table – Excitation map- c ycles – Races –Hazards: Static –Dynamic –Essential –Hazards elimination.

UNIT-V MEMORY DEVICES

Classification of memories –RAM organization – Write operation –Read operation – Memory c ycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell –D ynamic RAM cell –ROM organization - PROM –EPROM –EEPROM –EAPROM –Programmable Logic Devices –Programmable Logic Arra y (P LA)- Programmable Arra y Logic (PAL)-Field Programmable Gate Arra ys (FPGA). Implementation of combinational logic using ROM, PAL and P LA

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Morris Mano.M	Digital Design	Prentice Hall of India Pvt. Ltd., New Delhi	2003
2	John M .Yarbrough	Digital Logic Applications and Design	Thomson- Vikas publishing house, New Delhi	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Salivahanan.S and Arivazhagan.S	Digital Circuits and Design	Vikas Publishing House Pvt. Ltd, New Delhi	2004
2	Charles H.Roth	Fundamentals of Logic Design	Thomson Publication Company, New Delhi.	2003
3	Donald P.Leach and Albert Paul Malvino	Digital Principles and Applications	Tata McGraw Hill Publishing Compan y Limited, New Delhi	2003
4	Jain.R.P	Modern Digital Electronics	Tata McGraw–Hill publishing compan y limited, New Delhi	2003
5	Thomas L. Flo yd	Digital Fundamentals	Pearson Education, New Delhi	2003

WEBSITES:

http://www.allaboutcircuits.com/vol_2/chpt_9/2.htmlhttp://www.educypedia.b e/electronics/digital.html

16BEEC304 C PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in 'C' language
- Ability to work with arrays and structures.
- To discuss the implementation of different non linear data structures such as trees and graphs.

LEARNING OUTCOMES:

- Write small programs related to simple/ moderate mathematical and logical problems in 'C'.
- Study, analyze and understand simple data structures and how to use it in C language
- Identify and understand the working of different operating systems like windows and Linux etc.
- Perceptive of the basic data structures.
- Understand the basic search and sort algorithms.
- Cultivate the knowledge to use a particular data structure and algorithm to solve a problem

UNIT I INTRODUCTION TO C LANGUAGE (8)

Character Set, Variables And Identifiers, Keywords- Built-In Data Types- Arithmetic Operators and Expressions, Constants And Literals, Simple Assignment Statement- Basic Input/Output Statement-Simple 'C' Programs, usage of const keyword

UNIT II CONDITIONAL STATEMENTS AND LOOPS (8)

Logical and Relational Operators- If Statement, If-Else Statement- Loops: While Loop, Do While, For Loop- Nested Loops, Infinite Loops- Switch Statement

UNIT III ARRAYS (9)

One Dimensional Arrays- Array Manipulation; Searching, Insertion, Deletion Of An Element From An Array- Finding The Largest/Smallest Element In An Array- Two Dimensional Arrays, -Addition / Multiplication Of Two Matrices- Strings As Array Of Characters.

UNIT IV POINTERS AND FUNCTIONS (10)

Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays Example Problems- Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion.

UNIT V USER DEFINED DATATYPES AND FILES (10)

Structures – initialization - nested structures – structures and arrays – structures and pointers - union – typedef and enumeration types - bit fields - File Management in C – Files and Streams – File handling functions – Sequential access file- Random access file – Command line arguments.

Total Hours: 45

REFERENCES:

1. E. Balagurusamy, "Computing Fundamentals and C Programming", TMH Education, 5th Edition, 2014
2. Yashavant Kanetkar, "Let us C", BPB Publications, 13th Edition, 2013

3. H. M. Deitel and D. J. Deitel, ‘C: How to Program’, Prentice Hall, 7th Edition, 2012
4. E. Balagurusamy, “Programming in ANSI C”, TMH Education, 6th edition, 2012

16BEEC305 ELECTRO MAGNETIC FIELDS L T P C
3 1 0 4

OBJECTIVES:

- To impart knowledge on the basics of static electric and magnetic field and the associated laws.
- To give insight into the propagation of EM waves and also to introduce the methods in computational electromagnetic
- To make students have depth understanding of antennas, electronic devices, Waveguides is possible
- To study the various law in static magnetic fields
- To understand magnetic field concepts
- To learn the concept of Maxwell’s equations

INTENDED OUTCOMES:

- Analyze field potentials due to static changes and static magnetic fields.
- Explain how materials affect electric and magnetic fields.
- Analyze the relation between the field sunder time varying situations.
- Discuss the principles of propagation uniform plane waves.
- Apply Magnetic boundary conditions in evolving magnetic fields.
- Understand Faraday’s law for Electromagnetic induction

UNITI STATIC ELECTRICFIELD 9

Vector Algebra, Coordinate Systems, Vector differential operator, Gradient, Divergence, Curl, Divergence theorem, Stokes theorem, Coulombs law,Electric field intensity,Point,Line,Surface and Volume charged distributions, Electric flux density,Gauss law and its applications, Gauss divergence theorem, Absolute Electric potential,Potential difference,Calculation of potential differences for different configurations.Electric dipole,Electro static Energy and Energy density.

UNITII CONDUCTORS AND DIELECTRICS 9

Conductors and dielectrics in Static Electric Field,Current and current density,Continuity equation, Polarization, Boundary conditions, Methodofimages, Resistance of a conductor,Capacitance, Parallel plate,Coaxial and Spherical capacitors, Boundary conditionsfor perfect dielectric materials, Poisson’sequation,Laplace’sequation,Solution of Laplace equation,Application of Poisson’s and Laplace’s equations.

UNITIII STATIC MAGNETIC FIELDS 9

Biot-Savart Law,Magneticfield Intensity,Estimation of Magneticfield Intensity for straight and circular conductors, Ampere’s Circuital Law,Point form of Ampere’s Circuital Law,Stokes theorem, Magnetic flux and magnetic flux density, The Scalar and Vector Magnetic potentials,Derivation of Steady magneticfield Laws.

UNITIV MAGNETICFORCES AND MATERIALS 9

Forceona moving charge,Force on a differential current element,Force between current elements, Force and torque on a closed circuit, The nature magnetic materials,Magnetization and permeability,Magnetic boundary conditions in evolving magnetic fields,Themagnetic circuit, Potential energy and forceson magnetic materials,Inductance,Basic expressions fo rself and mutual inductances, Inductance evaluation for solenoid, toroid,coaxial cables and transmissionlines,Energy stored in Magneticfields.

UNITV TIME VARYING FIELDS AND MAXWELL'S EQUATIONS 9

Fundamental relations for Electro static and Magneto static fields,Faraday's law for Electromagnetic induction, Transformers, Motional Electromotive forces, Differential form of Maxwell's equations, Integral form of Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and their solutions,Poynting'stheorem, Time harmonic fields,Electro magnetic Spectrum.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	WilliamH Haytand Jr.JohnA Buck	Engineering Electromagnetics	TataMcGraw-Hill PublishingCompanyLtd NewDelhi	2008
2	SadikuMH	PrinciplesofElectro magnetics	OxfordUniversityPressI nc, NewDelhi	2009

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	DavidKCheng	FieldandWaveElect romagnetics	PearsonEducationInc,Delh i	2004
2	JohnDKrausandDaniel AFleisch,"	Electromagneticswi thApplications	McGrawHillBookCo	2005
3	KarlELongmanandSava VSavov	FundamentalsofEle ctromagnetics	PrenticeHallofIndiaNewD elhi	2006
4	AshutoshPramanic	Electromagnetism	PrenticeHall ofIndia,NewDelhi	2006

16BEEC311 C PROGRAMMING LABORATORY L T P C

0 0 3 2

OBJECTIVES:

- To provide an awareness to Computing and C Programming.
- To know the correct and efficient ways of solving problems.
- To learn to develop algorithm for simple problem solving.
- Analyze the given algorithms.
- Enable to write algorithms for solving problems with the help of fundamental data structures
- Write programs that implement of different non linear data structures such as trees and graphs.

INTENDED OUTCOMES:

- Able to understand the basic terminology used in computer programming.
- Able to write, compile and debug programs in C language.
- Able to use different data types in a computer program.
- Able to design programs involving decision structures, loops and functions.
- Able to understand the dynamics of memory by the use of pointers.
- Capability to analyze and differentiate different algorithms based on their time complexity.

LIST OF EXERCISES

1. Write a C program to find Factorial of a given number using do while loop.
2. Write a C Program to print Fibonacci series using while loop.
3. Write a C Program to check a given number is Prime or Not.
4. Write a C Program to compute the sum of even numbers for a given n value.
5. Write a C Program to check the given string is Palindrome or Not.
6. Write a C Program to check the given number is Armstrong or Not using functions.
7. Write a C Program to count the number of vowels from the given string using switch case.
8. Write a C Program to read a line of text from keyboard and print the number of characters, words and spaces.
9. Write a C Program to print the student's record using structure.
10. Write a C Program to find factorial of a number using recursion function.

16BEEC312 ELECTRON DEVICES AND CIRCUITS LABORATORY L T P C

0 0 3 2

OBJECTIVES

- To study experimentally the characteristics of diodes,BJT's and FET's.
- To verify practically, there sponse of various special purpose electron devices.
- To verify practically, the response of various special purpose electron devices.
- To understand the characteristic of LED.
- To learn how to use software's for simulating characteristics of various circuits.
- To divulge the basics of rectifier circuits.

INTENDED OUTCOMES:

- Familiarize the electronic devices and basic electronic components.
- Familiarize with basic electronic design.
- Gain in-depth core knowled gein the design of electronic devices
- Gain knowledge inverifying the characteristics of electronic devices by simulation.
- Divulge the basics of LED with three different wavelengths.
- Enable the students familiar with construction series voltage regulator.

LIST OF EXPERIMENTS

1. Characteristics of PN junction and Zenerdiode.
2. Input, Output and Transfer characteristics of CE Configuration.
3. Input, Output and Transfer characteristics of CC Configuration
4. Characteristics of LDR, Photo-diode and Phototransistor.
5. Transfer characteristics of JFET.
6. Transfer characteristics of MOSFET (with depletion and enhancement mode)
7. Characteristics of LED with three different wavelengths.
8. Halfwave rectifier, Fullwave rectifier and Fullwave Bridge rectifier with and without Capacitive filter
9. Series voltage Regulator
10. Simulation experiments1, 2,3,5,6 using PSPICE or Multisim.

16BEEC313 DIGITAL ELECTRONICS LABORATORY L T P C
0 0 3 2

OBJECTIVES

- To verify operation of logic gates and flip-flops.
- To design and construct digital circuits
- To do simulation of simple combinational and sequential circuits
- To design synchronous sequential circuits.
- To simulate simple combinational and sequential circuits
- To learn about Encoders and Decoders design.

INTENDED OUTCOMES:

- Differentiate between combinational and sequential circuits.
- Design simple digital circuits for various applications.
- Learn to simulate using HDL.
- Construct counter circuits for different application
- Simulate a design using VHD/Verilog HDL
- Design a two bit magnitude comparator.

LISTOFEXPERIMENTS

1. Study of Gates &Flip-flops.
2. HalfAdder and FullAdder.
3. Magnitude Comparator (2-Bit).
4. Encoders and Decoders.
5. Multiplexer and Demultiplexer.
6. Code Converters.
7. Implementation of combinational logic functions using standard ICs
8. Synchronous Counters.

9. Ripple Counter.
10. Mod–N Counter.
11. Shift Registers and Shift Register Counters.
12. Implementation of sequential logic functions using standard ICs.
13. Simulation Experiments using VHDL

16BEEC351 PCB DESIGNING **L T P C**
1 0 0 –

1 0 0 –

OBJECTIVES:

- To learn software used for PCB design
- To learn about the tools used in PCB.
- To create a net list for a design.
- To divulge the basics of OR-CAD PCB software.
- To make the students familiar with design verification.
- To learn the automatic routing and manual routing.

INTENDED OUTCOME:

- At the end of this course students will demonstrate the ability to simulate any circuit design using simulation software.
- Able to carry out any PCB design necessary for their graduation projects
- The course is intended to give the students the necessary knowledge and of PCB design steps, starting from a simple schematics, through creating new components, and all the way to down a final PCB layout ready for population.
- Gain good knowledge about PCB design .
- Clear idea about automatic routing and manual routing.
- Understand the basics tools used in PCB.

1. Introduction to OR-CAD PCB
2. Installation and Setup
3. PCB Basics(Tools)
4. PCB Design Session
5. Automatic Routing
6. Manual Routing
7. Design Verification
8. Creation of Net list

16BEEC401 LINEAR INTEGRATED CIRCUITS L T P C

3 0 0 3

OBJECTIVES

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear application s of operational amplifiers.
- To introduce the theory and applications of analog multipliers and P LL.
- To introduce the concepts of waveform generation and introduce some special function ICs.
- To teach the theory of ADC
- To learn the theory of DAC.

INTENDED OUTCOMES:

- Knowledge about the basic building blocks of linear integrated circuits.
- Knowledge about the linear and non-linear applications of operational amplifiers.
- Knowledge about the theory and applications of analog multipliers and P LL.
- Knowledge about the theory of ADC and DAC
- Knowledge about a few special function integrated circuits
- Design of Filters and Voltage regulators

UNIT I-OPERATIONAL AM PLIFIER CHARACTERISTICS

Op-amp symbol, terminals, packages and specifications - Block diagram Representation of op-amp-Ideal op-amp & practical op-amp - Open loop & closed loop configurations – DC & AC performance characteristics of op-amp – Frequency compensation - Noise – Differential amplifiers -Electrical Characteristics and internal schematic of 741 op - amps.

UNIT II-OP–AMP APPLICATIONS

Basic op-amp circuits: Inverting & Non-inverting voltage amplifiers -Voltage follower -Summing, scaling & averaging amplifiers - AC amplifiers.Linear Applications: Instrumentation Amplifiers-V-to-I and I-to-V converters-Differentiators and Integrators.

Non-linear Applications: Precision Rectifiers – Wave Shaping Circuits (Clipper and Clampers) – Log and Antilog Amplifiers – Analog voltage multiplier circuit and its applications - Comparators and its applications.

UNIT III- WAVEFORM GENERATORS AND PLL

Waveform Generators: Sine-wave Generators – Square / Triangle / Sawtooth Wave generators. IC 555 Timer: Monostable operation and its applications, Astable operation and its applications

P LL: Operation of the Basic P LL-Closed loop analysis of P LL-Voltage Controlled Oscillator-P LL Applications

UNIT IV-ACTIVE FILTERS & VOLTAGE REGULATOR

Filters: Comparison betweenPassive and Active Networks-Active Network Design – Filter Approximations-Design of LPF, HPF, BPF and Band Reject Filters – State Variable Filters

Voltage Regulators: Basics of Voltage Regulator – Linear Voltage Regulators using Op-amp – IC Regulators (78x x, 79xx, LM 317, 723)-Switching Regulators.

UNIT V-DATA CONVERSION DEVICES

Digital to Analog Conversion: DAC Specifications – DAC circuits – Weighted Resistor DAC-R-2R Ladder DAC- Inverted R-2R Ladder DAC Monolithic DAC

Analog to Digital conversion:ADC specifications-ADC circuits-Ramp Type ADC-Successive Approximation ADC-Dual Slope ADC-Flash Type ADC.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Roy Choudhur y and Shail Jain	Linear Integrated Circuits	New Age International Publishers	2003
2	Ramakant A.Ga yakwad	Op-Amps and Linear Integrated Circuits	Prentice Hall of India, New Delhi	2000

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Robert F. Coughlin, Frederick F. Driscoll	Operational-Amplifiers and Linear Integrated Circuits	Prentice Hall of India, New Delhi	2001
2	Sergio Franco	Design with operational amplifier and analog integrated circuits	McGraw Hill	2015

16BEEC402 **SIGNALS AND SYSTEMS** **L T P C**
3 2 0 4

OBJECTIVES

- To study the properties and representation of discrete and continuous signals.
- To study the sampling process and analysis of discrete systems using z-transforms.
- To study the analysis and synthesis of discrete time systems.
- To inculcate the characteristics of various signals.
- To familiarize with Z Transform and its application on signals
- To get familiarize of sampling of signals

INTENDED OUTCOMES:

- Knowledge about the properties and representation of discrete and continuous signals.
- Knowledge about the sampling process and analysis of discrete systems using z-transforms
- Knowledge about the analysis and synthesis of discrete time systems.
- Depict discrete systems in different domain using Fourier Transform
- Investigate stability of the system
- Carry on state-space analysis of signals and its multi-input, multi-output representation

UNIT-I REPRESENTATION OF SIGNALS

Classification of Signals – Periodic, aperiodic, even, odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – periodicity – unit impulse – unit step impulse functions – Transformation in independent variable of signals: time scaling, time shifting. Determination of Fourier series representation of continuous time and discrete time periodic signals – Explanation of properties of continuous time and discrete time Fourier series.

UNIT-II ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS

Continuous time Fourier Transform and Laplace Transform analysis with examples – properties of the Continuous time Fourier Transform and Laplace Transform basic properties, Parseval's relation, and convolution in time and frequency domains. Basic properties of continuous time systems: Linearity, Causality, time invariance, stability of frequency response of LT I systems -Analysis and characterization of LT I systems using Laplace transform: Computation of impulse response and transfer function using Laplace transforms.

UNIT-III SAMPLING THEOREM AND Z-TRANSFORMS

Sampling theorem – Reconstruction of a Signal from its samples, aliasing – sampling of band pass signals. Basic principles of z -transform - z-transform definition – Region of Convergence – Properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion, Relationship between z - transform and Fourier transform.

UNIT-IV DISCRETE TIME SYSTEMS

Computation of Impulse response & Transfer function using Z Transform. DTFT Properties and examples – LTI-DT systems - Characterization using difference equation – Block diagram representation – Properties of convolution and the interconnection of LTI Systems – Causality and stability of LTI Systems.

UNIT-V FILTER REALIZATION STRUCTURES

Realization structures – Direct Form – I, Direct Form – II, Cascade, Parallel and Transpose forms.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	AlanV.Oppenheim, Alan S.Willsky and Hamid Nawab.S	Signals and Systems	Pearson Education, New Delhi	2003
2	Roberts.M.J	Signals and Systems Analysis using Transform method and MATLAB	TMH, New Delhi	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	John G.Proakis and Dimitris G.Manolakis	Digital Signal Processing, Principles, Algorithms and Applications	PHI, New Delhi	2000
2	Simon Ha ykin and Barr y Van Veen	Signals and Systems	John Wile y, New York	2002
3	Lindner.K	Signals and Systems	McGraw Hill International, New York	2001
4	Moman .H. Ha ys	Digital Signal Processing	Tata McGraw-Hill Co Ltd., New Delhi	2004
5	Ashok Amhardar	Analog and Digital Signal Processing	PHI,New Delhi	2002

WEBSITES:

www.relisoft.comwww.astro.berkele y.edu
www.dsp guide.com

16BEEC403 TRANSMISSION LINES AND NETWORKS L T P C
3 0 0 3

OBJECTIVES

- To become familiar with propagation of signals through lines.
- To know about various line parameters by conventional and graphical methods.
- To understand the need for impedance matching
- To understand the different impedance matching techniques.
- To understand the design of different types of filters
- To know about the usuage of equalizer and attenuators.

INTENDED OUTCOMES:

- Familiar with propagation of signals through lines.
- Gain knowledge about calculation of various line parameters by conventional and graphical methods.
- Gain knowledge about Need for impedance matching and different impedance matching techniques.
- Students could understand the different impedance matching techniques.
- Students could understand the design of different types of filters
  Students will know about the usuage of equalizer and attenuators.

UNITI-TRANSMISSION LINE THEORY

General theory of Transmission lines – the transmission line– general solution–The infinite line–Wavelength, velocity of propagation– Waveform distortion– the distortion lessline- Loading and different methods of loading– Line not terminated in Z0 –Reflection coefficient–Calculation of current, voltage, power delivered and efficiency of transmission–Input and transfer impedance-Open and short circuited lines–reflection factor and reflection loss.

UNITII-HIGH FREQUENCY TRANSMISSION LINES

Transmission line equations at radio frequencies–Line of Zero dissipation–Voltage and current on the dissipation less line, StandingWaves, Nodes Standing Wave Ratio–Input impedance of the dissipation less line - Open and short circuited lines – Powerand impedance measurement on lines – Reflection losses– Measurement of VSWR and wavelength.

UNITIII-IMPEDANCE MATCHING IN HIGH FREQUENCY LINES

Impedance matching: Quarter wave transformer – Impedance matching bystubs–Single stuband double stubmatching– Smith chart – Solutions of problems using Smith chart – Single and double stubmatching using Smithc hart.

UNITIV-PASSIVE FILTERS

Characteristic impedance of symmetrical networks–filter fundamentals.Design of filters: Constant K, LowPass, High Pass, Band Pass, Band Elimination, m-derived sections and composite.

UNITV-ATTENUATORS AND EQUALIZERS

Attenuators: Lattice Attenuators, Bridged– Tattenuator, L-Type Attenuator. Equalizers:Inversenetwork, series, fullseries, shunt, fullshunt, constant resistanceT, constant resistance constant resistance lattice and bridged Tnetwork.

TEXTBOOKS:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publication
1	Ryder.J.D	Networks,Linesand Fields	PHI,NewDelhi.	2009
2	E.G.Jordan&balmain	ElectromagneticWaves AndRadiatingSystems, 2ndEdition,	Prentice-Hallof India,	2000

REFERENCES:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publication
1	UmeshSinha	TransmissionLinesand Network	SatyaPrakashan PublishingCompany, NewDelhi	2012
2	Sudhakar.A, ShyammohanS Palli	Circuits and Networks –AnalysisandSynthesis	TataMcGrawHill, 4th Edition	2010

16BEEC404 COMMUNICATION THEORY L T P C
3 0 0 3

OBJECTIVES

- To provide various Amplitude modulation and demodulation systems.
- To provide various Angle modulation and demodulation systems.
- To provide some depth analysis in noise performance of various receiver.
- To study some basic information theory with some channel coding theorem.
- To learn the transmission of a Random Process through a LTI filter.
  - To study the concept of differential entropy.

INTENDED OUTCOMES:

- Knowledge on various Amplitude modulation and demodulation systems.
- Knowledge on various Angle modulation and demodulation systems.
- Knowledge on some depth analysis in noise performance of various receiver.
- Knowledge on some basic information theory with some channel coding theorem.
- Some basic information theory with some channel coding theorem.
- Transmission of a Random Process through a LTI filter.

UNIT-I AMPLITUDE MODULATION

Generation and demodulation of AM, DSB-SC, SSB-SC, VSB Signals, Filtering of sidebands, Comparison of Amplitude modulation systems, Frequency translation, Frequency Division multiplexing, AM transmitters – Super heterodyne receiver, AM receiver.

UNIT-II ANGLE MODULATION

Angle modulation, frequency modulation, Narrowband and wideband FM, transmission bandwidth of FM signals, Generation of FM signal – Direct FM – indirect FM, Demodulation of FM signals, FM stereo multiplexing, P LL – Nonlinear model and linear model of P LL, Non-linear effects in FM systems, FM Broadcast receivers, FM stereo receives.

UNIT-III NOISE PERFORMANCE OF DSB, SSB RECEIVERS

Noise – Shot noise, thermal noise, White noise, Noise equivalent Bandwidth, Narrowband noise, Representation of Narrowband noise in terms of envelope and phase components, Sine wave plus Narrowband Noise, Receiver model, Noise in DSB-SC receiver, Noise in SSB receiver

UNIT-IV NOISE PERFORMANCE OF AM AND FM RECEIVERS

Noise in AM receivers threshold effect, Noise in FM receivers capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and de-emphasis in FM, Comparison of performance of AM and FM systems.

UNIT-V INFORMATION THEORY

Uncertainty, Information and entropy, Source coding theorem, Data compaction, Discrete memory less channels, mutual information, channel capacity, channel coding theorem, differential entropy, and mutual information for continuous ensembles, information capacity theorem, implication of the information capacity theorem, rate distortion theory, Compression of information.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Simon Ha ykin	Communication Systems	John Wiley & sons, New Jersy.	2001
2	Wayne Tomasi	Electronic Communication theory systems	PearsonEdition, New Jersy	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Roddy and Coolen	Electronic communication	PHI, New Delhi.	2003
2	Taub and Schilling	Principles of communication systems	TMH, New Delhi	2008

WEBSITES:

http://williamson-labs.com/480_mod.htmwww.mit.eduhttp://www.sfu.ca/~truax/fmtut.html

16BEEC405 **ELECTRONIC CIRCUITS** **L T P C**
3 0 0 3

OBJECTIVES
At the end of this course the students will learn and apply

- Operating point calculations and working of basic amplifiers.
- Working of different types of feedback amplifiers & oscillators.
- Frequency response and design of tuned amplifiers.
- Basic working & design of wave shaping circuits.
- Impart knowledge on feedback and oscillator circuits.
- Understand the concept of multivibrators.

INTENDED OUTCOMES:
- The purpose of this course is to introduce to the students
- The basics of biasing transistor circuits, feedback amplifiers, large signal amplifiers, tuned amplifiers, oscillators, wave shaping circuits, and to design and analyze various electronic circuits and systems
- Frequency response and design of tuned amplifiers.
- Basic working & design of wave shaping circuits.
- Design power supply for various application
- Design regulators for different application

UNIT I-BIASING CIRCUITS AND SMALL SIGNAL MODELS
Biasing circuits: DC load line and Q point – BJT biasing circuits – FET biasing circuits-Bias
Stabilization. Small-signal models: AC load line, BJT models and parameters – hybrid equivalent model, Hybrid π model, FET small-signal model and parameters.

UNIT II-SMALL -SIGN AL AMPLIFIERS - AN ALYSIS AND FREQUENCY RESPONSE
BJT amplifiers: CE, CB and CC amplifiers – multistage amplifiers -differential amplifier. Frequency response: low frequency response of BJT and FET amplifiers –Miller effect capacitance –high frequency response of BJT and FET amplifiers.

UNIT III-FEEDBACK AND OSCILLATO R CIRCUITS
Feedback circuits: concept of feedback – effects of negative feedback –Types of negative feedback topologies Oscillator circuits: oscillator principles – LC oscillators – RC oscillators – crystal oscillators.

UNIT IV-POWER AMPLIFIERS AND TUNED AMPLIFIERS
Power amplifiers: Class A amplifier – Class B and Class AB push-pull amplifiers – Class C amplifiers-Amplifier distortions – heat sink .
Tuned amplifiers: need for tuned circuits – single tuned – double tuned – video amplifier (CA3040).

UNITV-SOLID STATE SWITCHING CIRCUITS
Transistor switching times – multivibrators – astable multivibrator – monostable multivibrator – bistable multivibrator – Schmitt trigger .Oscillator-Sweep generators.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	David A Bell,	Fundamentals of Electronic Devices and Circuits	Oxford University Press	2009
2	Jacob Millman, Christos C Halkias, Satyabrata Jit	Electron Devices and Circuits	Tata McGraw Hill	2010

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Thomas L. Flo yd	Electronic Devices	9th edition, Pearson Education,	2011.
2	Albert P. Malvino David J. Bates	Electronic Principles	7th edition, Tata McGraw Hill	2007
3	Robert L. Bo ylestad and Louis Nashelsk y	Electronic Devices and Circuit Theor y	Pearson Education, 9th Edition	2009
4	David A. Bell	Solid State Pulse Circuits	Oxford Universit y Press	2007

16BEEC406A **CONTROL SYSTEMS** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the open loop and closed loop (feed back) systems
- To understand time domain and frequency domain analysis of control systems required for stability analysis.
- To understand the compensation technique that can be used to stabilize control systems
- To introduce the concept of compensators.
- To introduce control system componets and its applications.
- To gain basic knowledge on open loop and closed–loop frequency response of systems.

INTENDED OUTCOMES:

- Upon completion of the course, students will be able to:
- Perform time domain and frequency domain analysis of control systems required for stability analysis.
- Design the compensation technique that can be used to stabilize control systems.
- Analyze frequency and time response for any given system
- Design various controllers
- Describe the necessity of controllability and observability

UNIT-I CONTROL SYSTEM MODELLING
System concept, differential equations and transfer functions. Modeling of electric systems, translational and rotational mechanical systems, Simple electromechanical systems.
Block diagram representation of systems – Block diagram reduction methods – Closed loop transfer function, determination of signal flow graph. Mason's gain formula – Examples.

UNIT-II TIME DOMAIN ANALYSIS
Test signals – time response of first order and second order systems – time domain specifications – types and order of systems – generalized error co-efficient – steady state errors – concepts of stability – Routh-Hurwitz stability – root locus. Analysis using MATLAB

UNIT-IIIFREQUENCY DOMAIN ANALYSIS
Introduction – correlation between time and frequency response – stability analysis using Bode plots, Polar plots, Nichols chart and Nyquist stability criterion – Gain margin – phase margin. , Analysis using MATLAB.

UNIT-IVCOMPENSATORS
Realization of basic compensators – cascade compensation in time domain and frequency domain and feedback compensation – design of lag, lead, lag-lead compensator using Bode plot and Root locus. Introduction to P, PI and PID controllers. Analysis using MATLAB.

UNIT-VCONTROL SYSTEM COMPONENTS AND APPLICATION OF CONTROL SYSTEMS
Stepper motors – AC servo motor – DC servo motor – Synchros – sensors and encoders – DC tacho generator – AC tacho generator – Hydraulic controller – Pneumatic controller – Typical application of control system in industry.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of

				publication
1	Ogata.K	Modern Control Engineering	Prentice Hall of India, New Delhi	2003
2	Nagrath & Gopal	Control System Engineering	New Age International Edition, New Delhi.	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Benjamin.C.Kuo	Automatic Control Systems	Prentice Hall of India, New Delhi	2002
2	Gopal.M	Control Systems	Tata McGraw-Hill, New Delhi	1997

16BEEC406B　　COMPUTER NETWORKS　　L T P C

3 0 0 3

OBJECTIVES

- To introduce the students the functions of different layers.
- To introduce IEEE standard employed in computer networking.
- To make students to get familiarized with different protocols and network components.
- To familiarize the students with layering concepts.
- To imparts a good knowledge in transport layer protocol
- To learn about congestion avoidance mechanisms and quality of service

INTENDED OUTCOMES:

- Adequate knowledge about the functions of different layers.
- Adequate knowledge about IEEE standard employed in computer networking.
- Familiarize with different protocols and network components.
- Trace the flow of information from one node to another node in the network.
- Gain knowledge to allocate appropriate resources
- Analyze the performance of the network

UNIT I DATA COMMUNICATIONS

Components – Direction of Data flow – networks – Components and Categories – types of Connections – Topologies –Protocols and Standards – ISO / OS I model – Transmission Media – Coaxial Cable – Fiber Optics – Line Coding – Modems – RS232 Interfacing sequences-Real time applications.

UNIT II DATA LINK LAYER

Error – detection and correction – Parity – LRC – CRC – Hamming code – Flow Control and Error control: stop and wait – go back N ARQ – selective repeat ARQ- sliding window techniques – HDLC.LAN: Ethernet IEEE 802.3, IEEE 802.4, and IEEE 802.5 – IEEE 802.11–FDD I, SONET – Bridges. Real time applications.

UNIT III NETWORK LAYER

Internetworks - Packet Switching and Datagram approach – IP addressing methods – IP4 and IP6 - Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers- Real time applications.

UNIT IV TRANSPORT LAYER

Duties of transport layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QOS) – Integrated Services- Real time applications.

UNIT V APPLICATION LAYER

Domain Name Space (DNS) – SMTP, FTP, HTTP, WWW, Email, Search engines - POP server – Security – Cryptograph y- Real time applications.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Behrouz A. Foruzan	Data communication and Networking	Tata McGraw-Hill, New Delhi	2004
2	William Stallings	Data and Computer Communication	Pearson Education, New Delhi	2000

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	James .F. Kurouse &.Rouse.W	Computer Networking: A Top down Approach Featuring	Pearson Education, New Jersy	2001
2	Larr y L.Peterson & Peter S.Davie	Computer Networks	Harcourt Asia Pvt. Ltd, New Delhi	2000
3	Andrew S. Tannenbaum	Computer Networks	PHI, New Delhi	2003

16BEEC411 ELECTRONIC CIRCUITS AND SIMULATION LABORATORY **L T P C**
0 0 3 2

OBJECTIVES

- To study experimentally the working of amplifiers, regulators and analyze their behavior by plotting graphs.
- To study the Harlet and Colpitts Oscilaltor
- To know the design of Wein Bridge Oscillator
- To learn about Integrators, Differentiators, Clippers and Clampers
- To know the design of Astable, Monostable and Bistable multivibrators
- To design Class C Amplifier

INTENDED OUTCOME:

- Ability to simulate and design any given electronic circuit and analyze their performance frequency response and characteristics.
- Design the Harlet and Colpitts Oscilaltor
- Design of Wein Bridge Oscillator
- Know Integrators, Differentiators, Clippers and Clampers
- Design Astable, Monostable and Bistable multivibrators
- Design Class C Amplifier

LIST OF EXPERIMENTS

1. Series and Shunt feed back amplifiers: Frequency response, Input and output impedance calculation
2. Design of RC Phaseshift oscillator: Design Wein Bridge Oscillator
3. Design of Hartley and Colpitts Oscillator
4. Tuned Class C
5. Integrators, Differentiators, Clippers and Clampers
6. Design of Astable, Monostable and Bistable multivibrators

SIMULATION USING PSPICE:

7. Differentiate amplifier
8. Activefilter: Butter worth IInd order LPF
9. Astable, Monostable and Bistable multivibrator – Transistor bias
10. D/A and A/D converter (Successive approximation)
11. Analog multiplier
12. CMOS Inventor, NAND and NOR

16BEEC412 LINEAR INTEGRATED CIRCUITS LABORATORY **L T P C**
0 0 3

OBJECTIVES

- To expose the students to linear and integrated circuits
- To understand the basics of linear integrated circuits and available ICs
- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function IC.
- To study the characteristics of PLL
- To use PSPICE/ MultiSim software for circuit design.

INTENDED OUTCOMES:

- Design oscillators and amplifiers using operational amplifiers.
- Design filters using Opamp and perform experiment on frequency response.
- Analyse the working of PLL and use PLL as frequency multiplier.

- Design DC power supply using ICs.
- Design ofADC andDAC using discrete components.
- Analyse the performance of oscillators and multivibrators using PSPICE/MultiSim.

LIST OF EXPERIMENTS

1. Inverting, Noninverting and differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier.
4. Active lowpass, highpass and Bandpass filter.
5. Astable, Monostable multivibrators and SchmittTrigger using op-amp.
6. Phase shift and Wienbridge oscillator using op-amp.
7. Astable and Monostable using NE555 Timer.
8. PLL characteristics and Frequency Multiplier using PLL.
9. Design of ADC and DAC using discrete components.
10. Study of DC power supply using LM317and LM723 and SMPS control ICSG 3524/SG3525.
11. Simulation of Experiments1,2,3,4,5 using PSpice / MultiSim

16BEEC451	**LIFE SKILLS**	**L T P C**
		1 0 0 –

Course Objectives

- To elevate the students into productivity powerhouses who can employ life skills to better their performances.
- To help the students understand interpersonal skills.
- To support them in building interpersonal skills.
- To better the ability to work with others.
- To imparts good knowledge in stress management.
- To understand the leadership teamwork, creativity, efficiency & productivity

Course Outcomes

- Ability to communicate smartly and effectively with co-workers, relationship enhancement
- Improvement of time management and organizational skill.
- Development of leadership teamwork, creativity, efficiency & productivity
- Development of presentation skills
- Recognize stress symptom & develop stress deflecting strategies
- Brain storming & problem solving strategies to increase creativity and collaborative outcomes

UNIT I 4

Overview to communication, self Introduction, Presentation on their own topic, Extempore, Group Activity

UNIT II 3

Group Discussion, Do's and Don’ts of Group Discussion, Body language, Grooming and Resume, Resume correction

UNIT III 4

Introduction to HRM – Questions - Do's and Don’t's - Interview - Mock GD - Stress Management

UNIT IV 4

Personality Development - Presentation skills, Interpersonal skills, Critical thinking, Confidence building and Stress management.

TOTAL 15

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Barun K Mitra	Personality Development and Soft Skills	Oxford University Press-New Delhi	2012
2	Rajiv K. Mishra	Personality Development	Rupa & Co.	2012

16BEEC452 TECHNICAL SEMINAR L T P C
1 0 0 -

Course Objectives

The goal of this course for students is :

- To make students aware of recent technical advancements in electronics
- To enable students to overcome stage fear

Course Outcomes

At the end of this course students will be able to :

- Gain knowledge on recent trends in electronics
- Acquire fluency and confidence for conference presentation

16BEEC501 DIGITAL SIGNAL PROCESSING L T P C
3 1 0 4

OBJECTIVES

- To study DFT and its computation
- To study the design techniques for digital filters
- To study the finite word length effects in signal processing
- To study the fundamentals of digital signal processors
- To study the concept of Adaptive Filters
- To understand Direct I and Direct II structures

INTENDED OUTCOMES:

- Understand the structures of Discrete time signals and s ystems
- Understand Frequenc y response and desi gn of FIR and IIR filters.
- Understand Finite word length effect
- Understand DSP Processor- TMS320C5X.
- Apply Adaptive Filters to equalization.
- Apply direct form I and direct form II structures.

UNIT I-REVIE W OF D ISCRETE TIME SIGNALS AND SYSTEMS

Overview of signals and systems – DFT–FFT using DIT and DIF algorithms – Inverse DFT- FFT using DIT and DIF al gorithms – Applications – Circular convolution – MATLAB programs for DFT and FFT.

UNIT II-DESIGN AND IM PLE MENTATION OF IIR FILTERS

Design of analog filters using Butterworth and Chebyshev approximations – IIR digital filter design from analog filter using impulse invariance technique and bilinear transformations – Matlab programs for IIR filters.

UNIT III-DESIGN AN D IM PLE M ENTA TIO N OF FIR FILTERS

Linear phase response – Design techniques for FIR filters – Fourier series method and frequency sampling method –Design of Linear phase FIR filters using windows: Rectangular, Hanning and Hamming windows – Matlab programs for FIR filters.

UNIT IV- FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS

Fixed point arithmetic – effect of quantization of the input data due to Finite word length. Product round off – need for scaling – Zero input limit cycle oscillations - Limit cycle oscillations due to overflow of adders – Table look up implementation to avoid multiplications.

UNIT V-PROCESSOR FUNDAMENTALS

Features of DSP processors – DSP processor packaging(Embodiments) – Fixed point Vs floating point DSP processor data paths – Memory architecture of a DSP processor (Von Neumann – Harvard) – Addressing modes – pipelining – TMS320 family of DSPs (architecture of C6x).

TEXTBOOKS:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publication
1	AlanVOppenheim, RonaldW Schafer, JohnRBack	DiscreteTimeSignal processing	PHI,NewDelhi.	2000
2	VenkataramaniB& M.Bhaskar	DigitalSignalProcessor Architecture,Programmin gandApplication	TMH,NewDelhi	2003

REFERENCES:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publicati on
1	JohnGProakis,Dimtris GManolakis	DigitalSignalProcessing Principles,Algorithms andApplication	PearsonEducation, Fourthedition.	2007
2	Avtarsingh, Srinivasan.S,	DSP Implementation usingDSPmicroprocesso r withExamplesfrom TMS32C54XX	Thamson/Brooks colePublishers,Ne w Delhi	2003
3	M.H.Hayes	DigitalSignalProcessing	TataMcGraw-Hill, NewDelhi	2009
4	JohnyR.Johnson	IntroductiontoDigital SignalProcessing	PrenticeHall,New York	2001
5	SanjitMitra	DigitalSignalProcessing- AComputerbased approach	TataMcGraw-Hill, NewDelhi	2011

WEBSITES:

www.cnx.orgwww.dspguide.comhttp://mathworld.wolfram.com/Z-Transform.html

16BEEC502 DIGITAL COMMUNICATION

L T P C
3 0 0 3

OBJECTIVES

- To learn and understand Pulse modulation and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- Baseband pulse transmission which deal swith the transmission of pulse amplitude modulated signals in their baseband form Pass band data transmission methods
- To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.
- To understand Pulse Code Modulation (PCM) techniques
- To provide knowledge on inter symbol interference and nyquist criterion.
- To learn about pass band digital modulation

INTENDEDOUTCOMES:

- Gain knowledge in pulse modulation and discuss the process of sampling, quantization and coding that is fundamental to the digital transmission of analog signals.
- Gain adequate knowledge in baseband pulse transmission,which deals with the transmission of pulse-amplitude,modulated signals in their baseband form.
- Gain adequate knowledge in M-ary signaling and spread spectrum Technique.
- Analyze the spectral characteristics of band pass signaling schemes and their noise performance.
- Analyze the behavior of a communication system in the presence of noise.
- Investigate pulsed modulation system and analyze the system performance.

UNIT I-SAMPLING AND QUANTIZATION

Sampling Process – Aliasing – Instantaneous sampling – Natural Sampling – Flat Sampling – Quantization of signals – sampling and quantiz ing effects – channel effects – SNR for quantiz ation pulses – data formattin g techniques – Time division multiplexing.

UNIT II-DIGITAL M O DUL ATIO N SYSTEMS

PCM Systems – Noise Considerations in PCM s ystem – Overall Signal-to- noise ratio for PCM system – Threshold effect – Channel Capacity – Virtues, Limitations & Modification of PCM system – PCM Signal Multiplexing – Differential PCM – Delta Modulation – Noise Considerations in Delta Modulation – SNR Calculations – Comparison of PCM, DPCM & DM.

UNIT III-B ASE BAND PULSE TRANSMISSION

Maximum likelihood receiver structure – Matched filter receiver – Probabilit y error of the Matched filter – Inter symbol interference – Nyquist criterion for distortionless baseband transmission – Correlative coding – Eye pattern.

UNIT IV-PASS BAND DATA TRANSMISSION

Pass Band Transmission Model – Generation, Detection, Signal Space Diagram, Probability of Error for BFSK, BPSK, QPSK, DPSK, and Schemes– Comparison.

UNIT V-M-ARY SIGNALING AND INTRODUCTION TO SPREAD SPECTRUM TECHNIQUES

M-ary signaling, vectoral view of MPSK and MFSK signalin g, symbol error performance of M-ary systems – Introduction – Discrete Sequence Spread Spectrum technique – Use of Spread Spectrum with CDMA-Ranging Using Discrete Sequence Spread Spectrum – Frequency Hopping Spread Spectrum – Generation & Characteristics of PN Sequence.

TEXTBOOK:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publication
1	SimonHaykins	CommunicationSystems	JohnWileyPHI, NewDelhi	2001
2	Taub& Schilling	PrinciplesofDigital Communication	TataMcGraw-Hill,NewDelhi	2003

REFERENCES:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publication
1	SamK.Shanmugam	Analog&Digital Communication	JohnWiley Publication, New Delhi	2007
2	JohnG.Proakis	DigitalCommunication	McGrawHill,Inc, 5th Edition	2008
3	Singh,R.P. &Sapre,S.D	Communication Systems:Analog& Digital	TataMcGraw-Hill, 5threprint	2000

16BEEC503 ANTENNAS AND WAVE PROPAGATION **L T P C**
3 0 0 3

OBJECTIVES

- To stud y various antennas, arra ys and radiation patterns of antennas.

- To learn the basic working of antennas
- To understand various techniques involved in various antenna param eter measurements.
- To understand the propagation of radio waves in the atmosphere
- To have an exposure on special purpose antennas
- To understand the concept of beam forming in smart antennas

INTENDED OUTCOMES:

- Gain knowledge in various antennas, arra ys and radiation patterns of antennas.
- Gain knowledge in the basic workin g of antennas.
- Understand various techniques involved in various antenna parameter measurements.
- Understand the propagation of radio waves in the atmosphere.
- Choose appropriate antennas based on applications
- Analyze the antenna arrays and special antennas with introduction nto CAD modeling

UNIT I-ANTENNA FU ND AM E NTALS AND RADIATION

Definition and function of antennas – Antenna theorems-Antenna parameters – Radiation Mechanism – Antenna field z ones – Radiation from a small current element – Power radiated by a small current element and its radiation resistance – Hertzian dipole – Half wave dipole – Monopole – Current distributions.

UNIT II-ANTENN A A RRAYS AND SYNTHESIS

Linear arrays – Analysis of linear arrays – Phased arrays – Binomial arrays – Pattern multiplication – Method of excitation of antennas – Impedance matching techniques. Synthesis methods: Schelkunoff polynomial – Fourier transform – Wooden Lawson method.

UNIT III-SPECIAL PURPOSE ANTENNAS

Travelling wave – Loop – small loop – Dipole and Folded dipole antennas – Horn antenna – Reflector antenna – Yagi – Uda antenna – Log periodic antenna – Helical and Microstrip antennas. Introduction to CAD tools used for antenna modeling.

UNIT IV-ANTENNA MEASUREMENTS

Drawbacks in measurements of antenna parameters – Methods to overcome drawbacks in measurements –Measurement ranges – Impedance – Gain – Radiation pattern – Beam width – Radiation resistance – Antenna efficiency- Directivity-Polarization and Phase Measurements.

UNITV-RADIO WAVE PROPAGATION

Basics of propagation-Ground wave propagation – Space wave propa gation- Considerations in space wave propagation – Super refraction – Ionospher ic wave propagation – Structure of ionosphere – Mechanism of ionospheric propagation – Effect of earth’s Magnetic field on Radio wave propagation – Virtual height – MUF – Skip distance – OWF – Ionosphere abnormalities.

TEXTBOOK:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publication
1	JohnDKraus, Ronald JMarhefka, AhmadSKhaN	Antennaand WavePropagation	TataMcGrawHill, 4thEdition	2010
2	R.E.Collins	Antennaand WavePropagation	McGraw-Hill,	1998

REFERENCES:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publication
1	ConstantineA.Balanis	AntennaTheory: Analysisand Design	ThirdEdition,John WileyandSons	2012
2	G.S.N.Raju	Antennasand wavepropagation	StPearson Education	2012
3	RobertS.Elliott	AntennaTheory andDesign	JohnWileyand Revised Edition	2007
4	R.L.Yadava	Antennasand WavePropagation	PHI	2011

16BEEC504 MICROPROCESSORS AND MICROCONTROLLERS **L T P C**
3 0 0 3

OBJECTIVES

- To introduce the h/w architecture, instruction set and programming of 8086 microprocessor.
- To introduce the peripheral interfacing of microprocessors.
- To introduce the h/w architecture of ARM processor
- To introduce the h/w architecture, instruction set, programming and interfacing of 8051 microcontroller.
- To study advanced processor architecture
- To expose them to programming concepts

INTENDED OUTCOMES:

- Adequate knowledge about the architecture and programming of 8085 microprocessor.
- Adequate knowledge about the architecture of ARM processor
- Adequate knowledge about the architecture and programming of 8086 microprocessor.
- Gain knowledge on ARMv7 processor.
- Interface memory and I/O device with controllers
- Gain knowledge about architectures of RISC and ARM processors

UNIT I-MICROPROCESSOR- 8086

Review of 8085- Introduction to 8086 -Register Organization -Architecture-Signals-Memor y Organization-Bus Operation-I/O Addressing-Minimum Mode-Maximum Mode-Timing Diagram-Interrupts - Service Routines – I/O and Memory Interfacing concepts.

UNIT II-PROGRAMMING OF 8086

Addressing Modes- Instruction format-Instruction set-Assembly language programs in 8086. R ISC architecture – introduction to ARM Programming-register configuration and instruction set – sample program.

UNIT III-MICROCONTROLLER-8051

Register Set-Architecture of 8051 microcontroller- I/O and memory addressing- Interrupts-
Instruction set- Addressing modes.

UNIT IV-PROGRAMMINGANDINTERFACINGOF8051

Timer-Serial Communication-Interrupts Programming- Interfacing t oExternal Memory-Interfacing to ADC,LCD,DAC,Keyboard and stepper motor.

UNIT V-OVERVIEWOFARMPROCESSOR

Review of ARM v7 core and its architecture, Introductionto Advanced ARM CORTEX M4 architecture,Peripherals over view,Advantages of using Cortex M4, Instructionset implementation, CPU timers introduction.

TEXTBOOKS:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publication
1	K.RayandK.M. Bhurchandi,	AdvancedMicroprocessors and Peripherals–Architectures, ProgrammingandInterfacing	Indianedition.Tata McGrawHill,New Delhi	2001 Reprint
2	MuhammadAli Mazidi,Janice GillispieMazidi, RolinD.MCKinlay	The8051Microcontrollerand Embedded Systems	PearsonEducation, NewJersy.	2008

REFERENCES:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publication
1	KrishnaKant	Microprocessorand MicrocontrollerArchitecture, programmingandsystemdesign using8085,8086,8051and8096	PHI,NewDelhi.	2007
2	KennethJ.Ayala	The8051Microcontroller	ThompsonDelmar Learning,NewDelhi	2007
3	Ray.A.K, Bhurchandi.K.M	AdvancedMicroprocessorand Peripherals	TataMcGraw-Hill, NewDelhi	2007
4	BarryB.Brey	TheIntelMicroprocessors Architecture,Programmingand Interfacing	PearsonEducation, NewDelhi	2007
5	RameshS.Goankar	MicroprocessorArchitecture, Programming,andApplications withthe8085	PHI,NewDelhi.	2002
6	DouglasV.Hall	MicroprocessorandInterfacing, ProgrammingandHardware	Indianedition.Tata McGrawHill,New Delhi	2007
7	JonathanW Valvano	IntroductiontoArm(r)Cortex-M Microcontrollers	Createspace Independent Publisher	2012

16BEEC5E** **PROFESSIONAL ELECTIVE** **L T P C**
3 0 0 3

16BEEC511 DIGITAL SIGNAL PROCESSING LABORATORY **L T P C**
0 0 3 2

OBJECTIVES

- To implement the processing techniques using TMS320C5X

- To implement the IIR and FIR filter using MATLAB.
- To familiarize with DSP system simulations.
- To study the knowledge about various addressing modes of DSP.
- To imparts a good knowledge sampling and effect of aliasing.
- To familiarize with fast fourier transform and its simulation using MATLAB.

INTENDED OUTCOMES:

- Carry out simulation of DSP systems.
- Demonstrate the applications of FFT to DSP.
- Implement adaptive filters for various applications of DSP.
- Acquire good knowledge about IIR and FIR filters.
- Understand the Sampling and effect of aliasing
- Clear idea about various addressing modes of DSP.

LIST OF EXPERIMENTS USING TMS320C5X

1. Study of various addressing modes of DSP using simple programming examples
2. Sampling of input signal and display
3. Implementation of FIR filter
4. Calculation of FFT

USING MATLAB

5. Generation of Signals
6. Linear and circular convolution of two sequences
7. Sampling and effect of aliasing
8. Design of FIR filters
9. Design of IIR filters
10. Calculation of FFT of asignal

16BEEC512 COMMUNICATION SYSTEMS LABORATORY **L T P C**
0 0 3 2

OBJECTIVES:

- To Understand the radiation patterns and applications of all types of antennas
- Understand the design of Yagi antenna.
- Design Half-wave dipole Antenna using Matlab.
- To Implement AM & FM modulation and demodulation.
- To implement PCM & DM.
- To implement FSK, PSK and DPSK schemes.

INTENDED OUTCOMES:

- Distinguuish between radiation patterns of various antennas.
- Design antenna for any application
- Select proper type of antenna based on applications
- Distinguish between various antennas based on their radiation patterns.
- Demonstrate their knowledge in AM, FM transmission and reception.
- Demonstrate their knowledge in base band signaling schemes through implementation of FSK, PSK and DPSK.

LISTOFEXPERIMENTS

1 Radiation pattern of Halfwave dipole Antenna
2. Radiation pattern of Yagi Antenna
3. Radiation pattern of loop Antenna
4. Characteristics of AM receiver (Selectivity&Sensitivity)
5. Characteristics of FM receiver (Selectivity &Sensitivity)
6. Signal Sampling & Time division multiplexing
7. Pulse modulation and demodulation-PAM/PWM/PPM
8. Pulse code modulation & demodulation
9. Line Coding & Decoding
10. Delta modulation & demodulation
11. Digital modulation & demodulation–ASK,PSK,FSK
12. Simulation of hardware mentioned above using Lsim software

16BEEC513 MICROPROCESSOR AND MICROCONTROLLER LABORATORY

L T P C
0 0 3 2

OBJECTIVES

- Introduce ALP concepts and features.
- Write ALP for arithmetic and logical operations in 8086.
- Interface peripherals with microprocessor and microcontroller.
- Excute programs in 8051
- Know the concept of CPU timers.
- Gain knowledge on ARMv7 processor

INTENDED OUTCOMES:

- Write ALP Programmes for fixed and Floating Point and Arithmetic.
- Interface different I/Os with processor.
- Execute Programs in 8051.
- Design Memory Interfacing circuits using 8051.
- Gain knowledge on ARMv7 processor.
- Introduce the CPU timer's

LIST OF EXPERIMENTS

Minimum 12 Experiments to be conducted

1. Programs for 8/16 bit Arithmetic operations (Using 8085 and 8086).
2. Programs for Sorting and Searching (Using 8086).
3. Programs for String manipulation operations (Using 8086).
4. Programs for Di gital clock and Stop watch (Using 8086).
5. Programs on Subroutines (Using 8086)
6. Interfacing ADC and DAC(Using MSP 430 CONTROLLER).
7. 8255 PP I.
8. Transfer data seriall y between two kits (8253/8251).
9. 8279 Keyboard & displa y
10. Temperature control.
11. Traffic Control Using MSP 430 CONTRO LLER.
12. 8259 Programmable Interrupt Controller.
13. Interfacing and Programming of DC Motor Speed control(Using MSP 430 CONTROLLER)
14. Interfacing and Programming of Stepper Motor and (8051).
15. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.

16BEEC551	INPLANT TRAINING	L T P C
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Course Objective

The goal of this course for students is :

- To bridge the gap between academia and industry in providing a industry exposure for satisfying local industrial needs .

Course Outcomes

At the end of this course, the students will be able to :

- Gain knowledge on various tools used in industry
- Know recent technological advancement happening in industry

16BEEC601	MOBILE COMMUNICATION	L T P C
		3 0 0 3

OBJECTIVES

- To learn the fundamental cellular radio concepts
- To learn radio propagation models
- To provide ideas about analog and digital modulation techniques used in mobile communication
- To learn various coders and multiple access techniques used in mobile communication
- To study the architectures of AMPS, GSM, WLL, Bluetooth, DECT, GPRS
- To provide ideas about digital modulation techniques used in mobile communication

INTENDED OUTCOMES:

- Gain adequate knowledge in the fundamentals of cellular radio concepts
- Gain adequate knowledge in radio propagation models
- Ability to provide ideas about analog and digital modulation techniques used in mobile communication
- Provide ideas about digital modulation techniques used in mobile communication.
- Familiarize with the fundamentals of Multiple Access Techniques.
- Analyze the architectures of AMPS, GSM, WLL, Bluetooth, DECT, GPRS

UNIT-I CELLULAR CONCEPT AND S YSTEM DESIGN FUNDAMENTALS

Introduction to wireless communication: Evolution of mobile communications, mobile radio systems- Examples, trends in cellular radio and personal communications.

Cellular Concept: Frequency reuse, channel assignment, hand off, Interference and system capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems.

UNIT-II MOBILE RADIO PROPAGATION

Free space propagation model, reflection, diffraction, scattering, link budget design, Outdoor Propagation models, Indoor propagation models, Small scale Multipath propagation, Impulse model, Small scale Multipath measurements, parameters of Mobile multipath channels, types of small scale fading, statistical models for multipath fading channels.

UNIT-III MODUL ATION T ECH NIQUES AND EQUILISATION

Modulation Techniques: Minimum Shift Keying, Gauss ion MSK, M-ary QAM, M-ary FSK, Orthogonal Frequency Division Multiplexing, Performance of Digital Modulation in Slow-Flat Fading Channels and Frequency Selective Mobile Channels. Equalization: Survey of Equalization Techniques, Linear Equalization, Non-linear Equalization, Algorithms for Adaptive Equalization. Diversity Techniques, RAKE receiver.

UNIT-IV CO DING AND MULTIPLE ACCESS

Coding: Vocoders, Linear Predictive Coders, Selection of Speech Coders for Mobile Communication, GSM Codec, RS codes for CDPD. Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Capacity of Cellular CDMA and SDMA.

UNIT V WIREL E SS SYSTEMS ANTEN NAS AND STANDARDS

AMPS, GSM, W LL, Bluetooth, IS-95 and DECT - RFID antennas – Mobile Antennas - GPRS

TEXTBOOKS:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publication
1	Rappaport.T.S	Wireless Communications: PrinciplesandPractice	PearsonEducation/ PrenticeHallof India,NewDelhi	2003
2	JochenSchiller	MobileCommunication	PHI,NewDelhi.	2003

REFERENCES:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof publication
1	RoyBlake	WirelessCommunication Technology	ThomsonDelmar, NewDelhi.	2003
2	Lee.W.C.Y	MobileCommunications Engineering:Theoryand applications	McGraw-Hill International,New York	1998
3	StephenG.Wilson	DigitalModulationand Coding	PearsonEducation, NewDelhi	2003

16BEEC602A **VLSIDESIGN** **L T P C**
3 0 0 3

OBJECTIVES

- To learn the basic MOS Circuits.
- To learn the MOS process technology
- To learn the concepts of modeling a digital system using Hardware Description Language.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing V LS I subsystems.
- To learn the concepts of VLSI implementation strategies.

INTENDED OUTCOMES:

- Gain knowledge in the basic MOS Technology.
- Gain knowledge in the MOS Process Technology and its second order effect.
- Gain knowledge in the concepts of modeling a digital system using Hardware DescriptionLanguage.
- Gain knowledge in basic concept of V LS I implementation strategies based on CMOS and FPGA.
- Explore high speed adders and multipliers
- Gain exposure on clocking Strategies

UNIT I-MOS TECHNOLOGY

Chip Design Hierarchy – IC Layers – Photolithography and Pattern Transfers – Basic MOS Transistors – CMOS Fabrication: n-well – p-well – twin tub – Latch up and prevention- Layout design rules, physical design- basic concepts, CAD tool sets, physical design of logic gates- Inverter, NAND, NOR.

UNIT II-MOS CIRCUIT DESIGN PROCESS

Introduction to MOSFET: Symbols, Enhancement mode-Depletion mode transistor operation – Threshold voltage derivation – body effect – Drain current Vs voltage derivation – channel length modulation. NMOS and CMOS inverter – Determination of pull up to pull down ratio –Stick diagrams – V LS I Circuit Design Flow.

UNIT III-CMOS LOGIC GATES & OTHER COMPLEX GATES

Gate delays – Logical Effort - CMOS Static Logic – Transmission Gate Logic – Tri-State Logic – Pass Transistor Logic – Dynamic CMOS Logic – Domino CMOS Logic,NORA CMOS Logic, True Single Phase Clock (TSPC) Dynamic Logic

UNIT IV-VERIL OG HDL

Hierarchical modeling concepts – Basic concepts: Lexical conventions – Data types – Modules and ports. Gate level modeling – Dataflow modeling – Behavioral modeling – Design examples of Combinational and Sequential circuits – Switch level modeling – Functions – UDP concepts.

UNIT V-VLSI IM PLE MENTATION STRATEGIES

Introduction – Design of Adders: carry look ahead-carry select-carry save. Design of multiplier s: Array – Braun array – Baugh-Wooley Array. Introduction to FPGA – Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures.

TEXTBOOKS:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof the publication
1.	DouglasA. Pucknell	BasicVLSISystemsand Circuits	Prentice HallofIndia,3rd Edition,reprint	**2008**
2.	JohnP.Uyemura,	IntroductiontoVLSI CircuitsandSystems	John Wiley&Sons, Reprint	2009

REFERENCES:

S.NO.	Author(s)Name	Title ofthebook	Publisher	Yearofthe publication
1.	Smith.M.J.S	ApplicationSpecific integratedcircuits	PearsonEducation,New York	2008
2.	Weste& Eshraghian,	PrinciplesofCMOS VLSIDesign	AddisonWesley,2nd Edition	2008
3.	JohnP Uyemura	ChipDesignfor Submicron VLSI: CMOSlayoutand simulation	ThomsonIndiaEdition	2010
4	SamirPalnitkar,	VerilogHDL– Guide to Digital Design and S ynthesis	PearsonEducation,3rd Edition	2003

16BEEC602B OPTICAL COMMUNICATION **L T P C**

3 0 0 3

OBJECTIVES

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the different kind of losses, signal distortion in optical wave guides and other
- signal degradation factors.Design optimization of SM fibers, R I profile and cut-off wave length.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
- To learn the fiber optical receivers such as P IN AP D diodes, noise performance in photo detector, receiver operation and configuration.
- To learn fiber slicing and connectors, noise effects on system performance, operational principles W DM and solutions.

INTENDED OUTCOMES:

- Gain knowledge in basic elements of optical fiber transmission link, fiber modes configurations and structures.
- Gain knowledge in different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, R I profile and cut-off wave length.
- Gain knowledge in the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
- Gain knowledge in the fiber optical receivers such as P IN APD diodes, noise performance in photo detector, receiver operation and configuration.
- Gain knowledge in fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.
- Gain knowledge on optical amplifiers and networks.

UNIT-I INTROD UCTION TO OPTICA L FIBERS

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ra y Optics-Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes –Single Mode Fibers-Graded Index fiber structure.

UNIT-II SIGNAL DEGRADATION OPTICAL FIBERS

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination –Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in G I fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT-III FIBER OPTICAL SOURCES AND COUPLING

Direct and indirect Band gap materials-LED structures –Light source materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition –Rate equations –External Quantum efficiency –Resonant frequencies –Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers- Power Launching and coupling, Lancing schemes, Fibre –to- Fibre joints, Fibre splicing – Energy efficiency of LAS ER.

UNIT-IV FIBER OPTICAL RECEIVERS

P IN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation – preamplifiers, Error Sources –Receiver Configuration –Probability of Error – Quantum Limit.

UNIT-V DIGITAL TRANSMISSION SYSTEM

Point-to-Point links System considerations –Link Power budget –Rise - time budget –Noise Effects on System Performance-Operational Principles of WDM, Solutions-Erbium-doped Amplifiers. Basic on concepts of SONET/SDH Network.

TEXTBOOK:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof the publication
1.	GerdKeiser	OpticalFiber Communication	McGraw Hill International, Singapore	2000
2	Senior.J	Optical Communication Principlesand Practice	PrenticeHallof IndiaNewDelhi	2001

REFERENCES:

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S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof the publication
1.	Gower.J	Optical Communication System	PrenticeHallof India,NewDelhi	2001

16BEEC603A MICROWAVE ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To inculcate under standing of the basics required for circuit representation of RFnetworks.
- To deal with the issues in the design of microwave amplifier.
- To instill knowledge on the properties of various microwave components.
- To deal with the microwave generation and microwave measurement techniques
- To familiarize the students with the analysis of RF and microwave transmission lines.
- To acquaint the student with concepts microwave semiconductor devices and microwave tubes.

INTENDED OUTCOMES:

- Explain the active & passive microwave devices & components used in Microwave communication systems.
- Analyze the multi- port RF networks and RF transistor amplifiers.
- Generate Microwave signals and design microwave amplifiers.
- Measure and analyze Microwave signal and parameters.
- Understand the principle behind microwave measurements
- Design microwave systems for different practical application.

UNITI TWO PORT NETWORK THEORY 9

Review of Low frequency parameters: Impedance, Admittance, Hybridand ABCD parameters, Different types of inter connection of Two port networks, High Frequency parameters, Formulation of Sparameters, Properties of Sparameters, Reciprocal and lossless Network, Transmission matrix, RF behavior of Resistors,Capacitors and Inductors.

UNITII RF AMPLIFIERS AND MATCHING NETWORKS **9**

Characteristics of Amplifiers, Amplifier power relations, Stability considerations, Stabilization Methods, Noise Figure, Constant VSWR, Broadband, Highpower and Multistage Amplifiers, Impedance matching using discrete components,Two component matching Networks,Frequency responseand quality factor, T and Pi Matching Networks, Microstrip Line Matching Networks.

UNITIII PASSIVE AND ACTIVE MICROWAVE DEVICES **9**

Terminations, Attenuators, Phase shifters, Directional couplers, Hybrid Junctions, Power dividers, Circulator, Isolator, Impedance matching devices: Tuning screw, Stub and quarter wave transformers. Crystal and Schottkey diode detector and mixers, PIN diode switch,Gunn diode oscillator,IMPATT diode oscillator and amplifier,Varactor diode, Introduction toMIC.

UNITIV MICROWAVE GENERATION **9**

Review of conventional vacuum Triodes,Tetrodes and Pentodes, High frequency effects in vacuum Tubes,Theory and application of Two cavity Klystron Amplifier, Reflex Klystron oscillator, Traveling wave tube amplifier,Magnetron oscillator using Cylindrical,Linear,Coaxial Voltage tunable Magnetrons, Backwardwave Crossed field amplifier and oscillator.

UNITV MICROWAVE MEASUREMENTS **9**

Measuring Instruments: Principle of operation and application of VSWR meter, Power meter, Spectrumanalyzer, Networkanalyzer, Measurement of Impedance, Frequency, Power, VSWR, Q- factor, Dielectric constant, Scattering coefficients, Attenuation, S-parameters.

TEXTBOOKS:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof the publication
1.	Reinhold Ludwiga ndGeneB ogdanov	RFCircuitDesign: TheoryandApplications	Pearson EducationInc	2011
2.	Robert EColin	FoundationsforMicrowa veEngineering	JohnWiley &SonsInc	2005

REFERENCES:

S.NO.	Author(s)Name	Title ofthebook	Publisher	Yearofthe publication
1.	DavidM.Pozar	MicrowaveEngineer ing	WileyIndia(P)Ltd, NewDelhi	2008
2.	ThomasHL ee	PlanarMicrowaveEngine ering:APracticalGuideto	CambridgeUniversityPres s	2004
3.	Mathew.M.Radmanes	RFandMicrowave Electronics	PrenticeHall	2000
4.	AnnapurnaDasandSi sirKDas	MicrowaveEngine ering	TataMcGrawHill PublishingCompany Ltd, NewDelhi	2005

16BEEC603B **EMBEDDED SYSTEMS** **L T P C**

3 0 0 3

OBJECTIVES

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To develop knowledge on ARMv7core and ARMCORTEXM4 architecture.
- To developknowledge on Floating Point Unit
- To develop knowledge on Motion Control
- To imparts a good knowledge in Ports- Timer and Counting Devices

INTENDEDOUTCOMES:

- Gain adequate knowledge about devices and buses used for embedded networking.
- Gain adequate knowledge about ARMv7 core and ARMCORTEXM4 architecture.
- Gain adequate knowledge about Floating Point Unit
- Gain adequate knowledge about Motion Control
- Suggest design approach using advanced controllers to real-life situations.
- Gain knowledge on buses and devices for network

UNIT-I INTRODUCTION TO EMBEDDED SYSTEMS

Definition and Classification–Overview of Processors and hardware units in an embedded system–Software embedded into the system–Exemplary Embedded Systems –Embedded Systems on a Chip (SoC)and the use of VLSI designed circuits

UNIT-II DEVICES AND BUSES FOR DEVICES NETWORK

I/O Devices- Device I/O Types and Examples–Synchronous-Iso –synchronous and Asynchronous Communications from Serial Devices- Examples of Internal Serial-Communication Devices-UART and HDLC- Parallel Port Devices-Sophisticated interfacing features in Devices/ Ports-Timerand Counting Devices-'12C','USB','CAN'and advanced I/O Serial high speed buses.

UNIT-III OVERVIEW OF ARCHITECTURE

Review of ARM v7 core and its architecture, Introductionto AdvancedARM CORTEX M4 architecture,Peripherals overview,Advantages of using Cortex M4, Instruction se timplementation, CPU timers introduction.

UNIT-IV FLOATING POINT UNIT

Introduction to Floating Point Architecture, Advantages of FPU,Need for FPU,IEEEStandards for implementing FPU, Various FPU Modules in Cortex M4 Processors, Software flow for FPU implementation.

UNIT-V MOTION CONTROL

Introduction to motion control, advantages for using motion control modules, Implantation of motion control overview, introductionto PWM Modules, PWM Concepts for Motion Control, Configuration of PWM Modules,Introduction to encoders,types of encoders,QEP Module.

TEXTBOOK:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof Publication
1.	Raikamal	Embedded Systems Architecture, Programming and Design	TATA McGraw-Hill, First reprint, New York	2013
2.	JonathanW Valvano	Introduction to Arm(r) Cortex-M3 Microcontrollers	Createspace Independent Publisher	2012

REFERENCE:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof Publication
1.	AndrewSloss, DominicSymes, ChrisWright	ARMSystem Developer'sGuide	Elsevier/Morgan Kaufman	2004

16BEEC6E PROFESSIONAL ELECTIVE L T P C**

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16BEEC6E PROFESSIONAL ELECTIVE L T P C**

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16BEEC6E PROFESSIONAL ELECTIVE L T P C**

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16BEEC611A **VLSI DESIGN LABORATORY** **L T P C**
0 0 3 2

OBJECTIVES

- To learn Hardware Descriptive Language(Verilog/VHDL).
- To learn the fundamental principles of VLSI circuit design in digital and analog domain.
- To familiarise fusing of logical modules on FPGAs.
- To learn simulation, synthesis and implementation using Cadence tools.
- To familiarize the students with the design of adders using VHDL.
- To know about the various CAD tools.

INTENDED OUTCOMES:

- Write HDL code for basic as well as advanced digital integrated circuits.
- Import the logic modules into FPGA Boards.
- Acquire the knowledge of procedural assignments in VHDL.
- Acquire the knowledge of conditional statements
- Understand the concept of mixed language programming
- Ability to write verilog programmes for digital circuits.

LIST OF EXPERIMENTS

All the experiments must be implemented using Cadence tool

1. Study of Simulator tools
2. Study of Synthesis tools
3. Place and Root and Back annotation for FPGAs
4. Study of development tool for FPGAs for schematic entry and verilog
5. Design of traffic light controller using verilog and above tools
6. Design and simulation of pipelined serial and parallel adder to add/ subtract 8 number of size, 13 bits each in 2's complement
7. Design and simulation of back annotated verilog files for multiplying two signed, 8 bit numbers in 2's complement. Design must be pipelined and completely RTL compliant
8. Study of FPGA board and testing on board LEDs and switches using verilog codes
9. Testing the traffic controller design developed in S I. NO.5 on the FPGA board
10. Design a Real-time Clock (2 digits, 7 segments LED displays each for HRS., MTS, and SECS.) and demonstrate its working on the FPGA board. An expansion card is required for the displays.

16BEEC611B **OPTICAL COMMUNICATION LABORATORY** **L T P C**
0 0 3 2

OBJECTIVES

- To understand the working principle of optical sources, detector, fibers.
- To develop understanding of simple optical communication link.
- To undersstand the different characteristics of Fibres
- To learn about the characteristics and measurements in optical fiber.
- To learn about LED charateristics of fiber optic analog link for 3mm and 6mm cable
- To know the fiber optic tools

INTENDEDOUTCOMES:

- Analyze the performance of simple optical link.
- Analyse the mode characteristics of fiber.
- Understand Coupling Fibers to Semi-Conductor Source –Connectors & Splices.
- Understand LED charateristics of fiber optic analog link for 3mm and 6mm cable.
- Analyze the fiber optic tools.
- Analyze Photo Diode Characteristics of fiber optic receiver

LISTOFEXPERIMENTS

1. Numerical aperture determination for fibers and Attenuation Measurement in 3 mm cable Fibers.
2. Numerical aperture determination for fibers and Attenuation Measurement in 6 mm cable Fibers
3. Mode Characteristics of Fibres–SMFibres.
4. Study of Coupling Fibers to Semi-Conductor Source –Connectors & Splices.
5. Fiber optic analog link for 3mm and 6mm cable
6. Fiber optic digital link for 3mm and 6mm cable
7. LED Characteristics of fiber optic transmitter using 3 mm cable
8. LED Characteristics of fiber optic transmitter using 6 mm cable
9. Photo Diode Characteristics of fiber optic receiver
10. Study of fiber optic tools

16BEEC612A MICROWAVE ENGINEERING LABORATORY

L T P C
0 0 3 2

OBJECTIVES

- Know about the behavior of microwave components.
- Practice microwave measurement procedures
- To expose to magic tee coupler and its usage.
- To study the microwave power measurement.
- To understand the different attenuators.
- To learn the various components of microwave systems

INTENDED OUTCOMES:

- Analyse the radiation of pattern of antenna.
- Test various microwave components.
- Analyze the working of Gunn diode oscillators
- Gain knowledge on the usage of magic tee coupler
- Understand the concepts of couplers .
- Gain knowledge on implementation of couplers in specific areas

LIST OF EXPERIMENTS

1. VSWR Measurements–Determination of terminated impedance
2. Determination of guide wavelength, frequency measurement.

3. Radiation Pattern of Horns, Paraboloids.
4. Microwave Power Measurement.
5. Characteristics of Gunn diode Oscillator
6. Study of MagicTee
7. Study of attenuators (fixedandvariable)
8. Conduct an experiment using microwave test bench.
9. Study of resonant cavity
10. Simulation using CAD tools.

16BEEC612B EMBEDDED SYSTEMS DESIGN LABORATORY L T P C
0 0 3 2

OBJECTIVES

- To learn the working of ARM processor and PIC microcontroller.
- To understand the Building Blocks of Embedded Systems.
- To earn the concept of memory map and memory interface.
- To gain knowledge on PIC microcontroller interfacing
- To expose them to the concept of memory
- To gain inputs on stepper motor interface.

INTENDED OUTCOMES:

- Write programs in ARM and PIC microcntroller for a specific Application.
- Interface memory and Write programs related to memory operations
- Interface A/D and D/A convertors with ARM system.
- Write programmes for interfacing keyboard, display, motor and sensor.
- Enhance programming skill using EPROM and interrupt.
- Write programs for various interfacing boards.

1. Program for arithmetic operations and LED interface using PIC microcontroller.
2. Program for PWM Generation and motor speed control or Servo motor control using PICmicrocontroller.
3. Program for Key Board Interfacing using PICmicrocontroller.
4. Program for LCD Interfacing using PIC microcontroller.
5. Program for ADC interface and temperature control.
6. Program for DAC interface and generate waveforms.
7. Program for RS232C Serial port interfacing using PICmicrocontroller.
8. Program for I2C basedRTC/Memory interface using PIC microcontroller.
9. Program for Timer using PIC microcontroller.
10. Program for Compare and capture operation using PICmicrocontroller.

16BEEC651 COMMUNICATION SKILLS AND DEVELOPMENT L T P C
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16BEEC652 BASIC SIMULATION LABORATORY **L T P C**
1 0 0 -

1. Simulation using PSPICE
2. Simulation using OR CAD
3. Basic Bio signal pre processing using MATLAB
4. Basic Bio saignal pre processing using LabVIEW
5. Image processing using MATLAB

16BECC701 PROFESSIONAL ETHICS PRINCIPLES OF MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT **L T P C**
3 0 0 3

OBJECTIVE

- To enable the students to create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty and to appreciate the rights of others.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.
- To familiarize the student with professional rights and employee rights
- To imparts a good knowledge in weapons development.

INTENDEDOUTCOMES:

- Gain knowledge on human values
- Apply ethics in society,
- Discuss the ethical issues related to engineering
- Realize the responsibilities and rights in the society
- Understand about Computer Ethics
- Gain knowledge on Corporate Social Responsibility

UNIT I ENGINEERING ETHICS **9**
Senses of 'Engineering Ethics' – variety of moral issued – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – Models of Professional Roles – theories about right action – Self–interest – customs and religion – uses of ethical theories.

UNIT II FACTORS OF CHANGES **9**
Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws. Social changes – Meaning and nature – Theories.

UNIT III HISTORICAL DEVELOPMENT, PLANNING, ORGANISING **9**
Definition of Management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies and Planning Premises– Forecasting – Decision–making – Formal and informal organization – Organization Chart –.

UNIT IV DIRECTING AND CONTROLLING **9**
Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership

Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Process of Communication – System and process of Controlling – Requirements for effective control – Control of Overall Performance – Direct and Preventive Control – Reporting

UNIT V ENTREPRENEURSHIP AND MOTIVATION 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harold Kooritz and Heinz Weihrich	Essentials of Management	Tata McGraw Hill, New Delhi	2010
2	Khanka S.S	Entrepreneurial Development	S.Chand and Co. Ltd., NewDelhi	2006
3	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw–Hill, NewYork	2005

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Tripathy P.C and Reddy P.N	Principles of Management	Tata McGraw Hill, New Delhi	2008
2	Rabindra N Kanungo	Entrepreneurship and innovation	Sage Publications, New Delhi	1998
3	Charles E Harris, and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, New Delhi	2013

WEB REFERENCES

1. http://www.managementstudyguide.com/taylor_fayol.htm
2. http://tutor2u.net/business/gcse/people_motivation_theories.htm
3. http://lfkkb.tripod.com/eng24/gilliganstheory.html
4. http://www.developingeyes.com/five–types–of–entrepreneurs/

16BEEC702A MEASUREMENTS AND INSTRUMENTATION L T P C
3 0 0 3

OBJECTIVES:

- To gain knowledge about basic measurement concepts.
- To introduce Concepts of electronic measurements.
- To give exposure to different types of waveform generators and analyzers and their applications.
- To learn about digital instruments in measurements.
- To educate on virtual instrumentation, its applications, programming and DAQ cards and modules.
- To introduce data acquisition elements and transducers

INTENDED OUTCOMES:

- Basic measurement concepts
- Concepts of electronic measurements
- Importance of signal generators and signal analyzers in measurements
- Relevance of digital instruments in measurements
- The need for data acquisition systems
- Measurement techniques in optical domains.

UNIT-I BASIC MEASUREMENT CONCEPTS

Measurement systems – Static and dynamic characteristics – units and standards of measurements – error analysis – moving coil, moving iron meters – multimeters – True RMS meters – Bridge measurements – Maxwell, Hay, Schering, Anderson and Wien bridge.

UNIT-II BASIC ELECTRONIC MEASUREMENTS
Electronic multimeters – Cathode ray oscilloscopes – block schematic – applications – special oscilloscopes – Q meters – Vector meters – RF voltage and power measurements - Carbon microphone - Loud speaker.

UNIT-III SIGNAL GENERATORS AND ANALYZERS
Function generators – RF signal generators – Sweep generators – Frequency synthesizer – wave analyzer – Harmonic distortion analyzer – spectrum analyzer.

UNIT-IVDIGITAL INSTRUMENTS
Comparison of analog and digital techniques – digital voltmeter – multimeters – frequency counters – measurement of frequency and time interval – extension of frequency range – measurement errors.

UNIT-VDATA ACQUISITION SYSTEMS AND FIBER OPTIC MEASUREMENTS
Elements of a digital data acquisition system – interfacing of transducers – multiplexing –computer controlled instrumentation – IEEE 488 bus – fiber optic measurements for power and system loss – optical time domains reflect meter.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Albert D.Helfrick and William D.Cooper,	Modern Electronic Instrumentation and Measurement Techniques	Prentice Hall of India,New Delhi	2003
2	Joseph J.Carr	Elements of Electronics Instrumentation and Measurement	Pearson education,New Delhi	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Alan S Morris	Principles of Measurements and Instrumentation	Prentice Hall of India,New Delhi	2003
2	Ernest O. Doebelin	Measurement Systems-Application and Design	Tata McGraw-Hill,New Delhi	2004

WEBSITES:

http://mechatronics.mech.northwestern.edu/design_ref/tools/multimeter.html
http://www.radio-electronics.com/info/t_and_m/generators/radio-frequency-rf-signal-generator.php
www.physics.sc.edu/~hoskins/Demos/CathodeRay.html

16BEEC702B ROBOTICS AND AUTOMATION L T P C
3 0 0 3

OBJECTIVES:

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inversekinematics of robots.
- To study the Euler of Robot dynamics.
- To study the Lagrangian formulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the control of robots for some specific applications.

INTENDED OUTCOMES:

Uponcompletionof thecourse, thestudent shouldbeableto:

- Explain the basic concepts of working of robot
- Analyze the function of sensors in the robot
- Write a program tousea robot for a typical application
- Use Robots indifferent applications
- Analyze the trajectory planning for robot.
- Understand the control of robots for some specific applications.

UNITI BASIC CONCEPTS 9

Definition and origin of robotics–different types of robotics–various generations of robots– degrees of freedom–Asimov'slaws of robotics–dynamic stabilization ofrobots.

UNITII POWER SOURCESAND SENSORS 9

Hydraulic,pneumatic and electric drives–determination of HPof motor and gear ingratio–variable speed arrangements–path determination – micro machines in robotics– machine vision – ranging– laser–acoustic –magnetic, fiber opticandtactilesensors.

UNITIIIMANIPULATORS,ACTUATORSAND GRIPPERS **9**

Construction of manipulators– manipulator dynamics and forcec ontrol –electronic and pneumatic manipulator control circuits–endeffectors–U various typesof grippers –design considerations.

UNITIV KINEMATICSAND PATH PLANNING **9**

Solution of inverse kinematics problem–multiple solution jacobian workenvelop–hill Climbing Techniques– robot programminglanguages

UNITV CASESTUDIES **9**

Multiplerobots–machine interface–robots in manufacturing and non-manufacturing applications–robotcell design–selection of robot.

TEXT BOOKS:

S.NO.	**Author(s) Name**	**Title of the book**	**Publisher**	**Year of publication**
1	Mikell P.WeissG.M.,Nagel R.N., OdrajN.G,	Industrial Robotics	McGraw-Hill Singapore	1996
2	Ghosh	Control inRoboticsandAutomation: SensorBasedIntegration	AlliedPublishers,Chennai	1998

REFERENCES:

S.NO.	**Author(s) Name**	**Title of the book**	**Publisher**	**Year of publication**
1	Deb.S.R	RoboticsTechnologyandflexibleAutomation	JohnWiley,USA	1992
2	KlafterR.D., Chimielewski T.A.,NeginM	RoboticEngineering–Anintegratedapproach	PrenticeHall ofIndia, NewDelhi	1994
3	McKerrowP.J	Introduction to Robotics	AddisonWesley,USA,	1991
4	IssacAsimov	Robot	BallantineBooks,NewYork	1986
5	BarryLeatham- Jones	Elementsofindustrial Robotics	PITMAN Publishing	1987
6	Mikell P.Groover, MitchellWeiss,Roger N.Nagel Nicholas G.Odrey	Industrial RoboticsTechnology,Programmingand Applications	McGrawHill BookCompany	1986
7	FuK.S.Gonzaleaz R.C.andLee C.S.G	RoboticsControl Sensing, Visionand Intelligence	McGrawHill International Editions	1987

16BEEC7E** **PROFESSIONAL ELECTIVE** **L T P C**
3 0 0 3

16BESHOE/16BECSOE**/16BEEEOE **/16BTBTOE**/16BEMEOE**/16BTAS OE**/16BEAEOE**/ 16BECEOE****	**OPEN ELECTIVE**	**L T P C** **3 0 0 3**

16BESHOE/16BECSOE**/16BEEEOE **/16BTBTOE**/16BEMEOE**/16BTAS OE**/16BEAEOE**/ 16BECEOE****	**OPEN ELECTIVE**	**L T P C** **3 0 0 3**

16BEEC711A	**VLSI DESIGN LABORATORY**	**L T P C** **0 0 3 2**

OBJECTIVES

- To learn Hardware Descriptive Language(Verilog/VHDL).
- To learn the fundamental principles of VLSI circuit design in digital and analog domain.
- To familiarise fusing of logical modules on FPGAs.
- To learn simulation, synthesis and implementation using Cadence tools.
- To familiarize the students with the design of adders using VHDL.
- To know about the various CAD tools.

INTENDED OUTCOMES:

- Write HDL code for basic as well as advanced digital integrated circuits.
- Import the logic modules into FPGA Boards.
- Acquire the knowledge of procedural assignments in VHDL.
- Acquire the knowledge of conditional statements
- Understand the concept of mixed language programming
- Ability to write verilog programmes for digital circuits.

LISTOFEXPERIMENTS

AlltheexperimentsmustbeimplementedusingCadencetool

1. StudyofSimulatortools
2. StudyofSynthesistools

3. PlaceandRootandBackannotationforFPGAs

4. StudyofdevelopmenttoolforFPGAsforschematicentryandverilog

5. Designoftrafficlightcontrollerusingverilogandabovetools

6. Designandsimulationofpipelinedserialandparalleladdertoadd/subtract t8numberofsize,13bits eachin2'scomplement

7. Design and simulation of back annotated Verilog files for multiplying two signed, 8 bit numbers in2'scomplement. Design must be pipelined and completelyRTLcompliant

8. StudyofFPGAboardandtestingonboardLEDsandswitchesusingverilogcodes

9. Testingthetraffic controllerdesigndevelopedinSI.NO.5ontheFPGAboard

10. DesignaReal-time Clock(2digits,7segmentsLEDdisplayseach for HRS., MTS,andSECS.) and demonstrateits working on the FPGAboard.Anexpansioncard is requiredforthe displays.

16BEEC711B OPTICAL COMMUNICATION LABORATORY L T P C
0 0 3 2

OBJECTIVES

- To understand the working principle of optical sources, detector, fibers.
- To develop understanding of simple optical communication link.
- To undersstand the different characteristics of Fibres
- To learn about the characteristics and measurements in optical fiber.
- To learn about LED charateristics of fiber optic analog link for 3mm and 6mm cable
- To know the fiber optic tools

INTENDEDOUTCOMES:

- Analyze the performance of simple optical link.
- Analyse the mode characteristics of fiber.
- Understand Coupling Fibers to Semi-Conductor Source –Connectors & Splices.
- Understand LED charateristics of fiber optic analog link for 3mm and 6mm cable.
- Analyze the fiber optic tools.
- Analyze Photo Diode Characteristics of fiber optic receiver

LISTOFEXPERIMENTS

1. Numerical aperture determination for fibers and Attenuation Measurement in Fibers.
2. Mode Characteristics of Fibres–SM Fibres.
3. Fiber optic analog link for 3mm cable
4. Fiber optic analog link for 6mm cable
5. Fiber optic digital link for 3mm cable
6. Fiber optic digital link for 6mm cable
7. LED Characteristics of fiber optic transmitter
8. Photo Diode Characteristics of fiber optic receiver
9. Study of fiber optic tools
10. StudyofCoupling FiberstoSemi-ConductorSources–Connectors&Splices.

16BEEC791 PROJECT WORK- PHASE I **L T P C**
0 0 8 4

16BEEC751A REAL TIME CONTROLLER **L T P C**
1 0 0 –

INTRODUCTION
Real Time Systems, Types of Real Time systems – Hard and Soft, Real Time Event Characteristics, Challenges in Real Time System Design, Distributed and Multi-processor Architecture, Embedded systems and its Characteristics

ARCHITECTURE OF TI C2000
Introduction to Software Development and the Process, Assembler Directives, C2000 Architecture Overview, Central Processing Unit, Program Control, Programming and System Issues, Phase Locked Loop Application
Demo Classes
- Temperature Sensor Demo
- Low Power Modes of C2000

16BEEC751B VLSI DESIGN USING CADENCE TOOL **L T P C**
1 0 0 –

Course Objectives
- To understand the basics of VLSI, CMOS techniques.
- To know about the various CAD tools.
- To understand design styles & programming using verilogHDL language
- To learn simulation, synthesis and implementation using Cadence tools.
- To familiarize the students with the design of adders using VHDL.
- To indulge the fundamentals of Cadence IES.

Course Outcomes
- Familiar with VLSI basics.
- Ability to write verilog programmes for digital circuits.
- Gain mastery to work on cadence tools
- Acquire the knowledge of procedural assignments in VHDL.
- Acquire the knowledge of conditional statements
- Understand the concept of mixed language programming

Design using Cadence Tool

1.An Inverter
2. A Buffer
3.Transmission gates
4.Basic/Universal Gates.
5. T Flip-Flops
6.NCO (10 Bit number controlled oscillator)
7. Counter designs
8. Automatic generation layout followed by post layout extraction and simulation of NCO.

16BEEC801A **MEDICAL ELECTRONICS** **L T P C**
3 0 0 3

OBJECTIVES

- To study the method s of recording various bio potentials
- To study how to measure biochemical and various physiological information
- To understand the working of units whichwill help to restore normal functioning
- To understand the use of radiation for diagnostic and therapy
- To understand the need and technique of electrical safety in Hospitals
- To imparts good knowledge in diagnostic x-ray equipments.

INTENDEDOUTCOMES:

- Gainknowledgeaboutthemethodsofrecording variousBio potential
- Gainknowledgeabouthowto measurebiochemicalandvariousphysiological information
- Gainknowledgeabouttheworking ofunitswhichwillhelptorestorenormal functioning
- Gainknowledgeabouttheuseofradiationfordiagnosticandtherapy
- Gainknowledgeabouttheneedandtechniqueofelectrical safety inHospitals
- Gain knowledge on recent medical instruments

UNIT-I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING

Theorigin of Bio-potentials; Biopotential electrodes, biological amplifiers, ECG,EEG,EMG, PCG, EOG, leadsystems and recording methods, typical waveforms and signal characteristics.

UNIT-II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT

PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

UNIT-III ASSIST DEVICES AND BIO-TELEMETRY

Cardiac pacemakers, DC Defibrillator, Telemetry principles, frequency selection, Bio-telemetry radio- pill and tele-stimulation.

UNIT-IV RADIOLOGICAL EQUIPMENTS

Ionizing radiation, Diagnostic x-ray equipments, use of Radio Isotope in diagnosis, Radiation Therapy.

UNIT-V RECENT TRENDS IN MEDICAL INSTRUMENTATION

Thermograph, endoscopy unit, Laserin medicine, Diathermy units, Electrical safetyin medical equipment.

TEXTBOOK:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof Publication

1.	LeislieCromwell	Biomedical instrumentation and measurement	PrenticeHallof India,NewDelhi.	2002
2.	Khandpur,R.S.	Handbook of Biomedical	TataMcGraw-Hill, NewDelhi.	1997

REFERENCES:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof Publication
1.	JosephJ.Carrand JohnM.Brown	Introductionto Biomedicalequipment Technology	JohnWileyand Sons,NewYork	1997

16BEEC801B DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES

- To understand the Fundamentals of image processing.
- To learn Various transforms used in image processing.
- To learn the Image processing techniques like image enhancement, reconstruction, compression and segmentation.
- To familiarize the students with the the images for enhancement of certain properties or for optimized use of the resources.
- To inculate colour transformations.
- To study smoothing and sharpening of images

INTENDED OUTCOMES:

- Understand the Fundamentals of image processing.
- Knowledge about various transforms used in image processing.
- Knowledge about the Image processing techniques like image enhancement, reconstruct ion, compression and segmentation.
- Gain knowledge on Multi resolution analysis.
- Understand about video coding and compression techniques.
- Develop algorithms for image compression and coding

UNIT I-DIGITAL IMA GE FUNDAMENTALS

Introduction -Elements of Digital Image Processing system- elements of visual perception – image sensing and acquisition – Image sampling and quantization - image representation -Some basic relationship between pixels.

UNIT II-IMAGE TRANSFORMS

Introduction -2D Discrete Fourier Transform – Properties- Importance of Phase -Walsh –Hadamard – Discrete Cosine Transform, Haar –K L transforms –Singular Value Decomposition.

UNIT III-IMAGE ENHANCEMENT

Enhancement through point operation- Histogram manipulation – Gray level transformation-Neighborhood operation – Median filter - Image Sharpening- Bit plane slicing - Homomorphism Filtering – Zooming operation.

UNIT IV-IMAGE RESTORATION

Model of Image Degradation/restoration process –Inverse filtering -Least mean square (Wiener)filtering – Constrained least mean square restoration – Singular value decomposition-Recursive filtering.

UNIT V-IMA GE CO M PRESSIO N AND SEGMENTATION
Image compression schemes – Information theory – Run length, Huffman and arithmetic coding –Vector quantization - JPEG. Image Segmentation – Classification – Threshold – edge based segmentation – Hough transform – Active contour.

TEXTBOOKS:

S.No	Author(s)Name	Titleof thebook	Publisher	Yearof the publication
1.	Rafael C Gonzalez and Richard E Woods,	Digital Image Processing	PearsonEducation, 3rdEdition	**2003**
2.	S.Jayarman,S. EsakkirajanandT.Veerakumar	Digital Image Processing	TataMcGrawHill	**2010**
3.	A.K.Jain	Fundamentalsof DigitalImage Processing	PearsonEducation	**1989**

REFERENCES:

S.NO.	Author(s)Name	Titleof thebook	Publisher	Yearof the publication
1.	WilliamKPratt	DigitalImage Processing	JohnWilley	**2001**
2.	Millman Sonka, Vaclav Hlavac, Roger Boyle, and BroosColic	ImageProcessing Analysisand MachineVision	Thompson learning	1999

16BEEC8E PROFESSIONAL ELECTIVE** **L T P C**
3 0 0 3

16BEEC891 PROJECT WORK - PHASE II & VIVA VOCE **L T P C**
0 0 32 16

LIST OF ELECTIVES FOR V SEMESTER - ELECTIVE I
B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

16BEEC5E01 ADVANCED ELECTRONIC SYSTEM DESIGN L T P C
3 0 0 3

OBJECTIVES

- To study RF component such as resonator, filter, transmission lines, etc…
- To learn design of RF amplifiers using transistors.
- To study modern Power Supplies using SCR.
- To study modern Power Supplies using SMPS technology.
- To learn about signal shielding & grounding techniques and study of A/D and D/A Converters.
- To learn knowledge about fabrication of PCBs using CAD.
- To learn design of RF amplifiers using transistors.

INTENDED OUTCOMES:

- Gain knowledge in RF component such as resonator, filter, and transmission lines, etc…
- Gain knowledge in design of RF amplifiers using transistors.
- Gain knowledge in Power Supplies using SCR
- Gain knowledge on modern Power Supplies using SMPS technology.
- Gain knowledge about signal shielding & grounding techniques and stud y of A/D and D/A Converters.
- Gain knowledge about fabrication of PCBs using CAD.

UNIT-I INTRODUCTION TO RF DESIGN

RF behaviour of passive components, chip components and circuit board considerations, Review of transmission lines, Impedance and admittance transformation, Parallel and series connection of networks, ABCD and scattering parameters, Analysis of amplifier using scattering parameter. RF filter– Basic resonator and filter configurations – Butterworth and Chebyshev filters. Implementation of micro strip filters design. Band pass filter and cascading of band pass filter elements.

UNIT-II RFTRANSISTOR AMPLIFIER DESIGN

Impedance matching using discrete components. Micro strip line matching networks. Amplifier classes of operation and biasing networks – Amplifier power gain, Unilateral design (S13 =0) – Simple input and output matching networks – Bilateral design - Stability circle and conditional stability, Simultaneous conjugate matching for unconditionally stable transistors. Broadband amplifiers, High power amplifiers and multistage amplifiers.

UNIT-III DESIGN OF POWER SUPPLIES

DC power supply design using transistors and SCRs, Design of crowbar and fold back protection circuits, switched mode power supplies, Forward, fly back, buck and boost converters, Design of transformers and control circuits for SMPS.

UNIT-IV DESIGN OF DATA ACQUISITION SYSTEMS

Amplification of Low level signals, Grounding, Shielding and Guarding techniques, Dual slope, quad slope and high speed A/ D converters, Microprocessors Compatible A/D converters, Multiplying A/D converters and Logarithmic A/D converters, Sample and Hold, Design of two and four wire transmitters.

UNIT-V DESIGN OF PRINTED CIRCUIT BOARDS

Introduction to technology of printed circuit boards (PCB), General la y out and rules and parameters, PCB design rules for Digital, High Frequency, Analog, Power Electronics and Microwave circuits, Computer Aided design of PCBs.

TEXT BOOKS:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Reinhold Luduig and Pavel Bretchko	RF Circuit Design – Theory and Applications	Pearson Education, New York	2000
2.	S ydney Soclof	Applications of Analog Integrated Circuits	Prentice Hall of India, New Delhi	2003

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Keith H.Billings	Handbook of Switched Mode Supplies	McGraw-Hill Publishing Co, New	1989
2.	Michael Jaacob	Applications and Design with Analog Integrated Circuits	Prentice Hall of India, New Delhi	2004
3.	Otmar Kigenstein	Switched Mode Power supplies in Practice	John Wiley and Sons, Chennai	1989
4.	Muhammad H.Rashid	Power Electronics – Circuits, Devices and Applications	Prentice Hall of India New Delhi	2004
5.	Walter C.Bosshart	Printed circuit Boards – Design and Technology	TATA McGraw-Hill, New Delhi	2002

16BEEC5E02 TELECOMMUNICATION SWITCHING AND NETWORKS **L T P C**
3 0 0 3

OBJECTIVES

- To introduce the concept soft Frequency and Time division multiplexing.
- To introduce digital multiplexing and digital hierarchy namely SONET/SDH
- To introduce the concepts of space switching, times switching and combination switching, example of a switch namely No.4ESS Toll switch.
- To introduce the need for network synchronization and study synchronization issues. To outline network control and management issues.
- To study the enhanced local loop systems in digital environment. To introduce ISDN, DSL/ ADSL, and fiber optic system sine subscriber loop.
- To introduce statistical modeling of telephone traffic. To study blocking system characteristics and queuing system characteristics.
- To characterizeblockingprobabilityholdingservicetimedistributionsforinspeechanddata networks.

INTENDED OUTCOMES:

- Knowledge about the concepts of Frequency and Time division multiplexing.
- Knowledge about digital multiplexing and digital hierarchy namely SONET/ SDH
- Knowledge about the concepts of space switching, time switching and combination switching, example of a switch namely No.4ESS Toll switch.
- Knowledge about the need for network synchronization and study synchronization issues. To outline network control and management issues.
- Knowledge about the enhanced local loop systems in digital environment.
- Knowledge about ISDN, DSL/ADSL, and fiber optic system sin subscriber loop.
- Knowledge about statistical modeling of telephone traffic. Knowledge
- about blocking system characteristics and queuing system characteristics.
- Knowledge about characterize blocking probability holding service time
- distributions for in speech and data networks.

UNIT-I MULTIPLEXING

Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings. SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats, SONET Operations, Administration and Maintenance, Payload Framing and Frequency Justification, Virtual Tributaries, DS3 Payload Mapping, E4 Payload Mapping, SONET Standards, SONET Networks. SONET Rings: Unidirectional Path-Switched Ring, Bidirectional Line-Switched Ring.

UNIT-II DIGITAL SWITCHING

Switching Functions, Space Division Switching, and Time Division Switching, two-dimensional is switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SSN07 signaling.

UNIT-III NETWORK SYNCHRONIZATIONCONTROL AND MANAGEMENT

Timing: Timing Recovery: Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S. Network Synchronization, Network Control, Network Management.

UNIT-IV DIGITAL SUBSCRIBER ACCESS

ISDN: ISDN Basic Rate Access Architecture, ISDNU Interface, ISDND Channel Protocol. High- Data-Date Digital Subscriber Loops: Asymmetric Digital Subscriber Line, VDSL. Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next-Generation Digital Loop Carrier, Fiber in the Loop, Hybrid Fiber Coax Systems, Voice band Modems: PCM Modems, Local Microwave Distribution Service, Digital Satellite Services.

UNIT-V TRAFFIC ANALYSIS

Traffic Characterization: Arrival Distributions, Holding Time Distributions, Loss Systems, Network Blocking Probabilities: End-to-End Blocking Probabilities, Overflow Traffic, Delay Systems: Exponential service Times, Constant Service Times, Finite Queues.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Bellamy John	Digital Telephony	John Wily & Sons, Inc Chennai	2000
2.	Viswanathan.T	Telecommunication Switching System and Networks	Prentice Hall of India Ltd, New Delhi	1994

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	P.Gnanasivam	Telecommunication Switching System and Networks	New Age International	2007

16BEEC5E03 TELEVISION AND VIDEO ENGINEERING **L T P C**
3 0 0 3

OBJECTIVES

- To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver
- Picture Tubes and Television Camera Tubes
- To study the principles of Monochrome Television Transmitter and Receivers systems.
- To study the various Color Television systems with a greater emphasis on PAL system.
- To study the advanced topics in Television systems and Video Engineering
- To gain knowledge about ISDN, DSL/ADSL, and fiber optic system sin subscriber loop.
- Togain knowledge about statistical modeling of telephone traffic.

INTENDED OUTCOMES:

- Gain adequate knowledge about the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver Picture Tubes and Television Camera Tubes
- Gain adequate knowledge about the principles of Mono Chrome Television Transmitter and Receiver systems.
- Gain adequate knowledge about the various Color Television systems with a greater Emphasis on PAL system
- Gain adequate knowledge about the advanced topic sin Television systems and Video Engineering
- Understand blocking probability holding service time distributions for in speec hand data networks.

UNIT-I FUNDAMENTAL SOF TELEVISION

Geometry form and Aspect Ratio-Image Continuity-Number of scanning Lines-Interlaced scanning-Picture resolution- Camera Tubes-Image Orthicon-Videocon-plumb icon-silicon diode array Videocon-solid state image scanners-monochrome picture tubes-composite video signal-video signal dimension-horizontal sync. Composition-vertical sync. Details – functions of vertical pulse train – scanning sequence details. Picture signal transmission–positive and negative modulation–VSB transmission sound signal transmission–standard channel bandwidth.

UNIT-II MONOCHROME TELEVISION TRANSMITTER AND RECEIVER

TV transmitter–TV signal propagation–Interference–TV transmission Antennas–Monochrome TV receiver–RF tuner–UHF, VHF Tuner-Digital tuning techniques-AFT-IF subsystems-AGC–Noise cancellation- Video and sound inter carrier detection- vision IF subsystem- video amplifiers Requirements and configurations-DC re-Insertion-Video Amplifier Circuits-Sync separation–typical Sync processing Circuits-Deflection current wave form– Deflection Oscillators– Frame deflection Circuits–Requirements-Line Deflection circuits–EHT generation–Receiver Antennas.

UNIT-III ESSENTIAL SOF COLOUR TELEVISION

Compatibility– colour perception-Three colour theory- luminance, hue and saturation-colour television cameras-values of luminance and colour difference signals-colour television display tubes- delta–gun-precision–in-line and Trinitron colour picture tubes-purity and convergence-purity and static and dynamic convergence adjustments- pincushion correction techniques-automatic degaussing circuit-grey scale tracking–colour signal transmission-bandwidth-modulation of colour difference signals–weighting factors-Formation of chrominance signal.

UNIT-IV COLOUR TELEVISION SYSTEMS

NTS colour TV system-NTSC colour receiver-limitations of NTSC system–PAL colour TV system

–cancellation of phase errors-PAL–D colour system-PAL coder–Pal-De colour receiver-chromo signal amplifier-separation of U and V signals-colour burst separation–Burst phase Discriminator– ACC amplifier- Reference Oscillator-Indented colour killer Circuits-U and V demodulators-Colour signal mixing–merits and demerits of the PAL system–SECAM system–merits and demerits of SECAM system.

UNIT-V ADVANCED TELEVISIONSYSTEMS

Satellite TV technology- Cable TV–VCR-Video Disc recording and play Back-Tele Text broadcast receiver–digital television–Transmission and reception-projection Television–Flat panel display TV receiver–Stereo sound in TV–3DTV–EDTV–Digital equipment's for TV studios.

TEXT BOOKS:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Gulati,R.R.	Monochrome Television Practice, Principles, Technology and servicing	New age International Publishes, New Delhi	2004
2.	R.R.Gulati	Mono chrome and colour television	New age International Publisher, New Delhi	2003

REFERENCE

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Dhake.A.M.	Television and Video Engineering	TMH, New Delhi	2003
2.	S.P.Bali	Colour Television, Theory and Practice	TMH, New Delhi	1994

16BEEC5E04 COMPUTER ARCHITECTURE **L T P C**

3 0 0 3

OBJECTIVES

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail, the operation of the arithmetic unit including the algorithms &
- Implementation of fixed-point and floating-point addition, subtraction, multiplication & Division.
- To study in detail, the different types of control and the concept of pipelining.
- To study the hierarchical memory system including cache memories and virtual memory.
- To study the different way so for communicating with I/O devices and standard I/O
- Interfaces.

INTENDED OUTCOMES:

- Through knowledge about the basic structure and operation of a digital computer.
- Understand the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- Detailed exposure about the different types of control and the concept of pipelining.
- Detailed exposure about the hierarchical memory system including cache memories and virtual memory.
- Detailed exposure about the different ways of communicating with I/O devices and standard I/O interfaces.

UNIT-I ARCHITECTURE OF COMPUTING SYSTEMS

Functional units – Basic Operational Concepts, Bus Structures, Software Performance– Memory Locations & addresses– Memory operations– Instruction and instruction sequencing– addressing modes–assembly language–Basic I/O operations–stacks and queues.

UNIT-II ARITHMETIC UNIT

Addition and subtraction of signed numbers– Design of fast adders – multiplication of positive Numbers-signed operand multiplication and fast multiplication– Integer division– floating point numbers and operations.

UNIT-III BASIC PROCESSING UNIT

Fundamental concepts –Execution of a complete Instruction–Multiple bus organization–Hard wired control–micro programmed control. Pipelining–Basic concepts–data hazards–instruction hazards–influence on Instruction sets–Data path and control consideration–Super scalar operation.

UNIT-IV MEMORY SYSTEM

Basic concepts–semiconductor RAMs, ROMs–Speed, size and cost–cache Memories-Performance consideration –Virtual Memory-Memory Management requirements–Secondary storage.

UNIT-V I/O ORGANIZATION

Accessing I/O devices–Interrupts–Direct Memory Access–Buses–Interface Circuits–Standard I/O Interfaces (PCI, SCSI, USB).

TEXT BOOK:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	Carl Hamacher, Zvonko Vranesic and Safwat Zaky	Computer Organization	McGraw Hill	2002
2	William Stallings	Computer Organization &Architecture– Designing for Performance	Pearson Education, New Delhi	2003

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	David A. Patterson and John L. Hennessy	Computer Organization &Design, the hardware/ software interface	Morgan Kaufmann, New York.	2002
2	John P. Hayes	Computer Architecture& Organization	McGraw-Hill, New York	1998

WEBSITES:

www.webopedia.com/quick_ref/OSI_Layers.aspwww.yale.edu/pclt/COMM/TCPIP.HTM

LIST OF ELECTIVES FOR VI SEMESTER- ELECTIVE II, III, IV
B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

16BEEC6E01 ADVANCED MICROPROCESSORS L T P C

3 0 0 3

OBJECTIVES

- To introduce the concepts in internal programming model of Intel family of microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the basic architecture of Pentium family of processors.
- To introduce the architecture programming and interfacing of 16 bit microcontrollers.
- To introduce the concepts and architecture of RISC processor
- To introduce the concepts and architecture of ARM.

INTENDED OUTCOMES:

- Gain knowledge about the concept sin internal programming model of Intel family of microprocessors.
- Gain knowledge about the programming techniques using MASM, DOS and BIOS Function calls.
- Gain knowledge about the basic architecture of Pentium family of processors.
- Gain knowledge about the architecture programming and interfacing of 16 bit microcontrollers.
- Gain knowledge about the concepts and architecture of RISC processor
- Gain the concepts and architecture of ARM and ARM.

UNIT-I ADVANCED MICROPROCESSOR ARCHITECTURE

Internal Microprocessor Architecture-Real mode memory addressing– Protected Mode Memory addressing–Memory Paging-Data addressing modes–Program memory addressing modes–Stack memory addressing modes–Data movement instructions–Program control Instructions-Arithmetic and Logic Instructions.

UNIT-II MODULAR PROGRAMMING AND ITS CONCEPTS

Modular programming–UsingkeyboardandVideodisplay–DataConversions-Diskfiles-Interrupt hooks-using assembly languages with C/C++

UNIT-III PENTIUM PROCESSORS

Introduction to Pentium Microprocessor–Special Pentium Registers-Pentium memory management–New Pentium Instructions–Pentium Processor–Special Pentium pro features–Pentium4 processor

UNIT-IV 16-BIT MICRO CONTROLLER

8096/8097 Architecture-CPU registers–RALU-Internal Program and Data Memory Timers-High-speed Input and Output–Serial Interface-I/O ports–Interrupts–A/D Converter-Watch dog timer–Power down feature–Instruction Set-External memory Interfacing–External I/O interfacing.

UNIT-V RISC PROCESSORS ANDARM

The RISC revolution–Characteristics of RISC Architecture–The Berkeley RISC–Register Windows –Windows and parameter passing–Window overflow–RISC architecture and pipelining–Pipeline bubbles–Accessing external memory in RISC systems–Reducing the branch penalties–Branch Prediction–The ARM processors–ARM registers–ARM instructions–The ARM built-in shift Mechanism–ARM branch instructions–sequence control–Data movement and memory reference instructions.

TEXT BOOKS:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Barry B.Brey	The Intel Microprocessors 8086/8088, 80,86,80286,8038680486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium4, Architecture, Programming and	Prentice Hall of India Private Limited, New Delhi,	2003
2.	John Peatman	Design with Microcontroller	McGraw Hill Publishing Co Ltd, New Delhi	1997

REFERENCE

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Raj Kamal	The concepts and feature of microntrollers68HC11,8051and 8096	S Chand Publishers, New Delhi.	2000
2.	Alan Clements	The principles of computer Hardware	Oxford University Press, Oxford.	2003

16BEEC6E02 **WIRELESS NETWORKS** **L T P C**

3 0 0 3

OBJECTIVES

- To study about Wireless networks, protocol stack and standards.
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.
- To study the fundamentals of wireless communications
- To introduce the concept of diversity for reception
- To learn the main factors affecting performance of networks.

INTENDED OUTCOMES:

- Conversant with the latest 3G/4G and WiMAX networks and its architecture.
- Design and implement wireless network environment for any application using latest wireless protocols and standards.
- Apply the concept of fading to improve the quality of reception
- Identify the importance of multiplexing technique
- Understand the concept of diversity for reception
- Implement different type of applications for smart phones and mobile devices with latest network strategies.

UNIT-I PHYSICAL AND WIRELESS MAC LAYER ALTERNATIVES

Wired transmission techniques: design of wireless modems, power efficiency, out of band radiation, applied wireless transmission techniques, short distance base band transmission, VWB pulse transmission, broad Modems for higher speeds, diversity and smart receiving techniques, random access for data oriented networks, integration of voice and data traffic.

UNIT-II WIRELESS NETWORK PLANNING AND OPERATION

Wireless networks topologies, cellular topology, cell fundamentals signal to interference Ratio calculation, capacity expansion techniques, cell splitting, use of directional antennas for cell sectoring, microcell method, overload cells, channels allocation techniques and capacity expansion FCA, channel borrowing techniques, DCA, mobility management, radio resources and power management securities in wireless networks.

UNIT-III WIRELESS WAN

Mechanism to support a mobile environment, communication in the infrastructure, IS-95CDMA Forward channel, IS–95CDMA reverse channel, pallet and frame formats in IS–95, IMT–2000; Forward channel in W-CDMA and CDM A 2000, reverse channels in W-CDMA and CDMA-2000, GPRS and higher data rates, short messaging service in GPRS mobile application protocols.

UNIT-IV WIRELESS LAN

Historical overviews of the LAN industry, evolution of the WLAN industry, wireless home networking, IEEE 802.11. The PHY Layer, MAC Layer, wireless ATM, HYPERLAN, HYPERLAN –2.

UNIT-V WPAN AND GEOLOCATIONS YSTEMS

IEEE 802.15WPAN, Home RF, Bluetooth, interface between Bluetooth and 802.11, wireless geo location technologies for wireless geo location, geo location standards for E.911 service.

TEXT BOOK:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Kaveh Pahlavan, Prashant Krishnamoorthy	Principles of Wireless Networks	Pearson Education, New Delhi	2002
2.	Jochen Schiller	Mobile Communications	Person Education, New Delhi	2003

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Wang.Xand Poor.H.V	Wireless Communication Systems	Pearson education, New Delhi	2004
2.	Mallick.M	Mobile and Wireless design essentials	Wiley Publishing Inc., New Delhi	2003
3.	Nicopolitidis.P, Obaidat.M.S, Papadimitria.G.I, Pomportsis.A.S	Wireless Networks	John Wiley &Sons, New Jersy	2003

16BEEC6E03 SATELLITE COMMUNICATION L T P C
3 0 0 3

OBJECTIVES

- Overview of satellite systems in relation to the terrestrial systems.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards.
- To familiarize the students with the drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions.

INTENDED OUTCOMES:

- Gain knowledge in the overview of satellite systems in relation too the terrestrial systems.
- Gain adequate knowledge in satellite orbit sand launching.
- Gain adequate knowledge in earth segment and space segment components
- Gain adequate knowledge in satellite access by various users.
- Gain adequate knowledge in DTH and compression standards.
- Solve numerical problems related to orbital motion and design of link budget for the given parameters and conditions

UNIT-I OVERVIEW OF SATELLITE SYSTEMS, ORBITS AND LAUNCHING METHODS

Introduction– Frequency Allocations for Satellite Services–Intelsat–U.S. Domsats– Polar Orbiting Satellites– Problems–Kepler's First Law–Kepler's Second Law–Kepler's Third Law–Definitions of Terms for Earth-orbiting Satellites–Orbital Elements–Apogee and Perigee Heights–Orbital Perturbations–Effects of a Non spherical Earth–Atmospheric Drag–Inclined Orbits–Calendars– Universal Time– Julian Dates– Sidereal Time– The Orbital Plane– The Geocentric-Equatorial CoordinateSystem– EarthStationReferredtotheIJKFrame–TheTopcentric-HorizonCo-ordinate System–The Sub-satellite Point– Predicting Satellite Position.

UNIT-II GEO STATIONARY ORBIT & SPACE SEGMENT

Introduction–Antenna Look Angels–The Polar Mount Antenna– Limits of Visibility– Near Geostationary Orbits–Earth Eclipse of Satellite–Sun Transit Outage–Launching Orbits–Problems– Power Supply–Attitude Control–Spinning Satellite Stabilization–Momentum Wheel Stabilization–
Station Keeping–Thermal Control–TT & C Subsystem–Transponders–Wide band Receiver–Input De multiplexer – Power Amplifier– Antenna Subsystem– Morelos– Anik- E– Advanced Tiros -N Spacecraft

UNIT-III EARTH SEGMENT & SPACE LINK

Introduction–Receive-Only Home TV Systems–Outdoor Unit–Indoor Unit for Analog (FM) TV– Master Antenna TV System–Community Antenna TV System–Transmit-Receive Earth Stations– Problems– Equivalent Isotropic Radiated Power–Transmission Losses–Free-Space Transmission– Feeder Losses– Antenna Misalignment Losses–Fixed Atmospheric and Ionospheric Losses– Link Power Budget Equation– System Noise–Antenna Noise–Amplifier Noise Temperature–Amplifiers in Cascade– Noise Factor– Noise Temperature of Absorptive Networks– Overall System Noise Temperature–Carrier-to-NoiseRatio–Uplink– SaturationFluxDensity–Input Back Off– The Earth Station HPA –Downlink–Output Back off –Satellite TWTA Output–Effects of Rain–Uplink rain- fade margin– Downlink rain-fade margin– Combined Uplink and Downlink C/N Ratio – Inter modulation Noise.

UNIT-IV SATELLITE ACCESS

Single Access–Pre assigned FDMA, Demand-Assigned FDMA, SPADE System. Bandwidth- limited a Power-limited TWT amplifier operation, FDMA downlink analysis.
TDMA: Reference Burst; Preamble and Post amble, Carrier recovery, Network synchronization, unique word detection, Traffic Date, Frame Efficiency and Channel capacity, Pre assigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction, Downlink analysis for Digital transmission. Companion of uplink Power requirements for FDMA&TDMA. On-board signal Processing for TDMA / FDMA operation,

Satellite switched TDMA Code-Division Multiple Access – Direct- Sequence spread spectrum– code signal c(t) – auto correlation function for c(t)– Acquisition and tackling–Spectrum spreading and dispreading–CDMA throughput–Problems–Network Layers– TCP Link– Satellite Links and TCP – Enhancing TCP Over Satellite Channels Using Standard Mechanisms(RFC-2488)–Requestsforcomments–SplitTCPconnections–Asymmetric Channels– Proposed Systems.

UNIT-V DIRECT BROADCAST SATELLITE SERVICES

Introduction–Orbital Spacing–Power Rating and Number of Transponders–Frequencies and Polarization –Transponder Capacity– Bit Rates for Digital Television – MPEG Compression Standards–Forward Error Correction–Home Receiver Outdoor Unit(ODU)–Home Receiver Indoor Unit (IDU)–Downlink Analysis–Uplink-Problems-Satellite Mobile Services–VSATs–Radar sat –Global Positioning Satellite System–Orbcomm.

TEXT BOOK:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	Dennis Roddy	Satellite Communications	McGraw-Hill Publication, New York.	2001
2	Timothy Pratt–Charles Bostian & Jeremy Allmuti	Satellite Communications	John Willy &Sons (Asia)Pvt. Ltd	2004

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	Wilbur L. Pritchars Henri G. Suyder Hond RobertA.Nelson	Satellite Communication Systems Engineering	Pearson Education Ltd.,	200 3
2	M. Richharia	Satellite Communication Systems-Design Principles	Macmillan Press Ltd.	2003

16BEEC6E04 **DISASTER MANAGEMENT** **L T P C**

3 0 0 3

OBJECTIVES

- To understand the six elements of disaster management.
- To understand the "relief system" and the "disaster victim."
- To understand traditional patterns off foreign assistance
- To understand the tools of post-disaster management
- To gain knowledge about the organization of disaster management

INTENDED OUTCOMES:

- Understand the six elements of disaster management.
- Understand the "relief system "and the "disaster victim."
- Understand traditional patterns of foreign assistance
- Understand the tools of post-disaster management
- Gain knowledge about the organizations that are involved in natural disaster assistance
- Gain knowledge on seismicity

UNIT I: INTRODUCTION

Introduction – Disaster preparedness–Goals and objectives of ISDR Programme-Risk identification–Risk sharing–Disaster and development: Development plans and disaster management–Alternative to dominant approach–disaster-development linkages-Principle of risk partnership

UNIT II:APPLICATION OF TECHNOLOGY IN DISASTER RISK REDUCTION

Application of various technologies: Databases–RDBMS–Management Information systems–Decision support system and other systems–Geo graphic information systems–Intranets and extranets–video teleconferencing. Trigger mechanism–Remote sensing-an insight–contribution of remote sensing and GIS-Case study.

UNIT III: AWARENESS OF RISK REDUCTION

Trigger mechanism– constitution of trigger mechanism– risk reduction by education– disaster information network– risk reduction by public awareness

UNIT IV: DEVELOPMENT PLANNING ON DISASTER

Implication of development planning–financial arrangements–areas of improvement–disaster preparedness–community based disaster management–emergency response.

UNIT V: SEISMICITY

Seismic waves–Earthquakes and faults–measures of an earthquake, magnitude and intensity–ground damage–Tsunamis and earthquakes

TEXT BOOKS:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	Amitasinvhal	Understanding Earthquake disasters	TMH	2010
2	Pardeep Sahni, Madhavimalalgoda And ariyabandu	Disaster risk reduction In south asia	PHI	2003

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	Pardeepsahni, Alka Dhameja and Uma medury	Disaster mitigation: Experiences and reflections	PHI	2004

16BEEC6E05 RADAR AND NAVIGATIONAL AIDS **L T P C**
3 0 0 3

OBJECTIVES

- To study RADAR theory.
- To study and learn different types of RADAR and their working principle.
- To study RADAR signal detection methods.
- To study an overview of RADAR Navigation.
- To study Decca Navigation System
- To learn about RADAR systems and components.

INTENDED OUTCOMES:

- Gain adequate knowledge about RADAR theory.
- Gain adequate knowledge about different types of RADAR and their working principle.
- Gain adequate knowledge about RADAR signal detection methods.
- Gain adequate knowledge about RADAR Navigation.
- Gain adequate knowledge about RADAR systems and components.
- Gain adequate knowledge Decca Navigation System

UNIT I-RADAR QUATIONS

RADAR Block Diagram & operation– RADAR Frequencies– RADAR Equation–Detection of signal sin Noise – RADAR cross section of targets–RADAR cross section fluctuations – transmitter power–pulse repetition frequency–system losses and propagation effects.

UNIT II-MTI AND PULSE DOPPLER RADAR

Introduction to Doppler & MTIRADAR– Delay Line canceller–Moving Target Detector– Pulse Doppler RADAR– Non-Coherent MTI– CW RADAR– FMCWRADAR – Tracking RADAR– Mono pulse Tracking–Conical Scan and Sequential Lobbing.

UNIT III-RADAR SIGNAL DETECTION AND PROPAGATION ON WAVES

Detection criteria–automatic detection–constant false alarm rate receiver–Ambiguity diagram– pulse compression – introduction to clutter – surface clutter RADAR equation – anomalous propagation and diffraction.

UNIT IV-RADIO NAVIGATION

Ad cock directional finder–automatic directional finder– Decca Navigation System–Tactical Air Navigation –Instrument Landing System–Ground Controlled Approach.

UNIT V-RADAR TRANSMITTER AND RECEIVER

Linear beam power tubes– Solid state RF power sources–solid state devices used in RADAR–Magnetron-crossed field amplifiers – other aspects of radar transmitter–RADAR Receiver–Receiver noise figure–super hetero dyne receiver–dynamic range–RADAR Displays.

TEXTBOOK:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of the publication
1.	Merrill I. Skolnik	Introduction to Radar systems	Tata McGraw-Hill, New Delhi	2003
2.	N.S. Nagaraja	Elements of Electronic Navigation	Tata Mc-Graw Hill,2nd Edition	1993

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of the publication
1.	Nadav Levanon	RADAR Principles	John Wiley and Sons	**1989**
2.	Brook ner	RADAR Technology	Artech House	1986
3.	Mark,A. Richards	Fundamentals of radar signal processing	Mc-Graw Hill, Electronic Engineering, 1st Edition	2005
4.	V.S.Bagad	Radar Systems	Technical publications,1st edition	2008

16BEEC6E06 **INTERNET AND JAVA** **L T P C**
3 0 0 3

OBJECTIVES

- To learn Internet working with TCP/IP.

- To learn routing for high speed multimedia traffic
- To learn the fundamental sin WWW, HTML and XML.
- To learn Java for Networking application
- To understand the basic concepts in E-com, Network operating system.
- To understand the basic concepts in Web design.

INTENDED OUTCOMES:

- Thorough knowledge in Internet working with TCP/IP.
- Thorough knowledge about routing for high speed multimedia traffic
- Thorough knowledge in WWW, HTML and XML.
- Thorough knowledge in Java for Networking application
- Understand the basic concept sin E-com, Network operating system
- Understand the concepts in Web design.

UNIT-I INTERNET WORKING WITH TCP/IP

Review of network technologies, Internet addressing, Address resolution protocols (ARP/ RARP), Routing IP data gram's, Reliable stream transport service(TCP)TCP/IP over ATM networks, Internet Applications-E-mail, Telnet, FTP, NFS, Internet traffic management.

UNIT-II INTERNET ROUTING

Concepts of graph theory, Routing protocols, Distance vector protocols(RIP), Link state protocol (OSPP), Path vector protocols (BGP and IDRP), Routing for high speed multimedia traffic, Multicasting, Resource reservation(RSVP), IP switching.

UNIT-III WORLD WIDE WEB

HTTP protocol, Web browsers net scape, Internet explorer, Website and Web page design, HTML, XML, Dynamic HTML, CGI.

UNIT-IV JAVA PROGRAMMING

Language features, Classes, Object and methods, Sub classing and dynamic binding, Multithreading, Overview of class library, Object method serialization, Remote method invocation, JavaScript.

UNIT-V MISCELLANEOUS TOPICS

E-Commerce, Network operating systems, Web Design case studies.

TEXT BOOK:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Dauglas E.Comer.	Internet working with TCP/IP",Vol.I:	Prentice Hall of India, New Delhi.	1999
2.	WilliamStallings.	High Speed Networks.	Prentice Hall Inc, New Delhi.	1998

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Eric Laddand Jim O'Donnell.	UsingHTML4, XML andJava1.2, Que Platinum edition.	Prentice Hall of India, New Delhi.	1999

16BEEC6E07 TOTAL QUALITY MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.
- To familiarize the students with statistical fundamentals.
- To imparts a good knowledge in stages of FMEA.
- To learn about the New seven Management tools.

INTENDED OUTCOMES:

- Apply the tools and techniques of quality managements to manufacturing and servicing process
- Understand the Principles behind TQM
- List tools of quality
- Gain knowledge on Benchmarking process
- Understand the ISO Quality standards
- Gain knowledge on ISO auditing

UNIT1 INTRODUCTION

Definition of Quality, Dimensions of Quality, Quality Planning, Quality Costs-Analysis Techniques For Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership–Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT2 TQM PRINCIPLES

Customer satisfaction– Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement– Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement–Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership– Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures– Basic Concepts, Strategy, Performance Measure.

UNIT3 STATISTICAL PROCESS CONTROL(SPC)

The seven tools of quality, Statistical Fundamentals–Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT4 TQM TOOLS

Bench marking–Reasons to Benchmark, Bench marking Process, Quality Function Deployment(QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM)–Concept, Improvement Needs, FMEA–Stages of FMEA.

UNIT5 QUALITY SYSTEMS

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System–Elements, Implementation of Quality System, Documentation, Quality Auditing, QS9000, ISO 14000–Concept, Requirements and Benefits.

TEXTBOOKS:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of the publication
1	Dale H. Besterfiled	Total Quality Management	Pearson Education	2003
2	James R.Evans& William M.Lidsay	The Management and Control of Quality	South-Western (Thomson Learning)	2002

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of the publication
1.	Feigenbaum.A.V.	Total Quality Management	Mc Graw Hill	1991
2.	Oakland.J.S	Total Quality Management	Butterworth–Hcinemann Ltd., Oxford	1989
3.	NarayanaV.and Sreenivasan,N.S	Quality Management –Concepts and Tasks	New Age International	1996

16BEEC6E08 **PHOTONICS** **L T P C**
3 0 0 3

OBJECTIVES

- To study about Nature of light and the production of EM radiation for photonics application
- To study about the production of EM radiation for photonics application
- To study about applications &Trends and new direction sin photonic applications

INTENDEDOUTCOMES:

- Knowledge about Nature of light and the production of EM radiation for photonics application
- Knowledge about the production of EM radiation for photonics application
- Knowledge about applications &Trends and new directions in photonic applications

UNIT-I NATURE OF LIGHT AND THE PRODUCTION OF EM RADIATION FOR PHOTONICS APPLICATION

Wave descriptions (spectrum, superposition, interference effects), photon effects (photo electric effect, momentum, interaction with matter). Sources of light: thermal, discharge lamps, lasers, solid-state sources (such as LED's and laser diodes).

UNIT-II THEPRODUCTIONOFEMRADIATIONFORPHOTONICSAPPLICATION

Characteristics of light (polarization, coherence, mono chromaticity), ways to define these mathematically (Stokes parameters, Jones vectors & matrices) and how to determine these characteristics

UNIT-III TRANSMISSION & DETECTION OF LIGHT RADIATION

Ray optics ABCD matrix methods for transmission of light. Stability of a cavity. The q-parameter of a laser beam. Light detectors: photo multiplier tubes, Photodiodes, thermal detectors, Bolometers, CCD's, single photon detectors. Generic system issues: sources of noise and signal-to-noise ratio, limitation son temporal response and effective bandwidth.

UNIT-IV IMPARTING INFORMATION ON TO EM RADIATION & COMMUNICATION TECHNIQUES

Acousto-optic and electro-optic techniques, LED switching, analogue and digital techniques using lasers, AM, FM, phase modulation techniques Delivery methods. Basics of optical fiber techniques: step index fiber; acceptance angles, single and multimode fibers, dispersion limitations, transmission characteristics.

UNIT-V APPLICATIONS

Spectroscopy using etalons, spectrometers, interferometers Display systems (LCD's, plasmas etc.) Range-finding systems and applications (LIDAR etc.). More exotic applications (laser trapping, laser tweeze ring, different forms of measurements) Trends and new directions in photonic applications: Laser safety, practical tips on experimental techniques, different forms of laser systems used in research.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Smith,F.G. and King.T.A,	Optics and Photonics	Wiley & Sons, Chichester,	2000
2	Wilson,J. and Hawkes, J.F.B.	Optoelectronics: An introduction	Prentice-Hall, New York	1983

REFERENCES:

S.NO.	Author (s)Name	Title of the book	Publisher	Year of Publication
1.	Harry J.R. Dutton	Understanding Optical Communications	Prentice Hall Series in Networking, New Delhi	1998
2.	Shoichi Sudo, Katsunari Okamoto	New photonics Technologies for the information age	Technology & Engineering, New Delhi	2004

16BEEC6E09 DATA STRUCTURES AND ALGORITHMS **L T P C**

3 0 0 3

OBJECTIVES

- To learn the systematic way of solving problems
- To understand the different methods of organizing large amounts of data
- To learn top Program in C
- To efficiently implement the different data structures
- To efficiently implement solutions for specific problems
- To learn lists, stacks and queues

INTENDED OUTCOMES:

- Gain adequate knowledge about the systematic way of solving problems
- Gain adequate knowledge about the different methods of organizing large amounts of data
- Gain adequate knowledge to program in C
- Gain adequate knowledge to implement the different data structures
- Gain learn lists, stacks and queues.
- Gain adequate knowledge about to implement solutions for specific problems

UNIT-I PROBLEM SOLVING

Problem solving–Top-down Design–Implementation–Verification–Efficiency–analysis–Sample algorithms.

UNIT-II LISTS, STACKS AND QUEUES

Abstract Data Type(ADT)–The List ADT–The Stack ADT–The Queue ADT

UNIT-III TREES

Preliminaries– Binary Trees– The Search Tree ADT– Binary Search Trees– AVL Trees– Tree Traversals–Hashing–General Idea–Hash Function –Separate Chaining–Open Addressing–Linear Probing–Priority Queues (Heaps)–Model–Simple implementations–Binary Heap

UNIT-IV SORTING

Preliminaries–InsertionSort–Shellsort–Heapsort–Mergesort–Quicksort–ExternalSorting

UNIT-V GRAPHS

Definitions– Topological Sort– Shortest-Path Algorithms– Unweighted Shortest Paths– Dijkstra's Algorithm– Minimum Spanning Tree – Prim's Algorithm– Applications of Depth-First Search– Undirected Graphs–Bi connectivity –Introduction to NP-Completeness

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Dromey.R.G	How to Solve it by Computer	Prentice-Hall of India, New Delhi.	2002
2	Weiss.M.A	Data Structures and Algorithm Analysis in C	Pearson Education Asia, New Delhi	2002

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	Langsam .YAugenstein.M.J And Tenen baum.M	Data Structures using C	Pearson Education, Asia, New Delhi	2004
2	Richard.F.Gilberg, Behrouz A and Forouzan.A	Data Structures–A Pseudocode Approach with C	Thomson Brooks/ COLE, New York	1998
3	Aho.J.E.Hopcroft and Ullman.J.D	Data Structures and Algorithms	Pearson education, Asia, New Delhi	2007

WEBSITES:

http://www.cs.auckland.ac.nz/software/AlgAnim/trees.html
http://www.itl.nist.gov/div897/sqg/dads/HTML/graph.html

16BEEC6E10 PROBABILITY AND RANDOMPROCESS **L T P C**
3 0 0 3

OBJECTIVES

- To acquire knowledge about probability and random variables.
- To gain knowledge on 2-Drandomvariables.
- To gain knowledge about correlation functions.
- To learn about the applications of Fourier transforms like spectral density and others.
- To expose the concepts of random process
- To learn about Ergodicity

INTENDED OUTCOMES:

- Gain knowledge about probability and random variables.
- Gain knowledge on 2-D random variables.
- Gain knowledge about correlation functions.
- Gain knowledge about the applications of Fourier transforms like spectral density and others.
- Gain knowledge about the concepts of random process
- Gain knowledge about Ergodicity

UNIT I-PROBABILITY DISTRIBUTIONS

Random Variables- Moments- Moment generating function- Binomial, Poisson, Geometric, Exponential and Normal Distributions-Functions of Random Variables.

UNIT II-TWO DIMENSIONAL RANDOM VARIABLES

Two dimensional Random Variables-Marginal and conditional distributions–Transformation of Random Variables-central limit theorem-simple problems.

UNIT III-RANDOM PROCESSES

Classification of Random Processes-Stationarity-WSS and SSS Processes-Poisson Random Process-Renewal Process-Markov Chain and transition probabilities.

UNIT IV-CORRELATION FUNCTIONS

Auto correlation function and its Properties-Cross Correlation function and its Properties-Linear System with Random Inputs-Ergodicity.

UNIT V-SPECTRAL DENSITY

Power spectral Density Function-Properties-System in the form of convolution - Unit Impulse Response of the System - Einstein - Weiner-Khinchine Relationship-Cross Power Density Spectrum-Properties.

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Veerarajan,T.	Probability, Statistics and Random processes	3rd Edition, Tata McGraw Hill Publications, New Delhi	2008

REFERENCES:

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Siva Ramakrishna Das P. and Vijayakumari.C.	A text book of Engineering Mathematics-III	Viji's Academy	2010.
2	Trivedi KS	Probability and Statistics with reliability, Queueing and Computer Science Applications	Prentice Hall of India, 2nd revised edition, New Delhi	2002

WEBSITES:

1.www.cut-theknot.org/probability.shtml
2.www.ece.uah.edu/courses/ee420-500
3.http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Guwahati/probabilityrp/index. htm
4.www.mhhe.com/engcs/electrical/popoulis
5.http://hmdc.harvard.edu/projects/SPSS_Tutorial/spsstut.shtml

16BEEC6E11 **REMOTE SENSING** **L T P C**
3 0 0 3

OBJECTIVES

- To understand the basic concepts of Remote Sensing.
- To understand the concepts of optical and microwave remote sensing.
- To understand the concepts of geometric information systems.
- To understand the EMR interaction with Earth Surface Materials.
- To study about description of Sensors in Landsat.
- To study about Sonar remote sensing systems.

INTENDED OUTCOMES:

- Understand the basic concepts of Remote Sensing.
- Understand the concepts of optical and microwave remote sensing
- Understand the concepts of geometric information systems
- Understand the EMR interaction with Earth Surface Materials.
- Gain knowledge about description of Sensors in Landsat.
- Gain knowledge about Sonar remote sensing systems.

UNIT-1 REMOTE SENSING

Definition–Components of Remote Sensing–Energy, Sensor, Interacting Body-Active and Passive Remote Sensing– Platforms– Aerial and Space Platforms– Balloons, Helicopters, Aircraft and Satellites– Synoptivity and Receptivity– Electro Magnetic Radiation(EMR)– EMR spectrum– Visible, Infra-Red(IR), Near IR, Middle IR, Thermal IR and Microwave–Black Body Radiation - Planck's law–Stefan-Boltzman law.

UNIT-II EMRINT ERACTION WITH ATMOSPHERE AND EARTH MATERIALS

Atmospheric characteristics–Scattering of EMR–Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows– Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy–Reflectance–Specular and Diffuse Reflection Surfaces-Spectral Signature–Spectral Signature curves–EMR interaction with water, soil and Earth Surface: Imaging spectrometry and spectral characteristics.

UNIT-III OPTICALANDMICROWAVEREMOTESENSING

Satellites- Classification–Based on Orbits and Purpose–Satellite Sensors-Resolution–Description of Multi Spectral Scanning–Along and Across Track Scanners –Description of Sensors in Landsat, SPOT, IR S series–Current Satellites-Radar–Speckle-Back Scattering–Side Looking Airborne Radar–Synthetic Aperture Radar–Radiometer–Geometrical characteristics; Sonar remote sensing systems.

UNIT-IV GEOGRAPHICINFORMATIONSYSTEM

GIS–Components of GIS–Hardware, Software and Organizational Context–Data–Spatial and Non-Spatial–Maps–Types of Maps–Projection–Types of Projection-Data Input–Digitizer, Scanner– Editing–Raster and Vector data structures– Comparison of Raster and Vector data structure– Analysis using Raster and Vector data– Retrieval, Reclassification, Overlaying, Buffering– Data Output–Printers and Plotters

UNIT-V MISCELLANEOUS TOPICS

Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image–Image enhancement–Filtering–Classification-Integration of GIS and Remote Sensing– Application of Remote Sensing and GIS – Urban Applications- Integration of GIS and Remote Sensing–Application of Remote Sensing and GIS–Water resources– Urban Analysis – Watershed Management – Resources Information Systems. Global positioning system– an introduction.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Srinivas.M.G.	Remote Sensing Applications	Narosa Publishing House, New Delhi	2001
2.	Anji Reddy	Remote Sensing and Geographical Information Systems	B S Publications, New Delhi	2001

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Jensen,J.R	Remote sensing of the environment	Prentice Hall	2000
2.	Kang-Tsung Chang	Introduction to Geographic Information Systems	TMH.	2002
3.	Lilles and T.M. and Kiefer R.W	Remote Sensing and Image Interpretation	John Wiley and Sons, Inc, New York	1987
4.	Burrough P A, "Principle of GIS for land resource assessment", Oxford Mischael Hord	Remote Sensing Methods and Applications	John Wiley & Sons, New York	1986.
5.	Singal	Remote Sensing	Tata McGraw-Hill, New Delhi	1990

WEBSITES:

http://www.research.umbc.edu/
http://rst.gsfc.nasa.gov/start.html
IEEE Transaction Son Geo-science and Remote sensing.
Manual of Remote Sensing–American society of photogrammetry & remote sensing,1993.

16BEEC6E12 OPTO ELECTRONIC DEVICES **L T P C**
3 0 0 3

OBJECTIVES

- To know the basics of solid state physics and understand the nature and characteristics of light.

- To understand different methods of luminescence, display devices and laser types and their applications.
- To learn the principle of optical detection mechanism in different detection devices.
- To understand different light modulation techniques and the concepts and applications of optical switching.
- To study the integration process and application of optoelectronic integrated circuits in Transmitters and receivers.
- To study the design of opto electronic modulator.

INTENDED OUTCOMES:

- Thorough knowledge in the basics of solid state physics and characteristics of light.
- Knowledge in different methods of luminescence, display devices and laser types and their applications.
- Adequate knowledge about the principle of optical detection mechanism in different detection devices.
- Adequate knowledge about different light modulation techniques and the concepts and applications of optical switching.
- Adequate knowledge about the integration process and application of opto electronic integrated circuits in transmitters and receivers.
- Understand the design of optoelectronic integrated circuits.

UNIT-I ELEMENTS OF LIGHTAND SOLID STATE PHYSICS

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.

UNIT-II DISPLAY DEVICES AND LASERS

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications.

UNIT-III OPTICAL DETECTION DEVICES

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT-IV OPTO ELECTRONIC MODULATOR

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acoustic optic devices, Optical, Switching and Logic Devices.

UNIT-V OPTO ELECTRONIC INTEGRATED CIRCUITS

Introduction, hybrid and Mono Lithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.

TEXTBOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Wilson.J, and Haukes.J	Opto Electronics–An Introduction	Prentice Hall of India Pvt. Ltd., New Delhi	1998

REFERENCES:

	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Bhattacharya	Semiconductor Opto Electronic Devices	Prentice Hall of India Pvt., Ltd, New Delhi	1996
2.	Jasprit Singh	Opto Electronics–As Introduction to materials and devices	McGraw-Hill International Edition, New York	1998

LIST OF ELECTIVES FOR VII SEMESTER-ELECTIVE V
B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

16BEEC7E01 **SENSORS AND TRANSDUCERS** **L T P C**

3 0 0 3

OBJECTIVES

- To study basic concepts of various sensors and transducers.
- To develop knowledge in selection of suitable sensor based on requirement
- To familiarize the concepts of inductive and capacitive sensors and its comparison
- To imparts the knowledge in analysis of error.
- To learn the fundamentals of various thermal and radiation sensors.
- To study about applications of sensors in various field.

INTENDED OUTCOMES:

- Characterize and classify errors
- Understand basic concepts of mechanical sensors.
- Gain knowledge about thermal sensors
- Explain the principle behind magnetic sensors
- Gain knowledge about electro analytical sensors
- Gain thorough knowledge in selection of suitable sensor based on requirement and application.

UNIT I-INTRODUCTION

Definition, classification, static and dynamic parameters, Characterization–Electrical, mechanical, thermal, optical, biological and chemical, Classification of errors–Error analysis, Static and dynamic characteristics of transducers, Performance measures of sensors.

UNIT II- MECHANICAL AND ELECTRO MECHANICAL SENSORS

Resistive Potentiometer, strain gauge, Inductive sensors and transducer, capacitive sensors, ultrasonic sensors.

UNIT III-THERMAL AND RADIATION SENSOR

Thermal Sensors: Gas thermometric sensors, acoustic temperature sensors, magnetic thermometer, resistance change-type thermometric sensors, thermos emf sensors, junction semiconductor types, Thermal radiation sensors, spectroscopic thermometry

Radiation Sensors: Photo detectors, photovoltaic and photo junction cells, photo sensitive cell, photo FET sand other devices.

UNIT IV-MAGNETIC AND ELECTRO ANALYTICAL SENSOR

Magnetic Sensors: Force and displacement measurement, magneto resistive sensors, Hall Effect sensor, Inductance and eddy current sensors, Angular/rotary movement transducer, Electromagnetic flowmeter, squid sensor.

Electroanalytical Sensors: Electro chemical cell, cell potential, sensor electrodes, electro ceramics in gas media, chem FET.

UNIT V-SENSORS AND THEIR APPLICATIONS

Auto mobile sensor, Home appliance sensor, Aero space sensors, sensors for manufacturing, medical diagnostic sensors, environmental monitoring.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Patranabis D	Sensor and Actuators	Prentice Hall of India (Pvt)Ltd	2006
2	Ian Sinclair	Sensorand Transducers	Elsevier India Pvt Ltd, 3rd Edition	2011

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	A.K. Sawhney, Puneethsawhney	A Course in Electrical and Electronic Measurements and Instrumentation	Dhanpat Rai Publications	2012
2	Ernest O. Doeblin	Measurement System, Application and Design	Tata McGraw Hill Publishing Company Ltd.,5th Edition	2008

16BEEC7E02 COMPUTER HARDWARE AND INTERFACING **L T P C**

3 0 0 3

OBJECTIVES

- To introduce issues related to CPU and memory.
- To understand the components on them other board.
- To understand BIOS and Boot sequences
- To understand different storage media.
- To introduce the features of different I/O peripheral devices and the interfaces.
- To understand bus architecture

INTENDED OUTCOMES:

- Knowledge about issues related to CPU and memory.
- Understand the components on them other board
- Understand BIOS and Boot sequences
- Understand different storage media
- Knowledge about the features of different I/O peripheral devices and their interfaces.
- Knowledge about bus architecture

UNIT-I CPU ANDMEMORY

CPU essentials–processor modes–modern CPU concepts–Architectural performance features–the Intel's CPU–CPU overclocking–over clocking requirements–overclocking the system–over clocking the Intel processors–Essential memory concepts–memory organizations–memory packages –modules–logical memory organizations–memory considerations–memory types–memory techniques–selecting and installing memory.

UNIT-II MOTHER BOARDS

Active motherboards–sockets and slots–Intel D850GB–Pentium 4 motherboard–expansion slots– form factor–upgrading motherboard–chipsets–north bridge–south bridge–CMOS–CMOS optimization tactics–configuring the standard CMOS setup–motherboard BIOS–POST–BIOS features–BIOS and Boot sequences–BIOS short comings and compatibility issues–power supplies and power management–concepts of switching regulation – potential power problems– power management.

UNIT-III STORAGE DEVICES

The floppy drive–magnetic storage–magnetic recording principles–data and disk organization– floppy drive–hard drive–data organization and hard drive–sector layout–IDE drive standard and features–Hard drive electronics–CD-ROM drive–construction–CDROM electronics–DVD-ROM –DVD media–DVD drive and decoder.

UNIT-IV I/O PERIPHERALS

Parallel port–signals and timing diagram–IEEE 1384 modes–asynchronous communication-serial port signals–video adapters–graphic accelerators–3D graphics accelerator issues–DirectX–mice– modems–keyboards–soundboards– audio bench.

UNIT-V BUS ARCHITECTURE

Buses–Industry standard architecture(ISA), peripheral component Interconnect(PCI)–Accelerated Graphics port(AGP)–plug-and-play devices–SCSI concepts–USB architecture.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Stephen J.Bigelow	Trouble Shooting, maintaining and Repairing PCs.	Tata McGraw-Hill, New Delhi.	2001
2.	B.Govindarajul u	PC and Clones hardware troubleshooting and maintenance	Tata McGraw-Hill, New Delhi.	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Craig Zacker & John Rourke.	The complete reference: PC hardware.	Tata McGraw-Hill, New Delhi.	2001
2.	Mike Meyers.	Introduction to PC Hardware and Troubleshooting	Tata McGraw-Hill, New Delhi.	2003

16BEEC7E03 HIGH SPEED NETWORKS L T P C

3 0 0 3

OBJECTIVES

- To introduce about ATM and Frame relay.
- Overview of an up-to-date survey of developments in High Speed Networks.
- To know techniques involved to support real-time traffic and congestion control.
- To learn different levels of quality of service (Q.S) to different applications.
- To divulge the basics of RSVP.
- To make the student acquire Integrated Services Architecture.

INTENDED OUTCOMES:

- Knowledge about ATM and Frame relay.
- Knowledge on up-to-date survey of developments in High Speed Networks.
- Enable the students to know techniques involved to support real-time traffic and congestion control.
- Understand different levels of quality of service (Q.S) to different applications.
- Knowledge about ISDN architecture and its services
- Gain exposure on various protocols for QoS support.

UNIT-I HIGH SPEED NETWORKS

Frame Relay Networks–Asynchronous transfer mode–ATM Protocol Architecture, ATM logical Connection, ATM Cell–ATM Service Categories–AAL.
High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel–Wireless LANs: applications, requirements–Architecture of 802.11

UNIT-II CONGESTION AND TRAFFIC MANAGEMENT

Queuing Analysis-Queuing Models–Single Server Queues–Effects of Congestion–Congestion Control–Traffic Management–Congestion Control in Packet Switching Networks–Frame Relay Congestion Control.

UNIT-III TCP AND ATM CONGESTION CONTROL

TCP Flow control –TCP Congestion Control–Re transmission–Timer Management–Exponential RTO back off–KARN's Algorithm–Window management–Performance of TCP over ATM. Traffic and Congestion control in ATM– Requirements– Attributes– Traffic Management Frame work, Traffic Control– ABR traffic Management– ABR rate control, RM cell formats, ABR Capacity allocations–GFR traffic management.

UNIT-IV INTEGRATED AND DIFFERENTIATED SERVICES

Integrated Services Architecture–Approach, Components, Services-Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ–Random Early Detection, Differentiated Services

UNIT-V PROTOCOLSFORQOSSUPPORT

RSVP–Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms–Multiprotocol Label Switching–Operations, Label Stacking, Protocol details–RTP–Protocol Architecture, Data Transfer Protocol, RTCP.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	William Stallings	High Speed Networks And Internet	Pearson Education, New Delhi.	2002
2.	Irvan Pepelnjk, JimGuichard and Jeff Apcar	MPLS and VPN architecture	Cisco Press, New York.	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Warland & Pravin Varaiya	High Performance Communication Networks	Jean Har court Asia Pvt.Ltd	2001

16BEEC7E04 **NANO ELECTRONICS** **L T P C**
3 0 0 3

OBJECTIVES

- To Understand the basics of Quantum mechanics concepts and process involved in preparation of nano particle.
- To imparts a good knowledge in nanosensors and nanobiosensors
- To familiarize the students with the benefits of the nano-materials and appropriate use in solving practical problems.
- To inculate the nanoscale MOSFET.
- To divulge the applications of nanosenors in various fields.
- To make the student acquire the knowledge of carbon nanotubes and its application in various fields

INTENDED OUTCOMES:

- Understand the basics of Quantum Mechanics
- Gain knowledge on shrink down approaches
- Characterize SET and tunnel diodes
- Understand various aspects of carbon nano structures
- Advantages of the carbon nano sensors
- Knowledge on benefits of the nano-materials and appropriate use in solving practical problems.

UNIT I: BASICS OF NANO ELECTRONICS

Capabilities of nano electronics– physical fundamentals of nano electronics– basics of information theory – the tools for micro and nano fabrication – basics of lithographic techniques for nano electronics.

UNITII: QUANTUM ELECTRON DEVICES

From classical to quantum physics: upcoming electronic devices –electrons in mesoscopic structure– Short channel MOS transistor–split gate transistor–Electron wave transistor–Electron spin transistor –quantum cellular automate –quantum dot array –Principles of Single Electron Transistor(SET)– SET circuit design–comparison between FET and SET circuit design.

UNIT III: NANO ELECTRONICS WITH TUNNELING DEVICES AND SUPERCONDUCTING DEVICES

Tunneling element technology- RTD: circuit design–Defect tolerant circuits - Molecular electronics –elementary circuits–flux quantum devices–application of Super conducting devices–Nanotubes Based sensors, fluid flow, gas, temperature, Strain–oxide nano wire, gas sensing (ZnO,TiO, SnO, WO), LPG sensor (SnO powder)- Nano 2232 designs and Nano contacts-metallic nano structures.

UNIT IV: A SURVEY ABOUT THE LIMITS

Replacement Technologies– Energy and Heat dissipation– Parameter spread as Limiting Effect– Limitsduetothermalparticlemotion–Reliabilityaslimitingfactor–Physicallimits–Final objectives of integrated chip and systems.

UNITV: MEMORY DEVICES AND SENSORS

Nano ferroelectrics –Ferro electric random access memory–Fe-RAM circuit design –ferroelectric thin film properties and integration–calorimetric sensors–electro chemical cells–surface and bulk acoustic devices–gas sensitive FETs–resistive semiconductor gas sensors–electronic noses –identification of hazardous solvents and gases–semiconductor sensor array.

TEXTBOOK:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	K.Goser, P.Glosekotter & J.Dienstuhl,	From Transistors to Molecular Quantum Devices	Springer	2004
2.	Rainer Waser	Nano electronics and Information Technology: Advanced Electronic Materials Novel and Devices	Wiley VCH	2005

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Mick Wilson, Kamali Kannangara, Geoffsmith	Nano technology: Basic Science and Emerging Technologies: Materials, Devices, Measurement Techniques	Springer	2010
2.	Branda Paz,	A Handbook on Nano electronics	Vedams book	2008

LIST O FELECTIVES FOR VIII SEMESTER - ELECTIVE VI
B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

16BEEC8E01 ARTIFICIAL NEURAL NETWORKS L T P C
3 0 0 3

OBJECTIVES

- To learn the various architectures of building an ANN and its applications.
- Advanced methods of representing information in ANN like elf organizing.
- Networks, associative and competitive learning.
- To learn architecture of Neocognitron.
- To imparts a good knowledge in self-organizing map-learning algorithm.
- To familiarize the students with the Data processing and performance of architecture of spacio -temporal networks for speech recognition.

INTENDED OUTCOMES:

- Gain adequate knowledge about the various architectures of building an ANN and its applications.
- Sufficient knowledge regarding BPN and BAM.
- Understand the process of Annealing
- Gain knowledge about self organizing networks, associative and competitive learning.
- Understand the architecture of ART
- Aply neural networks for classification of various applications.

UNIT I: INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS
Neuro-Physiology-General Processing Element-ADALINE-LMS learning rule-MADALINE- MR2 training algorithm.

UNIT II: BPN AND BAM
Back Propagation Network-updating of output and hidden layer weights-application of BPN–associative memory- Bi-directional Associative Memory-Hopfield memory-traveling sales man problem.

UNIT III: SIMULATED ANNEALING AND CPN
Annealing, Boltzmannmachine-learning-application-CounterPropagationnetwork-architecture-Training-Applications.

UNIT IV: SOM AND ART
Self-organizing map-learning algorithm-feature map classifier-applications -architecture of Adaptive Resonance Theory-pattern matching in ART network.

UNIT V: NEOCOGNITRON
Architecture of Neocognitron -Data processing and performance of architecture of spacio -temporal networks for speech recognition.

TEXTBOOK:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	J. A. Freeman and B.M.Skapura	Neural Networks, Algorithms Applications and Programming Techniques	Wiley &Sons, Chichester,	2003

2	Laurene Fausett	Fundamentals of Neural Networks: Architecture, Algorithms and Applications	Prentice Hall	1994

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	S.N. Sivanandham Paul raj.M. P	Introduction to artificial neural networks	Vikas Publishers	2003

16BEEC8E02 VIRTUAL INSTRUMENTATION USING LABVIEW L T P C
3 0 0 3

OBJECTIVES

- To understand the basic needs of VI.
- To learn LabVIEW software basics.
- To understand data acquisition techniques.
- To learn different interfacing techniques.
- To design some real time application using LabVIEW software.
  - To learn programming techniques

INTENDED OUTCOMES:

- The students will be able to am iliarize the basic sand need of VI.
- The students will be able to learn LabVIEW software basics.
- To get better understanding of data acquisition techniques.
- The students can have an exposure to different interfacing techniques.
- The students can able to design some real time application using LabVIEW software.
  - Learn programming techniques

UNIT I-VIRTUAL INSTRUMENTATION

Historical perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II-VIPRO GRAMMING TECHNIQUES

VIS and sub-VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes,
Local and global variable, string &file
input.

UNIT III -DATA ACQUISITION BASICS

Introduction to data acquisition on PC, Sampling fundamentals, Input / Output techniques and buses. ADC, DAC, DIO, Counters &timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation, Simple applications using NIM y DAQ and NIELVIS.

UNIT IV-LabVIEW IN SIGNAL PROCESSING

Waveform Generation, Sampling, Quantization, Aliasing, Signal Reconstruction. Fourier transforms, Power spectrum, Correlation methods, windowing &filtering. Digital Filter Design, IIR/FIR Filtering system Design, Adaptive Filter design.

UNITV-FREQUENCY DOMAIN PROCESSING

Discrete Fourier Transform and Fast Fourier Transform, STFT, Wavelet Transform, Signal Processing applications.

TEXTBOOK:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	Sumathi &P.Surekha	LabVIEW based Advanced Instrumentation	Springer	2007
2	Jovitha Jerome	Virtual Instrumentation Using LabVIEW	PHI Learning Pvt. Ltd	2010

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	Sanjay Gupta, Joseph John	Virtual Instrumentation using LabVIEW	2nd Edition, Tata McGraw Hill Education Private Limited	2010
2	Gary W. Johnson, Richard Jennings	LabVIEW Graphical Programming	Fourth Edition, McGraw-Hill publications	2006

16BEEC8E03 **FPGA DESIGN** **L T P C**

3 0 0 3

OBJECTIVES

- To Provide an understanding of FPGA lifecycle
- To understand the concept of selecting a FPGA based on project specifications
- To enable the student to understand the floor planning, place and route optimization techniques.
- To introduce the lower power reduction techniques to analyze and design FPGA.
- To imparts a good knowledge in logical replications-I/O registers.
- To familiarize the students with the power consumption reduction techniques

INTENDED OUTCOMES:

- Ability to understand FPGA lifecycle
- Understand the concept of selecting a FPGA based on project specifications
- Understand the placement techniques
- Knowledge on lower power reduction techniques to analyze and design FPGA.
- Understand the floor planning techniques
- Understand the route optimization techniques

UNIT1 Introduction to Gate Array and CMOS Logic

Types of gate array–Design flow-CMOS Logic-Combinational–Sequential–Data path–Transistor as resistor–Capacitance-Hardware description language.

UNIT2 Field Programmable Gate Array

FPGA Architecture- Altera FPGA technologies- Xilinx FPGA technologies – Lattice FPGA technologies-Actel FPGA technologies.

UNIT 3 FPGA Implementation Issues

Lookuptables–Memoryavailability-Fixedcoefficientdesigntechnique–Distributedarithmetic.

UNIT 4 Floor Planning, Place and Route Optimization

Design Partitioning-Optimal floor planning–Relationship between placement and routing–Logical Replications-I/O registers–Register Ordering-Placement seed.

UNIT 5 Low Power FPGA Implementation

Sources of power Consumption-Power consumption reduction Techniques-Voltage scaling FPGA’s–Data reordering- Pipeline.

TEXTBOOK

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	Steve Kilts	Advanced FPGA Design	Wiley Inter-Science,	2003
2	Roger Woods, John McAllister, Dr. Ying Yi, Gaye Light bod	FPGA-based Implementation of Signal Processing Systems	Wiley	2008

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of Publication
1.	M.J. S. Smith	Application Specific Integrated Circuits	Pearson	2003

16BEEC8E04 **ASIC DESIGN** **L T P C**

3 0 0 3

OBJECTIVES

- To give basic knowledge of ASIC internals.
- To impart knowledge on ASIC types.
- To give basic understanding of tools used.
- To make the students acquire the design of ASIC library.
- To make the student acquire the knowledge of automatic test pattern generation algorithm.
- To acquaint the student with the introduction of SOC

INTENDED OUTCOMES:

- Understand basic knowledge of ASIC internals.
- Gain knowledge on types of ASIC.
- Gain knowledge about the tools used in ASIC design.
- Simulate and synhezise any circuit
- Perform testing of ASIC
- Gain knowledge about the optimization of area

UNIT I-INTRODUCTION TO ASICS

Introduction to ASICs: Full-custom and Semi-custom ASIC–CMOS logic –ASIC library design.

UNIT II-PROGRAMMABLE ASICS

Programmable ASICs–Anti fuse–static RAM–EPROM and technology–Actel ACT–Xilinx LCA –Altera flex–Altera MAX Logic cells– I/O cells–Interconnects– Low level design entry: Schematic entry.

UNIT III-SIMULATION AND SYNTHESIS

Logic synthesis: A comparator MUX, Inside a logic synthesizer, VHDL and logic synthesis, FSM synthesis, memory synthesis–Simulation: Types of simulation–logic systems–how logic simulation works.

UNIT IV-ASIC TESTING

Boundary scantest– Faults–Fault simulation–Automatic test pattern generation algorithm: D-algorithm, PODEM –Built in self-test.

UNIT V-ASIC CONSTURCTION

System partitioning–power dissipation–partitioning methods–floor planning and placement: –Routing: Global routing, detailed routing, special routing–Introduction to SOC.

TEXTBOOKS:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of the publication
1.	M.J. S. Smith	Application Specific Integrated Circuits	Pearson Education Reprint	2006
2.	Wolf Wayne	FPGA based system design	Pearson Education	2005

REFERENCES:

S.NO.	Author(s)Name	Title of the book	Publisher	Year of the publication
1.	M. Sarafzadehand C.K.Wong	An Introduction to VLSI Physical Design	McGraw Hill	1996
2.	JanM.Rabaey. Anantha Chandra kasan, Borivoje Nikolic	Digital Integrated Circuits	Prentice-Hall Publication	2002

OPEN ELECTIVES - OFFERED BY OTHER DEPARTMENTS
SCIENCE AND HUMANITIES

16BESHOE01 PROBABILITY AND RANDOM PROCESS **L T P C**
3 0 0 3

OBJECTIVES:

- To gain knowledge in measures of central tendency.
- To provide necessary basic concepts in probability and random processes.

INTENDED OUTCOMES:

- Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
- The students will have an exposure of various distribution functions, correlation and spectral densities.

UNIT-I MEASURES OF CENTRAL TENDENCY AND PROBABILITY
Measures of central tendency–Mean, Median, Mode-Standard Deviation
Probability-Random Variable-Axioms of Probability-Conditional Probability-Total probability–Bayes' theorem.

UNIT-II STANDARD DISTRIBUTIONS
Functions of a random Variable-Binomial, Poisson, Uniform, Exponential, Gamma (one Parameter only) and Normal Distributions-Moment generating functions, Characteristic function and their properties–Chebyshev's in equality.

UNIT-III TWO DIMENSIONAL RANDOM VARIABLES
Joint Distributions-Marginal and conditional Distributions-Probability Mass Function-Probability density functions–Covariance-Correlation and regression

UNIT-IV CLASSIFICATION OF RANDOM PROCESS
Definition and examples-first order, second order, strictly stationary, wide–sense stationary and Ergodic Processes-Markov Process-Binomial, Poisson and Normal Processes-Sinewave process.

UNIT-V CORRELATION AND SPECTRAL DENSITIES
Autocorrelation-Cross Correlation-Properties–Power spectral density–Cross spectral density-Properties–Wiener-Khintchine relation–Relationship between cross power spectrum and cross correlation Function-Linear time invariant System-System transfer function–Linear systems with random inputs– Autocorrelation and cross correlation functions of input and output.

TEXTBOOK:

S. No.	Author(s)Name	Title of the book	Publisher	Year of Publication
1	Peebles Jr, P. Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Pubishers, New Delhi.	2002

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Henry Starkand John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002
2	Ochi, M. K	Applied Probability and Stochastic Process	John Wiley &Sons, New York	1990
3	Ross, S	A first Course in Probability	Pearson Education, New Delhi(Chap2to8)	2002
4	Gupta, S.C .and Kapur, V. K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2007
5	Veerarajan, T.	Probabilitiy, Statistics and Random process	Tata McGraw-Hill Publications, Second Edition, New Delhi	2002

WEBSITES:

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld.Wolfram.com

16BESHOE02 FUZZY MATHEMATICS **L T P C**

3 0 0 3

OBJECTIVES:

- To know the fundamentals of fuzzy Algebra.
- To know the basic definitions of fuzzy theory
- To know the applications of fuzzy Technology

INTENDED OUTCOME:

- The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

UNIT I FUZZY SET (9)

Fuzzy Sets: Basics Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations – Level Sets – Fuzzy functions - Zadeh's Extension Principle

UNIT II OPERATIONS ON FUZZY SETS (9)

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tonearms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III FUZZY RELATION (9)

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNIT IV FUZZY MEASURE (9)

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures Vs Possibility Measures

UNIT V FUZZY INFERENCE (9)

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

Total : 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	George J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic: Theory and Applications	Prentice Hall of India, New Delhi.	2003

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Zimmermann H.J.	Fuzzy Set Theory and its Applications	Kluwer Academic publishers, USA.	2001
2	Michal Baczynski and Bala subramaniam Jayaram	Fuzzy Implications	Springer-Verlag publishers, Heidelberg	2008
3	Kevin M Passino and	Fuzzy Control	Addison Wesley	1998

	Stephen Yurkovich		Longman publishers, USA	

WEBSITES:

1. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

16BESHOE03 LINEAR ALGEBRA L T P C
3 0 0 3

OBJECTIVES:

- To know the fundamentals of linear Algebra.
- To study about the linear transformations
- To introduce the concepts of inner product spaces

INTENDED OUTCOMES:

The student will be able to

- Recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
- Visualize linear transformations as matrix form
- Articulate the importance of Linear Algebra and its applications in branches of Mathematics

UNIT I VECTOR SPACES (9)

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II EIGEN VALUES AND EIGEN VECTORS (9)

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

UNIT III SYSTEM OF LINEAR EQUATIONS (9)

Direct methods, Gauss elimination method, Gauss Jordan method, Croute's method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNIT IV LINEAR TRANSFORMATIONS (9)

Linear Transformations - The Null Space and Range - I isomorphism - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNIT V INNER PRODUCT SPACES (9)

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application: Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Shahnaz Bathul	Text book of Engineering Mathematics (Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES:

4. www.sosmath.com
5. www.nptel.ac.in
6. www.mathworld.wolfram.com

16BESHOE04 ENGINEERING ACOUSTICS **L T P C**

3 0 0 3

OBJECTIVES:

- To provide mathematical basis for acoustics waves and the characteristic behavior of sound in pipes, resonators and filters.
- To introduce the properties of hearing and speech

INTENDED OUTCOME:

- The students will have the knowledge on acoustics waves, the characteristic behavior of sound in pipes, resonators and filters and that knowledge will be used by them in different engineering and technology applications

UNIT I INTRODUCTION (9)

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves - Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales .Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence –method of images.

UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES (9)

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers. Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III PIPES RESONATORS AND FILTERS (9)

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

UNIT IV ARCHITECTURAL ACOUSTICS (9)

Sound in endo sure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design. Environmental Acoustics: Highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

UNIT V TRANSDUCTION (9)

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

Total: 45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lawerence E.Kinsler, Austin R.Frey,	Fundamentals of Acoustics	John Wiley & Sons	2000

REFERENCE:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	F. AltonEverest & Ken Pohlmann	Master Handbook of Acoustics	McGraw Hill Professional	2014

WEBSITES:

1. www.acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www. ocw.mit.edu

165BESHOE05 SOLID WASTE MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To understand about the solid waste
- To study about the waste treatment
- To gain knowledge on the disposal of waste and waste management.
- To get the information on energy conservation.

INTENDED OUTCOME:

- The students will know solid waste and energy conservation. They will understand the methodologies to disposal of solid waste and its management.

UNIT I SOLID WASTE (9)

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

UNIT II WASTE TREATMENT (9)

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNIT III WASTE DISPOSAL (9)

Sanitary Land Fill Method of Solid Waste Disposal – Land Fill Classification, Types, Methods &Siting Consideration – Layout & Preliminary Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfill Remediation

UNIT IV HAZARDOUS WASTE MANAGEMENT (9)

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure, Remediation, risk assessment.

UNIT V ENERGY GENERATION FROM WASTE (9)

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, Energy recovery systems. Biological & Chemical conversion technologies – Aerobic composting, low solids. Anaerobic digestion, high solids anaerobic digestion, Energy production from biological conversion products, other biological transformation processes. Chemical transformation processes.

Total: 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dara.S.S,Mishra.D.D	A Text book of Environmental Chemistry and Pollution Control	S.Chand and Company Ltd., New Delhi.	2011

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Naomi B. Klinghoffer and Marco J. Castaldi	Waste to Energy Conversion Technology (Woodhead Publishing Series in Energy)	Woodhead Publishing Ltd., Cambridge, UK	2013
2.	Frank Kreith, George Tchobanoglous	Hand Book of Solid Waste Management- 2nd edition	McGraw Hill Publishing Ltd., Newyork	2002
3.	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall (P) Ltd., New Delhi.	1999

WEBSITES:

1.www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.
2.http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/
3.www.alternative-energy-news.info/technology/garbage-energy/
4.nzic.org.nz/Chem Processes/environment/

16BESHOE06 **GREEN CHEMISTRY** **L T P C**

3 0 0 3

OBJECTIVES:

- To understand about the green chemistry
- To study the atom efficient process and synthesis elaborately.
- To gain knowledge on the green technology and renewable energy resources.
- To get the information on catalysis

INTENDED OUTCOMES:

- Students will know the chemistry and application of green technology for energy sources. They will understand the role of green catalyst in industries.

UNIT I INTRODUCTION TO GREEN CHEMICAL PRINCIPLES (9)

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

UNIT II ATOM EFFICIENT PROCESSES (9)

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

UNIT III BIO TECHNOLOGY AND GREEN CHEMISTRY (9)

Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

UNIT IV RENEWABLE RESOURCES (9)

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

UNIT V CATALYSIS IN GREEN CHEMISTRY (9)

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Sanjay K. Sharma, Ackmez Mudhoo	Green Chemistry for Environmental Sustainability	CRC Press , London	2010
2.	Ahluwalia V. K. and M.Kidwai	New Trends in Green Chemistry 2nd edition	Anamaya publishers., New Delhi.	2007

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons., New Delhi.	2012
2.	Mukesh Doble. Ken Rollins, Anil Kumar	Green Chemistry and Engineering, 1st edition	Academic Press, Elesevier., New Delhi.	2007
3.	Desai K. R.	Green Chemistry	Himalaya Publishing House, Mumbai.	2005
4.	Matlack A. S.	Introduction to Green Chemistry	Marcel Dekker: New York	2001

WEBSITES:

1.http://www.organic-chemistry.org/topics/green-chemistry.shtm
2.http://www.essentialchemicalindustry.org/processes/green-chemistry.html
3. http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm
4. http://www.epa.gov/research/greenchemistry/
5. http://www.amazon.in/Green-Chemistry-Catalysis

16BESHOE07 APPLIED ELECTROCHEMISTRY **L T P C**

3 0 0 3

OBJECTIVES:

- To get the information on electrochemical material.
- To study about the conducting polymers
- To understand about the fuel
- To gain knowledge on the batteries and power sources.

INTENDED OUTCOMES:

- Students will understand about the fuel. They will get knowledge on the batteries and power sources.

UNIT I METAL FINISHING (9)

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electro plating for electronic industry- Alloy plating, brass plating-Electro less plating of nickel- anodizing – Electroforming – Electro winning.

UNIT II CONDUCTING POLYMERS AND ELECTROCHEMICALS (9)

Lector polymerization- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene- Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNIT III BATTERIES AND POWER SOURCES-I (9)

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNIT IV BATTERIES AND POWER SOURCES-II (9)

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

UNIT V ELECTROCHEMICAL MATERIAL SCIENCE (9)

Solar cells- Preparation of CdS/Cu_2S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Cynthia G. Zoski	Hand Book of Electrochemistry	Academic Press, Elesevier., UK	2007
2.	D.Pletcher and F.C.Walsh	Industrial Electrochemistry	Chapman and Hall, London	1990

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M. Barak	Electrochemical Power Sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
2.	Bruno Scrosati	Applications of Electroactive Polymers	Chapman & Hall, London	1993
3.	K.L. Chopra and I. Kaur	Thin Film Devices and their Application	Plenum Press, New York.	1983
4.	M.M.Baizer	Organic Electrochemistry	Dekker Inc. New York	1983

WEBSITES:

1.http://www.anoplate.com/finishes/
2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html
3. http://inventors.about.com/od/sstartinventions/a/solar_cell.htm

16BESHOE08 INDUSTRIAL CHEMISTRY **L T P C**

3 0 0 3

OBJECTIVES:

- To understand about the fuel
- To study about the abrasives and lubricants.
- To gain knowledge on inorganic chemicals and explosive materials.
- To get the information on agriculture chemicals

INTENDED OUTCOMES:

- The student will acquire basic knowledge on cement. The student will understand the interaction of engineering materials and their utilization in industries.

UNIT I CEMENT AND LIME (9)

Manufacture of Portland cement – settling of hardening of port land cement – re gauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials- manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – Magnesian lime – dolomitic lime – hydraulic lime.

UNIT II ABRASIVES AND REFRACTORIES (9)

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories – definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

UNIT IIIINORGANIC CHEMICALS (9)

Common salt and soda ash – manufacture – different grades – products – alkalis – Na_2CO_3, caustic soda and color-alkali industry – manufacture principles of electrolytic process – chlorine – storage. Hydrochloric acid – manufacture – absorption – uses, Sulphur and sulphuric acid – extraction of Sulphur – manufacture of H_2SO_4 – chamber – contact processes – industrial uses.

UNIT IV EXPLOSIVES (9)

Explosives – uses – properties and tests – explosives for war – nitrocellulose – picric acid and T.N.T. – industrial explosives – nitroglycerin and dynamites – black powder – smoke screens – incendiaries – gas mask.

UNIT V AGRICULTURE CHEMICALS (9)

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

Total: 45

TEXT BOOKS:

S.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF

NO.	NAME			PUBLICATION
1.	Hari krishan	Industrial Chemistry	Goel Publishing House, Meerut.	2014
2.	B.K. Sharma	Industrial Chemistry	Goel Publishing House, Meerut.	2000

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH Publishing CO. New Delhi.	1998
2.	James A. Kent	Hand Book of Industrial Chemistry, 9th edition	Van Nostrand Reinhold, New York.	1992
3.	R.N. Sherve	Chemical Process Industries	McGraw-Hill, Kugakuisha Ltd., Tokyo.	1984
4.	S.D. Shukla and G.N. Pandy	A Text book of Chemical Technology	Vikas Publishing House (P) Ltd, New Delhi.	1979

WEBSITES:

1.http://en.wikipedia.org/wiki/Cement
2. http://www.hon.ch/HONselect/Selection/D01.html
3. http://fas.org/man/dod-101/navy/docs/fun/part12.htm
4. http://toxics.usgs.gov/topics/agchemicals.html

LIST OF OPEN ELECTIVES OFFERED BY
COMPUTER SCIENCE ENGINEERING

16BECSOE01 **INTERNET PROGRAMMING**

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the Java programming language and explore its current strengths and Weaknesses
- To study the way that object-oriented concepts are implemented in the Java programming language
- To write working Java code to demonstrate the use of applets for client side programming
- To study the way that exceptions are detected and handled in the Java programming language
- To write working Java code that demonstrates multiple threads of execution

UNIT I Introduction **9**
Introduction - Network of Networks, Intranet, Extranet and Internet. World Wide Web- Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. TCP/IP- Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing- Classful and Classless Addressing, Subnetting

UNIT II HTML **9**

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue. Image Maps- map, area, attributes of image area- Extensible Markup Language (XML)- Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts- Introduction- Environment Variable, GET and POST Methods.

UNIT III PERL **9**

Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling- JavaScript- Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies- Definition of cookies, Create and Store a cookie with example. Java Applets- Container Class, Components, Applet Life Cycle, Update method, Applications.

UNIT IV Client-Server programming **9**

Client-Server programming In Java - Java Socket, Java RMI. Threats - Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks- Network security techniques- Password and Authentication- VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH). Firewall- Introduction, Packet filtering, Stateful, Application layer, Proxy.

UNIT V Internet Telephony **9**
Introduction, VoIP- Multimedia Applications- Multimedia over IP: RSVP, RTP, RTCP and RTSP- Streaming media, Codec and Plugins, IPTV- Search Engine and Web Crawler- Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

Total Hours: 45

TEXT BOOKS:

1. Paul Deitel, Harvey Deitel and Abby Deitel, “Internet and World Wide Web-How to Program”, 5th Edition, 2011.
2. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.

REFERENCES:

1. Rahul Banerjee, Internetworking Technologies, An Engineering Perspective, PHI Learning, Delhi, 2011.
2. Robert W. Sebesta, “Programming the World Wide Web”, Pearson Education, 2016

16BECSOE02 MULTIMEDIA AND ANIMATION

L	T	P	C
3	0	0	3

Course Objectives:

- To study the graphics techniques and algorithms.
- To study the multimedia concepts and various I/O technologies.
- To enable the students to develop their creativity
- To impart the fundamental concepts of Computer Animation and Multimedia.

UNIT I Introduction 9

What is mean by Animation – Why we need Animation – History of Animation– Uses of Animation – Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects -Creating Animation.

UNIT II Creating Animation in Flash 9

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers - Action script.

UNIT III 3D Animation & its Concepts 9

Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation.

UNIT IV Motion Caption 9

Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage – Different Language of Script Animation Among the Software.

UNIT V Concept Development 9

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

Total Hours: 45

Text Books:

1. Computer Graphics, Multimedia and Animation-Malay K. Pakhira,PHI Learning PVT Ltd,2010

References:

1. Principles of Multimedia – Ranjan Parekh, 2007, TMH. (Unit I, Unit V)
2. Multimedia Technologies – Ashok Banerji, Ananda Mohan Ghosh – McGraw Hill Publication.
3. Encyclopedia of Multimedia and Animations-Pankaj Dhaka, Anmol Publications-2011

16BECSOE03 PC HARDWARE AND TROUBLE SHOOTING

L	T	P	C
3	0	0	3

Course Objectives:

- Assemble/setup and upgrade personal computer systems
- Perform installation, configuration, and upgrading of microcomputer hardware and software.
- Install/connect associated peripherals.
- Diagnose and troubleshoot microcomputer systems hardware and software, peripheral equipment.

UNIT I Introduction **9**

Introduction - Computer Organization – Number Systems and Codes – Memory – ALU – CU – Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques – Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC and User.

UNIT II Peripheral Devices **9**

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices – FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNIT III PC Hardware Overview **9**

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC.

UNIT IV Installation and Preventive Maintenance **9**

Introduction – system configuration – pre installation planning – Installation practice – routine checks – PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery.

UNIT V Troubleshooting **9**

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LSI's – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.

Total Hours: 45

Text Books:

1. B. Govindarajalu, "IBM PC Clones Hardware, Troubleshooting and Maintenance", 2/E, TMH, 2002.

References:

1. Peter Abel, Niyaz Nizamuddin, "IMB PC Assembly Language and Programming", Pearson Education, 2007
2. Scott Mueller, "Repairing PC's", PHI, 1992

16BECSOE04 JAVA PROGRAMMING

L	T	P	C
3	0	0	3

Course Objectives:

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development.
- Have the ability to write a computer program to solve specified problems.

  Be able to use the Java SDK environment to create, debug and run simple Java programs

UNIT I INTRODUCTION TO JAVA

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members –constructors – finalize method

UNIT II PACKAGES

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy –polymorphism – dynamic binding – final keyword – abstract classes

UNIT III I/O STREAMS

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes.

UNIT IV EXCEPTION HANDLING

Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions – Using exceptions for debugging

UNIT V THREADS

Introduction, Creating Threads, The Life Cycle of a Thread, Thread Methods, Using Threads, Synchronization of Threads, Summary

TEXT BOOKS:

1. Cay S. Horstmann and Gary Cornell Core Java: Volume I – Fundamentals Sun Microsystems Press 2008

REFERENCE BOOKS:

1. K. Arnold and J. Gosling The JAVA programming language Third edition, Pearson Education, 2009

2. Timothy Budd Understanding Object-oriented programming with Java Updated Edition, Pearson Education 2002

3. C. Thomas Wu An introduction to Object-oriented programming with Java Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2008

WEBSITES:

http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/
http://www.winprog.org/tutorial/msvc.html
http://www.tutorialized.com/tutorials/Visual-C/1
http://www.freeprogrammingresources.com/visualcpp.html

LIST OF OPEN ELECTIVES OFFERED BY
ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT

16BEEEOE01 ELECTRIC HYBRID VEHICLE L T P C
3 0 0 3

Course Objectives

- To understand the basic concepts of electric hybrid vehicle.
- To gain the knowledge about electric propulsion unit.
- To gain the concept of Hybrid Electric Drive-Trains.
- To gain the different Energy Management Strategies.
- To study about the efficiency manipulation in drives
- To understand and gain the knowledge about various energy storage devices

Course Outcomes:

- Summarize the basic concepts in bioprocess Engineering.
- Explain the concept of Hybrid Electric Vehicles.
- Understand the concept of Hybrid Electric Drive-Trains.
- Identify the different Energy Management Strategies.
- Understand the concept of different Energy Storage devices.
- Analyze the different motor drives used in Hybrid Electric Vehicles.

UNIT I INTRODUCTION 9

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II HYBRID ELECTRIC DRIVE-TRAINS 9

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT 9

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE 9

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENT STRATEGIES 9

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press – 2nd edition	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	Standards media – 2nd edition	2009
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley – 2nd edition	2012

16BEEEOE02 ENERGY MANAGEMENT AND ENERGY AUDITING L T P C
3 0 0 3

Course Objectives:

- To gain the knowledge about energy management.
- To understand the basic concepts in economic analysis in energy management.
- To understand the basic principles of energy audit.
- To gain the knowledge about the basic concept of types of Energy Audit
- To gain and Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- To study about the behaviour changes of PF requirement in motor currents

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the concept of Energy Management.
- Analyze the different methods for economic analysis
- Knowledge about the basic concept of Energy Audit and types.
- Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- Investigate the different methods to improve power factor.

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UNIT I ENERGY MANAGEMENT 9

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS 9

Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worth method.

UNIT III BASIC PRINCIPLES OF ENERGY AUDIT 9

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT IV ENERGY EFFICIENT MOTORS 9

Electric Motors: Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation –over motoring – motor energy audit-

Energy conservation: Importance-energy saving measures in DG set-fans and blower's pumps- air conditioning system- energy efficient transformers.

UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS
9

Power factor - methods of improvement, location of capacitors, p.f with nonlinear loads, effect of harmonics on p.f,- p.f motor controllers –Energy efficient lighting system design and practice- lighting control– Measuring Instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLCs.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Murphy W.R. and G.Mckay Butter worth	Energy Management	Heinemann Publications	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John.C.Andreas	Energy Efficient Electric Motors	Marcel Dekker Inc Ltd – 3rd edition	2005
2	W.C.Turner Steve Doty	Energy Management Handbook	Lulu Enterprises, Inc. - 8th Edition Volume II	2013

16BEEEOE03 PROGRAMMABLE LOGIC CONTROLLER L T P C
3 0 0 3

Course Objectives

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To gain the knowledge of storage techniques in PLC
- To acquire the knowledge about how to handle the data and functions
- To study about flow charts of ladder and spray process system
- To understand the principles of PID.

Course Outcome

- At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.
- To acquire the knowledge of storage techniques in PLC
- Students know how to handle the data and functions
- Students known about advanced controller in PLC applications
- Students gather real time industrial application of PLC
- Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION 9

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING 9

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS 9

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS 9

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES 9

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	JR Hackworth and F.D Hackworth – Jr	Programmable Logic Controllers – Programming Method and Applications	Pearson	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	2004
2	W.Bolton	Programmable Logic controller	Elsevier Newnes Publications, 5th Edition	2009

WEBSITE

http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logic controller

16BEEEOE04 RENEWABLE ENERGY SOURCES **L T P C**

3 0 0 3

Course Objectives

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
- To study about solar energy collectors and its storages
- To study about the inter connected system in wind power
- To understand the basic principles fuel cell, Geo thermal power plants.
- To gain the knowledge about hydro energy.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Analyze the Energy Scenario in india
- Understand the concept of Solar Energy
- Understand the concept of Wind Energy
- Understand the concept of Hydro Energy
- Analyze the different energy sources
- Students gathered the real time inter connected system modelling in wind power

UNIT I INTRODUCTION 9

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

UNIT II SOLAR ENERGY 9

Introduction to solar energy: solar radiation, availability, measurement and estimation– Solar thermal conversion devices and storage – solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

UNIT III WIND ENERGY 9

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNIT IV HYDRO ENERGY 9

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V OTHER SOURCES 9

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rai.G.D	Non-conventional sources	Khanna publishers	2011

		of energy		
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rao.S. & Parulekar	Energy Technology	Khanna publishers, Eleventh Reprint	2013
2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis – 3rd edition	2015

WEBSITES

1. www.energycentral.com
2. www.catelelectricpowerinfo.com

OPEN ELECTIVES
(COURSES OFFERED BY OTHER DEPARTMENTS)
BIO TECHNOLOGY

16BTBTOE01 **BIO REACTOR DESIGN** **L T P C**
3 0 0 3

INTENDEDOUTCOMES

- To understand the basic design of bioreactors
- To understand the principle of heat transfer inside a bioreactor
- To understand the principle of heat transfer inside bioreactor
- To design bio reactors for various operations

UNITI ENGINEERINGPROPERTIES AND STORAGE TANK (9)

Introduction to various mechanical properties of material to be used material of construction, design of cylindrical storage tank.

UNITII REACTOR DESIGN (9)

Design of Airlift ferment or, Bubble column reactor and Continuous stirred tank reactor.

UNITIII HEATTRANSFER EQUIPMENTS (9)

Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulation evaporator.

UNITIV MASSTRANSFER EQUIPMENTS (9)

Design of Boll man extractor, fractionating column, packed tower and spray tray absorber

UNITV SEPERATIONEQUIPMENTS (9)

Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rot art drum drier and Swenson–walker crystallizer.

TEXTBOOKS:

S.No	Author(s)Name	Title of the book	Publisher	Year o Publications
1	James Edwin Bailey, DavidF.Ollis	Biochemical Engineering Fundamentals	McGraw-Hill	2007
2	DonW.Green,RobertH. Perry	Chemical Engineer Handbook	The McGraw-Hill Companies	2008

REFERENCE BOOKS

S.No	Author(s)Name	Title of the book	Publisher	Year of Publications
1	Pauline.M.Doran	Bioprocess Engineering Principles	Academic Press	2013

16BTBTOE02 **FOOD PROCESSING AND PRESERVATION** **L T P C**

3 0 0 3

INTENDED OUTCOMES

The students are exposed to

- Properties of food material
- Various methods used for preserving fruits and vegetables.

UNITI SCOPE AND IMPORTANCE OF FOOD PROCESSING (9)

Properties of food- Physical, thermal, mechanical, sensory. Raw material Preparation -Cleaning, sorting, grading, peeling.

UNITII PROCESSING METHODS (9)

Heating- Blanching and Pasteurization. Freezing - De hydration- canning- additives-fermentation- extrusion cooking -hydrostatic pressure cooking- dielectric heating- micro wave processing and aseptic processing –Infrared radiation processing- Concepts and equipment used.

UNITIII FOOD CONVERSION OPERATIONS (9)

Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membrane separation-filtration-equipment and application.

UNITIV FOOD PRESERVATION BY COOLING (9)

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Water activity, methods to control water activity.

UNITV PRESERVATION METHODS FOR FRUITS ANDVEGETABLES (9)

Pre processing operations - preservation by reduction of water content: drying / dehydration and concentration –chemical preservation –preservation of vegetables by acidification, preservation with sugar - Heat preservation– Food irradiation- Combined preservation techniques.

TEXT BOOKS

S.No	**Author(s)Name**	**Title of the book**	**Publisher**	**Year of Publications**
1	R.PaulSingh,DennisR.	Introduction to food Engineering.	Academic Press	2001
2	P.Fellows.	Food Processing Technology, Principles and practice.	Wood head Publishing Ltd	2000

3	MirceaEnachescuDauthy	Fruit and Vegetable Processing	FAO agricultural services bulletin	1995

REFERENCEBOOKS

S.No	Author(s)Name	Title of the book	Publisher	Year of Publications
1	M.A. Rao, Syed S.H. Rizvi, Ashim K.Datta	Engineering properties Of foods	CRC Press	2005
2	B.Sivasankar	Food processing and preservation	PHI Learning Pvt.Ltd	2002

16BTBTOE03 **BASIC BIO INFORMATICS** **L T P C**

3 0 0 3

INTENDED OUTCOMES

1. To enable the students to get aware of available tools and databases for performing research in bioinformatics.
2. To provide the thorough understanding of protein structure in detail.

UNITI OVERVIEW OFBIOINFORMATICS (9)

The scope of bio informatics; bio informatics & the internet; useful bio informatics sites. Data acquisition: sequencing DNA, RNA & proteins; determination of protein structure; gene & protein expression data; protein interaction data. Databases–contents, structure & annotation: file formats; annotated sequence databases; miscellaneous databases.

UNITII RETRIEVAL OF BIOLOGICAL DATA (9)

Data retrieval with Entrez &DBGET/ Link DB; data retrieval with SRS (sequence retrieval system).Searching sequence databases by sequence similarity criteria: sequence similarity searches; amino acid substitution matrices ; database searches, FASTA & BLAST; sequence filters; iterative database searches &PSI-BLAST .Multiple-sequence alignment, gene & protein families: multiple-sequence alignment & family relationships; protein families & pattern databases; protein domain families.

UNITIII PHYLO GENETICS (9)

Phylogenetic, cladistics &ontology; building phylogenetic trees; evolution of Macro molecular sequences. Sequence annotation: principles of genome annotation; annotation tools & resources.

UNITIV STRUCTURAL BIOINFORMATICS (9)

Conceptual models of protein structure; the relationship of protein three-dimensional structure to protein function; the evolution of protein structure & function; obtaining, viewing & analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure: CATH & SCOP; introduction to protein structure prediction; structure prediction by comparative modeling; secondary structure prediction; advanced protein structure prediction & prediction strategies.

UNITV MICROARRAYDATAANALYSIS (9)

Microarray data, analysis methods; microarray data, tools & resources; sequence sampling &SAGE. Bioinformatics in pharmaceutical industry: informatics &drug discovery; pharma informatics resources. Basic principles of computing in bio informatics: running computer software; computer operating systems; software downloading &installation; data base management.

TEXTBOOK

S.No.	Author (s) Name	Title of the book	Publisher	Year of Publication

1	Dan E. Krane,Micha L.Rayme	Fundamental Concepts of Bioinformatics	Pearson education	2004
2	Andreas D. Baxevanis,B. F.Francis Ouellette	Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins	Wiley-Inter science	2004
3	David W. Mount	Sequence and Genome Analysis	Cold Spring Harbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

REFERENCEBOOKS

S.No.	Author (s) Name	Title of the book	Publisher	Year of Publication
1	Michael J. Korenberg	Microarray Data Analysis: Methods and Applications	Springer Science &Business Media	2007

16BTBTOE04 FUNDAMENTALS OF NANO BIOTECHNOLOGY L T P C
3 0 0 3

INTENDED OUTCOMES

1. To develop skills of the students in the field of Nano biotechnology and its applications in various fields.
2. Thecoursewillserveasaneffectivecoursetounderstand Socio-economicissuesof Nano biotechnology.

UNITI INTRODUCTION (9)

Introduction, Scope and Overview, Length scales , Importance of Nano scale and Technology, History of Nanotechnology, Future of Nanotechnology:Nano Technology Revolution, Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concept, Controversies and confusions, Understanding advanced capabilities, Nanotechnology in Different,Fields:Nanobiotechnology,Materials,Medicine,Dentalcare.

UNITII NANOPARTICLES (9)

Introduction, Types of Nano particles, Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Applications, Toxic effects of Nanomaterial's, Significance of Nanoparticles Nanofabrications-MEMS/NEMS,AtomicForceMicroscopy,Selfassembledmonolayers/Dip-pen Nanolithography, Soft Lithography, PDMS Molding, Nanoparticles, Nanowires and Nanotubes.

UNITIII APPLICATIONS (9)

Nano medicine, Nano biosensor and Nano fluidics. Nano crystals in biological detection, Electrochemical DNA sensors and Integrated Nano liter systems. Nano-Bio devices and Systems. Fabrication of Novel Biomaterials through molecular self-assembly- Small scale systems for in vivo drug delivery-Future Nano machine.

UNITIV NANO BIOTECHNOLOGY (9)

Clinical applications of Nano devices. Artificial neurons. Real-time Nano Sensors-Applications in cancerbiology. Nanomedicine.Syntheticretinylchipsbasedonbacteriorhodopsins. Highthroughput DNA sequencing with Nano carbon tubules. Nano surgical devices.

UNITV ETHICAL ISSUES IN NANOTECHNOLOGY (9)

Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology: With Especial Reference to Nano medicine, Nano medicine Applied in Nonmedical Contexts, Social Issues Relating to Nano medicine. Social and Ethical Issues, Economic Impacts, Other Issues, Nano technology and Future Socio-economic challenges.

TEXT BOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Niemeyer, C.M. and Mirkin, C.A	Nano biotechnology: Concepts, Applications and Perspectives	Wiley-VCH	2004
2	Good sell, D.S.	Bio nanotechnology	John Wiley and Sons, Inc	2004

REFERENCEBOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Shoseyov,O. and Levy,I	Nano biotechnology: Bio inspired Devices and Materials of the Future	Humana Press	2007
2	Bhushan,B.	Springer Handbook of Nanotechnology	Springer-VerlagBeri Heidelberg	2004
3	FreitasJrR.A	Nano medicine	Landes Bioscience	2004
4	Kohler,M.and Fritzsche,W.	Nanotechnology–An Introduction to Nano structuring Techniques	Wiley-VCH	2004

MECHANICAL ENGINEERING
OPEN ELECTIVES
(COURSES OFFERED TO OTHER DEPARTMENTS)

16BEMEOE01 COMPUTER AIDED DESIGN **L T P C**
3 0 0 3

OBJECTIVE

1. To provide an overview of how computers are being used in mechanical component design

UNIT I OVERVIEW OF CAD SYSTEMS **9**

Conventional and computer aided design processes-advantages and disadvantages. Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations. Networking of CAD systems.

UNIT II INTERACTIVE COMPUTER GRAPHICS AND GRAPHICS TRANSFORMATIONS **9**

Generative, cognitive and image processing graphics. Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Two- and Three – Dimensional graphics concepts, Graphical input technique, Geometric transformations, Visual Realism, Computer animation, customizing graphics software.

UNIT III GEOMETRIC MODELING **9**

Wireframe, surface, NURBS and solid modeling-applications and advantages. Creating primitive solids, sweeping solids, boolean operations. Extracting entities from a solid. Filleting of edges of solids. Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

UNIT IV PARAMETRIC DESIGN AND OBJECT REPRESENTATION **9**

Types of co-ordinate systems. Parametric design - definition and advantages. Parametric representation of analytic and synthetic curves. Parametric representation of surfaces and solids - manipulations.

UNIT V PRODUCT DESIGN AND DEVELOPMENT **9**

Automated 2D drafting - basics, mechanical assembly - bill of materials generation. Mass property calculations.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vera B Anand	Computer Graphics and Geometric Modeling for Engineers	John Wiley & Sons, New York	2000
2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	Dhanpat Rai & Sons, New Delhi	2002
2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	William M Newman and Robert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994
5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998
6	Rao S S	Optimization Techniques	Wiley Eastern, New Delhi	2003

16BEMEOE02 INDUSTRIAL SAFETY AND ENVIRONMENT L T P C

3 0 0 3

OBJECTIVE

1. Upon completion of this course, the students can able to understand the role of logistics and understand the phases of supply chain

UNIT I INTRODUCTION TO LOGISTICS 9

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNIT II PHASES OF SUPPLY CHAIN 9

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAIN MODELS 9

Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain with customer.

UNIT IV SUPPLY CHAIN ACTIVITIES 9

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNIT V SCM ORGANISATION AND INFORMATION SYSTEM 9

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERP Software's

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Shari.P.B and Lassen.T.S	Managing the global supply chain	Viva books, New Delhi	2000
2	Ayers.J.B	Hand book of supply chain management	The St. Lencie press	2000

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nicolas.J.N	Competitive manufacturing management - continuous improvement, Lean production, customer focused quality	McGrawHill, New York	1998
2	Steudel.H.J and Desruelle.P	Manufacturing in the nineteen - How to become a mean, lean and world class competitor	Van No strand Reinhold, New York	1992

16BEMEOE03 **TRANSPORT PHENOMENA** **L T P C**
3 0 0 3

OBJECTIVE

1. Upon completion of this course, the students can able to understand the relationship between free energy, entropy, internal energy, and enthalpy

UNIT I INTRODUCTION AND BASIC CONCEPTS 9

General overview of transport phenomena including various applications, Transport of momentum, heat and mass , Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II PROPERTIES, UNITS AND OTHER PHYSICAL PARAMETERS 9

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III MOMENTUM TRANSPORT 9

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNIT IV ENERGY TRANSPORT 9

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heat transfer

UNIT V MASS TRANSPORT 9

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion-Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

TOTAL 45

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

WEB REFERENCE

1. https://laulima.hawaii.edu/portal

16BEMEOE04 INTRODUCTION TO BIOMECHANICS L T P C

3 0 0 3

OBJECTIVE

1. Biomechanics provides key information on the most effective and safest movement patterns, equipment, and relevant exercises to improve human movement.

UNIT I INTRODUCTION 9

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNIT II KEY MECHANICAL CONCEPTS 9

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY 9

Gross (Whole-Body) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups - Anthropometric Data

UNIT IV ANATOMICAL DESCRIPTION 9

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNIT V MECHANICS OF THE MUSCULOSKELETAL SYSTEM 9

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit - Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle - Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control

TOTAL 45

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Duane Knudson	Fundamentals of Biomechanics	Springer Science+ Business Media, LLC	2007
2	C. Ross Ethier Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

OPENEL ECTIVES
(COURSES OFFERED TO OTHER DEPARTMENTS)
AUTOMOBILE ENGINEERING

16BEAEOE01 AUTOMOBILE ENGINEERING L T P C
3 0 0 3

INTENDED OBJECTIVES:

- This course enables the students to know about all the main and auxiliary systems of automobile with its base construction and working.

UNIT-I ENGINE AND FUEL FEED SYSTEMS
Classification of Engine, construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburetor working principle, requirements of an automotive carburetor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNIT –II TRANSMISSION SYSTEMS
Requirements of transmission system. Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. Objective of the gearbox - Determination of gear ratios for vehicles. Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propeller Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

UNIT -III SUSPENSION SYSTEM
Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension – Pneumatic suspension – Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

UNIT-IV BRAKES
Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theory, Brake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System (ABS).

UNIT -V ELECTRICAL SYSTEM
Principle and construction of lead acid battery. Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator. Starting System and charging system.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2.	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., New Delhi	2003

3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publishes	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
2.	Crouse.W.H	Automobile Electrical Equipment", 3rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAE Inc	2001

16BEAEOE02 BASICS OF TWO AND THREE WHEELERS **L T P C**
3 0 0 3

INTENDED OBJECTIVES:

- The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.

UNIT I INTRODUCTION
Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS
2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburetor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHES AND TRANSMISSION
Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES
Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS
Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992.
2.	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century book house.	1988.

REFERENCES:

SL. NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M.M.Griffin.	Motor cycles from inside and outside.	Prentice Hall Inc, New Jersey.	1978.

2.	Bruce A. Johns, David D.Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAEOE03 **AUTOMOBILE MAINTENANCE** **L T P C**
3 0 0 3

INTENDED OBJECTIVES:

- The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems in Automobile.

UNIT I MAINTENANCE OF RECORDS AND SCHEDULES
Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE
Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE
Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE
Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY
Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	John Doke	Fleet Management	McGraw Hill Co	1984
2.	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011
3.	Service Manuals from Different Vehicle Manufacturers			

16BEAEOE04 INTRODUCTION TO MODERN VEHICLE TECHNOLOGY **L T P C**
3 0 0 3

INTENDED OBJECTIVES:

- This course enables the students to have a knowledge about the recent technologies that is in use in automobile.

UNIT I TRENDS IN POWER PLANTS
Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNIT II DRIVER ASSISTANCE SYSTEMS
Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti-spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNIT III SUSPENSION BRAKES AND SAFETY
Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT IV NOISE & POLLUTION
Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT V TELEMATICS
Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

TEXT BOOKS

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Ljubo Vlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001
2.	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems –Progress in Technology	Automotive Electronics Series,SAE, USA.	1998

REFERENCES

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William B Riddens	“Understanding Automotive Electronics”, 5th Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold,	“Understanding Automotive Electronics”	SAE	1998
3.	Robert Bosch,	“Automotive HandBook”, 5th Edition	SAE	2000

OPENELECTIVES
(COURSES OFFERED TO OTHER DEPARTMENTS)
CIVIL ENGINEERING

16BECEOE01 HOUSING, PLAN AND MANAGEMENT **L T P C**
3 0 0 3

COURSE OBJECTIVES

1. To examine the role and tasks of basic housing policies and building bye laws
2. Understand the process of integrated service delivery in the context of economic, social, environmental and institutional factors
3. Analyze the Innovative construction methods and Materials
4. Analyze city management strategies and strengthen the urban governance through a problem solving approach
5. To know the Importance of basic housing policies and building bye laws
6. To use Housing Programmes and Schemes

COURSE OUTCOME

The students will be able to

1. Know the Importance of basic housing policies and building bye laws
2. Use Housing Programmes and Schemes
3. Plan and Design of Housing projects
4. Examine Innovative construction methods and Materials
5. Know Housing finance and loan approval procedures
6. Understand Construction as well as managing techniques

UNIT I INTRODUCTION TO HOUSING 9

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II HOUSING PROGRAMMES 9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organizations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems).

TOTAL HRS : 45

TEXT BOOKS

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 2002.

2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 2001.

REFERENCES

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.
2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 2000.

16BECEOE02 **BUILDING SERVICES** **L T P C**

3 0 0 3

COURSE OBJECTIVES

1. Defining and identifying of eng. services systems in buildings.
2. The role of eng. services systems in providing comfort and facilitating life of users of the building.
3. The basic principles of asset management in a building & facilities maintenance environment
4. Importance of Fire safety and its installation techniques
5. To Know the principle of Refrigeration and application
6. To Understand Electrical system and its selection criteria

COURSE OUTCOME

The students will be able to
1. Machineries involved in building construction
2. Understand Electrical system and its selection criteria
3. Use the Principles of illumination & design
4. Know the principle of Refrigeration and application
5. Importance of Fire safety and its installation techniques
6. Know the principle behind the installation of building services and to ensure safety in buildings

UNIT I MACHINERIES **9**

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS 9

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN 9

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilization factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS 9

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION 9

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

TOTAL HRS : 45

TEXT BOOKS

1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 2002.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2005.

REFERENCES

1. Philips Lighting in Architectural Design, McGraw-Hill, New York, 2000.
2 A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 2005.
3 National Building Code.

16BECEOE03 MANAGEMENT OF IRRIGATION SYSTEMS L T P C
3 0 0 3

OBJECTIVES

1. To enable the students for a successful career as water management professionals.
2. To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.
3. To expose the students the need for an interdisciplinary approach in irrigation water management
4. To providing a platform to work in an interdisciplinary team.
5. To provide students an ability to understand the applications of mathematical and scientific concepts to analyse intricate technical, social and environmental problems in irrigation water management and finding solutions for them.
6. To promote student awareness for a life-long learning process and inculcate professional ethics and codes of professional practice in water management.

OUTCOME

At the end of this the students will be in a capacity to

1. Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.
2. Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management
3. Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach.
4. Gain insight on local and global perceptions and approaches to participatory water resource management
5. Learn from successes and failures in the context of both rural and urban communities of water management.
6. Exposure on the use of economic concepts in irrigation development and to impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector.

UNIT I. IRRIGATION SYSTEM REQUIREMENTS 9

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNIT II. IRRIGATION SCHEDULING 9

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III. MANAGEMENT 9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV. OPERATION 9

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V. INVOLVEMENT OF STAKE HOLDERS 9

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL HRS : 45

TEXT BOOKS

1. Dilip Kumar Majumdar, "Irrigation Water Management – Principles and Practice", Prentice Hall of India Pvt. Ltd., New Delhi, 2000
2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi

REFERENCES

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 2000
2. Maloney, C. and Raju, K.V., "Managing Irrigation Together", Practice and Policy in India, Stage Publication, New Delhi, India, 2000

16BECEOE04 ADVANCED CONSTRUCTION TECHNOLOGY **L T P C**
3 0 0 3

OBJECTIVE:

1. To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
2. To study different methods of construction to successfully achieve the structural design with recommended specifications.
3. To involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. To study of construction equipment's, and temporary works required to facilitate the construction process
5. To provide a coherent development to the students for the courses in sector of Advanced construction technology.
6. To present the new technology of civil Engineering and concepts related Advanced construction technology.

OUTCOMES:

1. Implementation of new technology concepts which are applied in field of Advanced construction.
2. Different methods of construction to successfully achieve the structural design with recommended specifications.
3. Application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. Will gain the Knowledge of construction equipment's, and temporary works required to facilitate the construction process
5. Development to the students for the courses in sector of Advanced construction technology.
6. The new technology of civil Engineering and concepts related Advanced construction technology.

UNIT - I MODERN CONSTRUCTION METHODS 9
Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT - II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES 9
Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines

UNIT - III MODERN CONSTRUCTION EQUIPEMENTS -I 9
Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting, Tunneling and hoisting

UNIT - IV MODERN CONSTRUCTION EQUIPEMENTS -II 9
Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant

UNIT - V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES 9
Principles and Practices of Temporary structures, Shoring, and Strutting, Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipment's

TOTAL HRS : 45

TEXT BOOKS

1. Peurifoyu , R. L., , Ledbette, W.B., Construction Planning , Equipment and Methods, Mc Graw Hill Co., 2000.

2. Antill J.M., PWD, Civil Engineering Construction, Mc Graw Hill Book Co., 2005

REFERENCE

1.Varma, M Construction Equipment and its Planning & Applications, Metropolitan Book Co., 2000

2.Nunnaly, S.W., Construction Methods and Management , Prentice – Hall, 2000

3.Ataev, S.S., Construction Technology, MIR , Pub. 2000

OPEN ELECTIVES OFFERED BY

ELECTRONICS AND COMMUNICATION ENGINEERING TO OTHER DEPARTMENTS

16BEECOE01 REAL TIME EMBEDDED SYSTEMS **L T P C**
3 0 0 3

Course Objectives

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing
- To study about memory management
- To imparts knowledge on

Course Outcomes

At the end of the course the students will be able to

- Understand overview of embedded systems architecture
- Acquire knowledge on embedded system, its hardware and software.
- Gain knowledge on overview of Operating system
- Discuss about task Management
- Gain knowledge about semaphore management and message passing.
- Gain knowledge about memory management.

UNIT-I INTRODUCTION TO EMBEDDED SYSTEM

Introduction- Embedded systems description, definition, design considerations & requirements-Overview of Embedded System Architecture (CISC and RISC)-Categories of Embedded Systems-embedded processor selection & tradeoffs- Embedded design life cycle -Product specifications-hardware / software partitioning- iterations and implementation- hardware software integration – product testing techniques–ARM7

UNIT-II OPERATING SYSTEM OVERVIEW

Introduction–AdvantageandDisadvantageofUsingRTOS–Multitasking–Tasks-RealTime Kernels – Scheduler- Non-Preemptive Kernels – Preemptive Kernels – Reentrancy- Reentrant Functions– Round Robin Scheduling- Task Priorities- Static Priorities– Mutual Exclusion–Deadlock– Inter task Communication–Message Mailboxes–Message Queues- Interrupts- Task Management–Memory Management-Time Management–Clock Ticks.

UNIT-III TASK MANAGEMENT

Introduction-µ C/OS-II Features-Goals ofµ C/OS-II-Hardware and Software Architecture–Kernel Structures: Tasks–Task States–Task Scheduling–Idle Task–Statistics Task–Interrupts Under µ C/OS-II–Clock Tick-µ C/OS- II Initialization. Task Management: Creating Tasks–Task Stacks–StackChecking–Task'sPriority–SuspendingTask–ResumingTask.TimeManagement: Delaying a Task–Resuming a Delayed Task–System Time. Event Control Blocks-Placing a Task in the ECB Wait List–Removing a Task from an ECB wait List.

UNIT-IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING

Semaphore Management: Semaphore Management Overview– Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox –Deleting Mailbox–Waiting for a Message box–Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue–Deleting a Message Queue–Waiting for a Message Queue–Sending Message to a Queue– Flushing a Queue.

UNIT-V MEMORY MANAGEMENT

Memory Management: Memory Control Blocks–Creating Partition-Obtaining a Memory Block–Returning a Memory Block. Getting Started withµC/OS-II–Installingµ C/OS-II–PortingµC/OS-II: Development Tools–Directories and Files– Testing a Port -IAR Workbench withµ C/OS-II-µ C/OS- II Porting on a 8051CPU– Implementation of Multitasking- Implementation of Scheduling and Rescheduling –Analyze the Multichannel ADC with help ofµC/OS-II.

REFERENCES

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	JeanJ. Labrosse	Micro C/OS–II The Real Time Kernel	CMPBOOKS	2009
2	David Seal	ARM Architecture Reference Manual.	Addison-Wesley	2008
3	Steve Furbe,	ARM System-on-Chip Architecture,	Addison-Wesley Professional, California	2000

16BEECOE02 CONSUMER ELECTRONICS **L T P C**

3 0 0 3

Course Objectives

- To study about various speakers and microphone
- To learn the fundamental of television systems and standards
- To learn the process of audio recording and reproduction
- To study various telephone networks
- To discuss about the working of home appliances
- To familiarize with TV services like ISDN.

Course Outcomes

At the end of the course the students will be able to

- Understand working of various type of loud speakers
- Acquire knowledge on various types of picture tubes
- Demonstrate the working of various optical recording systems
- Distinguish various standards for color TV system
- Acquire knowledge on various telecommunication networks
- Demonstrate the working of various home appliances

UNIT I LOUDSPEAKERS AND MICROPHONES

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters – Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNIT–II TELEVISION STANDARDS AND SYSTEMS

Components of a TV system–interlacing–composite video signal. Colour TV– Luminance and Chrominance signal; Monochrome and Colour Picture Tubes- Color TV systems– NTSC, PAL, SECAM-Components of a Remote Control.

UNIT–III OPTICAL RECORDING AND REPRODUCTION

Audio Disc– Processing of the Audio signal–readout from the Disc –Reconstruction of the audio signal–Video Disc–Video disc formats- recording systems–Playback Systems.

UNIT–IV TELECOMMUNICATION SYSTEMS

Telephone services-telephone networks–switching system principles–PAPX switching–Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellular modems

UNIT–VHOME APPLIANCES

Basic principle and block diagram of microwave oven; washing machine hardware and software;
Components of air conditioning and refrigeration systems.

TEXT BOOK:

1.S.P. Bali, “Consumer Electronics”, PearsonEducation,2005.

16BEECOE03 NEURAL NETWORKS AND ITS APPLICATIONS

L T P C
3 0 0 3

Course Objectives

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.
- To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
- To gain exposure in the field of neural networks and relate the human neural system into the digital world
- To provide knowledge of computation and dynamical systems using neural networks

Course Outcomes

At the end of the course the students will be able to

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks
- Apply perception concept in design
- Design using ART phenomena
- Gain knowledge on SOM concepts
- Ability to develop the use of Soft Computing to solve real-world problems

UNIT I INTRODUCTION TO NEURAL NETWORKS

Introduction-biological neurons and their artificial models-learning, adaptation and neural network's learning rules-types of neural networks-single layer, multiple layer-feed forward, feedback networks

UNIT II LEARNING PROCESS

Error– correction learning– memory based learning- hebbian learning-competitive learning-Boltzmann learning-supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT III PERCEPTION

Single layer Perception-Adaptive filtering-unconstrained Optimization-Least-mean square algorithm-Leaning Curve-Annealing Technique-perception convergence Theorem-Relationship between perception and Baye's Classifier-Back propagation algorithm

UNIT IV ATTRACT OR NEURAL NETWORK AND ART

Hopfield model-BAM model -BAM Stability-Adaptive BAM -Lyapunov function-effect of gain-Hopfield Design-Application to TSP problem-ART-layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP

UNIT V SELF ORGANIZATION

Self-organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical Vector Quantization. Applications of self-organizing maps: The Neural Phonetic Type Writer Learning Ballistic Arm Movements

REFERENCES:

1.SimonHaykin, "Neural Networks and Learning Machines"-3/E-Pearson/Prentice Hall2009
2.SatishKumar-"Neural Networks: A Classroom Approach"-TMH-2008
3. Freeman J.A., S kapura D.M." Neural networks, algorithms, applications, and programming techniques"-AdditionWesley,2005.
4.LaureneFausett, "Fundamentals of Neural Networks: Architectures, Algorithms, and Applications"

-Pearson/PrenticeHall5. Robert JS chalk off- “Artificial Neural Networks, McGrawHill”-1997

16BEECOE04 FUZZY LOGIC AND ITS APPLICATIONS **L T P C**
3 0 0 3

Course Objectives

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.
- Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
- To learn about applications on Fuzzy based systems
- To familiarize with fuzzy fiction and de fuzzy fiction procedures

Course Outcomes

At the end of the course the students will be able to

- Understand the basic concepts of Fuzzy logic and its applications in various domain
- Gain knowledge on theory of Reasoning
- Develop fuzzy controllers
- Understand concepts of adaptive fuzzy control
- Ability to develop how to use Fuzzy computation to solve real- world problems
- Design fuzzy based model for any application

UNIT-I

Basics of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT–II

Theory of Approximate Reasoning: Linguistic variables, Fuzzy proportions, Fuzzy if-then statements, inference rules, compositional rule of inference-fuzzy models

UNIT-III

Fuzzy Knowledge Based Controllers (Fkbc): Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzy fiction and de fuzzy fiction procedures–Design of Fuzzy Logic Controller

UNIT-IV

Adaptive Fuzzy Control: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

UNIT V

Fuzzy based systems: Simple applications of FKBC-washing machines-traffic regulations-lift control-fuzzy in medical Applications-Introduction to ANFIS.

TEXTBOOKS:

1. An Introduction to Fuzzy Control-D .Diankar ,H. Hellendoom and M .Rein frank- Narosa Publishers India,1996.
2. Fuzzy Sets Uncertainty and Information-G.J. KlirandT.A. Folger-PHIIEEE,1995.

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM AND SYLLABI 2016

(FULL TIME PROGRAMME)

Department of Electrical and Electronics Engineering

FACULTY OF ENGINEERING

KARPAGAM ACADEMYOFHIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)
Pollachi Main Road, EachanariPost,
Coimbatore- 641021, India.

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OF STUDY AND SCHEME OF EXAMINATIONS
(2016 and onwards)

SEMESTER - I

COURSE CODE	COURSETITLE	SUB AREA	PEO	PO	L	T	P	C	CIA	ESE	TOTAL	CONTACT HOURS /WEEK
THEORY:												
16BECC101	Communicative English	HS	2	i,j,l	3	0	0	3	40	60	100	3
16BECC102	Engineering Mathematics - I	BS	2	a,b,e, l	3	2	0	4	40	60	100	5
16BEPH103/ 16BECH103	Engineering Physics /Engineering Chemistry **CHOICE BASED**	BS	1,2	a,b,c,e,g ,l	3	0	0	3	40	60	100	3
16BEEE104	Basic Electrical Engineering	ES	1,2	a,b,c,e,g ,l	3	0	0	3	40	60	100	3
16BEEE105	Basic Electronics Engineering	ES	1,2	a,b,c,e,g ,l	3	0	0	3	40	60	100	3
PRACTICAL:												
16BEPH111/ 16BECH111	Engineering Physics Laboratory /Engineering Chemistry Laboratory **CHOICE BASED**	BS	1,2	a,b	0	0	4	2	40	60	100	4
16BEEE112	Engineering Workshop Practices Laboratory	ES	1,2	a,c,d, e,f,j	0	0	4	2	40	60	100	4
16BEEE113	Computer Practice and programming Laboratory	ES	1	a,b,c, d,e,l	1	0	4	3	40	60	100	5
TOTAL					**16**	**2**	**12**	**23**	**320**	**480**	**800**	**30**

VALUE ADDED COURSE

16BECC151*	Human Values	MC	1,2	c,d,e,f	1	0	0	-	100*	-	-	1
Total Contact Hours/Week = 31 Hours												

SEMESTER II

SEMESTER 2													
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/ WEEK**
THEORY												
16BECC201A/ 16BECC201B	Business Communication/ Technical English **CHOICE BASED**	HS	1,2	i,j,l	3	0	0	3	40	60	100	3
16BECC202	Engineering Mathematics-II	BS	2	a,b,c,e,l	3	2	0	4	40	60	100	5
16BEPH203/ 16BECH203	Engineering Physics/Engineering Chemistry **CHOICE BASED**	BS	1,2	a,b	3	0	0	3	40	60	100	3
16BECC204	Environmental Sciences	HS	1	a,c,e,f,g, h,l	3	0	0	3	40	60	100	3
16BEEE205	Analysis of Electric Circuits	ES	1	a,b,c,d,e,l	3	2	0	4	40	60	100	5
PRACTICAL												
16BEPH211/ 16BECH211	Engineering Physics Laboratory / Engineering Chemistry Laboratory **CHOICE BASED**	BS	1,2	a,b	0	0	4	2	40	60	100	4
16BEEE212	Electric Circuits Laboratory	ES	2	a,c,d,e,f, j,l	0	0	3	2	40	60	100	3
16BEEE213	Engineering Graphics	ES	1,2	c,d	1	0	3	3	40	60	100	3
TOTAL					**16**	**4**	**10**	**24**	**320**	**480**	**800**	**29**

VALUE ADDED COURSE

16BEEE251*	Aptitude Training	MC	1,2		1	0	0	-	100*	-	-	1
Total Contact Hours/Week =30 Hours												

SEMESTER III

SEMESTER 3													
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/ WEEK**
THEORY												
16BEEE301A/ 16BEEE301B	Methods of Applied Mathematics / Linear Algebra and Special Function (**CHOICE BASED)**	BS	1,2	a,b,c,e,l	3	2	0	4	40	60	100	5
16BEEE302	Electrical Machines-I(**HC)**	PC	1	a,b,c,d,e,j	3	0	0	3	40	60	100	3
16BEEE303	Electromagnetic Theory (**HC)**	PC	1	a,b,c,d,e,j	3	0	0	3	40	60	100	3
16BEEE304	Electronic Devices and Circuits	PC	2	a,b,c,d,e, l	3	0	0	3	40	60	100	3
16BEEE305A/ 16BEEE305B	Renewable Energy Sources/ Power Plant Engineering(**CHOICE BASED)**	ES	1	a,b,c,d,e,g, l	3	0	0	3	40	60	100	3
PRACTICAL												
16BEEE311	Electrical Machines – I Laboratory	PC	1	a,d,e,k,l	0	0	3	2	40	60	100	3
16BEEE312	Electronic Devices and Circuits Laboratory	PC	2	a,d,e,k,l	0	0	3	2	40	60	100	3
16BEEE313	Basic Simulation Laboratory for Electrical Systems	ES	1	a,d,e,j,k,l	0	0	3	2	40	60	100	3
TOTAL					**15**	**2**	**9**	**22**	**320**	**480**	**800**	**26**

VALUE ADDED COURSE

16BEEE351*	Introduction to Solar PV Design	MC	1,2	a,b,c,d,e ,l	1	0	0	-	100*	-	-	1
Total Contact Hours/Week =27 Hours												

SEMESTER IV

SEMESTER 4												
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/ WEEK**
THEORY												
16BEEE401	Electrical Machines - II**(HC)**	PC	1	a,b,c,d,e g,l	3	2	0	4	40	60	100	5
16BEEE402	Transmission and Distribution Systems **(HC)**	PC	1	a,b,c,d,e g,l	3	0	0	3	40	60	100	3
16BEEE403A/ 16BEEE403B	Measurements and Instrumentation /Transducer Engineering **(SC)** **(CHOICE BASED)**	PC	1	a,b,c,d,e,l	3	0	0	3	40	60	100	3
16BEEE404	Pulse and Digital Logic Circuits **(HC)**	PC	2	a,b,c,e,	3	0	0	3	40	60	100	3
16BEEE405A/ 16BEEE405B	BasicThermodynamics and Energy Conversion Devices / Engineering Materials **(CHOICEBASED)**	ES	1,2	a,b,c,d,e,g, l	3	0	0	3	40	60	100	3
PRACTICAL												
16BEEE411	Electrical Machines Laboratory –II	PC	1	a,b,c,d,e,l	0	0	3	2	40	60	100	3
16BECC412	Scientific Computing Laboratory	BS	2	a,b,c,e	0	0	2	2	40	60	100	3
16BEEE413	Measurements and Instrumentation Laboratory	PC	1	a,d,e,j,k,l	0	0	3	2	40	60	100	3
TOTAL					**15**	**2**	**8**	**22**	**320**	**480**	**800**	**26**

VALUE ADDED COURSE

16BEEE451*	Electricity Standards	MC	1,2	a,b,c,d,e ,l	1	0	0	-	100*	-	-	1
Total Contact Hours/Week =27 Hours												

SEMESTER V

SEMESTER 5													
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/ WEEK**
THEORY												
16BEEE501	Power Electronics**(HC)**	PC	2	a,b,c,d, e,g	3	0	0	3	40	60	100	3
16BEEE502	Power System Analysis**(HC)**	PC	2	a,d,e	3	2	0	4	40	60	100	5
16BEEE503	Control System Engineering **(HC)**	PC	1	a,b,c,d,e,l	3	2	0	4	40	60	100	5
16BEEE5E_ _	Professional Elective-I **(CHOICE BASED)**	PE	-	-	3	0	0	3	40	60	100	3
16BEEE5E_ _	Professional Elective-II **(CHOICE BASED)**	PE	-	-	3	0	0	3	40	60	100	3
PRACTICAL												
16BEEE511	Power Electronics Laboratory	PC	2	a,c,d,j,k,l	0	0	3	2	40	60	100	3
16BEEE512	Analog and Digital Circuits Laboratory	PC	2	a,d,e,k,l	0	0	3	2	40	60	100	3
16BEEE513	Control System Engineering Laboratory	PC	1	c,d,e,f,i,j	0	0	3	2	40	60	100	3
TOTAL					**15**	**4**	**9**	**23**	**320**	**480**	**800**	**28**

VALUE ADDED COURSE

16BEEE551*	In plant Training	MC	-	-	-	0	0	-	100*	-	-	-
16BEEE552*	Control and Maintenance for Electrical Motors/ Programmable Logic Controller (PLC)	MC	1,2	a,b,d,e,l	1	0	0	-	100*	-	-	1
Total Contact Hours/Week =29 Hours												

SEMESTER VI

SEMESTER 6													
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/WEEK**
THEORY												
16BEEE601	Solid State Drives**(HC)**	PC	2	a,b,c,d,e, g	3	0	0	3	40	60	100	3
16BEEE602	Power System Operation and Control **(HC)**	PC	2	a,b,c,d,e, g,l	3	0	0	3	40	60	100	3
16BEEE603A/ 16BEEE603B	Microprocessor and Microcontroller / Microprocessor based system design (**SC**) **CHOICE BASED**	PC	1	a,b,c,e,h, k,l	3	0	0	3	40	60	100	3
16BEEE604	Design of Electrical Apparatus**(HC)**	PC	1	a,c,d,g,l	3	0	0	3	40	60	100	3
16BEEE6E_ _	Professional Elective-III **(CHOICE BASED)**	PE	-	-	3	0	0	3	40	60	100	3
16BEEE6E_ _	Professional Elective-IV (**CHOICE BASED)**	PE	-	-	3	0	0	3	40	60	100	3
PRACTICAL												
16BEEE611	Micro Processor and Micro Controller Laboratory	PC	2	a,c,d,j,k,l	0	0	3	2	40	60	100	3
16BEEE612	Electrical Estimation and Rewinding Laboratory	PC	1,2	a,c,d,e,f,g	0	0	3	2	40	60	100	3
TOTAL					**18**	**0**	**6**	**22**	**320**	**480**	**800**	**24**

VALUE ADDED COURSE

16BEEE651*	PCB Design and Servicing of Domestic Appliances	MC	1,2	a,b,d,e,l	1	0	0	-	100*	-	-	1
Total Contact Hours/Week =25 Hours												

SEMESTER VII

SEMESTER 7													
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/WEEK**
THEORY												
16BECC701	Professional Ethics, Principle of Management and Entrepreneurship Development	HS	1	a,b,d,e,f, g,i	3	0	0	3	40	60	100	3
16BEEE702	Power System Protection and Switchgear**(HC)**	PC	2	a,b,c,d,e, g,l	3	0	0	3	40	60	100	3
16BEEE7E_ _	Professional Elective-V**(CHOICE BASED)**	PE	-	-	3	0	0	3	40	60	100	3
	Open Elective-I **(CHOICE BASED)**	OC	-	-	3	0	0	3	40	60	100	3
	Open Elective - II **(CHOICEBASED)**	OC	-	-	3	0	0	3	40	60	100	3
PRACTICAL												
16BEEE711	Power System Simulation Laboratory	PC	1	a,c,d,j,k,l	0	0	3	2	40	60	100	2
16BEEE791	Project work- Phase- I	PW	1,2	-	0	0	8	4	40	60	100	8
TOTAL					**15**	**0**	**11**	**21**	**280**	**420**	**700**	**25**

VALUE ADDED COURSE

16BEEE751*	ETAP and PSCAD	MC	1,2	a,b,d,e,l	1	0	0	-	100*	-	-	1
Total Contact Hours/Week =26 Hours												

SEMESTER VIII

SEMESTER 8													
COURSE CODE	**COURSETITLE**	**SUB AREA**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**	**CONTACT HOURS/WEEK**
THEORY												
16BECC801A/ 16BECC801B	Energy Management, Utilization and Auditing/ Smart Grid **(SC) CHOICE BASED**	PC	2	b,e,f,g,h, i,j	3	0	0	3	40	60	100	3
16BEEE8E_ _	Professional Elective-VI**(CHOICE BASED)**	PE	-	-	3	0	0	3	40	60	100	3
PRACTICAL												
16BEEE891	Project work -Phase - II & Viva-Voce	PW	1,2	-	0	0	32	16	120	180	300	32
TOTAL					**6**	**0**	**32**	**22**	**200**	**300**	**500**	**38**
Total Contact Hours/Week =38 Hours												

L:Lecture Hour **T:Tutorial Hour** **CIA:**
P:Practical Hour **C: No. of Credits** **ESE: End Semester Examination**
V A C: Value Added Course

Total Credits earned: 23+24+22+22+23+22+21+22=179

against the specified range –[175-190 Credits]

* Credits for **Mandatory Courses (MC)** are not counted for computation of CGPA.The passing minimum for **Mandatory Courses (MC)** is 50 marks out of 100 Marks.There will be two tests, of which one will be class test covering 50% of syllabus for 50 marks and other class test covering next 50% of syllabus for 50 marks.[Total 50+50=100Marks].

Interested students can opt one self study course in the Seventh semester from open electives which will be reflected in the mark sheets, only if he/she passes in the course.

LIST OF PROFESSIONAL ELECTIVES

S. No	SUB. CODE	TITLE OF THE COURSE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE-I AND PROFESSIONAL ELECTIVE-II VSEMESTER											
1	16BEEE5E01	Network Analysis and Synthesis	2	a,d,e	3	0	0	3	40	60	100
2	16BEEE5E02	Advanced Control System	2	b,c,h,i	3	0	0	3	40	60	100
3	16BEEE5E03	Electric Hybrid Vehicle	2	a,c,d,h	3	0	0	3	40	60	100
4	16BEEE5E04	Communication Engineering	1	-	3	0	0	3	40	60	100
5	16BEEE5E05	Introduction to Neural Networks	1	a,c,e,g,l	3	0	0	3	40	60	100
6	16BEEE5E06	Computer Architecture	1	a,c,e	3	0	0	3	40	60	100
7	16BEEE5E07	Fuzzy Logic and its applications	1	a,c,e,n	3	0	0	3	40	60	100
8	16BEEE5E08	Distributed Generation	2	c,d,e,g, h,i	3	0	0	3	40	60	100
9	16BEEE5E09	Digital Signal Processing	1	a,b,c,d,e, g,l,m	3	0	0	3	40	60	100
10	16BEEE5E10	Industrial Automation	1	a,c,d,e, k,m,n	3	0	0	3	40	60	100
11	16BEEE5E11	Sensor and Transducer	1	a,b,c,e,i	3	0	0	3	40	60	100
12	16BEEE5E12	Intellectual Property Rights	1	h,j,l	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE-III AND PROFESSIONAL ELECTIVE-IV VI SEMESTER											
13	16BEEE6E01	Computer Organization and Architecture	1	a,c,e	3	0	0	3	40	60	100
14	16BEEE6E02	Embedded System	1	-	3	0	0	3	40	60	100
15	16BEEE6E03	Programmable Logic Controller and its Application	1,2	a,b,d,e,l	3	0	0	3	40	60	100

16	16BEEE6E04	Computer Networks	1	a,c,e	3	0	0	3	40	60	100
17	16BEEE6E05	High Voltage Engineering	2	a,b,c,d,e, g,l	3	0	0	3	40	60	100
18	16BEEE6E06	Special Electrical Machines	2	a,c,d,e,h	3	0	0	3	40	60	100
19	16BEEE6E07	Fibre Optics and Laser Instruments	1	a,b,e,k,l, m	3	0	0	3	40	60	100
20	16BEEE6E08	Mobile Communication	1	a,b,d,e	3	0	0	3	40	60	100
21	16BEEE6E09	Switched Mode Power Conversion	2	a,c,e	3	0	0	3	40	60	100
22	16BEEE6E10	Biomedical Instrumentation	1,2	a,c,d,e,f, m,n	3	0	0	3	40	60	100
23	16BEEE6E11	Modern semiconductor Devices	2	a,c,d,e,g	3	0	0	3	40	60	100
		PROFESSIONAL ELECTIVE-V VII SEMESTER									
24	16BEEE7E01	Artificial Intelligence and Expert Systems	2	a,c,e	3	0	0	3	40	60	100
25	16BEEE7E02	HVDC and EHVAC	2	a,b,c,h,i, l	3	0	0	3	40	60	100
26	16BEEE7E03	Power System Economics	2	a,c,e	3	0	0	3	40	60	100
27	16BEEE7E04	Power System Restructuring and Deregulation	2	a,c,e,j,k, l	3	0	0	3	40	60	100
28	16BEEE7E05	Power Quality	2	a,c,d,e,h, l	3	0	0	3	40	60	100
29	16BEEE7E06	Power System Dynamics	2	a,c,e	3	0	0	3	40	60	100
30	16BEEE7E07	Computer Aided Analysis and Design of Electrical Apparatus	1	a,c,d,g	3	0	0	3	40	60	100
31	16BEEE7E08	Digital System Design using VHDL	1	a,c,e,h,l	3	0	0	3	40	60	100
32	16BEEE7E09	Optimization Techniques	2	a,c,e	3	0	0	3	40	60	100
33	16BEEE7E10	Real Time Operating System	1	a,c,e.j.l, n	3	0	0	3	40	60	100
34	16BEEE7E11	Advances in Soft Computing	1	a,c,e	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE-VI VIII SEMESTER											
35	16BEEE8E01	Flexible AC Transmission Systems	2	a,b,c,e,j,l	3	0	0	3	40	60	100
36	16BEEE8E02	Power System Stability	2	d,e	3	0	0	3	40	60	100
37	16BEEE8E03	Power Generation Systems	2	c,d,e,g,h,i	3	0	0	3	40	60	100
38	16BEEE8E04	Total Quality Management	1	b,e,f,g,h,i,j	3	0	0	3	40	60	100
39	16BEEE8E05	Virtual Instrumentation	1	a,b,e,h,l,m,n	3	0	0	3	40	60	100
40	16BEEE8E06	Robotics and Automation	1	a,c,e,m,n	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVES

List of Open Electives offered by Other Departments Science& Humanities												
SL. No.	**SUB. CODE**	**TITLE OFTHE COURSE**	**PEO**	**PO**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	16BESHOE01	Probability and Random Process	1,2	a,c,d,h, j	3	0	0	3	40	60	100
2	16BESHOE02	Fuzzy Mathematics	1	a,b,c	3	0	0	3	40	60	100
3	16BESHOE03	Linear Algebra	1	a,g,h,j	3	0	0	3	40	60	100
4	16BESHOE04	Engineering Acoustics	1,2	a,b, g,h,j	3	0	0	3	40	60	100
5	16BESHOE05	Solid Waste Management	1,2	a,b,c,g	3	0	0	3	40	60	100
6	16BESHOE06	Green Chemistry	1,2	a,b,c,g	3	0	0	3	40	60	100
7	16BESHOE07	Applied Electrochemistry	1,2	a,b,c,	3	0	0	3	40	60	100
8	16BESHOE08	Industrial Chemistry	1,2	a,b,c,	3	0	0	3	40	60	100
Computer Science Engineering											
10	16BECSOE01	Internet Programming	1,2	a,b,c,g, h	3	0	0	3	40	60	100
11	16BECSOE02	Multimedia and Animation	1,2	a,b,c,g, h,j	3	0	0	3	40	60	100
12	16BECSOE03	PC Hardware and Trouble shooting	1	a,b,c,d ,j	3	0	0	3	40	60	100
13	16BECSOE04	Java Programming	1,2	a,b,c,d,	3	0	0	3	40	60	100
Electronics and Communication Engineering											
14	16BEECOE01	Real Time Embedded Systems	1,2	a,b,c,d	3	0	0	3	40	60	100
15	16BEECOE02	Consumer Electronics	1	a,b,c,j	3	0	0	3	40	60	100
16	16BEECOE03	Neural Networks and its Applications	1	a,b,c,d	3	0	0	3	40	60	100

17	16BEECOE04	Fuzzy Logic and its Applications	1,2	a,d,g, h,j	3	0	0	3	40	60	100
Bio Technology											
18	16BTBTOE01	Bioreactor Design	1,2,	a,b,c,	3	0	0	3	40	60	100
19	16BTBTOE02	Food Processing and Preservation	1,2	a,b,d	3	0	0	3	40	60	100
20	16BTBTOE03	Basic Bioinformatics	1	a,b,c,	3	0	0	3	40	60	100
21	16BTBTOE04	Fundamentals of Nano Biotechnology	1	a,b,c,d,g, h,j	3	0	0	3	40	60	100
Mechanical Engineering											
22	16BEMEOE01	Computer Aided Design	1	a,b,c,d	3	0	0	3	40	60	100
23	16BEMEOE02	Industrial Safety and Environment	1	a,b,d,g	3	0	0	3	40	60	100
24	16BEMEOE03	Transport Phenomena	1,2	a,b,c,d	3	0	0	3	40	60	100
25	16BEMEOE04	Introduction to Biomechanics	1,2	a,b,c,d,g ,h,j	3	0	0	3	40	60	100
Automobile Engineering											
30	16BEAEOE01	Automobile Engineering	1,2	a,b,d,g	3	0	0	3	40	60	100
31	16BEAEOE02	Basics of Two and Three Wheelers	1,2	a,b,d,	3	0	0	3	40	60	100

32	16BEAEOE03	Automobile Maintenance	1	a,b,c	3	0	0	3	40	60	100
33	16BEAEOE04	Introduction to Modern Vehicle Technology	1,2	a,b,c	3	0	0	3	40	60	100
Civil Engineering											
34	16BECEOE01	Housing, Plan and Management	1,2	a,b,c,d	3	0	0	3	40	60	100
35	16BECEOE02	Building Services	1,2	a,b,c,d	3	0	0	3	40	60	100
36	16BECEOE03	Management of Irrigation Systems	1,2	a,b,c, d	3	0	0	3	40	60	100
37	16BECEOE04	Advanced Construction Technology	1,2	a,b,d	3	0	0	3	40	60	100
List of Electives Offered to Other Departments **Electrical and Electronics Engineering**											
38	16BEEEOE01	Electric Hybrid Vehicle	2	a,c,d ,h,m ,n	3	0	0	3	40	60	100
39	16BEEEOE02	Energy Management and Energy Auditing	2	b,e,f,g, h,i,j,n	3	0	0	3	40	60	100
40	16BEEEOE03	Programmable Logic Controller	1,2	a,b, d,e,l	3	0	0	3	40	60	100
41	16BEEEOE04	Renewable Energy Resources	1	a,b,c,d, e,g,l	3	0	0	3	40	60	100

SL. NO.	COURSE WORK- SUBJECT AREA	AREA CODE
1	Humanities and social science including management	HS
2	Basic sciences including maths, physics, chemistry and biology	BS
3	Engineering science including materials, Workshop, Drawing, Basic of Electrical/ Electronics/ Mechanical/ Computer/civil/ instrumentation	ES
4	Professional core course relevant to the chosen branch **(Must be split into Hard Core (HS)(no choice) and Soft Core (SC) (with choice))**	PC
5	Professional Electives	PE
6	Open Electives	OC
7	Project work, seminar and internship	PW
8	Mandatory Courses(Value addition)	MC

**--Skill Development
**--Employability
**--Entrepreneurship

PROGRAM OUTCOMES: On successful completion of the programme,

a	Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining to Electronics and Instrumentation Engineering.
b	Identify and formulate Electrical and Electronics Engineering problems from research literature and be ability to analyze the problem using first principles of Mathematics and Engineering Sciences.
c	Come out with solutions for the complex problems and to design system components or process that fulfill the particular needs taking into account public health and safety and the social, cultural and environmental issues.
d	Draw well-founded conclusions applying the knowledge acquired from research and research methods including design of experiments, analysis and interpretation of data and synthesis of information and to arrive at significant conclusion.
e	Form, select and apply relevant techniques, resources and Engineering and IT tools for Engineering activities like electronic prototyping, modeling and control of systems and also being conscious of the limitations.
f	Understand the role and responsibility of the Professional Electrical and Electronics Engineer and to assess societal, health, safety issues based on the reasoning received from the contextual knowledge.
g	Be aware of the impact of professional Engineering solutions in societal and environmental contexts and exhibit the knowledge and the need for Sustainable Development.
h	Apply the principles of Professional Ethics to adhere to the norms of the engineering practice and to discharge ethical responsibilities.
i	Function actively and efficiently as an individual or a member/leader of different teams and multidisciplinary projects.
j	Communicate efficiently the engineering facts with a wide range of engineering community and others, to understand and prepare reports and design documents; to make effective presentations and to frame and follow instructions.
k	Demonstrate the acquisition of the body of engineering knowledge and insight and Management Principles and to apply them as member / leader in teams and multidisciplinary environments.
l	Recognize the need for self and life-long learning, keeping pace with technological challenges in the broadest sense.

PROGRAM SPECIFIC OUTCOMES:

m	Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining to Electronics and Instrumentation Engineering
n	Identify and formulate Electrical and Electronics Engineering problems from research literature and be able to analyze the problem using first principles of Mathematics and Engineering Sciences.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1	Have successful technical and professional careers in their chosen fields such as circuit theory, Field theory, control theory and computational platforms.
PEO 2	Engross in life long process of learning to keep themselves abreast of new developments in the field of Electronics and their applications in power engineering

MAPPING

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
1	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓
2	✓	✓	✓	✓	✓	✓		✓		✓			✓	✓

SEMESTER I

16BECC101 COMMUNICATIVE ENGLISH L T P C 3 0 0 3

Course Objectives:

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.
- To study formal context

Course Outcomes :

Students undergoing this course will be able to

- Use English language for communication: verbal & non –verbal.
- Enrich comprehension and acquisition of speaking & writing ability.
- Gain confidence in using English language in real life situations.
- Improve word power: lexical, grammatical and communication competence.
- Acquire good vocabulary for easy communication.
- Be familiar with sentence structure and sentence formation

Unit I 9

Listening – Types of listening - Listening to class reading - Video tapes/ Audio tapes. **Speaking** – Introduction on self - Introduction on one's friend. **Reading** - Reading for comprehension – Reading different kind of passages like descriptive, narrative, objective, conversational and argumentative. **Writing** – Formal and Informal letters- Free writing on any topic –My favorite place, hobbies, dreams, goals, etc- - To fill in different application forms. **Grammar** – Articles- WH questions –Yes/No Question - Subject Verb agreement. **Vocabulary** - Word Formation – Word expansion (Root word) - Prefix and Suffix.

Unit II 10

Listening – Understanding the passage in English –Pronunciation practice. **Speaking** – Asking and answering questions - Telephone etiquette. **Reading** – Critical reading – Finding key information in a given text (Skimming - Scanning). **Writing**– Coherence and cohesion in writing – Short paragraph writing – Writing short messages. **Grammar** – Parts of speech – Noun – Verb – Adjectives - Adverbs. **Vocabulary** – Compound Nouns/Adjectives – Irregular verbs.

Unit III **10**

Listening – Listening for specific task – Fill in the gaps. **Speaking** – Phonemes – Syllables – Role play – Conversation Practice. **Reading** – Reading and Comprehension. **Writing** - Autobiographical writing – Biographical writing - Instruction writing. **Grammar** – Preposition – Infinitive – Gerund – Tenses. **Vocabulary** – Foreign words used in English – British and American usage.

Unit IV **8**

Listening – Responding to questions – Reading in class for complete understanding and for better pronunciation. **Speaking** – Debate- Presentations in seminars. **Reading** – Making inference from the reading passage – Predicting the content of reading passages. **Writing** - Interpreting visual materials (tables, graphs, charts, etc) Letters to the Editor. **Grammar** – Sentence pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

Unit V **8**

Listening - Listening to different accents, speeches/presentations. **Speaking**- Extempore talk – Just-a-minute talk. **Reading**-Reading strategies–Intensive reading – Text analysis. **Writing** - Creative writing – Writing circulars and notices – Writing proposal. **Grammar** – Direct and Indirect speech – Conditional sentences - Auxiliary verbs. **Vocabulary** – Abbreviations & Acronyms.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

TOTAL:45 HOURS

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Sangeeta Sharma , Meenakshi Raman	Technical Communication: Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2009
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES:

1.www.learnerstv.com – Listening/ Speaking/ Presentation

2.www.usingenglish.com – Writing/ Grammar

3.www.englishclub.com – Vocabulary Enrichment/ Speaking

4.www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking

5.www.teachertube.com – Writing Technically

6.www.Dictionary.com – Semantic / Grammar

16BECC102 ENGINEERING MATHEMATICS –I L T P C 3 2 0 4

Course Objectives:

1. To develop analyzing skills for solving different engineering problems.
2. To understand the concept of Matrices.
3. To remember the basics of differential calculus and its applications.
4. To apply the problems in differential equations.
5. To Create knowledge about functions of several variables and Sequence
6. To study the algebraic manipulation

Course Outcomes:

The student will be able to

- Acquire the basic knowledge and understanding of mathematics
- Apply advanced matrix knowledge to engineering problems.
- Improve their ability in evaluating geometrical applications of differential calculus problems.
- To solve the problems by applying the differential Equations.
- Evaluating engineering problems involving functions of several variables.
- Understand the concepts of sequences and series.

UNIT I MATRICES 12

Review of Matrix Algebra - Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction to canonical form through orthogonal reduction.

UNIT II DIFFERENTIAL CALCULUS 12

Overview of Derivatives - Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes- Evolutes as Envelope of normals – Maxima and Minima of functions of two or more Variables – Method of Lagrangian Multipliers

UNIT III DIFFERENTIAL EQUATIONS 11

Linear Differential equations of second and higher order with constant coefficients - Euler's form of Differential equations – Method of variation parameters.

UNIT -IV FUNCTIONS OF SEVERAL VARIABLES 12

Partial derivatives – Euler's theorem for homogeneous functions – Total derivatives – Differentiation of implicit functions – Jacobians –Maxima and Minima of functions of two or more

Variables - Method of Lagrangian multipliers.

UNIT V SEQUENCES AND SERIES **13**

Sequences: Definition and examples – **Series:** Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.

TOTAL: 60 HOURS

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics	McGraw Hill Education (India) Private Limited, New Delhi.	2014
2	Sundaram, V. Lakhminarayan,K.A. & Balasubramanian,R.	Engineering Mathematics for first year.	Vikas Publishing Home, New Delhi.	2006

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Grewel . B. S.	Higher Engineering Mathematics	Khanna Publications, New Delhi.	2014
2	Bhaskar Rao. P. B, Sri Ramachary SKVS, Bhujanga Rao. M	Engineering Mathematics I	BS Publications, India.	2010
3	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
4	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009

5	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES :

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.intmath.com/matrices-determinants
4. www. Intmath.com/calculus/calculus-intro.php

16BEPH103 ENGINEERING PHYSICS L T P C 3 0 0 3

Course Objectives:

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology
- Understand the basics of laser and optical fiber with appropriate applications.
- Introduce the concepts of quantum mechanics for diverse applications.
- Impart the basic knowledge of crystal and its various crystal structures.
- Disseminate the fundamentals of nuclear physics and their applications.
- To study the quantum mechanics.

Course Outcomes:

Upon completion of this course, the students will be able to

- Identify the elastic nature of materials and its thermodynamic properties.
- Infer the characteristics of laser and optical fibers for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Identify the different atomic arrangements of crystals and its defects
- Make use of the concepts of sound waves for medical applications
- Illustrate the basic ideas of nuclear reactors for energy resources

UNIT I PROPERTIES OF MATTER AND THERMODYNAMICS 9

Three types of modulus of elasticity – basic definitions, relation connecting the moduli (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniform bending Concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBER OPTICS 9

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER -CO_2, Semiconductor LASER- Applications of LASER in industry and medicine. Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNIT III QUANTUM PHYSICS 9

Introduction to quantum theory – Black body radiation-Photo electric effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electron microscope.

UNIT IV CRYSTAL PHYSICS 9

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures- crystal defects – point, line and surface defects

UNIT V ULTRASONICS AND NUCLEAR PHYSICS 9

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications – Sonogram Introduction – basics about nuclear fission and fusion, nuclear composition –Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

TOTAL: 45 HOURS

TEXT BOOK:

S.NO	**AUTHOR(S) NAME**	**TITLE OF THE BOOK**	**PUBLISHER**	**YEAR OF PUBLICATION**
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641	2015

REFERENCES:

S.NO	**AUTHOR(S) NAME**	**TITLE OF THE BOOK**	**PUBLISHER**	**YEAR OF PUBLICATION**
1	Serway and Jewett	Physics for Scientists and Engineers with Modern Physics	Thomson Brooks/Cole, Indian reprint, New Delhi	2010
2	Gaur, R.K. and Gupta, S.C	Engineering Physics	Dhanpat Rai Publications,New Delhi.	2011
3	M.N. Avadhanulu and PG Kshirsagar	A Text book of Engineering Physics	S.Chand and company, Ltd., New Delhi	2011

4	D.C. Ghosh, N.C. Ghosh, P.K. Haldar	Engineering Physics	University Science, New Delhi	2011
5	P. Khare, A. Swarup	Engineering Physics: Fundamentals and Modern Applications	Jones & Bartlett Learning	2009

WEBSITES:

1. www.nptel.ac.in
2. www.physicsclassroom.com
3. www. oyc.yale.edu
4. www.physics.org

16BECH103 ENGINEERING CHEMISTRY L T P C 3 0 0 3

Course Objectives:

- To gain knowledge on adsorption phenomena.
- To make the students conversant with basics of water technology.
- To make the student acquire sound knowledge of electrochemistry and storage devices.
- To acquaint the student with concepts of fuels and rocket propellants.
- To develop an understanding of the basic concepts of corrosion science.
- To acquaint the students with the basics of surface chemistry

Course Outcomes:

At the end of this course, students will be able to

- Outline the basic principles of chemistry for water treatment (K)
- Examine the electrochemical properties to design non – conventional energy storage devices (S)
- Apply the concepts combustion of different fuels (S)
- Identify the concepts of corrosion and its protection in the engineering field (S)
- Apply the concepts of surface chemistry in the field of engineering (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I WATER TECHNOLOGY 9

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverse osmosis.

UNIT II ELECTROCHEMISTRY AND STORAGE DEVICES 9

Electrochemical cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - Fe^{2+}vs dichromate) –Electrolytic conductance-application (conductometric titration)-Batteries-Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H_2-O_2 Fuel Cell.

UNIT III FUELS AND COMBUSTION 9

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method -

Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, Combustion of fuel- Introduction-GCV-NCV-Flue gas analysis.

UNIT IV CORROSION SCIENCE **9**

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings – Organic coatings-Paints - Constituents and functions –Inorganic coatings- Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating - Hot dipping.

UNIT V SURFACE CHEMISTRY AND PHASE RULE **9**

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm- Role of adsorbents in industries (catalysis and water softening).Phase Rle: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

TOTAL-: 45 HOURS

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company (P) Ltd., Chennai.	2012

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3rd Reprint NewDelhi.	2013

2.	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5^{th} edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010
3.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009
4.	Dara.S.S	Text book of Engineering Chemistry.	S.Chand & Co.Ltd., New Delhi	2008
5.	Sharma.B. K	Engineering Chemistry	Krishna Prakasam Media (P) Ltd., Meerut	2001

WEBSITES:

1. http://www.studynotes.ie/leaving-cert/chemistry/
2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html
3. http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
4. http://ocw.mit.edu/courses/#chemistry
5. http://www.chem.qmul.ac.uk/surfaces/sec

16BEEE104 BASIC ELECTRICAL ENGINEERING L T P C 3 0 0 3

Course Objectives

- To impart the basic knowledge about the DC Electric circuits.
- To study the working of various Electrical Machines.
- To study the basic concepts of Electrical safety and wiring
- To get the knowledge of Magnetic circuits and its properties
- To impart the basic knowledge about the DC Electric circuits.
- To study the basic of power system

Course Outcomes:

At the end of this course, students will be able to

1. To understand and analyze basic electric and magnetic circuits.
2. Attributing the electric circuits with DC and AC excitation by applying various circuit laws.
3. Attributing the electrical machines and transformer.
4. Evaluate the various digital circuits in real time applications.
5. Analysis various semiconductor devices in real time applications.
6. Reproduce the Measuring Instruments and Electrical Installation.

UNIT I – FUNDAMENTALS OF DC CIRCUITS 9

Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor, Kirchhoff's laws, Mesh analysis, Nodal analysis –equivalent resistor, current division, voltage division

UNIT II – MAGNETIC CIRCUITS 9

Introduction to magnetic circuits-Simple magnetic circuits-Faraday's laws, Lenz law-Flemings rules - induced emfs and inductances-self and mutual inductance.

UNIT III – AC CIRCUITS (Elementary treatment only) 9

Generation of AC, Average and RMS values, Form and peak factors, concept of phasor representation, J operator – representation of AC in rectangular and polar form – power and power factor - Introduction to three phase systems - types of connections, relationship between line and phase values.

UNIT IV–ELECTRICAL MACHINES (Elementary treatment only) 9

Working principle, construction, types and applications of DC machines and AC machines –single phase transformers - single phase induction motors: capacitor start and capacitor start & run motors

UNIT V–ELECTRICAL SAFETY, WIRING AND INTRODUCTION TO POWER SYSTEM 9

Safety measures in electrical system- types of wiring- wiring accessories staircase, fluorescent lamps & corridor wiring- Basic principles of earthing-Types of earthing- protection devices MCB- Fuses and its types –calculation of fuses.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Dash.S.S,Subramani. C,Vijayakumar.K	Basic Electrical Engineering	First edition, Vijay Nicole Imprints Pvt.Ltd	2013

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	SmarajtGhosh	Fundamentals of Electrical & Electronics Engineering	Second edition, PHI Learning	2007
2	Metha.V.K, RohitMetha	Basic Electrical Engineering	Fifth edition,Chand.S& Co	2012
3	Kothari.D.P and Nagrath.I.J	Basic Electrical Engineering	Second edition,Tata McGraw - Hill	2012
4	Bhattacharya.S.K	Basic Electrical and Electronics Engineering	First edition, Pearson Education	2011

WEBSITES

1.www.nptel.com
2.www.electrical4u.com

16BEEE105 BASIC ELECTRONICS ENGINEERING L T P C 3 0 0 3

Course Objectives

- To impart the basic knowledge about the basic electronic components.
- To get the operation and characteristics of various semiconductor devices.
- To get the operation and characteristics of various transducers.
- To study the OPTO electronic devices
- To study the different operation of OPTO devices
- To understand the basic concepts of digital electronics.

Course Outcomes:

The students shall develop an

- Intuitive understanding of basic electronic components,
- Intuitive understanding of basic concepts of semiconductor devices,
- Intuitive understanding of basic concepts of Transducers.
- Intuitive understanding of basic concepts of digital electronics
- Able to apply them in practical situation.
- Analysis the real time application of it.

UNIT I- ELECTRONIC COMPONENTS 9

Passive components – resistors, capacitors and inductors -properties, common types, I-V relationship and uses.

UNIT II- SEMICONDUCTOR DEVICES 9

Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET.

UNIT III – OPTOELECTRONIC DEVICES 9

LED, LCD, LDR, Photodiode, Phototransistor, Solar cell, Opto couplers

UNIT IV- TRANSDUCERS 9

Transducers - Instrumentation – general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers – piezoelectric and thermocouple.

UNIT V- DIGITAL ELECTRONICS 9

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems- simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Thyagarajan.T, SendurChelvi.K.P, Rangaswamy.T.R	Basics:Electrical, Electronics and Computer Engineering	New Age International,Third Edition	2007
2	SomanathanNair.B, Deepa.S.R	Basic Electronics	I.K. International Pvt.Ltd	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Thomas L. Floyd	Electronic Devices	Pearson Education, 9th Edition	2011
2	Rajput.R.K	Basic Electrical and Electronics Engineering	LaxmiPublications, First Edition	2007

WEBSITES

1. www.nptel.com
2.www.electrical4u.com

16BEPH111 ENGINEERING PHYSICS LABORATORY L T P C 0 0 4 2

Course Objective

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To prepare for the lab experiment and perform individually a wide spectrum of experiments.
- To present experimental data in various appropriate forms like tabulation, and plots.
- To analyze, Interpret and summarize experimental results.
- To communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- To learn the band gap of semiconductor

Course Outcome

- The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- Prepare for the lab experiment and perform individually a wide spectrum of experiments.
- Present experimental data in various appropriate forms like tabulation, and plots.
- Analyze, Interpret and Summarize experimental results.
- Communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- Prepare to develop the skills for understanding basic electric

LIST OF EXPERIMENTS – PHYSICS

1. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
2. Determination of wavelength of mercury spectrum – spectrometer grating.
3. Determination of Young's modulus of the material – Non uniform bending (or) Uniform bending.
4. Determination of Viscosity of liquid – Poiseuille's method.
5. Spectrometer Dispersive power of a prism.
6. Torsional pendulum – Determination of Rigidity modulus.
7. Particle size determination using Diode Laser
8. Determination of Laser parameters – Wavelength, and angle of divergence.
9. Determination of acceptance angle in an optical fiber.
10. Determination of thickness of a thin wire – Air wedge method
11. Determination of Band Gap of a semiconductor material.
12. Determination of Specific resistance of a given coil of wire – Wheatstone Bridge

16BECH111 ENGINEERING CHEMISTRY LABORATORY L T P C 0 0 4 2

Course Objective

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To estimate the amount of alkalinity ions, hardness, chloride in water sample
- To make the student acquire practical skills in the determination of conductance of solutions, EMF etc
- To acquaint the students with the determination of molecular weight of a polymer by viscometry
- To carried out different types of titrations for estimation of concerned

Course Outcome

- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
- Estimate the amount of alkalinity ions, hardness, chloride in water sample
- Measure molecular/system properties of conductance of solutions, EMF etc
- Acquaint the students with the determination of molecular weight of a polymer by visocometry
- Determine the corrosion rate of steel by weight loss method.
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more qualities and quantities of materials involved for accurate results.

LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of alkalinity of Water sample.
2. Estimation of hardness of Water by EDTA
3. Estimation of chloride in Water sample (Argentometric method)
4. Determination of corrosion rate by weight loss method.
5. Conductometric Titration (Simple acid base).
6. Conductometric Titration (Mixture of weak and strong acids).
7. Conduct metric Titration using $BaCl_2$ vs Na_2 SO_4.
8. pH Titration (acid & base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$).
10. Estimation of Ferric ion by Spectrophotometry.
11. Determination of water of crystallization of a crystalline salt (Copper sulphate).
12. Determination of molecular weight and degree of polymerization using Viscometry.
13. Determination of chemical oxygen demand.

16BEEE112 ENGINEERING WORKSHOP PRACTICES LABORATORY L T P C 0 0 4 2

Course Objectives

1. To prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
2. to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice
3. To prepare for understanding operations of CNC machines
4. To prepare for assembling different components in engineering division
5. To prepare for carpenter working tools handling
6. To prepare students for handling the tools in engineering and furnace division

Course Outcomes

At the end of this course, students will be able to

1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
2. Students will be able to fabricate components with their own hands.
3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
4. By assembling different components, they will be able to produce small devices of their interest.
5. Acquire knowledge of various different tools handling in engineering division
6. Knowledge gathering in casting and welding process too

PART – A (MECHANICAL)

i. WELDING

i. Preparation of arc welding of butt joints, lap joints and tee joints.

ii. BASIC MACHINING

i. Simple Turning and Taper turning
ii. Drilling and Tapping
iii. Sheet Metal Work
iv. Model making – Trays, funnels, etc.

iii. DEMONSTRATION ON

i. Smithy operations
ii. Foundry operations
iii. Plumbing Works
iv. Carpentary Works

PART –B (ELECTRICAL & ELECTRONICS)

iv. **ELECTRICAL ENGINEERING**

i. Study of electrical symbols and electrical equipments.
ii. Construct the wiring diagram for Stair case wiring and Fluorescent lamp wiring.
iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energy meter.
iv. Measurement of electrical quantities – voltage, current, power & power factor in R load.
v. Measurement of energy using single phase energy meter.

v. **ELECTRONICS ENGINEERING**

i. Study of Electronic components– Resistor (color coding), capacitors and inductors.
ii. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
iii. Study of logic gates AND, OR, NOT, NOR and NAND.
iv. Study of HWR and FWR.

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jeyachandran, K., Natarajan, S. and Balasubramanian, S	A Premier on Engineering Practices Laboratory	Anuradha Publishers, Kumbakonam	2007
2	Jeyapoovan, T., Saravanapandian, M	Engineering Practices Lab Manual	Vikas Puplishing House Pvt. Ltd, Chennai	2006
3	Bawa, H.S	Workshop Practice	Tata McGraw – Hill Publishing Company Limited, New Delhi	2007

16BEEE113 COMPUTER PRACTICE AND PROGRAMMING LABORATORY
L T P C 1 0 4 3

Course Objectives

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools using algorithm
- Understand, analyze and implement software development tools using linux
- Acquire and analyze the roots of equations
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

Course Outcomes:

The course will enable the students.

1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs(in C language).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To decompose a problem in to functions and synthesize a complete program using divide and conquer approach. and use arrays, pointers and structures to formulate algorithms and programs.
6. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

THEORY:

What is computer- Computer Components- What is C- C Character set- Constants, Variables and Keywords-General form of C Program - Relational and Logical Operators - Selection Structures- If and nested if - Switch Case - Loops-Definition and types- Functions- Arrays- Introduction to Strings-Pointers.

PRACTICALS:

1. Working with word Processing, Spreadsheet and presentation software in Linux
2. Programming in Scratch:
   Practicing fundamental concepts of programming like sequence, selection decision statements, working of loops and event driven programming

3. C Programming:
   Practicing programs to get exposure to basic data types, algebraic expressions, Conditional statements, Input and Output Formatting, Decision Statements, Switch Case, Control structures, arrays, Strings and function, implementation of pointers.

TOTAL: 45 HOURS

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	E. Balagurusamy	Computing Fundamentals and C Programming	TMH Education, 5th Edition	2014
2	Yashavant Kanetkar	Let us C	BPB Publications, 13th Edition	2013

16BECC151* **HUMAN VALUES** **L T P C** **1 0 0**

Course Objectives

1.To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings

2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence.

3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

4.To know the value of being a human being.

5.To provide a much needed orientational input in value education to the young enquiring minds.

6.To study the value of being a useful citizen.

Course Outcomes

1.To involves a systematic and rational study of the human being vis-à-vis the rest of existence.

2. To make free from any dogma or value prescriptions.

3. To analysis process of self-investigation and self-exploration, and not of giving sermons.

4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.

5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

6. To Educate the values and meaning of life in the young minds and to transform them as responsible citizens

UNIT I **4**

Human life on Earth - Concept of Human Values - Value Education - Aim of education and value education - Types of values - Components of values – Attitudes – types of attitudes

UNIT II **4**

Self Development : Self analysis – Goal Setting - Thought Analysis – Guarding against Anger - Respect to age, experience, maturity, family members, neighbors, co-workers

UNIT III **5**

Individual Qualities – Truthfulness – Constructivity – Sacrifice – Sincerity - Self Control – Altruism – Tolerance - Scientific Vision – Regulating Desire

UNIT IV **4**

Mind Culture - Modern Challenges of Adolescent - Emotions and behavior - Sex and spirituality - Adolescent Emotions - Meditation

UNIT V **3**

Body and Mind Fitness : (a) Physical Exercises (b) Activities: (i) Moralization of Desires (ii) Neutralization of Anger (iii) Eradication of Worries (iv) Benefits of Blessings .

TOTAL: 20 HOURS

REFERENCES

S.No	Author(s) Name	Title of the Book	Publisher	Year of Publications
1	Subramanian. R	Professional Ethics	Oxford, New Delhi	2013

2	Govindarajan. M, Natarajan. S, Senthil Kumar. V.S	Engineering Ethics	Prentice Hall of India, New Delhi	2004
3	Tripathi. A.N	Human Values	New Age International	2009
4	Pope. G. U.	Thirukkural with English Translation	Uma Publication, Thanjavur.	2002

SEMESTER II

16BECC201A BUSINESS COMMUNICATION L T P C 3 0 0 3

Course Objectives:

- To help students comprehend the role of listening skills in effective communication.
- To familiarize students with verbal and non-verbal communication.
- To expose students to neutral accent.
- To develop emotional intelligence skills in them for enhancing their self-esteem.
- To assist them in setting goals and developing positive attitude.
- To enable students to acquire decision making skills, problem solving

Course Outcomes:

- Design and deliver a persuasive presentation that convinces the audience of the topic's relevance and overcomes resistance, using appropriate visual support and adhering to a specified time limit.
- Use a strategic communication model and critical thinking to identify objectives, analyze audiences, and choose the most effective structure and style for delivering strategically sound written and spoken messages.
- Practice principles of effective business writing and document design in all written documents.
- Build an understanding of different organizational cultures, business practices, and social norms to communicate more effectively in domestic and cross-cultural business contexts.
- Develop their soft skills and inter personal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- Acquire decision making skills, problem solving skills and assertive skills.

UNIT I 9

What is Business Communication? - Types of Communication – Formal and informal communication – Process of Communication- modes of Communication – Barriers to communication.

UNIT II 9

Written Business Communication – Style- word-usage- organisation of Ideas – mechanics of writing and fill up of forms - Cover Letter- Letter for Job Application- Letter of Complaint - Memos - Resumes - Email- Reports Revising and proofreading- Advertising slogans- jargons- Description of Graphics and visual aids - interpretation of graphs using expressions of comparison and contrast .

UNIT III 9

Reading and Understanding the news articles - Oral Business Communication - First Impressions - Attire – Effective Presentation strategies- Nuances of delivery – Controlling nervousness and stage fright- Visual aids Presentations- Capturing Audience - Tone - Behavior - Telephone Etiquette-

Non - verbal communication - Eye contact - Facial expressions - Posture - Gestures - Body langage – Etiquette- Organization of presentation – brain storming- Negotiations.

UNIT - IV **9**

Difference between goals and dreams - SMART goal setting - 3 Ds of goal setting- Determination, Discipline and Direction - Developing the right attitude - Motivation - Intrinsic and Extrinsic motivation - Dealing with change - Dedication - Taking responsibilities - Decision making.

UNIT - V **9**

Intrapersonal skills - Self-analysis - Thought process – Interpersonal skills - Confidence building - Resolving conflicts- Analytical skills - Team Building - Leadership skills - Planning/organizing - Ability to work independently - Professional ethics - Communicating via e-mail. Ethical perspectives and their implications for responsible communication - Proposal Presentation

TOTAL: 45 HOURS

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Meenakshi Raman ; Prakash Singh	Business Communication	Oxford University Press	2012

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Murthy, G .R. K.	Soft Skills for Success**.**	The ICFAI University Press, Hyderabad.	2008
2	Jagadeesan, G & Santanakrishnan,R.	Soft Skills Development: Training and Evaluation.	The ICFAI University Press, Hyderabad.	2008
3	Sherfield, Robert M., Rhonda J. Montgomery, & Patricia G. Moody	Developing Soft Skills.	Pearson Education, New Delhi.	2005

WEBSITES

1. http://tribehr.com/social-hr-software/talent-management/skills-tracking
2. www.ispeakyouspeak.blogspot.com
3. https://alison.com/subjects/6/Personal-Development-Soft-Skills
4. www.learning-development.hr.toolbox.com
5. http://www.niit.com/solution/soft-skill-training
6. http://mybcommlab.com to test your understanding of the concepts presented in each chapter and explore additional materials that will bring the ideas to life in videos, activities, and an online multimedia e-book.

16BECC201B TECHNICAL ENGLISH L T P C 3 0 0 3

Course Objectives:

- To motivate learners to acquire listening & speaking skills in both formal and informal context
- To focus on question forms & to make them understand the important of using question tags and also the functional use of transformation of sentences.
- To improve their reading habit and to train them in critical and analytical reading
- To equip them to write for academic as well as work place context
- To enable students to face interviews
- To study the receptive and productive skills

Course Outcomes:

Students undergoing this course will be able to

- Acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- Enhance them reading texts critically and analytically
- Develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Enrich the ability to face interviews with confidence.
- Enable to write documents and formal written communication
- Admire and appreciate elegancy in communication.

UNIT-1 10

Listening - Difference between Hearing & Listening –Listening to informal conversation. **Speaking** - Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., **Reading** – Extensive and Intensive reading. **Writing** – Report writing - Writing a covering letter. **Grammar** – Regular & Irregular verbs - Kinds of sentences - Question tags. **Vocabulary** – Homonyms and Homophones.

UNIT-II 8

Listening – Note Taking- Improving grasping ability. **Speaking** – Welcome address - Vote of thanks - Master of ceremony. **Reading** – Active and Passive reading - Reading for vocabulary- Reading for a purpose. **Writing** - Writing a review (Film review) - Summary of a story. **Grammar** - Modal verbs – Conjunction - Expression of cause and effect. **Vocabulary** - Phrasal verbs - Idioms.

UNIT – III 9

Listening - Barriers to listening (Physical, Psychological, Linguistic & Cultural). **Speaking** – Stress, Pause and Intonation. **Reading** – Rapid reading – Skimming, Scanning and Surveying. (SQ3R)**Writing** - Essay writing -Minutes of meeting - Agenda – **Grammar** - Active and Passive voice - Purpose expression. **Vocabulary** - Same words used as noun and verb - Often misspelt and confused words.

UNIT-IV **8**

Listening – Listening to telephone conversation - Viewing model interviews. **Speaking** – Group Discussion - Correlation between verbal & non - verbal communication. **Reading** – Reading comprehension (short & long text) - Reading job advertisements and profile of a company. **Writing** – Job application - Resume writing - Checklist preparation. **Grammar** - Numerical expressions – Collocations - **Vocabulary** - Singular and Plural (Nouns)

UNIT- V **10**

Listening – Types of listening- Improving listening comprehension**. Speaking** - Oral presentation - Vocal communication techniques - Voice, quality, volume, pitch etc., **Reading** -Note making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation writing – Short essays writing- **Grammar**- Transformation of sentences (Simple, Compound & Complex). **Vocabulary** - Collection of Technical Vocabularies with their meanings.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

TOTAL: 45 HOURS

TEXT BOOK:

S. NO.	**AUTHOR(S) NAME**	**TITLE OF THE BOOK**	**PUBLISHER**	**YEAR OF PUBLICATION**
1	Sangeeta Sharma , Meenakshi Raman	Technical Communication: Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2008
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES :

1. www.learnerstv.com – Listening/ Speaking/ Presentation
2. www.usingenglish.com – Writing/ Grammar
3. www.englishclub.com – Vocabulary Enrichment/ Speaking
4. www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking
5. www.teachertube.com – Writing Technically
6. www.Dictionary.com – Semantic / Grammar

16BECC202 ENGINEERING MATHEMATICS- II L T P C 3 2 0 4

Course Objectives:

- To have knowledge in integral calculus and Vector calculus
- To expose the concept of Analytical function and Complex integration.
- The syllabus is designed to develop the use of integrals techniques which is needed by Engineers for practical applications.
- It aims to equip the students in integration to solve engineering problems
- To learn Basic concepts of multiple and vector integrals.
- To study complex integration

Course Outcomes:

The student will be able to

- Solve problems in Fluid Dynamics, Theory of Elasticity, heat and mass transfer etc.
- Find the areas and volumes using multiple integrals
- Improve their ability in Vector calculus
- Expose to the concept of Analytical function.
- Apply Complex integration in their Engineering problems
- Analysis the real time application of it.

UNIT-I MULTIPLE INTEGRALS 11

Double integral – Cartesian coordinates – Polar coordinates – Change of order of integration – Triple integration in Cartesian co-ordinates – Area as double integrals.

UNIT-II VECTOR CALCULUS 13

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem, Gauss divergence theorem and Stoke's theorems (Statement Only)- Surfaces : hemisphere and rectangular parallelopipeds.

UNIT- III PARTIAL DIFFERENTIAL EQUATIONS 11

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT-IV ANALYTIC FUNCTIONS 12

Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms – Sufficient condition for an analytic function (Statement Only) - Properties of analytic functions – Constructions of an analytic function - Conformal mapping: w = z+a, az, 1/z and bilinear transformation.

UNIT-V COMPLEX INTEGRATION 13

Complex Integration - Cauchy's integral theorem and integral formula (Statement Only) – Taylor series and Laurent series - Residues – Cauchy's residue theorem (Statement Only) - Applications of Residue theorem to evaluate real integrals around unit circle and semi circle (excluding poles on the real axis).

TOTAL : 60 HOURS

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO N
1	Hemamalini. P.T	Engineering Mathematics I & II	McGraw-Hill Education Pvt.Ltd, New Delhi	2014
2	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2014

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Erwin Kreyszig	Advanced Engineering Mathematics.	John Wiley & Sons. Singapore	2011
2	Venkataraman, M. K.	Engineering Mathematics.	The National Publishing Company, Chennai	2005
3	Narayanan. S, Manicavachagam pillay.T.K and Ramaniah.G	Advanced Mathematics for Engineering Students.	Viswanathan S.(Printers and Publishers) Pvt. Ltd. Chennai.	2002
4	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES:

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.sosmath.com/diffeq/laplace/basic/basic.html
4. www.mathworld.wolframe.com

16BEPH203	ENGINEERING PHYSICS	L T P C	3 0 0 3

Course Objectives:

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology
- Understand the basics of laser and optical fiber with appropriate applications.
- Introduce the concepts of quantum mechanics for diverse applications.
- Impart the basic knowledge of crystal and its various crystal structures.
- Disseminate the fundamentals of nuclear physics and their applications
- To inculcate the characteristics of electronic materials through basics.

Course Outcomes

- Identify the elastic nature of materials and its thermodynamic properties.
- Infer the characteristics of laser and optical fibers for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Identify the different atomic arrangements of crystals and its defects
- Make use of the concepts of sound waves for medical applications
- Illustrate the basic ideas of nuclear reactors for energy resources

UNIT I PROPERTIES OF MATTER AND THERMODYNAMICS 9

Three types of modulus of elasticity – basic definitions, relation connecting the moduli (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniform bending Concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBER OPTICS 9

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER -CO_2, Semiconductor LASER- Applications of LASER in industry and medicine.Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNIT III QUANTUM PHYSICS 9

Introduction to quantum theory – Black body radiation-Photo electric effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electron microscope.

UNIT IV CRYSTAL PHYSICS **9**

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures- crystal defects – point, line and surface defects

UNIT V ULTRASONICS AND NUCLEAR PHYSICS **9**

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications – Sonogram Introduction – basics about nuclear fission and fusion, nuclear composition –Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

TOTAL: 45 HOURS

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Serway and Jewett	Physics for Scientists and Engineers with Modern Physics	Thomson Brooks/Cole, Indian reprint, New Delhi	2010
2	Gaur, R.K. and Gupta, S.C	Engineering Physics	Dhanpat Rai Publications,New Delhi.	2011
3	M.N. Avadhanulu and PG Kshirsagar	A Text book of Engineering Physics	S.Chand and company, Ltd., New Delhi	2011
4	D.C. Ghosh, N.C. Ghosh, P.K. Haldar	Engineering Physics	University Science, New Delhi	2011

5	P. Khare, A. Swarup	Engineering Physics: Fundamentals and Modern Applications	Jones & Bartlett Learning	2009

WEBSITES:

1. www.nptel.ac.in
2. www.physicsclassroom.com
3. www. oyc.yale.edu
4. www.physics.org

16BECH203 **ENGINEERING CHEMISTRY** **L T P C** **3 0 0 3**

Course Objectives:

- To gain knowledge on adsorption phenomena.
- To make the students conversant with basics of water technology.
- To make the student acquire sound knowledge of electrochemistry and storage devices.
- To acquaint the student with concepts of fuels and rocket propellants.
- To develop an understanding of the basic concepts of corrosion science.
- To acquaint the students with the basics of surface chemistry.

Course Outcomes

Upon completion of the course the students will be able to

- Outline the basic principles of chemistry for water treatment (K)
- Examine the electrochemical properties to design non – conventional energy storage devices (S)
- Apply the concepts combustion of different fuels (S)
- Identify the concepts of corrosion and its protection in the engineering field (S)
- Apply the concepts of surface chemistry in the field of engineering

UNIT I WATER TECHNOLOGY **9**

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverse osmosis.

UNIT II ELECTROCHEMISTRY AND STORAGE DEVICES **9**

Electrochemical cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - Fe^{2+} vs dichromate) –Electrolytic conductance-application (conductometric titration)-Batteries-Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H_2-O_2 Fuel Cell.

UNIT III FUELS AND COMBUSTION **9**

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method - Petroleum processing and fractions - Synthetic petrol - Bergius and

Fischer-Tropsch method - Knocking
- Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, Combustion of fuel- Introduction-GCV-NCV-Flue gas analysis.

UNIT IV CORROSION SCIENCE **9**

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings – Organic coatings-Paints - Constituents and functions –Inorganic coatings- Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating - Hot dipping.

UNIT V SURFACE CHEMISTRY AND PHASE RULE **9**

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm- Role of adsorbents in industries (catalysis and water softening).Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

TOTAL: 45 HOURS

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company (P) Ltd., Chennai.	2012

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3rd Reprint NewDelhi.	2013

2.	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5th edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010
3.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009
4.	Dara.S.S	Text book of Engineering Chemistry.	S.Chand & Co.Ltd., New Delhi	2008
5.	Sharma.B. K	Engineering Chemistry	Krishna Prakasam Media (P) Ltd., Meerut	2001

WEBSITES:

1. http://www.studynotes.ie/leaving-cert/chemistry/
2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html
3. http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
4. http://ocw.mit.edu/courses/#chemistry
5. http://www.chem.qmul.ac.uk/surfaces/sec

16BECC204 ENVIRONMENTAL SCIENCES L T P C 3 0 0 3

Course Objectives

- To give a comprehensive insight into natural resources, ecosystem and biodiversity.
- To educate the ways and means of the environment
- To protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures
- To impart knowledge on ecosystem and biodiversity.
- To motivate public to participate in environment protection and improvement.

Course Outcomes (COs)

Upon completion of the course the students will be able to

- Recognize the importance of natural resources (S)
- Associate themselves with the various ecosystems (S)
- Describe the importance of biodiversity (S)
- Identify and minimize the difference pollutions (S)
- Prioritize and analyses the social issues (S)
- Integrate the environmental principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **9**

Definition, Scope and Importance – Need for public awareness -Forest resources: Use and over- exploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources- role of an individual in conservation of natural resources.

UNIT II ECOSYSTEM **9**

Chemistry and Environment- Environmental segments, Composition and Structure of atmosphere- Concept of an ecosystem- Structure, components and function of an ecosystem Energy flow in the ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marine ecosystem)

UNIT III BIODIVERSITY **9**

Introduction to biodiversity, Definition- Genetic diversity, Species diversity and Ecosystem diversity, Bio-geographical classification of India, Importance of biodiversity- Value of biodiversity - Hot Spots of biodiversity-Threats to biodiversity - Endangered and Endemic Species of India – Conservation of biodiversity- In-Situ and Ex-Situ conservation of biodiversity.

UNIT IV ENVIRONMENTAL POLLUTION **9**

Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control measures of urban and industrial wastes– Role of an individual in prevention of pollution–Disaster management-earthquake, tsunami, cyclone and landslides.

UNIT V SOCIAL ISSUES AND ENVIRONMENT **9**

From Unsustainable to Sustainable development, Urban problems related to energysources,Water conservation, Rain water harvesting and Watershed management, Resettlement and rehabilitation of people, its problems and concerns, Environmental ethics- Issues and possible solutions- Climate change- Green house effect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation- Environment Protection Act- Human Rights- Value education, Role of Information Technology in Environment and Human health-Population growth, Variation of population among nations-Population explosion.

TOTAL: 45 HOURS

TEXT BOOKS

S.No	Author(s) Name	Title of the Book	Publisher	Year of Publication
1.	Dr. Ravikrishnan, A	Environmental Science	Sri Krishna Hi tech Publishing Company Private Ltd., Chennai	2012
2.	Anubha kaushik C.P. Kaushik	Environmental Science and Engineering	New Age International (P) Ltd., New Delhi.	2010

REFERENCES

S.No	Author(s) Name	Title of the Book	Publisher	Year of Publication
1.	William P.Cunningham	Principles of Environmental Science	Tata Mc Graw -Hill Publishing Company, New Delhi.	2008
2.	Linda D. Williams	Environmental Science Demystified	Tata Mc Graw -Hill Publishing Company Ltd., New Delhi.	2005
3.	Bharucha Erach	Environmental Science Demystified	Mapin Publishing (P) Ltd., Ahmedabad.	2005
4.	Tyler Miller G. Jr	Environmental Science	Thomson & Thomson Publishers, New Delhi.	2004

5.	Trivedi, R.K. and Goel, P.K	Introduction to Air Pollution	Techno-Science Publications, Jaipur.	2003

WEBSITES

1. http://people.eku.edu/ritchisong/envscinotes1.html
2. http://nptel.ac.in/courses.php?disciplineId=120
3. www.newagepublishers.com/samplechapter/001281.
4. www.unesco.org/ext/field/beijing/scienceb.htm,www.infinitepower.org/education.htm
5. http://www.sciencedaily.com/news/top/environment/

Course Objectives

- To gain knowledge on the principles and procedure for the Analysis of Circuits.
- To enable the students to understand the DC circuit analysis and network theorems.
- To learn the Sinusoidal steady state analysis.
- To Obtain the solution of first and Second order system
- To learn and analyze the electrical circuits using Laplace Transforms.
- To understand transients and resonance in RLC circuits and coupled circuits.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Apply network theorems for the analysis of electrical circuits.
- Obtain the solution of first and Second order system
- Analyze the electrical circuits using Laplace Transforms.
- Obtain the transient and steady-state response of electrical circuits.
- Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
- Analyze two port circuit behavior.

UNIT I BASIC CIRCUITS ANALYSIS 12

Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC 12

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenin's and Norton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V ANALYSING THREE PHASE CIRCUITS 12

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power factor measurements in three phase circuits.

TOTAL: 60 HOURS

TEXT BOOKS:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Sudakar A. and Shyam Mohan S.Palli	Circuits and Networks (Analysis and Synthesis)	Tata McGraw Hill Book Co	2007
2	A.Chakrabarti	Circuit Theory – Analysis and Synthesis	Dhanpat Rai & Co. New Delhi, Fifth Edition	2006

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Arumugam and Prem Kumar	Electric Circuit Theory	Khanna Publishers, New Delhi	2000
2	Joseph Edminister	Electric Circuits	Schaum's outline series, Tata McGraw Hill Book Company, Third Edition	2013
3	Hayt W.H and Kemmerley J.E	Engineering Circuit Analysis	Tata McGraw Hill Book Co., Fifth Edition	2002

16BEPH211 ENGINEERING PHYSICS LABORATORY L T P C 0 0 4 2

Course Objective

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To prepare for the lab experiment and perform individually a wide spectrum of experiments.
- To present experimental data in various appropriate forms like tabulation, and plots.
- To analyze, Interpret and Summarize experimental results.
- To communicate clearly understanding of various experimental principles, instruments/setup, and procedure
- To learn the bandgap of semiconductor

Course Outcome

- The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- Prepare for the lab experiment and perform individually a wide spectrum of experiments.
- Present experimental data in various appropriate forms like tabulation, and plots.
- Analyze, Interpret and Summarize experimental results.
- Communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- Prepare to develop the skills for understanding basic electric circuits

LIST OF EXPERIMENTS – PHYSICS

1. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
2. Determination of wavelength of mercury spectrum – spectrometer grating.
3. Determination of Young’s modulus of the material – Non uniform bending (or) Uniform bending.
4. Determination of Viscosity of liquid – Poiseuille’s method.
5. Spectrometer Dispersive power of a prism.
6. Torsional pendulum – Determination of Rigidity modulus.
7. Particle size determination using Diode Laser
8. Determination of Laser parameters – Wavelength, and angle of divergence.
9. Determination of acceptance angle in an optical fiber.
10. Determination of thickness of a thin wire – Air wedge method
11. Determination of Band Gap of a semiconductor material.
12. Determination of Specific resistance of a given coil of wire – Wheatstone Bridge

16BECH211 ENGINEERING CHEMISTRY LABORATORY L T P C 0 0 4 2

Course Objective

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To estimate the amount of alkalinity ions, hardness, chloride in water sample
- To make the student acquire practical skills in the determination of conductance of solutions, EMF etc
- To acquaint the students with the determination of molecular weight of a polymer by viscometry
- To carried out different types of titrations for estimation of concerned in materials
- To study the molecular weight and degree of polymerization using viscometry.

Course Outcome

- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
- Estimate the amount of alkalinity ions, hardness, chloride in water sample
- Measure molecular/system properties of conductance of solutions, EMF etc
- Acquaint the students with the determination of molecular weight of a polymer by visocometry
- Determine the corrosion rate of steel by weight loss method.
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more qualities and quantities of materials involved for accurate results.

LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of alkalinity of Water sample.
2. Estimation of hardness of Water by EDTA
3. Estimation of chloride in Water sample (Argentometric method)
4. Determination of corrosion rate by weight loss method.
5. Conductometric Titration (Simple acid base).
6. Conductometric Titration (Mixture of weak and strong acids).
7. Conduct metric Titration using $BaCl_2$ vs Na_2 SO_4.
8. pH Titration (acid & base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$).
10. Estimation of Ferric ion by Spectrophotometry.
11. Determination of water of crystallization of a crystalline salt (Copper sulphate).
12. Determination of molecular weight and degree of polymerization using Viscometry.
13. Determination of chemical oxygen demand.

16BEEE212 ELECTRIC CIRCUITS LABORATORY L T P C 0 0 3 2

Course Objective

- To impart the basic knowledge about the Electric circuits.
- To understand the different electrical measurements.
- To understand the working of oscilloscope.
- To acquire the knowledge of network theorems
- To observe and analyze the electrical parameters in RLC resonance circuits
- To experiment the basic laws in voltage and current

Course Outcomes (Cos)

At the end of this course, students will demonstrate the ability

- To understand and analyze basic electric circuits.
- Getting basic practical knowledge about the DC Electric circuits.
- Getting knowledge about the testing of different network theorems using simple circuits.
- To introduce basic electrical equipments in the lab
- To enable the students to analysis the basic laws using simple circuits.
- Apply the knowledge in real time application.

LIST OF EXPERIMENTS

1. Study of Electrical Measurements and the Oscilloscope.
2. Study of Potentiometers and Rheostats.
3. Study and verify of Series Circuits, Parallel Circuits and Series-Parallel Circuits in DC Circuits.
4. Study and verify of Ohm's Law and Kirchoff's law.
5. Study and verify of Mesh Analysis.
6. Study and verify of Nodal Analysis.
7. Verification of Superposition Theorem
8. Verification of Thevenin's Theorem
9. Verification of Maximum Power Transfer Theorem
10. Verification of Series RLC Resonance and Parallel RLC Resonance.

16BEEE213 ENGINEERING GRAPHICS L T P C 1 0 4 3

Course Objectives

- To prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- To prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice
- To prepare the students for creating drawings in engineering
- To prepare the students for getting experience in engineering graphics
- To prepare the students for getting experience in engineering solid modelling and computer aided design
- To prepare the students to get better understandings in projection of solids.

Course Outcomes

On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical constructions and multiple views of objects.
- Do orthographic projection of lines and plane surfaces.
- Draw projections and solids and development of surfaces.
- Prepare isometric and perspective sections of simple solids.
- Demonstrate computer aided drafting.
- Analysis the real time application of it

UNIT I INTRODUCTION (3 +10)

Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

UNIT II SCALES AND PLANE CURVES (3 + 10)

SCALES: Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

UNIT III FREE HAND SKETCHING (3 + 12)

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT IV PROJECTION OF POINTS, LINES AND PLANE SURFACES (3 + 12)

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT V PROJECTION OF SOLIDS (3 + 12)

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

INTRODUCTION TO DRAFTING SOFTWARE/PACKAGE (NOT FOR EXAM) (4)
Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

TOTAL: 75 HOURS

TEXT BOOKS:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1.	Venugopal K and Prabhu Raja V	Engineering Graphics	New Age International Publishers	2007
2.	VTU	A Primer on Computer Aided Engineering Drawing	Belgaum	2006

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1.	Kumar M S	Engineering Graphics	D D Publications, Chennai, Ninth Edition	2007
2.	Bureau of Indian Standards	Engineering Drawing Practices for Schools and Colleges SP 46	BIS, New Delhi	2003
3.	Luzadder W J	Fundamentals of Engineering Drawing	Prentice Hall Book Co., New York	1998

WEBSITES

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

16BECC251* **APTITUDE TRAINING** **L T P C** **1 0 0 -**

COURSE OBJECTIVES

1. To understand the basic concepts of QUANTITATIVE ABILITY
2. To understand the basic concepts of LOGICAL REASONING Skills
3. To acquire satisfactory competency in use of VERBAL REASONING
4. To solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
5. To solve off-campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
6. To compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

COURSE OUTCOMES

1. Understand the basic concepts of QUANTITATIVE ABILITY
2. Understand the basic concepts of LOGICAL REASONING Skills
3. Acquire satisfactory competency in use of VERBAL REASONING
4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
5. Solve off-campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
6. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc

UNIT I

Introduction, Speed Math's, Problems on Numbers, Averages, Ratios and Proportions, Problems on Ages

UNIT II

Percentage, Data Interpretation, Profit and loss, Simple and Compound Interest

UNIT III

Time Speed and Distance, Time and Work, Pipes and Cistern, Geometry, Probability, Permutation and Combination

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Agarwal.R.S	Quantitative Aptitude for Competitive Examinations	S.Chand Limited	2011

2	Abhijit Guha	Quantitative Aptitude for Competitive Examinations	Tata McGraw Hill	2011
3	Edgar Thrope	Test Of Reasoning for Competitive Examinations	Tata McGraw Hill, 4th Edition	2012

SEMESTER III

16BEEE301A METHODS OF APPLIED MATHEMATICS L T P C 3 2 0 4

Course Objectives

1. To hone the analytical skills in the minds of Engineers.
2. To provide sound foundation in the mathematical fundamentals necessary to formulate, solve and analyze Engineering problems.
3. To study the Fourier series
4. To study the basic principles of different transforms.
5. To study the application of PDE
6. To study the difference equations

Course Outcomes:

Upon Completion of this course the students will be able to:

1. Explain the fundamental concepts of probability and standard distributions which can describe real life phenomenon.
2. Explain the basic concepts of one- and two-dimensional random variables and their applications in engineering.
3. Apply the concept of testing of hypothesis for small and large samples in real life problems.
4. Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
5. Discuss the notion of sampling distributions and statistical techniques used in engineering and management problems.
6. Discuss about the techniques in quality control that model engineering problems.

UNIT I LAPLACE TRANSFORM 13

Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals – Initial and final value theorems. Inverse Laplace transforms – Convolution theorem (statement only) – Solution of Ordinary Differential Equations with constant coefficients using Laplace transforms – Transform of periodic functions.

UNIT II FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT III FOURIER TRANSFORM 12

Fourier integral theorem (Statement Only) – Fourier transform pair –Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity – Relation between Fourier and Laplace transforms

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded)

UNIT V Z -TRANSFORM AND DIFFERENCE EQUATIONS 10

Z-transform - Elementary properties – Inverse Z- transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL : 60 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2013
2	Erwin Kreyszig	Advanced Engineering Mathematics.	Wiley India (P) Ltd, New Delhi.	2014

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Venkateswarlu S	Engineering Mathematics, Vol I	Anuratha Agencies and Publishers, Kumbakonam.	2007
2	Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G	Advanced Mathematics for Engineering Students. Volumes II and III,	Viswanathan S Printers and Publishers Pvt. Ltd. Chennai.	2002
3	Bali N P., Manish Goyal	A text book of Engineering Mathematics	Laxmi Publications Pvt. Ltd., New Delhi	2006
4	Ramana B V	Higher Engineering Mathematics	Tata Mc Graw Hill Publishing Co. Ltd. New Delhi.	2008

WEBSITES

1. www.sosmath.com
2. http://mathworld.wolfram.com/FourierSeries.html
3. www. nptel.ac.in

16BEEE301B LINEAR ALGEBRA AND SPECIAL FUNCTIONS L T P C 3 2 0 4

Course Objectives:

1. To develop analytical skills for solving engineering problems
2. To make the students to study about linear algebra and some useful special functions.
3. To study the linear transformations
4. To get knowledge about inner product spaces
5. To study the hyperbolic function
6. To study the Bessel function

Course Outcomes:

- Be able to acquire basic knowledge on vector spaces and linear transformations.
- Be able to build and solve the special functions.
- Apply the concept of testing of hyperbolic functions for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- Discuss the notion of sampling distributions and statistical techniques used in engineering and management problems.
- Discuss about the techniques in quality control that model engineering problems

UNIT I VECTOR SPACES 12

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II LINEAR TRANSFORMATIONS 12

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNIT III INNER PRODUCT SPACES 12

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

UNIT IV HYPERBOLIC FUNCTIONS, BETA AND GAMMA FUNCTIONS 12

Hyperbolic functions: Hyperbolic functions and Inverse Hyperbolic functions – Identities – Real and imaginary parts – solving problems using hyperbolic functions.

Beta And Gamma Functions : Definitions – Properties – Relation between beta and gamma integrals – Evaluation of definite integrals in terms of beta and gamma functions.

UNIT V BESSEL FUNCTIONS 12

Bessel Functions – Preliminaries – Definitions – Bessel Differential Equation – Differential recurrence relations – the pure recurrence relation – A generating function – Bessel's integral – Index half and odd integer.

TOTAL : 60 HOURS

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dr. Grewal B.S.	Higher Engineering Mathematics	Khanna Publishers, New Delhi.	2013
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES:

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com

16BEEE302 **ELECTRICAL MACHINES- I** **L T P C 3 0 0 3**

Course Objectives

- To study the working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
- To stidy the concepts of magnetic fields
- To study the concepts of magnetic circuits.
- To study the working principles of DC machines as Generator types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
- To estimate various losses taking place in D.C. Motor
- To study the different testing methods to arrive at their performance.

Course Outcomes

At the end of this course, students will demonstrate the ability to

1. Understand the concepts of magnetic fields
2. Understand the concepts of magnetic circuits.
3. Understand the operation of dc machines.
4. Analyze the differences in operation of different dc machine configurations.
5. Analyze the single phase transformers circuits.
6. Analyze the three phase transformers circuits.

UNIT I DC GENERATORS **9**

Definitions – Basic laws and rules – Construction and operation - types - Emf equation - Commutation – Armature reaction Applications

UNIT II DC MOTORS **9**

Definitions – Basic laws and rules - Operation - types – Back Emf equation - Torque equation - Starters – Speed control - Applications

UNIT III TESTING OF DC MACHINES **9**

Losses and efficiency – Swinburne's, Hopkinson's and load tests – Retardation test – Electric braking.

UNIT IV SINGLE PHASE TRANSFORMER **9**

Principle of operation – Types and construction–EMF equation-. Phasor diagram - Open Circuit and Short circuit test– Equivalent circuit – Load test – Regulation and efficiency -All day efficiency – Sumpner's tes- applications.

UNIT V THREE PHASE TRANSFORMER **9**

Principle of operation – Types and construction -Three phase transformers connections – Scott connection – Parallel operation - Auto transformers- Inrush current phenomenon and its prevention – Off-load and On-load tap changing- applications

TOTAL: 45 HOURS

TEXT BOOKS:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kothari D.P. and Nagrath I.J	Electric Machines	Tata McGraw Hill, Fourth Edition	2011
2	Fitzgerald A.E., Kingsly C. and Kusko.A	Electric Machinery	Tata McGraw Hill	2007

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Sen S.K	Electric Machinery	Khanna Publishers, New Delhi	2008
2	Say M.G	Alternating Current Machines	5th Edition, Pitman Publishing	2007
3	Irving. L. Kosow	Electrical Machines and Transformers	PHI, 2 nd Edition	2007
4	Theraja B.L. and Theraja A.K	A Text Book of Electrical Technology	Vol. II, S.Chand & Co. Ltd., New Delhi	2007
5	Bimbhra P.S	Electrical Machinery	Khanna Publishers, New Delhi	2009

WEBSITE

1. http://nptel.iitm.ac.in/courses/IIT–MADRAS/Electrical_Machines_I/index.php

16BEEE303 ELECTROMAGNETIC THEORY L T P C 3 0 0 3

Course Objectives

- To introduce the basic mathematical concepts related to electromagnetic vector fields
- To impart knowledge on the concepts of electrostatics, electrical potential, energy density and their applications.
- To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
- To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations
- To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector.
- To study the different thermodynamic fields

Course Outcomes

At the end of the course, students will demonstrate the ability

1. To understand the basic laws of electromagnetism.
2. To obtain the electric and magnetic fields for simple configurations under static conditions.
3. To understand the concept of Conductors, Dielectrics and Capacitance.
4. To analyze time varying electric and magnetic fields.
5. To understand Maxwell's equation in different forms and different media.
6. To understand the propagation of EM waves.

UNIT I INTRODUCTION 9

Sources and effects of electromagnetic fields – Vector fields – Different co- ordinate systems – Divergence theorem – Stoke's theorem.

UNIT II ELECTROSTATICS 9

Coulomb's Law – Electric Field Intensity – Field Due to Point, Line, Surface and Volume Charges – Electric Flux Density - Gauss's law and its Application – Electrical Potential — Electrical Field in Free space, conductors – Electric Field due to infinite long Conductors, circular loop – Boundary Conditions, Poisson's and Laplace's equations – Capacitance – Energy Stored in Capacitance – Energy Density .

UNIT III MAGNETOSTATICS 9

Lorentz law of force, Magnetic Field Intensity- Biot Savarts law – Ampere's Law – Magnetic Field due to Straight Conductors, circular loop,– Magnetic flux density (B) – B in free space, conductor, Magnetic Materials- Magnetization – Magnetic Field in Multiple Boundary Conditions – Magnetic Force – Self Inductance and Mutual Inductance – Inductance of Solenoids, Toroids.

UNIT IV ELECTRODYNAMIC FIELDS 9

Faraday's laws, Maxwell's Equations (differential and integral forms) – Conduction Current and Displacement Current – Relation between Field Theory and Circuit Theory.

UNIT V ELECTROMAGNETIC WAVES 9

Generation – Electromagnetic Wave Equations –Wave Propagation in Free Space, Dielectrics and conductors – Skin Depth, Pointing Theorem – Plane Wave Reflection and Refraction.

TOTAL: 45 HOUR

TEXTBOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	William H. Hayt	Engineering Electromagnetics	Tata McGraw Hill, New Delhi	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Nagrath, I.J., Kothari D.P	Electric machines	Tata McGraw Hill publishing Co Ltd., New Delhi	2004
2	Kraus and Fleish	Electromagnetics with Applications	5th edition, McGraw Hill international edition	2010
3	Sadiku	Elements of electromagnetics	6th edition, oxford university press	2014
4	Joseph Edminister	Schaum's outline of electromagnetic	4th edition, McGraw Hill	2013

WEBSITES

1. http://en.wikipedia.org/wiki/Electromagnetic_force

2.http://ocw.mit.edu/OcwWeb/Electrical–Engineering–and–Computer Science/6013Electromagnetics–and–ApplicationsFall2002/CourseHome/index.html

16BEEE304 ELECTRONIC DEVICES AND CIRCUITS L T P C 3 0 0 3

Course OBJECTIVES

- Understand electronic systems with a continuously variable signal
- Understand proportional relationship between a signal and a voltage or current that represents the signal.
- To learn function of basic component's use in linear circuits.
- Understand component symbol, working principle, classification and specification.
- To get more understanding about amplifies and oscillators
- To learn different theorems for simplification of basic linear electronics circuits.

Course Outcomes

- To impart knowledge on semiconductor devices,
- Understand the working of amplifiers,
- Understand the working of oscillators,
- Understand the working of pulse circuits.
- Analysis the real time application of semiconductor diode
- Analysis the application of amplifier, transistor and special devices

UNIT I SEMICONDUCTOR DIODE 9

Theory of p-n junction – p-n junction as diode – p-n diode currents – Volt-amp characteristics –
Diode resistance – Temperature effect of p-n junction – Transition and diffusion capacitance of p-n diode – zener diode -Diode switching times.

UNIT II TRANSISTOR 9

Junction transistor – Transistor construction CE, CB and CC configurations – Transistor switching times Voltage rating –Junction field effect transistor–pinch off voltage– output and transfer characteristics

UNIT III AMPLIFIER 9

CE, CC and Common base amplifiers –Differential amplifiers-Push-pull amplifiers - Negative feedback amplifiers - Voltage / current, series/shunt -Single and double tuned amplifier.

UNIT IV MISELLANEOUS DEVICES 9

Construction and operation: Solar cell, photodiode, photo transistor, opto coupler and laser diode, UJT, thermistors, piezo electric devices, MOSFETS–FET as a variable resistor.

UNIT V OSCILLATORS AND PULSE CIRCUITS 9

Oscillators – Colpitts, Hartley, Phase shift, Wien bridge and crystal oscillators. RC Diode clampers and clippers, Wave shaping circuits: Multivibrators types – Schmitt triggers – UJT based saw tooth oscillators- varactor diode**,** tunnel diode -LDR, LEDs, LCDs.

TOTAL: 45 HOURS

TEXT BOOKS:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jacob Millman & Christos.C.Halkias.	Electronic Devices & Circuits	Prentice Hall of India, New Delhi.	2003
2	Allen Mottershead	Electronic Devices and Circuits – An Introduction	Prentice Hall of India Private Limited, New Delhi.	2003
3	David A. Bell	Electronic Devices and Circuits	Prentice Hall of India, New Delhi.	2003

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Robert. L. Boylestad & Lo Nashelsky	Electronic Devices & Circuit Theory	Pearson Education	2002
2	Jacob Millman & Herbert Taub	Pulse, Digital & Switching Waveforms	Tata McGraw Hill, Edition 2000	2003
3	Donald L.Schilling and Charles Belove	Electronic Circuits	Tata McGraw Hill	2003

16BEEE305A RENEWABLE ENERGY SOURCES L T P C 3 0 0 3

Course Objectives

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
- To study about solar energy collectors and its storages
- To study about the inter connected system in wind power
- To understand the basic principles fuel cell, Geo thermal power plants.
- To gain the knowledge about hydro energy.

Course Outcomes

At the successful completion of this course, the student is expected to have/be able to:

- List and generally explain the main sources of energy and their primary applications in the US, and the world.
- Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment.
- Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources.
- List and describe the primary renewable energy resources and technologies.
- Analyze the different energy sources
- Students gathered the real time inter connected system modeling in wind power

UNIT I INTRODUCTION 9

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

UNIT II SOLAR ENERGY 9

Introduction to solar energy: solar radiation, availability, measurement and estimation– Solar thermal conversion devices and storage – solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

UNIT III WIND ENERGY 9

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines . Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNIT IV HYDRO ENERGY 9

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V OTHER SOURCES 9

Bio energy and types –Ful cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rai.G.D	Non-conventional resources of energy	Khanna publishers ,Fourth edition	2010
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rao.S. & Parulekar	Energy Technology	Khanna publishers, Fourth edition	2005
2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis	2006

WEBSITES

1. www.energycentral.com
2. www.catelelectricpowerinfo.com

16BEEE305B POWER PLANT ENGINEERING L T P C 3 0 0 3

Course Objectives

- To learn the economics connected with power generation.
- To understand the measurements of various parameter in power plant and their control.
- To study about Powerplant instrumentation
- To acquire knowledge of renewable power system
- To study about technologies of distributed system
- To study layout and working of thermal, nuclear and hydropower plants.

Course Outcomes

At the end of the course the student will gain knowledge about

1. Economics of power generation, layout and working of thermal, nuclear and hydropower plants.
2. Distributed generation, boiler turbine monitoring system.
3. Assess the instrumentation available in the plant
4. Demonstrate the monitoring control in the plant
5. Analyze the various cost arrivals for various TARIFF consumers
6. Analysis the real time application of it.

UNIT I ECONOMICS OF POWER GENERATION 9

Choice of power plant; Load management; Number and size of generating unit; Cost of electrical energy; All types of tariff – Calculation – Power factor improvement.

UNIT II THERMAL POWER PLANT 9

Plant layout; Selection of site – Types of thermal power plants; Steam power plant based on fossil fuels; Thermal power plant equipment: Boiler, economizer, super heater, condenser, combustion chamber and gas loops, turbines, auxiliaries; Instrumentation and control; Heat balance.

UNIT III GAS POWER PLANT 9

Open and close cycles; Regeneration; Inter–cooling and reheating; Steam – gas power plant; Combined cycle power plant ; Plant protection ; Instrumentation and Control; Plant management; Plant layout; Optimized Generation; Load flow.

UNIT IV HYDRO POWER PLANT 9

Mass curve and storage capacity; Classification; Components; Turbines – Characteristics and their selection; Governor; Plant layout and design; Auxiliaries; Underground, automatic, remote controlled, and pumped storage plants. Optimized Generation.

UNIT V NUCLEAR AND DIESEL – ELECTRIC POWER PLANTS 9

Nuclear reactors and fuels; Radioactivity; Mass defect and binding energy; Chain reaction; Materials used in nuclear plants; Types of reactors. Diesel–electric Power Plant: Fields of use; Sub–systems; Starting and stopping; Heat balance; Plant layout and design; Remote operation; Auxiliaries.

TOTAL: 45 HOURS

TEXT BOOK:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Black and Veatch	Power Plant Engineering	CBS Publishers & Distributors	2005

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gupta, B. R.	Generation of Electrical Energy	S. Chand Publishing, New Delhi 14th Edition	2012
2	Deshpande, M. V.	Elements of Power Station Design	PHI Learning Pvt. Ltd. - reprint	2010

WEBSITES

1. www.energycentral.com
2. www.catelelectricpowerinfo.com

16BEEE311 ELECTRICAL MACHINES – I LABORATORY L T P C 0 0 3 2

Course Objective

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.
- To observe the speed control experiments in DC motor
- To acquire the knowledge of energy consumption measurements in single phase system
- To observe and analyze the electrical parameters in R load
- To experiment the basic laws in voltage and current

Course Outcomes (Cos)

At the end of this course, students will demonstrate the ability

- To understand and analyze basic electric and magnetic circuits.
- Getting basic practical knowledge about the Electric circuits.
- Getting knowledge about the testing of Electrical Machines and Transformers.
- To observe the speed control experiments in DC moto
- To study the working principles of electrical machines and power converters.
- Gathered knowledge of commercial system energy calculations

LIST OF EXPERIMENTS

1. Open circuit characteristics and load test on separately excited DC generator.
2. Open circuit characteristics and load test on DC compound generator.
3. Open circuit characteristics and load test on DC shunt generator.
4. Load test on DC shunt motor.
5. Load test on DC series motor.
6. Load test on DC compound motor.
7. Swinburne’s test and speed control on DC shunt motor.
8. OC and SC tests on single phase transformer.
9. Load test on single phase transformer.
10. Sumpner’s test.

16BEEE312 ELECTRONIC DEVICES AND CIRCUITS LABORATORY L T P C 0 0 3 2

Course Objectives

- To introduce the fundamentals of BJT
- To impact FET input and output characteristics
- To impact JFET input and output characteristics
- To learn knowledge of transistor
- To study about oscillator
- To study the design and implementation of various electronic circuits

Course Outcomes

- To analysis FET input and output characteristics
- To analysis JFET input and output characteristics
- To demonstrate the knowledge of transistor
- To analysis real time application of oscillator
- To design and implementation of various electronic circuits
- To analysis the real time application of it

LIST OF EXPERIMENTS

1. Static characteristics of semiconductor diode.
2. Characteristics of Zener diode and study of simple voltage regulator circuits.
3. Static Characteristics of transistor configuration.
4. Static and transfer characteristics of JFET.
5. Differential amplifier using FET.
6. Static characteristics of UJT.
7. Characteristics of Photodiode and Phototransistor.
8. Colpitts oscillator.
9. RC Phase shift oscillator.
10. Frequency response of common emitter amplifier.

16BEEE313 BASIC SIMULATION LABORATORY FOR ELECTRICAL SYSTEMS

L T P C 0 0 3 2

Course Objectives

- To impart knowledge on the MATLAB software
- To study about Simulink creation using MATLAB
- To study Electrical CAD
- To get knowledge about proteus
- To get knowledge about PLC
- To study about PLC language

Course Outcomes (COs)

- To analysis real time project in MATLAB software
- To analysis real time project using MATLAB coding
- To analysis real time project in Electrical CAD
- To analysis real time project in proteus
- To analysis real time project in PLC
- To analysis real time project using PLC language

LIST OF EXPERIMENTS

1. Introduction to MATLAB, Starting and Quitting MATLAB, Basic Commands, Working with Matrices.
2. MATLAB Expressions, Relational and Logical Operations, Plotting Function Complex and Statistical Functions, Input / Output of Variables Flow Control.
3. MATLAB Simulink Basic; Starting Simulink - Basic Elements - Building a System - Gathering Blocks - Modifying the Blocks - Connecting the Blocks - Running Simulations.
4. Introduction to Electrical CAD : Schematic components and Symbol Builder.
5. Electrical CAD: Circuit Builder Component tools and Wire/Wire number tools.
6. Introduction to Proteus: Create and name a new file, Insert segment(s) into the session, Edit each segment and Segment Parameters.
7. Proteus: Test segments in real time, save the finished session and Transfer it to Proteus.
8. Proteus: Create a model and test it.
9. Introduction to Programmable Logic Controller (PLC): Program Files, Data Files and input/ output table file operation.
10. Programmable Logic Controller (PLC): Program Scan, Scan Process, Data flow overview, Scan Patterns and PLC Programming Language.

16BEEE351*　　INTRODUCTION TO SOLAR PV DESIGN　　L T P C　　1 0 0 –

Course Objectives

- Understanding the basic concepts of solar power plant.
- Learn the working of PV cell
- Learn the different types of modules
- Learn the application of it
- Gain information regarding maintenance of solar power plant.
- Gain information regarding installation of solar power plant.

Course Outcomes

The students will able to

- Acquire knowledge on PV Module and equipment present in solar power plant
- Understand the installation and maintenance procedures of PV plant
- Design and Select batteries and inverters for PV module.
- Sizing and selection of PV panels
- Arriving the models of accessories needed for solar power plant
- Analysis the real time application

UNIT I INTRODUCTION

Introduction about Solar Energy- History of Photovoltaic System- PV module (Solar Cell) – Types of PV Module – Manufacturing of PV Module – Testing of PV Module – Working Principle of PV Cell – Overview of Solar Power Plant – working Principle of Solar Power Plant – Grid Tie System – Stand Alone System – India 2030 – Selection of PV Module – Inverter – Selection of Inverter – Battery – Selection of Battery – Cable – Selection of Cable – Charger Controller Unit – MPPT – Junction Box.

UNIT II PV SYSTEM

Load List Preparation – Design Sizing & Calculation on PV Panels – Series & Parallel Connection – Site selection – Detailed Introduction on Installation – Installation Techniques – Maintenance of PV Panel & Battery – Importance of Maintenance – Application of photovoltaic system – Advantages & Disadvantages of photovoltaic system.

UNIT III SELECTION & DESIGN

Hands on Practice – Sizing & Calculation on PV Panels to find the number of Panels required for given load - Design & Selection of Battery – Selection of Inverters.

REFERENCES:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	I.D. Mayergoyz, W. Lawson	Basic Electric Circuit Theory	Academic Press	1996
2	John Balfour, Michael Shaw	Adavanced Photovoltaic System Design	-	-
3	Ryan Mayfield	Photovoltaic Design and Installation for Dummies	-	-
4	Solar Energy International	Photovoltaic: Design and Insatllation Manual	-	-

16BEEE401 **ELECTRICAL MACHINES II** **L T P C 3 2 0 4**

Course Objectives

- To learn Construction and performance of salient and non–salient type synchronous generators.
- To get the knowledge of operation and performance of synchronous motor.
- To study and understand the concept of AC machine windings.
- To study and understand the concepts of rotating magnetic fields.
- To study the operation and performance of 3 Phase induction motors and its starting and speed control.
- To study the Construction, principle of operation and performance of single phase induction motors and few special machines

Course Outcomes

At the end of this course, students will demonstrate the ability to
1. Understand the concept of AC machine windings.
2. Understand the concepts of rotating magnetic fields.
3. Understand the operation of ac machines.
4. Analyze performance characteristics Induction Machines.
5. To understand the different types of single phase induction motor based on its starting methods.
6. Understand the operation of synchronous motor and analyze the performance of motor under different loading and excitation conditions.

UNIT I ALTERNATORS 12

Alternators - Types and constructional features - Emf equation-parallel operation - Armature reaction - Load characteristics – Phasor diagram - Predetermination of regulation by EMF, MMF and ZPF methods.

UNIT II TWO REACTION THEORY 12

Basic ideas of two reaction theory - Direct and quadrature axis reactances and their determination - Phasor diagram and regulation of salient pole alternators - Parallel operation - Synchronizing torque - Expression for synchronizing power.

UNIT III SYNCHRONOUS MOTORS 12

Synchronous motors - Principle of operation - Synchronous machines on infinite bus bars - Phasor diagram - V and inverted V curves - Current and power circle diagrams - Hunting and its suppression - Starting methods – Synchronous condenser.

UNIT IV INDUCTION MOTORS 12

Polyphase induction motors - Types and constructional features - Principle of operation - Torque - slip characteristics -Effect of rotor resistance - Equivalent circuit - Circle diagram - Starting and speed control of Induction motor-Introduction to Induction generator.

UNIT V SINGLE PHASE INDUCTION MOTOR 12

Construction and Principle of operation of single phase induction motor- Double revolving field theory –Methods of starting – types- Applications.

TOTAL: 60 HOURS

TEXT BOOK:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kothari D. P. and Nagrath I. J	Electric Machines	Tata McGraw Hill, Fourth Edition	2011
2.	Theraja B. L and Theraja A. K	A Textbook of Electrical Technology	Vol. II, S Chand & Co. Ltd., New Delhi	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Fitzgerald A. E., Kingsly C. and Kusko A	Electric Machinery	Tata McGraw Hill	2007
2	Langsdorf A. S	Theory of A.C Machinery	Tata McGraw Hill	2001
3	Sen. S. K	Electric Machinery	Khanna Publishers, New Delhi,	2008
5	Bimbhra P.S	Electrical Machinery	Khanna Publishers, New Delhi	2009

WEBSITES

1. www.classle.net/sites/default/files/text/68781/2_2_0.pdf

2. www.gtbit.org/downloads/emecsem3/emecsem3n4qbank.pdf

16BEEE402 TRANSMISSION AND DISTRIBUTION SYSTEMS L T P C 3 0 0 3

Course Objectives

- To develop expression for computation of fundamental parameters of lines.
- To categorize the lines into different classes and develop equivalent circuits for these classes.
- To study the voltage distribution in insulator strings and cables and methods to improve the same
- To learn the modeling of transmission line parameters.
- To study the different insulation materials
- To learn about the use of cables in transmission line parameters

Course Outcomes

At the end of the course the students will be able

- To understand the transmission and distribution systems of electric power,
- To understand electrical and mechanical design parameters of lines.
- To understand the transmission line parameters
- To analyze and modeling the transmission line parameters
- To understand the different cables for transmission lines
- To understand the different insulation materials for transmission lines

UNIT I INTRODUCTION 12

Structure of electric power system: Generation, transmission and distribution; HVDC and EHV AC transmission: comparison of economics of transmission, technical performance and reliability, application of HVDC transmission system.

UNIT II TRANSMISSION LINE PARAMETERS 12

Parameters of single and three phase transmission lines with single and double circuits: Resistance, inductance and capacitance of solid, stranded and bundled conductors: Symmetrical and unsymmetrical spacing and transposition; skin and proximity effects; interference with neighbouring communication circuits. Typical configuration, conductor types and electrical parameters of 400, 220, 110, 66 and 33 kV lines.

UNIT III MODELING AND PERFORMANCE OF TRANSMISSION LINES 12

Classification of lines: Short, medium and long line; equivalent circuits, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; real and reactive power flow in lines: Power-angle diagram; surge-impedance loading, loadability limits based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss. Sag computations. FACTS (qualitative treatment only): SVC, TCSC, STATCOM and UPFC.

UNIT IV INSULATORS AND CABLES 12

Insulators: Types, voltage distribution in insulator string and grading, improvement of string efficiency. Underground cables: Constructional features of LT and HT cables, capacitance, dielectric stress and grading, thermal characteristics.

UNIT V SUBSTATION, GROUNDING SYSTEM AND DISTRIBUTION SYSTEM 12

Types of substations: bus-bar arrangements; substation bus schemes: single bus scheme, double bus with double breaker, double bus with single breaker, main and transfer bus, ring bus, breaker-and-a-half with two main buses, double bus-bar with bypass isolators. Resistance of grounding systems: Resistance of driven rods, resistance of grounding point electrode, grounding grids, design principles of substation grounding system; neutral grounding. Radial and ring-main distributors, interconnectors. AC distribution: AC distributor with concentrated load; three-phase four wire distribution system sub-mains; stepped and tapered mains.

TOTAL: 60 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Hadi Saadat	Power System Analysis	Tata McGraw Hill Publishing, New Delhi Company	2003
2	Central Electricity Authority (CEA)	Guidelines for Transmission System Planning	Tamil Nadu Electricity Board	2003
3	Colin Bayliss and Brian Hardy	Transmission and Distribution Electrical Engineering	Elsevier, Newnes	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gupta, B. R	System Analysis and Design	S.Chand, New Delhi	2003
2	V.K.Metha Rohit Metha	Principles of power system	S.Chand & co, New Delhi	2010
2	Singh, S. N	Electric Power Generation, Transmission and Distribution	Prentice Hall of India Pvt. Ltd, New Delhi	2002

WEBSITE

1. http://www.adamiano.com/

16BEEE403A MEASUREMENTS AND INSTRUMENTATION L T P C 3 0 0 3

Course Objectives

- To study the units, dimensions and standards.
- To study the different types of measuring instruments.
- To provide adequate knowledge in electrical and electronic measurement techniques and instruments.
- To make the students to have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working.
- Introduction to general instrument system, error, calibration etc.
- Emphasis is laid on analog and digital techniques used to measure voltage, current, energy and power, etc.

Course Outcomes

At the end of the course the students will have

- Learn units, dimensions and standards.
- Learn basics of different types of measuring instruments to measure different electrical quantites
- Apply their knowledge to measure electrical quantities using standard analog and digital measuring instruments
- Basic knowledge of measurement systems towards measurements, including error analysis, interpretation, experimental uncertainty, calibration, etc.
- To apply basic concepts of measurement systems with electrical signals, including signal conditioners (gain, attenuation), indicating and recording devices
- Measure different electrical parameters usin conventional bridges and acquire data through digital measuring instruments and interpret the data.

UNIT I INTRODUCTION 9

Functional elements of an instrument – Units and standards of measurements – Static and dynamic characteristics – Sources of Errors in measurement – DC and AC bridges –Wheatstone, Kelvin's double, Maxwell, Anderson, Wien and Schering bridges–Measurement of high resistance – Standards and calibration.

UNIT II MEASURING INSTRUMENTS 9

Classification of instruments – working principle of potentiometers – Principle of operation and construction of PMMC, MI, type instruments – Principle types and working of analog and digital voltmeters, ammeters and multimeters – Determination of B–H curve and measurement of iron loss – Instrument transformers – CT and PT – Instruments for measurement of frequency and phase.

UNIT III MEASUREMENT OF POWER AND ENERGY 9

Dynamometer type wattmeter – Single and three phase wattmeters – Induction type instruments – Single and three phase energy meters – calibration of energy meters – direct and phantom loading – Grounding techniques – Megger - Power factor meter- Principle of operation, construction and types of digital frequency meters, Digital Energymeters.

UNIT IV STORAGE, DISPLAY DEVICES AND TRANSDUCERS 9

Magnetic measurements – Magnetic disk and tape–recorders – Strip chart recorder – XYrecorder. Digital plotters and printers – Cathode ray Oscilloscope– digital CRO and dot matrix display. Classification of transducers – Selection of transducers – Resistive – capacitive and inductive

transducers – LVDT – Piezo-electric, optical and digital transducers.
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UNIT V VIRTUAL INSTRUMENTATION **9**

Concept of VIs and sub VI - Display types – Digital – Analog – Chart and Graphs. Loops - structures - Arrays – Clusters. Local and global variables – String and file I/O. Timers and dialog control.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Doebelin. E.O.	Measurement Systems – Application and Design	Tata McGraw Hill Publishing Company, New Delhi.	2003
2	Sawhney. A. K.	A Course in Electrical and Electronic Measurements and Instrumentation	Dhanpat Rai and Co., New Delhi.	2004

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Moorthy. D. V. S.	Transducers and Instrumentation	Prentice Hall of India Pvt. Ltd, New Delhi.	2003
2	Martin Reissland	Electrical Measurements	NewAge International (P) Ltd., Delhi.	2001
3	Gupta, J. B	A Course in Electronic and Electrical Measurements	S. K. Kataria and Sons, Delhi.	2003
4	Gary. W. Johnson and Richard	LabVIEW Graphical Programming	Tata McGraw Hill Publications, New York.	2006

WEBSITES

1. http://www.elect.mrt.ac.in

16BEEE403B TRANSDUCER ENGINEERING L T P C 3 0 0 3

Course Objectives

- To impart knowledge about the principles and analysis of sensors.
- Discussion of errors and error analysis.
- Emphasis on characteristics and response of transducers.
- To have an adequate knowledge in resistance transducers.
- Basic knowledge in inductance and capacitance transducers and exposure to other transducers
- To get the knowledge of recent development in it

Course Outcomes

At the end of the course the student will be able to

1. Understand all types of sensors and transducers.
2. Justify the concept and working principle of different transducers and sensors
3 Justify the transducers that will be utilised in the electrical industries
4. Identify recent developments in transducer domain
5. Discover the knowledge for small technology up gradations in it
6. Analysis the real time application.

UNIT I SCIENCE OF MEASUREMENTS AND INSTRUMENTATION OF TRANSDUCERS 9

Units and standards – Calibration methods – Static calibration – Classification of errors – Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS 9

Static characteristics – Accuracy, precision, resolution, sensitivity, linearity etc.
Dynamic characteristics – Mathematical model of transducer – Zero, I and II order transducers.
Response to impulse, step, ramp and sinusoidal inputs.

UNIT III VARIABLE RESISTANCE TRANSDUCERS 9

Principle of operation, construction details, characteristics and application of resistance potentiometer, strain gauge, resistance thermometer, thermistor, hot-wire anemometer, piezo resistive sensor and humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 9

Induction potentiometer – Variable reluctance transducers – EI pick up – LVDT – Capacitive transducer and types – Capacitor microphone – Frequency response.

UNIT V OTHER TRANSDUCERS **9**

Piezoelectric transducer, magnetostrictive – IC sensor – Digital transducers – Smart sensor – Fibre optic transducer.

TOTAL:45 HOURS

TEXT BOOKS:

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	E.A. Doebelin	Measurement Systems – Applications and Design	Tata McGraw Hill, New York	1990
2	A.K. Sawhney	A course in Electrical & Electronic Measurement and Instrumentation	Dhanpat Rai and Co (P) Ltd	2004

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	D. Patranabis	Sensors and Transducers	Prentice Hall of India	1999
2	John P. Bentley	Principles of Measurement Systems	Pearson Education	2000
3	Hermann K.P. Neubert	Instrument Transducers	Oxford University Press	2000
4	D.V.S Murthy	Transducers and Instrumentation	Prentice Hall of India	2001
5	S. Ranganathan	Transducer Engineering	Allied Publishers Pvt. Ltd	2003
6	Al Sutko and J.D. Faulk	Industrial Instrumentation	Vikas Publications Delhi	1996

16BEEE404 PULSE AND DIGITAL LOGIC CIRCUITS L T P C 3 0 0 3

Course Objectives

- To study characteristics; realize circuits; design for signal analysis using Op–amp ICs.
- To study the applications of Op–amp.
- To introduce the fundamentals of Digital Circuits, combinational and sequential circuits.
- To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.
- To study the implementation of combinational circuits
- To study the design of various synchronous and asynchronous circuits

Course Outcomes

At the end of the course the students will be able to understand the characteristics ,applications of operational amplifier and importance of analysis and design of digital circuits.

1. Obtain discrete representation of LTI systems.
2. Analyze stability of open loop and closed loop discrete-time systems.
3. Design and analyze digital controllers.
4. Design state feedback and output feedback controllers.
5. Analysis the real time application of digital controllers.
6. Analysis the real time application of State space approach

UNIT I INTRODUCTION AND CHARACTERISTICS OF OPAMP 9

Ideal OP-AMP characteristics-Non ideal characteristics- DC characteristics- Input bias current-Input bias voltage-Input offset current-Thermal drift.AC characteristics –Frequency response-Frequency compensation techniques- Slew rate. Basic applications of op-amp – summer, differentiator and integrator.

UNIT II APPLICATIONS OF OPAMP 9

Instrumentation amplifier, first and second order active filters, V/I and I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

UNIT III NUMBER SYSTEM AND BOOLEAN ALGEBRA 9

Review of number system; types and conversion, codes. Boolean algebra: De–Morgan’s theorem, switching functions and simplification using K–maps and Quine McCluskey method.

UNIT IV COMBINATIONAL CIRCUITS 9

Design of Logic gates. Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates and multiplexers.

UNIT V SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Flip flops – SR, D, JK and T. Design of synchronous sequential circuits – Counters, state diagram; state reduction and state assignment. Analysis of asynchronous sequential machines, state assignment and asynchronous design problem – Hazards.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Roy Choudhary, D, and Sheil B Jani	Linear Integrated Circuits	New Age Publishing, New Delhi.	2003
2	Morris Mano, M.	Digital Logic and Computer Design	Prentice Hall of India, New Delhi.	2002
3	Charles H Roth	Fundamentals Logic Design	Jaico Publishing, New Delhi.	2002

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jacob Millman, Christos C Halkias	Integrated Electronics - Analog and Digital circuits system	Tata McGraw Hill, New Delhi.	2003
2	Floyd, L.	Digital Fundamentals	Pearson Education, New Delhi.	2003
3	John F Wakerly	Digital Design Principles and Practice	Pearson Education, New Delhi.	2002

16BEEE405A BASIC THERMODYNAMICS AND ENERGY CONVERSION DEVICES
L T P C 3 0 0 3

Course Objectives

- Basic concepts and first law of thermodynamics
- Second law of thermodynamics
- Gas power cycles
- Refrigeration and Air conditioning systems.
- Different modes of Heat Transfer
- Different modes of energy conservation

Course Outcomes

At the end of the course the student will be able to understand the following

- Basic laws of thermal engineering
- Concepts of Entropy and heat engines of the closed system
- To gain experience in gas cycles and its performance
- Need of R&AC in various climatic conditions and its factors
- To gain knowledge of all heat transfer systems
- To understand the application of it.

UNIT I - BASIC CONCEPTS OF THERMODYNAMICS 9

System - Ideal gas laws - Perfect gas, thermodynamic equilibrium, property, state, process, path and cycle, zeroth law of thermodynamics - Point and path functions - Quasi static process, reversible and irreversible processes. First law of thermodynamics, energy, work, heat, PMM1, applications of First law to closed and open systems. Pressure - Volume diagrams, steady flow process, application of steady flow energy equation.

UNIT II - SECOND LAW OF THERMODYNAMICS 9

Limitations of first law, statements of second law of Thermodynamics, PMM II, Clausius inequality, heat engine, heat pump, refrigerator, Carnot cycle, Carnot theorem, entropy, temperature - Entropy diagram, entropy changes for a closed system. Third law of thermodynamics.

UNIT III - GAS POWER CYCLES 9

Otto, Diesel, dual cycles: Efficiency, mean effective pressure, comparison. Introduction to Brayton cycle - Reheat and regeneration.

UNIT IV - REFRIGERATION AND AIR-CONDITIONING 9

Vapour compression refrigeration: Working principle, simple problems in vapour compression refrigeration cycle with sub-cooling and superheating. Introduction to vapour absorption system.

Air-conditioning - Factors affecting air-conditioning, types of air-conditioning - Summer, winter, window and central air-conditioning.

UNIT V - HEAT TRANSFER **9**

Modes of heat transfer, steady state heat conduction - Plane wall, composite wall, hollow and composite cylinders. Overall heat transfer coefficient. Convection, empirical relations. Laws of radiations - Concept of block body - Radiant heat transfer between two surfaces. TOTAL 60 hours

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rajput.R.K	Thermal Engineering	Lakshmi Publications	2010
2	Yunus A.Cengel	Introduction to Thermodynamics & Heat Transfer	McGraw Hill Higher-Education	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kothandaraman.C.P, Domkundwar.S, Anand Domkundwar	A Course in Thermal Engineering	Dhanpat Rai & Co. (P) Ltd.	2010
2	Nag.P.K	Engineering Thermodynamics	Tata McGraw Hill, New Delhi	2008
3	Sarkar.B.K	Thermal Engineering	3rd Edition, Tata McGraw Hill, New Delhi	-

16BEEE405B ENGINEERING MATERIALS L T P C 3 0 0 3

COURSE OBJECTIVE

Students will learn

- various types of materials
- Ferrous metals and their properties
- Non ferrous metals and their properties
- Ceramic materials and their properties
- Polymers and composites
- the applications of it in engineering and technology

COURSE OUTCOMES

- At the end of the course the student will be able to understand the concepts of engineering materials
- To acquire the difference need of ferrous and non ferrous materials in various applications
- To understand the properties of ceramic and glasses in real time need
- Future requirement of microstructural activities and its need in real time world
- Valued the mechanical behaviour of various composites
- Observe the temperature deviation in various metals

UNIT I INTRODUCTION TO ENGINEERING MATERIALS 9

Atomic bonding and Crystal structure of engineering materials. Chemical and Physical properties of engineering materials. Mechanical Properties and Behaviours of Materials – Stress - Strain Relationships, Tensile Strength, Hardness, Impact Strength, Fatigue & Stress Rupture, Creep & Stress Rupture, Comparison of Material Properties

UNIT II FERROUS METALS AND THEIR PROPERTIES 9

Iron - Carbon Equilibrium Diagram, Carbon Steel & AISI Numerical Identification Systems. Properties, processing and applications of Alloy Steel, Tool Steel, Stainless Steel. General characteristics of metal alloys, Fundamentals of heat treatment and the use of TTT diagrams. Production, forming, and joining of metals.

UNIT III NONFERROUS METALS 9

Properties, processing and applications of Aluminum, Magnesium & Titanium, Copper and its Alloys, Low Melting Temperature Alloys. Production, forming, and joining of metals. The Chemistry and prevention of corrosion

UNIT IV CERAMIC MATERIALS 9

Microstructural features of ceramics and glasses - Mechanical properties of ceramics and glasses - Production, forming, and joining of ceramics

UNIT V POLYMERS AND COMPOSITES 9

Microstructural features of polymers and composites - Mechanical behaviour of polymers and composites - Production, forming, and joining of polymers and composites.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ganesan.S and Baskar.T	Engineering Physics II	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William D Callister Jr	Material Science and Engineering-An Introduction	John Wiley ans Sons Inc., , New York,	2013
2	James F Shackelford	Introduction to materials Science for Engineers	Macmillan Publication Company, New York	2014
3	Charles Kittel	Introduction to Solid State Physics	John Wiley & sons, Singapore.	2005

WEBSITES

1. www.nptel.ac.in
2. www.physicsclassroom.com
3. www.oyc.yale.edu
4. www.physics.org

16BEEE411 ELECTRICAL MACHINES LABORATORY –II L T P C 0 0 3 2

Course Objectives

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skills
- To study the operation of synchronous motor on infinite bus for different excitation condition
- To Study the performance of single phase induction motor by conducting direct and indirect testing
- To study the performance of three phase induction motor by conducting direct and indirect testing
- To study the importance of various components in alternators
- To study the importance need of ZPF methods

Course Outcomes

1. Compare the different indirect testing methods to predetermine the voltage regul salient and non-salient pole alternator
2. Determine the positive, negative and zero sequence impedance of alternators
3. Analyze the operation of synchronous motor on infinite bus for different excitati
4. Assess the performance of three phase induction motor by conducting direct and
5. Assess the performance of single phase induction motor by conducting direct an
6. Choose the appropriate induction motor starter for various industrial and comme

LIST OF EXPERIMENTS

1. Regulation of Alternator by EMF and MMF Methods
2. Load test on three phase Alternator
3. Regulation of salient pole Alternator by Slip Test
4. Regulation of Alternator by ZPF method
5. Parallel operation of alternator with bus bar
6. V and Inverted V curves of Synchronous Motor
7. Equivalent Circuit of three phase Induction Motor
8. Load Test on three phase Induction Motor
9. Performance characteristics of three phase Induction Motor by Circle Diagram
10. Load Test on single phase Induction Motor
11. Speed control of Induction Motor
12. Study of different types of starting of Induction Motors

16BEEE412 **SCIENTIFIC COMPUTING LAB** **L T P C 0 0 2 2**

Course Objectives:

- To introduce the scientific computing, covering some important aspects of solving algebraic equations, IVP, BVP.
- To implement the methods using the spread sheet in Excel
- To implement solution of numerical integration
- To implement solution of initial value problems governed by ODE
- To implement solution of BVP governed by PDE
- To implement solution of transcendental equation.

Course Outcomes:

- To develop analytical skills for solving different engineering problems.
- To understand the concepts of Matrices, sequences and series.
- To solve problems by applying Differential Calculus and Differential equations.
- To analysis initial value problems governed by ODE
- To analysis BVP governed by PDE
- To analysis transcendental equation.

LIST OF EXPERIMENTS

1. Finding solution of Transcendental equation
    i) Newton – Raphson Method
    ii) Bisection method
    iii) Iterative method by reducing the equation to the form x= f(x)

2. Finding the dominant eigenvalue and eigenvector by power method

3. Numerical integration
    i) Gauss 2 point and 3 point formulae
    ii) Trapezoidal method
    iii) Simpson's 1/3 rule

4. Solution of initial value problems governed by ODE
    i) Runge - Kutta 4^{th} order method
    ii) Modified Euler's method
    iii) Milne's method
    iv) Adam – Bashforth method

5. Solution of BVP governed by PDE
    i) Laplace Equation
    ii) One – dimensional heat equation
        a) Explicit method : Bender – Schmidt's method
        b) Implicit method : Crank - Nicolson's method
    iii) One dimensional wave equation
        Implicit method

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Steven C. Chapra, Raymond P. Canale	Numerical Methods for Engineers	McGraw - Hill Pub. Co. Ltd	2014
2	Curtis F. Gerald and Patrick O. Wheatley	Applied Numerical Analysis	Pearson Education, South Asia	2009

16BEEE413 MEASUREMENTS AND INSTRUMENTATION LABORATORY

L T P C 0 0 3 2

Course Objectives

- To deal with measurement of inductance and capacitance.
- To deal with measurement of resistance.
- To deal with calibration of current transformer
- To deal with calibration of single phase energy meter.
- To get the knowledge of two watt meter method to measure 3 phase power and power factor
- To deal with calibration of voltmeter, ammeter and wattmeter.

Course Outcomes

- Learn units, dimensions and standards.
- Learn basics of different types of measuring instruments to measure different electrical quantities
- Apply their knowledge to measure electrical quantities using standard analog and digital measuring instruments
- basic knowledge of measurement systems towards measurements, including error analysis, interpretation, experimental uncertainty, calibration, etc.
- To apply basic concepts of measurement systems with electrical signals, including signal conditioners (gain, attenuation), indicating and recording devices
- Measure different electrical parameters using conventional bridges and acquire data through digital measuring instruments and interpret the data.

LIST OF EXPERIMENTS

1. Calibration of Pressure and Displacement Transducer.
2. Measurement of inductance & capacitance.
3. Measurement of resistance using wheatstone bridge
4. Calibration of current transformer and Study of instrument transformers.
5. Calibration of single phase energy meter.
6. Conversion of Galvanometer into Voltmeter and Ammeter.
7. Measurement of three phase power and power factor using two wattmeter method.
8. Measurements of resistance using Kelvin's bridge.
9. Calibration of Voltmeter, Ammeter and Wattmeter
10. Study of phantom loading.
11. Study of Smart Energy Meter.

**16BEEE451*	ELECTRICITY STANDARDS L T P C	1 0 0 –**

Course Objectives

- Understanding the basic knowledge of electricity standards.
- Gain information regarding various electricity equipment standards.
- Learn the battery norms and standards
- Learn the harmonic norms and standards

Course Outcomes

The Students will able to

- Acquire knowledge on various Indian and International standards.
- Understand the standards used for transformer and their sizing.
- Understand the information regarding various electricity equipment standards.
- Understand the battery norms and standards
- Understand the harmonic norms and standards
- Analysis the real time implementation

UNIT I INDIAN AND INTERNATIONAL STANDARDS

Indian Standards – IS – International Standards – ANSI – IEEE – IEC – Transformers – IEC 60076 & IS 2026, Rotating Machines – IEC 60034 & IS 34.

UNIT II STANDARDS FOR SIZING

Battery – IEEE 1115 – Instrument Transformers – IEC 60044 & IS 2705 – Short Circuit study – IEC 60909 & IEC 61363 – Harmonic Study – IEEE 519.

REFERNCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Robert J. Alonzo	Electrical Codes, Standards, Recommended Practice and Regulations : An Examination of Relevant Safety Considerations	P.E. ISBN: 978-0-8155-2045-0	-
2	Donald Fink, H. Wayne Beaty	Standard Handbook for Electrical Engineers	15^{th} Edition, ISBN: 0071441468	2006

SEMESTER V

16BEEE501 **POWER ELECTRONICS** **L T P C 3 0 0 3**

Course Objectives

- To introduce the application of electronic devices for conversion, control and conditioning of electric power.
- To get an overview of different types of power semi–conductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers and basic topologies of DC–DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction methods.
- To know the practical application for power electronics converters in conditioning the power supply.
- To get the knowledge of real time application of it

Course Outcomes

At the end of this course students will demonstrate the ability to

1.Understand the differences between signal level.

2. Understand the differences between power level devices.

3.Analyze controlled rectifier circuits.

4.Analyze the operation of DC-DC choppers.

5.Analyze the operation of voltage source inverters.

6.Understand different modulation techniques.

UNIT I POWER SEMI CONDUCTOR DEVICES 9

Silicon Controlled Rectifier(SCR),TRIAC,DIAC - Structure, V-I Characteristics- Two Transistor Model, Structure and characteristics of Power Diode, Power BJT, MOSFET, IGBT, GTO, Comparisons of Power Semiconductor Devices-Firing circuits.

UNIT II PHASE CONTROLLED CONVERTERS 9

Operation and Analysis of Single Phase Half and Fully Controlled Converter using R, RL load- Three Phase Half and Fully Controlled Converter using R, RL load-Effects of Source Impedance, Dual converter (only Block diagram approach).

UNIT III CHOPPERS 9

Step-Down and Step-up Choppers-Control Strategies of Chopper- Multi Quadrant Operation of Chopper- Switched Mode Regulators: Buck, boost, Buck–Boost Regulator- Applications of DC Chopper.

UNIT IV DC-AC CONVERTER 9

Single phase half bridge and full bridge inverters - three phase bridge inverters (120 and 180 degree modes of operation)- Multilevel inverter (block diagram Approach only)- PWM techniques- single PWM, multiple PWM, Sinusoidal PWM, Current source inverter(CSI).

UNIT V AC-AC CONVERTER AND APPLICATIONS 9

Single phase cyclo converter, Single phase AC voltage controller- Applications- Uninterrupted Power Supply topologies (On line and Off line) – Flexible AC Transmission Systems –Unified Power Flow Controller– HVDC Transmission.

TEXT BOOKS **TOTAL: 45 HOURS**

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Muhammad H Rashid	Power Electronics: Circuits, Devices and Applications	Pearson Education New Delhi	2004
2	Ned Mohan, Tore M Undeland, William P Robbins	Power Electronics: Converters, Applications and Design	John Wiley and sons, New Delhi	2003
3	Singh. M.D and Kanchandani	Power Electronics	Tata McGraw Hill &Hill Publication Company limited, NewDelhi	2002

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Bimal K Bose	Modern Power Electronics and AC Drives	Pearson Education , New Delhi	2003
2	Andrzej M. Trzynadlowski	Introduction to Modern power	Wiley India Pvt. Ltd	2012
3	Robert W Erickson and Dragan Maksimovic	Fundamentals of Power Electronics	Springer, New Delhi	2006

WEBSITE

- http://nptel.iitm.ac.in/courses/Webcoursecontents/IITKharagpur/PowerElectronics/PDF/L–1(SSG)(PE)((EE)NPTEL).pdf

16BEEE502 POWER SYSTEM ANALYSIS L T P C 3 2 0 4

Course Objectives

- To become familiar with different aspects of modeling of components and system
- To study different methods of analysis of power system for power system planning and operation.
- To model steady-state operation of large sized power system
- To understand the power flow problem using efficient numerical methods suitable for computer application.
- To model and analyses power systems under abnormal (fault) conditions.
- To model and analyses the dynamics of power system for small signal and large signal disturbances and to design the system for enhancing stability.

Course Outcomes

At the end of this course, students will demonstrate the ability to
1.Use numerical methods to analyze a power system in steady state.
2. Understand stability constraints in a synchronous grid.
3. Understand methods to control the voltage, frequency.
4. Understand methods to control the power flow.
5. Understand the monitoring and control of a power system.
6. Understand the basics of power system economics

UNIT I THE POWER SYSTEM – AN OVERVIEW AND MODELING 12
Modern Power System - Basic Components of a power system - Per Phase Analysis Generator model - Transformer model - line model. The per unit system -Change of base.

UNIT II POWER FLOW ANALYSIS 12
Introduction - Bus Classification - Bus admittance matrix, Nodal method, Singular transformation method without mutual coupling - Solution of non-linear Algebraic equations - Gauss Seidal method - Newton Raphson method - Fast decoupled method - Flow charts and comparison of the three methods.

UNIT III FAULT ANALYSIS - BALANCED FAULT 12
Introduction – Balanced three phase fault – short circuit capacity – systematic fault analysis using bus impedance matrix – algorithm for formation of the bus impedance matrix.

UNIT IV FAULT ANALYSIS – SYMMETRICAL COMPONENTS AND 12
UNBALANCED FAULT
Introduction – Fundamentals of symmetrical components – sequence impedances – sequence networks – single line to ground fault – line fault - Double line to ground fault – Unbalanced fault analysis using bus impedance matrix.

UNIT V POWER SYSTEM STABILITY 12
Basic concepts and definitions – Rotor angle stability – Voltage stability – Mid Term and Long

Term stability – Classification of stability – An elementary view of transient stability – Equal area criterion – Reponses to a short circuit fault- factors influencing transient stability – Numerical integration methods – Euler's method – modified Euler's method – Runge Kutta methods.

TOTAL: 60 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Hadi Saadat	Power System Analysis	Tata McGraw Hill Publishing Company, New Delhi.	2002
2	Olle I Elgerd	Electric Energy Systems Theory – An Introduction	Tata McGraw Hill, New Delhi.	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kundur, P	Power System Stability and Control	Tata McGraw Hill Publications,	2010
2	Nagrath, I. J. and Kothari, D. P	Modern Power System Analysis	Tata McGraw Hill Publications, New Delhi.	2009
3	Duncan Glover, J. and Mulukutla. S Sarma	Power System Analysis and Design	CL-Engineering. Hyderabad, India.	2001

WEBSITE

http://www.powerqualityanddrives.com

16BEEE503 CONTROL SYSTEM ENGINEERING L T P C 3 2 0 4

Course Objectives

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems.
- To introduce stability analysis
- To introduce state variable representation of physical systems
- To introduce the design of compensators.

Course Outcomes

1. Derive the transfer function of electrical and mechanical systems using various reduction techniques
2. Analyze the response of the control system by investigating steady state error and time domain specifications
3. Construct the root locus to find the stability of the system and explain the effects of different types of controller
4. Construct the frequency response of the system using various plots and correlate the time and frequency domain specifications and effect of compensation
5. Design the different types of compensators using frequency response plots to stabilize the control system
6. Explain the state variable representation of physical systems with the effects of state feedback its assessment for linear-time invariant systems.

UNIT-I CONTROL SYSTEM MODELLING 12

System concept, differential equations and transfer functions. Modeling of electric systems, translational and rotational mechanical systems, Simple electromechanical systems. Block diagram representation of systems – Block diagram reduction methods – Closed loop transfer function, determination of signal flow graph. Mason's gain formula – Examples.

UNIT-II TIME DOMAIN ANALYSIS 12

Test signals – time response of first order and second order systems – time domain specifications – types and order of systems – generalized error co-efficient – steady state errors – concepts of stability – Routh-Hurwitz stability – root locus.

UNIT-III FREQUENCY DOMAIN ANALYSIS 12

Introduction – correlation between time and frequency response – stability analysis using Bode plots, Polar plots, Nichols chart and Nyquist stability criterion – Gain margin – phase margin.

UNIT-IV COMPENSATORS 12

Realization of basic compensators – cascade compensation in time domain and frequency domain and feedback compensation – design of lag, lead, lag-lead compensator using Bode plot. Introduction to P, PI and PID controllers.

UNIT-V CONTROL SYSTEM COMPONENTS AND APPLICATION OF CONTROL SYSTEMS 12

Stepper motors – AC servo motor – DC servo motor – Synchros – sensors and encoders – DC tachogenerator – AC tachogenerator – Hydraulic controller – Pneumatic controller – Typical application of control system in industry.

TOTAL: 60 HOURS

TEXT BOOKS

S.NO.	Author(s) Name	Title of the Book	Publisher	Year of publication
1	Ogata.K	Modern Control Engineering	Prentice Hall of India, New Delhi	2003
2	Nagrath & Gopal	Control System Engineering	New Age International Edition, New Delhi.	2002

REFERENCES

S.NO.	Author(s) Name	Title of the Book	Publisher	Year of publication
1	Benjamin.C.Kuo	Automatic Control Systems	Prentice Hall of India, New Delhi	2002
2	Norman S. Nise	Control System Engineering	Wiley Publication, 6th edition	2010

16BEEE511 POWER ELECTRONICS LABORATORY L T P C 0 0 3 2

Course Objectives

- To study the characteristics of switching devices and its applications in rectifier inverter, chopper and resonant converter.
- To study about power electronic circuits
- To study about industrial control of power electronic circuits
- To study about the various characteristic of SCR and TRIAC
- To study about the various characteristic of PWM inverter
- To study power electronic circuits for different loads

Course Outcomes

At the end of this course, students will demonstrate the ability to

1. The students will be able to demonstrate the all power semiconductor devices.
2. To expose students to operation and characteristics of power semiconductor devices and passive components, their practical application in power electronics.
3. To provide a practical exposure to operating principles, design and synthesis of different power electronic converters.
4. To introduce students to industrial control of power electronic circuits as well as safe electrical connection and measurement practices.
5. Able to analyze power electronics circuits
6. Able to apply power electronic circuits for different loads

LIST OF EXPERIMENTS

1. Demonstrate the characteristics of SCR.
2. Demonstrate the characteristics of MOSFET.
3. Demonstrate the characteristics of IGBT.
4. Design and Simulation studies on single half and fully controlled convertor using R, RL load.
5. Design and simulation studies on boost convertor using power semiconductor devices..
6. Design and Simulation studies on buck convertor using power semiconductor devices..
7. Design and Simulation studies on single phase invertors using power semiconductor devices.
8. Implementation of single phase half controlled converter using SCR.

9. Implementation of single phase fully controlled convertor using SCR

10. Implementation of DC-DC Boost convertor using MOSFET.

11. Implementation of DC-DC Buck convertor using MOSFET.

12. Implementation of three phase induction motor using PWM inverter

16BEEE512 ANALOG AND DIGITAL CIRCUITS LABORATORY L T P C 0 0 3 2

Course Objectives

- To understand Basic Analog Circuits and their applications using Active Devices
- To learn basic function of single stage amplifier, multistage amplifier and power Amplifier and their working principle.
- To understand the Boolean functions, Adder and subtractor circuits.
- To understand Basic Analog Circuits and their applications using Active Devices
- To understand basic construction of feedback circuits and their application in Oscillators
- Understand basic amplifier and oscillator circuits and their application in analog circuits.

Course Outcomes (COs)

1. Determine the output wave forms of Full Wave Rectifiers with and without filters.
2. Draw the equivalent circuit of MOSFET and sketch the V-I characteristics.
3. Design the Darlington amplifier and develop the circuit.
4. Compare the theoretical and practical frequency response of Wein bridge oscillators.
5. Design of astable and Monostable multivibrators for generation of different waveforms
6. Design of clipper and clamper.

LIST OF EXPERIMENTS

1. Verification of truth table of Logic Gates and Flip Flops.
2. Implementation of Boolean Functions, Adder and Subtractor circuits.
3. a. Code converters, Excess 3, 2’s Complement, Binary to gray code, Parity generator and parity checker using suitable ICs.
   b. Encoders and Decoders.
4. Counters: Design and implementation of 4–bit modulo counters as synchronous and asynchronous types using FF IC’s and specific counter IC.
5. Shift Registers: Design and implementation of 4–bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC’s.
6. Multiplexer and De–multiplexer (4:1, 8:1 and 1:4, 1:8)
7. Study of NE/SE 555 timer in astable and Monostable operation.
8. Inverting and non–inverting amplifiers, Adder and comparator using Op–Amps.
9. Integrator and Differentiator using Op–Amps.
10. Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated ICs.
11. Voltage to frequency characteristics of NE/ SE 566 VCO IC.
12. Frequency multiplication using NE/SE 565 PLL IC.

16BEEE513 CONTROL SYSTEM ENGINEERING LAB0RATORY L T P C 0 0 3 2

Course Objectives

Students will learn

- To provide a platform for understanding the basic concepts of linear control theory and its application to practical systems
- The transfer function of DC Shunt Motor.
- To find the frequency response of different compensators
- To find the step response of P Controller.
- To find the step response of PI & PID Controller.
- To identify the type of damping from the given Characteristic equation.
- The speed control of Dc motor..

Course Outcomes (COs)

- Determine the transfer function of DC Shunt Motor.
- Ability to find the frequency response of different compensators
- Ability to find the step response of P Controller.
- Ability to find the step response of PI & PID Controller.
- Ability to identify the type of damping from the given Characteristic equation.
- Evaluate the speed control of Dc motor.

LIST OF EXPERIMENTS

1. Transfer function of separately Excited DC generator.
2. Transfer function of armature controlled DC shunt motor.
3. Transfer function of field controlled DC shunt motor.
4. Transfer function of AC servomotor.
5. Step response of P, PI, and PID controllers.
6. Identification of type of damping from the given characteristic equation of second order system.
7. Simulation of step response & step response of second order under damped system using ‘C’ and MATLAB simulink.
8. Frequency response of Lead compensator network.
9. Frequency response of Lag compensator network.
10. DC Motor speed control.

16BEEE552A* **CONTROL AND MAINTENANCE OF ELECTRICAL APPLIANCES**
L T P C 0 0 1 0

Course Objectives

- Make use of various types of control circuit elements like industrial switches, relays, timers, solenoids, contactors and interlocking arrangement.
- Construct various types of automatic starters for electrical motors.
- Construct control circuits for braking, jogging, reversing operations.
- To make use of PLCs for control applications.
- To study PLCs for controlling the motors.
- To study the single phase preventer circuits using PLC

Course Outcomes

The students will be able to

- Analysis the types of automatic starters for electrical motors.
- Analysis control circuits for braking, jogging, reversing operations.
- Analysis PLCs circuit for control applications.
- Program PLCs for controlling the motors.
- Analysis the single phase preventer circuits using PLC
- Analysis various types of control circuit elements like industrial switches, relays, timers, solenoids, contactors and interlocking arrangement.

LIST OF EXPERIMENTS

1. Conduct acidity test on transformer oil.
2. Wire and test the control circuit for DOL starter and jogging in cage motor.
3. Wire and test the control circuit for automatic and semi-automatic star-delta starter.
4. Wire and test the control circuit for dynamic braking of cage motor.
5. Wire and test the control circuit for Synchronization of Three Phase Alternators by bright lamp method.
6. Test the working of single phase preventer.
7. Wire and test the DOL starter using PLC.
8. Wire and test the Star-Delta starter using PLC.
9. Wire and test the control circuit for jogging, forward and reverse operations using PLC.
10. Wire and test the single phase preventer using PLC.

16BEEE552B* PROGRAMMABLE LOGIC CONTROLLER (PLC) L T P C 1 0 0 –

Course Objectives

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To gain the knowledge of storage techniques in PLC
- To acquire the knowledge about how to handle the data and functions
- To study about flow charts of ladder
- To understand the principles of spray process system

Course Outcome

At the end of the course the student will be able

- To understand the registers and functions in PLC and they are able to do the program.
- To acquire the knowledge of storage techniques in PLC
- Students know how to handle the data and functions
- Students known about advanced controller in PLC applications
- Students gather real time industrial application of PLC
- Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION

PLC- Introductions to the purpose, functions - Identification of various components of the PLC - Typical areas of Application- operations of the PLC in industrial applications.

UNIT II PLC LADDER LOGIC PROGRAMMING

Basic ladder logic symbols – Basic Steps in Ladder logic diagram - Ladder logic evaluation - Start/stop logic – Ladder Logic for simple applications.

UNIT III APPLICATIONS

Ladder logic for motor control - Star Delta PLC Ladder Diagram - Ladder Diagram for DOL Motor Starter.

SEMESTER VI

16BEEE601 SOLID STATE DRIVES L T P C 3 0 0 3

Course Objectives

1. To study and understand the operation of electric drives controlled from a power electronic converter and to introduce the design concepts of controllers.
2. To understand the stable steady–state operation and transient dynamics of a motor–load system.
3. To study and analyze the operation of the converter/chopper fed dc drive and to solve simple problems.
4. To study and understand the operation of both classical and modern induction motor drives.
5. To understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.
6. To analyze and design the current and speed controllers for a closed loop solid–state d.c motor drives.

Course Outcomes

At the end of the course the students will be able to

1. Understand the concept of drive characteristics and various converters used for drives.
2. Understand the operation of electric drives controlled from a power electronic converter.
3. Understand the stable steady–state operation and transient dynamics of a motor–load system.
4. Analyze the operation of the converter/chopper fed dc drive and to solve simple problems.
5. Understand the operation of both classical and modern induction motor drives.
6. Understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.

UNIT I DRIVE CHARACTERISTICS 9

Concept of Electric Drives –parts of electrical Drives – Dynamics of electric drive – torque equation – Selection of power rating of motor-Four quadrant operation of electric drives– Loads with rotational and translational motion – Steady state stability- components of load torques-Modes of operation and Characteristics.

UNIT II CONVERTER AND CHOPPER FED DC MOTOR DRIVES 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive – continuous and discontinuous conduction -Chopper controlled DC drives - Time ratio control and current limit control - Single, two and four quadrant operations.

UNIT III INDUCTION MOTOR DRIVES 9

Three phase induction motor drives-AC Voltage controlled drives- variable frequency control –V/f control -Slip Power recovery schemes- rotor frequency control -VSI fed induction motor drive and CSI fed induction motor drive- Basic of vector control.

UNIT IV SYNCHROUNOUS MOTOR DRIVES 9

V/f control and self control of synchronous motor: Margin angle control and power factor control - permanent magnet synchronous motor –Sinusoidal and Trapezoidal types, closed loop control of synchronous motor, Basics of Traction drives.

UNIT V CONTTROLLER FOR DRIVES 9

Transfer function for DC motor / load and converter – closed loop control with current and speed feedback , design of controllers; current controller and speed controller-converter selection and Characteristics.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gopal K Dubey	Fundamentals of Electric Drive	Narosa Publishing house, II Edition	2011
2	B.K Bose	Modern Power Electronics and AC Drives	Pearson Education, 3rd Reprint	2002

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	S.K. Pillai	A First course on Electrical Drives	Wiley Eastern Limited- Reprint of 3rd edition	2014

WEBSITE

http://nptel.iitm.ac.in/courses/Webcourse–contents/IIT–Delhi/Industrial Drives/index.htm

16BEEE602 POWER SYSTEM OPERATION AND CONTROL L T P C 3 0 0 3

Course Objectives

- To become familiar with different aspects of modeling of components and system
- To study different methods of analysis of power system for power system planning and operation.
- To model steady-state operation of large sized power system
- To understand the power flow problem using efficient numerical methods suitable for computer application.
- To model and analyze power systems under abnormal (fault) conditions.
- To model and analyze the dynamics of power system for small signal and Large signal disturbances and to design the system for enhancing stability.

Course Outcomes

At the end of this course, students will demonstrate the ability to
1.Understand the concepts of power systems.
2. Understand the various power system components.
3. Evaluate fault currents for different types of faults.
4. Understand the generation of over-voltages and insulation coordination.
5. Understand basic protection schemes.
6. Understand concepts of HVDC power transmission and renewable energy generation.

UNIT I INTRODUCTION 9

System load variation: System load characteristics, load curves - daily, weekly and annual, load-duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control: Governor Control, LFC, EDC, AVR, system voltage control, security control.

UNIT II REAL POWER - FREQUENCY CONTROL 9

Fundamentals of speed governing mechanism and modeling: Speed-load characteristics – Load sharing between two synchronous machines in parallel; concept of control area, LFC control of a single-area system: Static and dynamic analysis of uncontrolled and controlled cases, Economic Dispatch Control. Multi-area systems: Two-area system modeling; static analysis, uncontrolled case; tie line with frequency bias control of two-area system derivation.

UNIT III REACTIVE POWER–VOLTAGE CONTROL 9

Typical excitation system, modeling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between voltage, power and reactive power at a node; methods of voltage control: Injection of reactive power. Tap-changing transformer, numerical problems - System level control using generator voltage magnitude setting, tap setting of OLTC transformer and MVAr injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 9

Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost. Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ-iteration method. (No derivation of loss coefficients) Base point and participation factors. Economic dispatch controller added to LFC control.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Energy control centre: Functions – Monitoring, data acquisition and control. System hardware configuration – SCADA and EMS functions: Network topology determination, state estimation security analysis and control. Various operating states: Normal, alert, emergency, inextremis and restorative. State transition diagram showing various state transitions and control strategies.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Olle I Elgerd	Electric Energy Systems Theory – An Introduction	Tata McGraw Hill Publishing Company Ltd, New Delhi 2nd Edition,.	2003
2	Allen J Wood and Bruce F Wollenberg	Power Generation, Operation and Control	John Wiley and Sons, Inc..	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kothari, D.P. and Nagrath, I.J.,	Modern Power System Analysis	Tata McGraw Hill Publishing Company Limited, New	2003
2	Grigsby, L.L	The Electric Power Engineering Hand Book	CRC Press and IEEE Press	2001

WEBSITE

http://www.cdeep.iitb.ac.in/nptel/ElectricalEngineering/PowerSystemOperationandControl/CourseObjective.html

16BEEE603A MICROPROCESSOR AND MICROCONTROLLER L T P C 3 0 0 3

Course Objectives

- To study the Architecture of 8085 and 8051.
- To study the addressing modes and instruction set of 8085 and 8051.
- To introduce the need and use of Interrupt structure.
- To develop skill in simple program writing.
- To introduce commonly used peripheral/interfacing ICs and Advanced Processors.
- To study the advanced processors

Course Outcomes

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1. At the end of this course, students will demonstrate the ability to Explain about the architecture of 8051 microprocessor, pin configuration, interrupts and the timing diagram of 8085
2. Develop the assembly language program using mnemonics and corresponding machine code based on architecture of 8051 microprocessor
3. Define the 8051 microcontroller with its architecture, pinouts, memory organization, interrupts and compare the programming concepts with 8051
4. Illustrate the interfacing of 8085 with various peripheral devices for transmission, reception and control of data
5. Make use of the data conversion technique such as ADC and DAC and to interface with 8085 processor and 8051 microcontroller
6. Develop the microcontroller assembly language program for various real time applications

UNIT I 8085 PROCESSOR 9

Architecture – Functional block diagram – Signals – Memory interfacing – I/O ports and data transfer concepts – Timing Diagram – Interrupt structure.

UNIT II INSTRUCTION SETS 9

Instruction format and addressing modes – Assembly language format – Data transfer, data manipulation and control instructions.

UNIT III PERIPHERAL INTERFACING 9

Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279 Key board / display controller and 8253 Timer/ Counter – Interfacing with 8085 – A/D and D/A converter interfacing.

UNIT IV 8051 MICRO CONTROLLER 9

Architecture – Functional block diagram – Instruction format and addressing modes – Interrupt structure – Timer –I/O ports – Serial communication.

UNIT V ADVANCED PROCESSORS 9

Architecture of PIC 16C7X MICROCONTROLLER - memory organization – Addressing modes – Instruction set – Introduction to TMSLF2407 DSP controller and ARM Processors.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gaonkar, R. S.	Microprocessor Architecture, Programming, and Applications with the 8085	Wiley Eastern Ltd., New Delhi.	2002
2	Muhammad Ali Mazidi and Janice Gilli Mazidi	The 8051 Micro Controller and Embedded Systems	Pearson Education , New Delhi.	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Fernando E Valdes–Perez and Ramon Pallas–Areny	Microcontrollers: Fundamentals and Applications with PIC	CRC , Colorado, USA	2009
2	William Routt	Microprocessor Architecture, Programming and Systems Featuring the 8085	Delmar Cengage Learning, New York	2006
3	David Calcutt, Frederick Cowan, and Hassan Parchizadeh	8051 Microcontrollers: An Applications Based Introduction	Newnes,United States	2004
4	John B. Peatman	Design with PIC Microcontrollers	Pearson Education, Asia	2004
5	Hamid A. Toliyat, Steven Campbell	DSP based Electromechanical Motion Control	CRC Press, USA	2003

WEBSITES

1. http://ce.kashanu.ac.ir/sabaghian/micro/Micro_Spring2005.htm
2. http://www.berk.tc/micropro/microlinks.htm
3. http://www.arm.com/products/processors/instruction-set-architectures/index.php

16BEEE603B MICROCONTROLLER BASED SYSTEM DESIGN L T P C 3 0 0 3

Course Objectives

- To expose the students to the fundamentals of microcontroller based system design.
- To teach I/O and RTOS role on microcontroller.
- To impart knowledge on PIC Microcontroller based system design. To introduce Microchip PIC 8 bit peripheral system Design
- To give case study experiences for microcontroller based applications
- To study interface systems for 8051

Course Outcomes

- At the end of the course the student will be able to understand the concepts of PIC
- Define the 8051 microcontroller with its architecture, pinouts, memory organization, interrupts and compare the programming concepts with 8051
- Illustrate the interfacing of 8085 with various peripheral devices for transmission, reception and control of data
- Make use of the data conversion technique such as ADC and DAC and to interface with 8085 processor and 8051 microcontroller
- Develop the microcontroller assembly language program for various real time applications

UNIT I 8051 ARCHITECTURE **9**

Architecture – memory organization – addressing modes – instruction set –Timers - Interrupts - I/O ports, Interfacing I/O Devices – Serial Communication.

UNIT II 8051 PROGRAMMING **9**

Assembly language programming – Arithmetic Instructions – Logical Instructions –Single bit Instructions – Timer Counter Programming – Serial Communication Programming Interrupt Programming – RTOS for 8051 – RTOSLite – FullRTOS – Task creation and run – LCD digital clock/thermometer using FullRTOS

UNIT III PIC MICROCONTROLLER **9**

Architecture – memory organization – addressing modes – instruction set – PIC progrmming in Assembly & C –I/O port, Data Conversion, RAM & ROM Allocation, Timer programming, MP- LAB.

UNIT IV PERIPHERAL OF PIC MICROCONTROLLER **9**

Timers – Interrupts, I/O ports- I2C bus-A/D converter-UART- CCP modules -ADC, DAC and Sensor Interfacing –Flash and EEPROM memories.

UNIT V SYSTEM DESIGN – CASE STUDY **9**

Interfacing LCD Display – Keypad Interfacing - Generation of Gate signals for converters and Inverters - Motor Control – Controlling DC/ AC appliances – Measurement of frequency - Stand alone Data Acquisition System.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Muhammad Ali Mazidi, Janice G. Mazidi and Rolin D. McKinlay	The 8051 Microcontroller and Embedded Systems'	Prentice Hall,	2005.

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey	PIC Microcontroller and Embedded Systems using Assembly and C for PIC18'	Pearson Education	2008
2	John Iovine	PIC Microcontroller Project Book	McGraw Hill	2000
3	Myke Predko	Programming and customizing the 8051 microcontroller	Tata McGraw Hill	2001

16BEEE604 DESIGN OF ELECTRICAL APPARATUS L T P C 3 0 0 3

Course Objectives

- To provide sound knowledge about constructional details and design of various electrical machines.
- To study mmf calculation and thermal rating of various types of electrical machines.
- To design armature and field systems for D.C. machines.
- To design core, yoke, windings and cooling systems of transformers.
- To design stator and rotor of induction machines.
- To design stator and rotor of synchronous machines and study their thermal behaviour.

Course Outcomes

At the end of this course, students will demonstrate the ability to
1. Understand the construction of electrical machines.
2. Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines
3. Understand the principles of electrical machine design
4. Carry out a basic design of an AC and DC machine.
5. Use software tools to do design calculations.
6. Understand performance characteristics of electrical machines

UNIT I MAGNETIC CIRCUITS AND COOLING OF ELECTRICAL MACHINES 9

Major consideration in electrical machine design –electrical engineering materials –design limitations and specifications- concept of magnetic circuit – mmf calculation for various types of electrical machines – Gap Contraction Factor –Net Length of Iron -real and apparent flux density of rotating machines -direct and indirect cooling methods – cooling of turbo alternators.

UNIT II DC MACHINES 9

Constructional details – output equation – main dimensions - choice of specific loadings – choice of number of poles – armature design – winding diagrams – design of field poles and field coil – design of commutator and brushes

UNIT III TRANSFORMERS 9

Constructional details of core and shell type transformers – output rating of single phase and three phase transformers — design of core, yoke and windings of transformers – equivalent circuit parameters from designed data – design of tank and cooling tubes of transformers.

UNIT IV THREE PHASE INDUCTION MOTORS 9

Constructional details of squirrel cage and slip ring motors – output equation – main dimensions – choice of specific loadings – design of stator – winding diagrams - design of squirrel cage and slip ring rotor - introduction to computer aided design.

UNIT V SYNCHRONOUS MACHINES 9

Output equation – choice of specific loadings – main dimensions – short circuit ratio – design of stator and rotor of cylindrical pole and salient pole machines - design of field coil - performance calculation from designed data - introduction to computer aided design.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Sen, S.K	Principles of Electrical Machine Design with Computer Programs	Oxford and IBH Publishing Co.Pvt. Ltd., New Delhi	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Agarwal, R.K	Principles of Electrical Machine Design	S.K.Kataria and Sons, Delhi.	2002
2	Mittle, V.N. and Mittle	Design of Electrical Machines	Standard Publications and Distributors, Delhi.	2002
3	Juha Pyrhonen, Tapani Jokinen, and Valeria Hrabovcova	Design of Rotating Electrical Machines	Wiley .	2009
4	Greg Stone, Edward A Boulter, Ian Culbert, and Hussein Dhirani	Electrical Insulation for Rotating Machines: Design, Evaluation, Aging, Testing, and Repair	1st edition, Wiley-IEEE Press.	2004

WEBSITES

1. www.electricmotors.machinedesign.com/guiEdits/.../bdeee2_1.aspx
2. www.advancedmotortech.com/images/InductionMachine_Jan2012.pdf

16BEEE611 MICROPROCESSOR AND MICRO CONTROLLER LABORATORY

L T P C 0 0 3 2

OBJECTIVES

On completion of the course, students are able to:

- To understand the basic architecture of 8- bit microprocessors.
- Able to write programs on 8085 microprocessor based systems.
- Identify the addressing modes of an instruction.
- Develop programming skills in assembly language
- To understands the basic architecture of microcontroller.

COURSE OUTCOMES (COs)

1. Apply the basic arithmetic and logical operations using 8085 microprocessor with the help of assembly language programming
2. Analyze the performance of different weighted and non weighted codes, its conversions with logic diagram using 8085 microprocessor
3. Illustrate the interfacing of 8085 with various peripheral devices for serial and parallel communication of data
4. Demonstrate the basic instructions with 8051 microcontroller execution including conditional jumps, looping and calling subroutines
5. Make use of the basic conversion techniques of ADC and DAC to interface it with 8085 processor and 8051 microcontroller
6. Develop a model using processor to apply computing platform and software for engineering problems

LIST OF EXPERIMENTS

8-bit Microprocessor

1. Simple arithmetic operations
   - Multi precision addition / subtraction / multiplication / division
2. Programming with control instructions
   - Increment / Decrement
   - Ascending / Descending order
   - Maximum / Minimum of numbers
   - Rotate instructions.
   - Hex / ASCII / BCD code conversions
3. Interface Experiments
   - A/D Interfacing
   - D/A Interfacing
   - Traffic light controller
4. Simple Interfacing experiments using 8251, 8279 and 8254
5. Programming practice on assembler and simulator tools

8-bit Micro controller

6. Demonstration of basic instructions with 8051 Micro controller execution, including

- Conditional jumps, looping
- Calling subroutines
- Stack parameter testing

7. Parallel port programming with 8051 using port 1 facility
    - Stepper motor and D/A converter
8. Programming Exercise on
    - RAM direct addressing
    - Bit addressing
9. Programming practice using simulation tools and C - compiler
    - Initialize timer
    - Enable interrupts
10. Study of micro controllers with flash memory.

Additional Experiments Using 8051 Microcontroller:

1. A/D Conversion with LCD display.
2. Speed control of DC Motor using PWM technique.
3. Programming with flash controller (EPROM, EEPROM).
4. Interfacing Monitor and Keyboard.
5. Seven Segment display interface.
6. Interfacing of I/O devices (Relay, LED and Buzzer).
7. PLC programming using 8051microcontroller.
8. Study of “In Circuit Debugger”.

16BEEE612 ELECTRICAL ESTIMATION AND REWINDING LABORATORY
L T P C 0 0 1 0

Course Objectives

- To introduce the basic electrical Estimation in the lab.
- To be able to deal with motor rewinding and transformer winding connections.
- To study the electrical design of party hall.
- To study the electrical design of saw mill.
- To study the electrical design of primary health centre.
- To study the electrical design of university building

Course Outcomes

At the end of the course the students will be able

- To do wiring and winding for all electrical equipment‟s.
- To analysis the electrical estimation for residential flat
- To analysis the electrical estimation for University building
- To analysis the electrical estimation for Primary health centre
- To analysis the electrical estimation for Party hall
- To analysis the electrical estimation for Saw mill

LIST OF EXPERIMENTS

ELECTRICAL ESTIMATION:

1. Residential single bed room Flat.
2. Industrial power wiring having 2 or 3 machines and Irrigation Pump motor (5hp) wiring.
3. University building having 6 class rooms with Computer centre having 35 computers, a/c unit, UPS, light and fan.
4. Primary Health Centre having minimum 6 rooms.
5. Lighting scheme of a party hall having minimum 20 twin TL fittings and Street Light service having 12 lamp light fittings
6. Erection of one no. 15hp induction motor in Saw mill / Flour mill and 3 phase Service connection to a building having 5 KW load.

REWINDING:

7. Design and wind 230/12-0-12 volt, 500mA Transformer and test it.
8. Design and wind a No volt coil used in starter.
9. Study about the winding connection diagram for Single Phase Induction Motor.

10. Study about the winding connection diagram for Three Phase Induction Motor.
11. Wind and insert the coils for ceiling fan motor (minimum 2 coils).
12. Give end connection for a 3 phase Induction motor winding for a 2 pole/ 4 pole operations and run it. Measure the No load current and speed.

16BEEE651*   PCB DESIGN AND SERVICING OF DOMESTIC APPLIANCES

L T P C   1 0 0 –

Course Objectives

Students will learn

- Specification and classification of PCBs
- PCB Fabrication
- Different application of PCB
- Service to domestic appliances
- Installation to domestic appliances
- Repair of domestic appliances

Course Outcomes

Students will able to analysis

- Techniques of PCBs
- PCB Fabrication
- Real time application of PCB
- Service to domestic appliances
- Installation to domestic appliances
- Repair of domestic appliances

UNIT I PCB BASIC PRINCIPLE

Specification and classification of PCBs - Techniques of layout design - Artwork generation Methods - General design factor for digital and analog circuits .

UNIT II PCB FABRICATION

Introduction to PCB technology - PCB Fabrication techniques-single, double sided and multilayer - Etching: chemical principles and mechanisms - Post operations- stripping, black oxide coating and solder masking - PCB component assembly processes

UNIT III INSTALL, SERVICE AND REPAIR OF DOMESTIC APPLIANCES

Installation procedure of electric iron, mixer grinder, ceiling and table fan - Working of Ceiling and Table Fan - circuit description, fault finding - removal of faulty component

SEMESTER VII

16BECC701 PROFESSIONAL ETHICS, PRINCIPLE OF MANAGEMENT AND ENTREPRENEURSHIP L T P C 3 0 0 3

Course Objective

- To enable the students to create an awareness on Engineering Ethics, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.
- To study ethics in society and realize the responsibilities and rights in the society
- To study advanced philosophical knowledge of the profession of recreation and leisure
- To study synthesis of trends and issues as related to current professional practice
- To evaluation of organizational theories and human resource management principles
- To study the ethical practice and ethical management

Course Outcome

At the end of this course, students will be able to

- Apply ethics in society and realize the responsibilities and rights in the society
- Discuss the ethical issues related to engineering
- Advanced philosophical knowledge of the profession of recreation and leisure
- Synthesis of trends and issues as related to current professional practice
- Evaluation of organizational theories and human resource management principles
- Ethical practice and ethical management

UNIT I ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – variety of moral issued – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – Models of Professional Roles – theories about right action – Self–interest – customs and religion – uses of ethical theories.

UNIT II FACTORS OF CHANGES 9

Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws. Social changes – Meaning and nature – Theories.

UNIT III HISTORICAL DEVELOPMENT, PLANNING, ORGANISING 9

Definition of Management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Steps involved in Planning – **Course Objectives** – Setting **Course Objectives** – Process of Managing by **Course Objectives** – Strategies, Policies and Planning Premises– Forecasting – Decision–making – Formal and informal organization

– Organization Chart –.

UNIT IV DIRECTING AND CONTROLLING 9

Human Factors – Creativity and Innovation – Harmonizing **Course Objectives** – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment –Process of Communication – System and process of Controlling – Requirements for effective control – Control of Overall Performance – Direct and Preventive Control – Reporting

UNIT V ENTREPRENEURSHIP AND MOTIVATION 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, **Course Objectives**.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harold Kooritz and Heinz Weihrich	Essentials of Management	Tata McGraw Hill, New Delhi	2010
2	Khanka S.S	Entrepreneurial Development	S.Chand and Co. Ltd., NewDelhi	2006
3	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw–Hill, NewYork	2005

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Tripathy P.C and Reddy P.N	Principles of Management	Tata McGraw Hill, New Delhi	2008
2	Rabindra N Kanungo	Entrepreneurship and innovation	Sage Publications, New Delhi	1998
3	Charles E Harris, and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, New Delhi	2013

WEB REFERENCES

1. http://www.managementstudyguide.com/taylor_fayol.htm
2. http://tutor2u.net/business/gcse/people_motivation_theories.htm
3. http://lfkkb.tripod.com/eng24/gilligansthoery.html
4. http://www.developingeyes.com/five–types–of–entrepreneurs/

16BEEE702 POWER SYSTEM PROTECTION AND SWITCHGEAR L T P C 3 0 0 3

Course Objectives

- To expose the students to the various faults in power system
- To learn the various methods of protection scheme
- To understand the current interruption in Power System and study the various switchgears.
- Discussion on various earthing practices, usage of symmetrical components to estimate fault current and fault MVA.
- Study of Relays, protection scheme, and solid state relays.
- To understand the method of circuit breaking, various arc theories, Arcing phenomena – capacitive and inductive breaking, Types of circuit breakers.

Course Outcomes

At the end of this course, students will demonstrate the ability to
1. Understand the different components of a protection system.
2. Evaluate fault current due to different types of fault in a network.
3. Understand the protection schemes for different power system components.
4. Understand the basic principles of digital protection.
5. Understand system protection schemes, and the use of wide-area measurements.
6. Analysis the Real time application of it.

UNIT I INTRODUCTION 9

Principles and need for protective schemes – nature and causes of faults –Power system earthing - Zones of protection and essential qualities of protection – Protection scheme.

UNIT II OPERATING PRINCIPLES AND RELAY CONSTRUCTIONS 9

Electromagnetic relays – Over current, directional, distance and differential, under frequency Relays, Reverse power relay, Relay Coordination, Microprocessor based Relay – static relays.

UNIT III APPARATUS PROTECTION 9

Apparatus protection: Transformer, generator, motor; protection of bus bars and transmission lines – CTs and PTs and their applications in protection schemes.

UNIT IV THEORY OF CIRCUIT INTERRUPTION 9

Physics of arc phenomena and arc interruption. Restriking voltage, Recovery voltage, rate of rise of recovery voltage, resistance switching, current chopping, and interruption of capacitive current – DC circuit breaking.

UNIT V CIRCUIT BREAKERS 9

Types of Circuit Breakers – Air blast, Air break, oil, SF_6 and Vacuum circuit breakers – comparative merits of different circuit breakers – Testing of circuit breakers.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Ravindranath, B. and Chander, N	Power System Protection and Switchgear	New Age International (P) Ltd , New Delhi 2nd Edition	2011
2	Badri Ram and	Power System Protection	Tata McGraw hill,	2011
	Vishwakarma, D.N.	and Switchgear	New Delhi.	

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Wadhwa, C. L.	Electrical Power Systems	New Age International (P) Ltd , New Delhi	2000
2	Gupta, P.V., Bhatnagar, V.S., Chakrabarti, A	A Text book on Power System Engineering	Reprint – 2009 edition, Dhanpat Rai and Co, New Delhi.	2009
3	Paithankar, Y.G. and Bhide, S.R.	Fundamentals of Power System Protection	Prentice Hall of India Pvt. Ltd., New Delhi.	2003

WEBSITES

1. www.pdf-search-engine.com/protection-and-switchgear-pdf.html - 69k
2. https://subjects.ee.unsw.edu.au/elec9712/.

16BEEE711 POWER SYSTEM SIMULATION LABORATORY L T P C 0 0 3 2

Course Objectives

- To acquire software development skills and experience in the usage of standard package necessary for analysis and simulation of power system required for its planning, operation and control.
- The various line parameters.
- The voltage regulation and efficiency of different types of transmissions.
- A network under unsymmetrical fault conditions and interpret the results.
- The bus impedance and admittance matrix.
- A network under symmetrical fault conditions and interpret the results

Course Outcomes

- Apply load flow analysis to an electrical power network and interpret the results using Gauss-Seidel and Newton Raphson Methods.
- Apply load flow analysis to an electrical power network and interpret the results using Fast-Decoupled Methods.
- Explain the transient stability analysis of single and multi machine infinite bus system
- Examine the electromagnetic transients and its impact in power system studies
- Evaluate the frequency dynamics, economic dispatch of single and two area power systems.
- Evaluate the Economic dispatch in power systems

LIST OF EXPERIMENTS

1. Computation of Parameters and Modeling of Transmission Lines.
2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
3. Load Flow Analysis - I: Solution of Load Flow and related Problems using

   Gauss-Seidel Method
4. Load Flow Analysis - II: Solution of Load Flow and related Problems using Newton-Raphson and Fast-Decoupled Methods
5. Study of symmetrical and unsymmetrical Fault Analysis.
6. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System
7. Transient Stability Analysis of Multi-machine Power Systems
8. Electromagnetic Transients in Power Systems.

9. Load – Frequency Dynamics of Single- Area and Two-Area Systems.
10. Economic Dispatch in Power Systems without considering transmission losses.
11. Economic Dispatch in Power Systems with transmission losses.

16BEEE751* **ETAP AND PSCAD** **L T P C** **1 0 0 –**

Course Objectives

Students will learn

- Component block of ETAP
- To Draw Single Line Diagram of Power System
- Component block of PSCAD
- Case study of it

Course Outcomes

Students will analysis

- Component block of ETAP
- Single Line Diagram of Power System
- Component block of PSCAD
- Case study of it

UNIT I INTRODUCTION – ETAP

Introduction – Study of components block – To draw Single Line Diagram of Power System.

UNIT II APPLICATION

Load flow Analysis of three bus System and Fault Analysis.

UNIT III INTRODUCTION – PSCAD

PSCAD- Introduction, Features- Study of components block- Creating a small simulation case using PSCAD.

SEMESTER VIII

16BECC801A ENERGY MANAGEMENT, UTILIZATION AND ENERGY AUDITING

L T P C 3 0 0 3

Course Objectives

- To gain the knowledge about energy management.
- To understand the basic concepts in economic analysis in energy management.
- To understand the basic principles of energy audit.
- To gain the knowledge about the basic concept of types of Energy Audit
- To gain and Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- To study about the behavior changes of PF requirement in motor currents

Course Outcomes

At the end of this course, students will demonstrate the ability to

- understand and analyse the energy data of industries
- carryout energy accounting and balancing
- conduct energy audit and suggest methodologies for energy savings
- understand the principle, design of illumination systems and energy efficiency lamps.
- analysis the methods of industrial heating and welding.
- understand the electric traction systems and their performance

UNIT I ENERGY MANAGEMENT 9

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS 9

Economics analysis – Depreciation Methods, time value of money, Calculation of simple payback, net preset value, internal rate of return, present worth method, replacement analysis, life cycle costing analysis.

UNIT III ILLUMINATION, HEATING AND WELDING 9

Nature of radiation – definition – laws – photometry – lighting calculations – design of illumination systems (for residential, industrial, commercial, health care, street lightings, sports, administrative complexes) - types of lamps - energy efficiency lamps. Methods of heating, requirement of heating material – design of heating element – furnaces – welding generator – welding transformer and its characteristics.

UNIT IV ELECTRIC TRACTION 9

Introduction – requirements of an ideal traction system – supply systems – mechanics of train movement – traction motors and control – multiple units – braking – current collection systems – recent trends in electric traction.

UNIT V BASIC PRINCIPLES OF ENERGY AUDIT **9**

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	W.C.Turner Steve Doty	Energy Management Handbook	John Wiley and Sons 7th Edition	2009
2	E. Openshaw Taylor	Utilization of Electrical Energy in SI Units’	Orient Longman Pvt.Ltd	2003
3	B.R. Gupta	Generation of Electrical Energy	Eurasia Publishing House (P) Ltd, New Delhi	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	H. Partab	Art and Science of Utilisation of Electrical Energy	Dhanpat Rai and Co, New Delhi	2004
2	C.L. Wadhwa	Generation, Distribution and Utilization of Electrical Energy	New Age International Pvt.Ltd	2003
3	J.B. Gupta	Utilization of Electric Power and Electric Traction	S.K.Kataria and Sons	2002

16BECC801B **SMART GRID** **L T P C 3 0 0 3**

Course Objectives

- To study about the characteristics of smart grid, models and operating principles.
- To study about energy storage and communication systems used in smart grid.
- To study the models and operating principles of smart grid
- To study the different batteries technology
- To get knowledge about communication system in smart grid
- To study about reliability and stability process

Course Outcomes

At the end of the course the student will be able to

1. Gain the knowledge about Distributed Generations.
2. Acquire the knowledge about Island mode of operation**.**
3. Understand the basic knowledge about storage devices
4. Analysis the different batteries technology.
5. Understand the communication system in smart grid
6. Analysis the reliability and stability process

UNIT I INTRODUCTION : SMART GRID AND EMERGING TECHNOLOGIES 9

Defining a smart grid – Characteristics of smart grid - Values of a smart grid – The economic Case – The environmental Case – Benefits to utilities – Benefits to consumers – Power system components – Power system protection: Traditional Vs Smart – Case study – Generation fundamentals – Traditional Generations – Distributed Generations – micro grid generation – Generator Protection – Challenges and Opportunities – Cost of smart grid – Government Regulations – Emerging Technologies - FACTS – optimizing integration systems – Multi generation buildings – Case study.

UNIT II SMART GRID: MODELS AND OPERATING PRINCIPLES 9

Solar Photovoltaic models and grid Integration – Design of a 2 MVA PV station – DG system as part of utility power system – The smart grid PV - UPS DG system – Split DC Bus UPS – PV DG system – Island mode of operation – Parallel operation of Inverters – Power Quality. Wind turbine model and grid Integration – Micro turbine model & Grid Integration. Electric Vehicle model and Grid Integration.

UNIT III SMART GRID: DISTRIBUTED GENERATION SYSTEMS 9

Power Converter System – Control System Development – Current limit and Saturation Control, Simulation using simulate and MATLAB. Inverter Parallel operation – Load sharing control Algorithm – Distributed Generation System and Newton Raphson method in power flow – Plant modeling and 3 phase 4 wire DG unit topology – Single distributed generation System –MIMO Linear system Stability robustness – PWM rectifier control – 3 Phase AC – DC – AC topology.

UNIT IV ENERGY STORAGE AND COMMUNICATION 9

State–of–the art storage devices – Battery types – Ultra capacitors based Energy Storage System – Flywheel – Wide Area Network – Substation Information System – Wireless Networks – Distribution Automation – AMI Networks – Utility monitoring and Control – Inter-system Coordination – Industrial systems – Consumer Residential Systems – Network Protection – Channel model Fundamental – Low, medium, High voltage, main Topologies – Residential and Business Indoor wiring Topologies – The Power line Channel model – Digital Transmission Techniques - Threats – IEC61850 Considerations.

UNIT V SMART GRID: RELIABILITY, STABILITY AND COMPONENT INTEGRATION 9

Smart Grid Programming – Virtual Power Producer – Intelligent reconfiguration using SCADA – Problems in distributed grids – Solutions. Integration of Mini – Micro generation in distribution Grids – Power supply Quality generic standards – Renewable Energies specific standards – Smart Grid stability analysis schemes – Supply guarantee and Power quality – Integration in power systems – Distributed Generation advantages and needs.

TOTAL: 45 HOURS

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Fox-Penner	Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities	Island Press , Washington DC	2010
2	StanMark Kaplan, Fred Sissine	Smart Grid: Modernizing Electric Power Transmission and Distribution; Energy Independence, Storage and Security; Energy Independence and Security Act and Resiliency	The Capitol.Net, Washington DC	2009
3	Ali Keyhani Moham mad N. Marwali , Min Dai	Integration of Green and Renewable Energy in Electric Power Systems	Wiley, USA	2009
4	Ryszard Michal Strzelecki , Grzeg orz Pawel Benysek	Power Electronics in Smart Electrical Energy Networks	Springer, USA	2008
5	Hendrik C. Ferreira ,Lutz Lampe , John Newbury,Theo G Swart	Power Line Communications: Theory and Applications for Narrowband and Broadband Communications over Power Lines	Wiley, New York	2010

WEBSITES

1. www.wca.org
2. www.sandc.com

LIST OF DEPARTMENT ELECTIVES

ELECTIVE – I (ONLY APPLICABLE FOR FIFTH SEMESTER)

16BEEE5E01 NETWORK ANALYSIS AND SYNTHESIS L T P C 3 0 0 3

Course Objectives

- To understand the concept of network analysis.
- To understand the basic principles of network theorems.
- To study the electrical circuits using Laplace Transforms
- To study the transient and steady-state response of electrical circuits.
- To study the sinusoidal steady-state (single-phase and three-phase).
- To get the knowledge of two port circuit behavior.

Course Outcomes

At the end of this course, students will demonstrate the ability to

1. Apply network theorems for the analysis of electrical circuits.
2. Obtain the solution of first and Second order system
3. Analyze the electrical circuits using Laplace Transforms.
4. Obtain the transient and steady-state response of electrical circuits.
5. Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
6. Analyze two port circuit behavior.

UNIT-I INTRODUCTION 9

Circuits elements, Independent and dependent sources, signals and wave forms; periodic and singularity voltages, step, ramp, impulse, Doublet. Development of circuit concept, Conventions for describing networks.

UNIT-II GRAPH THEORY 9

Graph of a Network, definitions, tree, co tree, link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.

UNIT-III NETWORK THEOREMS (APPLICATIONS TO AC NETWORKS) 9

Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem.

UNIT-IV FILTERS SYNTHESIS 9

Classification of filters, Ladder network, T section, IT section, terminating half section. Pass bands and stop bands. Design of constant-K, m-derived filters. Composite filters.

UNIT-V NETWORK SYNTHESIS 9

Positive real function, definition and properties; Properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point admittance functions using Foster and Cauer first and second forms.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	S Chakraborty Ghosh A	Network Analysis & Synthesis	Tata Mc graw Hill 1st edition	2009

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M.E. Van Valkenburg	Network Analysis	Phi Learning - 3rd Edition	2014
2	Gobind Daryanani	Principles of Active Network Synthesis & Design	Wiley India Pvt Ltd	2009

16BEEE5E02 ADVANCED CONTROL SYSTEM L T P C 3 0 0 3

Course Objectives

- To study the state variable analysis
- To provide adequate knowledge in the phase plane analysis and also describing function analysis.
- To study the analysis discrete time systems using conventional techniques.
- To analyze the stability of the systems using different techniques.
- To study the design of optimal controller.
- To study the types of compensators

Course Outcomes

At the end of the course the student will be able to

- understand the state variable analysis, Z- transform, state equation
- Construct the frequency response of the system using various plots
- Correlate the time and frequency domain specifications and effect of compensation
- Design the different types of compensators using frequency response plots to stabilize the control system
- Explain the state variable representation of physical systems with the effects of state feedback its assessment for linear-time invariant systems.

UNIT 1 STATE VARIABLE ANALYSIS 9

Concept of state – State Variable and State Model – State models for linear and continuous time systems – Solution of state and output equation – controllability and observability - Pole Placement –State observer Design of Control Systems with observers

UNIT II PHASE PLANE AND DESCRIBING FUNCTION ANALYSIS 9

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearising non-linear systems - Construction of phase portraits – Singular points – Limit cycles Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – Conditions for stability – Stability of oscillations.

UNIT III Z-TRANSFORM AND DIGITAL CONTROL SYSTEM 9

Z transfer function – Block diagram – Signal flow graph – Discrete root locus – Bode plot.

UNIT 1V STATE-SPACE DESIGN OF DIGITAL CONTROL SYSTEM 9

State equation – Solutions – Realization – Controllability – Observability – Stability – Jury's test.

UNIT V OPTIMAL CONTROL 9

Introduction -Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	I.J. Nagrath and M. Gopal	Control Systems Engineering	New Age International Publishers	2003
2	Ashish Tewari	Modern control Design with Matlab and Simulink	John Wiley, New Delhi	2002

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	M.Gopal	Modern control system theory	New Age International Publishers	2002
2	Gene F. Franklin, J. David Powell and Abbasemami-Naeini	Feedback Control of Dynamic Systems	Fourth edition, Pearson Education, Low price edition	2002
3	Raymond T. Stefani & Co	Design of feedback Control systems	Oxford University	2002

16BEEE5E03 ELECTRIC HYBRID VEHICLE L T P C 3 0 0 3

Course Objectives

- To study the basic concepts of electric hybrid vehicles.
- To study about energy storage system for hybrid vehicle.
- To gain the knowledge about electric propulsion unit.
- To gain the concept of Hybrid Electric Drive-Trains.
- To gain the different Energy Management Strategies.
- To study about the efficiency manipulation in drives

Course Outcomes

- At the end of the course the student will be able to understand the concepts of electric hybrid vehicle.
- Summarize the basic concepts in bioprocess Engineering.
- Explain the concept of Hybrid Electric Vehicles.
- Understand the concept of Hybrid Electric Drive-Trains.
- Identify the different Energy Management Strategies.
- Understand the concept of different Energy Storage devices.
- Analyze the different motor drives used in Hybrid Electric Vehicles.

UNIT I INTRODUCTION 9

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II HYBRID ELECTRIC DRIVE-TRAINS 9

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT 9

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE 9

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENT STRATEGIES 9

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	CRC Press	2004
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley	2003

16BEEE5E04 COMMUNICATION ENGINEERING L T P C 3 0 0 3

Course Objectives

- To introduce the fundamental techniques of analog, digital and data communication.
- To explain satellite and fibre optic communication and Networking systems.
- To understand basic signals, analog modulation, demodulation and radio receivers.
- To explain the characteristics and model of transmission medium
- To study the recent techniques.
- To get the knowledge about the application of it

Course Outcomes

- Ability to understand and analyze analog circuits.
- Gain Knowledge on digital modulation techniques.
- Understand coding techniques
- Analysis the real time application of it.
- Analysis the model of transmission medium
- To able to modulation and demodulation techniques.

UNIT I MODULATION SYSTEMS 9

Time and frequency domain representation of signals, amplitude modulation and demodulation, frequency modulation and demodulation, super heterodyne radio receiver. Frequency division multiplexing. Pulse width modulation.

UNIT II TRANSMISSION MEDIUM 9

Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, path loss, white Gaussian noise.

UNIT III DIGITAL COMMUNICATION 9

Pulse code modulation, time division multiplexing, digital T–carrier system. Digital radio system. Digital modulation: Frequency and phase shift keying – Modulator and demodulator, bit error rate calculation.

UNIT IV DATA COMMUNICATION AND NETWORK PROTOCOL 9

Data Communication codes, error control. Serial and parallel interface, telephone network, data modem, ISDN, LAN, ISO–OSI seven layer architecture for WAN.

UNIT V SATELLITE AND OPTICAL FIBRE COMMUNICATION 9

Orbital satellites, geostationary satellites, look angles, satellite system link models, satellite system link equations. Advantages of optical fibre communication – Light propagation through fibre, fibre loss, light sources and detectors.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Wayne Tomasi	Electronic Communication Systems	Pearson Education New Delhi	2002
2	Roy Blake	Electronic Communication Systems	Thomson Delmar , New Delhi	2002

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	William Schweber	Electronic Communication Systems	Prentice Hall of India, New Delhi.	2002
2	Kennedy, G.	Electronic Communication Systems	Prentice Hall of India, New Delhi.	2002
3	Miller, M.	Modern Electronic Communication	Prentice Hall of India, New Delhi.	2003
4	John G Proakis and Masoud Salehi	Communication Systems Engineering	Prentice Hall of India, New Delhi.	2001

WEBSITES

1. www.complextoreal.com/tutorial.htm
2. www.discogs.com/artist/Nephlim+Modulation+Systems

16BEEE5E05 INTRODUCTION TO NEURAL NETWORKS L T P C 3 0 0 3

Course Objectives

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To study about the perception concept in design
- To study about the design using ART phenomena
- To study about the vector quantization
- To have a solid understanding of Basic Neural Network

Course Outcomes

At the end of the course the student will be able to sove problems using neural

1. Understand the basic concepts of neural networks and its applications in various domains
2. Gain knowledge about learning process in Neural Networks
3. Apply perception concept in design
4. Design using ART phenomena
5. Gain knowledge on SOM concepts
6. Ability to develop the use of Soft Computing to solve real-world problems

UNIT I INTRODUCTION TO NEURAL NETWORKS 9

Biological Neuron, artificial neuron-comparison, neuron model, architectures-Feedforward and recurrent types. Perceptron -learning rule-graphical, algorithmn, limitations, multilayer network.

UNIT II BACKPROPAGATION NETWORKS 9

Backpropagation algorithm-derivation of up-dation rules, drawbacks. Variants of Backpropagation algorithm-momentum, variable learning rate-simple problems. Data based modeling using backpropagation algorithm – applications - example.

UNIT III ASSOCIATIVE AND SELF-ORGANIZING NETWORKS 9

Associative Learning –supervised and unsupervised types- Instar , outstar and Kohonen networks, Bidirectional associative memories, Hopfield Network. Self organizing map algorithm –Simple problems.

UNIT IV SUPERVISED AND UNSUPERVISED LEARNING NETWORKS 9

Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

UNIT V APPLICATIONS 9

Applications – Electric drives-Speed control of DC Shunt motor- Neural Network Toolbox in Mat lab-Steepest Descent Backpropogation.

TOTAL: 45 HOURS

TEXTBOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Martin T.Hagan,Howard B. Demuth, Mark Beale	Neural Network Design	Cenage Learning	2008

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	S.N Sivanandam, S.Sumathi, S.N.Deepa	Introduction to Neural Networks using MATLAB 6.0	TMH	2006
2	Laurene V. Fausett	Fundamentals of Neural Networks-architecture, algorithm and application	Pearson Education	2004

16BEEE5E06 COMPUTER ARCHITECTURE L T P C 3 0 0 3

Course Objectives

- To study the various representations of data, register transfer language for micro operations and organization and design of a digital computer.
- To teach the concept of micro–programmed control unit, the central processing unit, stack and instruction formats.
- To Study the various arithmetic operation's algorithms
- To study the hardware implementations and concept of pipelining and vector processing.
- To illustrate the techniques to communicate with input and output devices.

Course Outcomes

1. Understand the concepts of microprocessors, their principles and practices.
2. Write efficient programs in assembly language of the 8086 family of microprocessors.
3. Organize a modern computer system and be able to relate it to real examples.
4. Develop the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes.
5. Implement embedded applications using ATOM processor.
6. Analysis the real time application of it.

UNIT I DATA REPRESENTATION, MICRO–OPERATIONS, ORGANIZATION AND DESIGN 9

Data representation: Data types, complements, fixed–point representation, floating–point representation, other binary codes and error detection codes.Register transfer and micro operations: Register transfer language, bus and memory transfers, arithmetic micro–operations, logic micro–operations, shift micro–operations, arithmetic logic shift unit.Basic computer organization and design: Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, memory reference instructions, input–output and interrupt. Complete computer description, design of basic computer, design of accumulator.

UNIT II CONTROL AND CENTRAL PROCESSING UNIT 9

Micro programmed control: memory, address sequencing, micro–program example, design of control unit.Central processing unit: General registers and organization, stack and pointer organization, instruction formats, modes, data transfer and manipulation, program control, reduced Instruction set computer.

UNIT III COMPUTER ARITHMETIC, PIPELINE AND VECTOR PROCESSING 9

Computer arithmetic: Addition, subtraction, multiplication and division algorithms, floating–point arithmetic operations, decimal arithmetic unit, decimal arithmetic operations.Pipeline and vector processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, RISC pipeline, vector processing array processors.

UNIT IV INPUT–OUTPUT ORGANIZATION 9

Input–output organization: Peripheral devices, input–output interface, asynchronous data transfer (UART and USART), modes of transfer, priority interrupt, direct memory access, input–output processor, serial communication.

UNIT V MEMORY ORGANIZATION 9

Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Morris Mano	Computer System Architecture	Pearson Education, India	2002
2	John L Hennessy and David A Patterson	Computer Architecture, A Quantitative Approach	Morgan Kaufmann, San Francisco, USA	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Vincent P Heuring and Harry F Jordan	Computer Systems Design and Architecture	Pearson Education, Asia	2002
2	Andrew S Tanenbaum	Structured Computer Organization	Pearson Education, New Delhi	2002
3	William Stallings	Computer Organization and Architecture	Pearson Education, New Delhi	2003

WEBSITES

1. arch–www.cs.wisc.edu
2. ece.eng.wayne.edu/~gchen/ece4680/lecture–notes/lecture–notes.html

16BEEE5E07 FUZZY LOGIC AND ITS APPLICATIONS L T P C 3 0 0 3

Course Objectives

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models
- To study about the development of fuzzy controllers
- To Understand the concepts of adaptive fuzzy control
- To study the fuzzy based model system

Course Outcomes

- Understand the basic concepts of Fuzzy logic and its applications in various domain
- Gain knowledge on theory of Reasoning
- Develop fuzzy controllers
- Understand concepts of adaptive fuzzy control
- Ability to develop how to use Fuzzy computation to solve real- world problems
- Design fuzzy based model for any application

UNIT I FUZZY SETS AND RELATIONS 9

Classical sets, fuzzy sets-operation, properties. Fuzzy relations-Equivalence and tolerance relation, Fuzzification- membership function-types, methods.

UNIT II FUZZY INFERENCE SYSTEM 9

Building Blocks of a Fuzzy system, fuzzification, fuzzy Rule-based Systems. Composition of rules, types of inference, defuzzification methods.

UNIT III FUZZIFICATION AND FUZZY ARITHMETIC 9

Lambda-cuts for fuzzy sets-lambda cuts for fuzzy relations- defuzzification methods - Extension principle-functions of fuzzy sets- fuzzy transform-fuzzy numbers-approximate methods of extension-vertex method-DSW algorithm

UNIT IV FUZZY LOGIC AND FUZZY RULE BASED SYSTEMS 9

Fuzzy logic –approximate reasoning-fuzzy tautologies-contradictions-equivalence-and logical proofs-other forms of implication operation and composition operation-linguistic hedges-rule based systems-fuzzy associative memories- multi objective decision making.

UNIT V APPLICATIONS 9

Fuzzy Tool box in Mat lab – Case Study – Temperature Control in a Shower-Water level Control in a Tank.

TOTAL 45 HOURS

TEXTBOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Timothy J.Ross	Fuzzy Logic with Engineering Applications	Wiley student edtion,2nd edition	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	George j.Klir & Tina A.Folger	Fuzzy sets Uncertainty & Information	PHI	2001

16BEEE5E08 DISTRIBUTED GENERATION L T P C 3 0 0 3

Course Objectives

- To study about the distributed generation system.
- To study about the relaying and protections in the distributed system.
- To get the knowledge of distributed generation, boiler turbine monitoring system.
- To get the knowledge in Planning of distributed system
- To know the control of DG inverter
- To gather knowledge of protection of distributed systems

Course Outcomes

At the end of the course the students will

- Understand the distributed generation system , boiler turbine monitoring system.
- Understand the Planning of distributed system
- Analysis the control of DG inverters
- Analysis the protection of distributed systems
- Understand the rel time system
- Analysis the norms and standards used in it

UNIT I INTRODUCTION TO DISTRIBUTED GENERATION 9

Introduction to the concept of distributed generation - Distributed generation advantages and needs - Radial distribution system protection: Fuse, circuit breakers, reclosers- Per-unit analysis, fault analysis, sequence component analysis, sequence models of distribution system components. Implications of DG on distribution system protection coordination.

UNIT II DISTRIBUTION SYSTEM LOADING 9

Introduction – Distribution system loading, line drop model, series voltage regulators and on line tap changers- Power quality requirements and source switching using SCR based static switches- Loop and secondary network distribution grids and impact of DG operation.

UNIT III RELAYING AND PROTECTION 9

Relaying and protection, distributed generation interconnection relaying, sensing using CTs and PTs- Intentional and unintentional islanding of distribution systems. Passive and active detection of unintentional islands, non detection zones - EMI considerations in DG applications.

UNIT IV DISTRIBUTED GENERATION PLANNING 9

DG planning and forecasting techniques - Load characteristics: Definitions - tariffs and metering of energy, cost implications of power quality, cost of energy and net present value calculations and implications on power converter design- Distribution Transformers: Types. Distribution sub-stations and primary systems: Voltage drop and power loss calculations: Distribution feeder costs.

UNIT V DG INVERTERS CONTROL 9

Control of DG inverters, phase locked loops, current control and DC voltage control for stand alone and grid parallel operations. Protection of the converter.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Dr. M.K. Khedkar, Dr. G.M. Dhole	A Textbook of Electric Power Distribution Automation	Laxmi Publications, Ltd	2010

REFERENCES

S No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Ned Mohan, Tore M. Undeland, William P. Robbins	Power Electronics: Converters, Applications and Design	Wiley	2002
2	Turan Gonen	Electric Power Distribution Systems	CRC Press	2006
3	Pabla, A. S	Electric Power Distribution	6th Edition, Tata McGraw-Hill Education	2011
4	M. V. Deshpande	Electrical Power System Design	Tata McGraw-Hill Education	2001

16BEEE5E09 DIGITAL SIGNAL PROCESSING L T P C 3 0 0 3

Course Objectives

- To introduce the concept of analyzing discrete time signals and systems in the time and frequency domain.
- To classify signals and systems and their mathematical representation.
- To analyze the discrete time systems.
- To study various transformation techniques and their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor and quantization effects.

Course Outcomes

1. Represent signals mathematically in continuous and discrete-time, and in the frequency domain.
2. Analyze discrete-time systems using z-transform.
3. Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms.
4. Design digital filters for various applications.
5. Apply digital signal processing for the analysis of real-life signals.
6. Analysis the real time application of it

UNIT I INTRODUCTION 9

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect, analog to digital conversion.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 9

Discrete Fourier series, Fourier transform of discrete sequence, Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 9

Discrete Fourier Transform and its properties - Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 9

FIR design: Windowing Techniques - Rectangular, Hamming, Hanning – Need and choice of windows – Linear phase characteristics.

IIR design: Analog filter design - Butterworth filter design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

UNIT V PROGRAMMABLE DSP CHIPS 9

Architecture and features of TMS 320C54 signal processing chip – Overview of instruction set and addressing modes of TMS 320C54

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Proakis, J. G. and Manolakis, D. G	Digital Signal Processing Principles, Algorithms and Applications.	Pearson Education, New Delhi.	2003
2	Mitra, S.K	Digital Signal Processing – A Computer Based Approach	Tata McGraw Hill Publications, New Delhi.	2001

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Alan V Oppenheim, Ronald W Schafer and John R Buck	Discrete – Time Signal Processing	Pearson Education, New Delhi.	2003
2	Venkataramani, B., and Bhaskar, M.,	Digital Signal Processors, Architecture, Programming and Applications.	Tata McGraw Hill, New Delhi.	2003
3	Salivahanan, S., Vallavaraj, A., Gnanapriya, C	Digital Signal Processing	Tata McGraw Hill Publications, New Delhi.	2003

WEBSITES

1. http://www.dspguide.com
2. http://www.dsptutor.freeuk.com

16BEEE5E10 INDUSTRIAL AUTOMATION L T P C 3 0 0 3

Course Objectives

- To study and gain knowledge about various sensors.
- To study and gain knowledge about controllers.
- To study the concept of sensors,
- To study the concept of actuators
- To study the various tuning controllers
- To study the application of SCADA.

Course Outcomes

At the end of the course the student will be able to
1. Understand the concept of sensors,
2. Understand the concept of actuators
3. Analyze the various tuning controllers
4. Analyze the various advanced control techniques used in industrial automation.
5. Understand the application of SCADA.
6. Analyze the SCADA usuage in Industries.

UNIT I SENSORS, ACTUATORS 9

Sensors, Actuators and Signal conditioning Sensors: Displacement sensors, Force sensors, Ultrasonic sensors, Temperature sensors, Pressure sensors etc Actuators: Dc motors, Servo motors, Stepper motors, Piezo electric actuators, Pneumatic actuators etc. Signal Conditioning: Filtering, Amplifying, Isolation, ADC, DAC, Sensor protection circuits, Signal transmission and noise suppression, Estimation of errors and calibration.

UNIT II CONTROLLER TUNING 9

PI controller, PD controller, PID controller and tuning methods: Ziegler-Nichols tuning method, Cohen coon tuning method, Implementation of PID controllers (digital and analog).

UNIT III AUTOMATION 9

PLC (Programmable logic controllers): Overview, operation and architecture, PLC programming, Application examples. DCS (Distributed control systems): Overview, Advantages, Functional requirements of Distributed control systems, Communication for distributed control

UNIT IV APPLICATIONS 9

Application examples SCADA (supervisory control and data acquisition): Introduction to SCADA, SCADA system components, architecture and communication, SCADA applications.

UNIT V ADVANCED CONTROL TECHNIQUES 9

Feed forward control, Ratio control, Cascade control, Adaptive control, Duplex or split range control, Override control, internal mode control.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Krishna Kant	Computer-Based Industrial Control	2nd edition Prentice Hall of India Ltd	2003
2	Stephanopoulous	Chemical Process Control – Theory and Practice	Prentice Hall of India Ltd	2014
3	William C. Dunn	Fundamentals of Industrial Instrumentation and Process Control	TataMcGrawHill	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Muhammad Abdelati	Modern Automation Systems	University Science Press	2009
2	Ogata	Modern Control Engineering	5th edition, , Prentice Hall of India	2010

16BEEE5E011 SENSOR AND TRANSDUCER L T P C 3 0 0 3

Course Objectives

- It deals with various types of Sensors & Transducers and their working principle
- It deals with resistive transducers
- It deals with capacitive transducers
- It deals with inductive transducers
- It deals with some of the miscellaneous transducers
- It deals with characteristics of transducers

Course Outcomes

At the end of the course the student will be able to understand all types of sensors and transducers.

1. Understand all types of sensors and transducers.
2. Justify the concept and working principle of different transducers and sensors
3 Justify the transducers that will be utilised in the electrical industries
4. Identify recent developments in transducer domain
5. Discover the knowledge for small technology up gradations in it
6. Analysis the real time application

UNIT I INTRODUCTION OF TRANSDUCERS 9

Transducer – Classification of transducers – Basic requirement of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS 9

Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs.

UNIT III RESISTIVE TRANSDUCERS 9

Potentiometer –Loading effect – Strain gauge – Theory, types, temperature compensation – Applications – Torque measurement – Proving Ring – Load Cell – Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer.

UNIT IV INDUCTIVE AND CAPACITIVE TRANSDUCER 9

Self inductive transducer – Mutual inductive transducers– LVDT Accelerometer – RVDT – Synchros – Microsyn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone.

UNIT V MISCELLEANEOUS TRANSDUCERS 9

Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Sawhney A.K	A Course in Electrical and Electronics Measurements and Instrumentation	18th Edition, Dhanpat Rai & Company Private Limited	2007
2	Renganathan. S	Transducer Engineering	Allied Publishers, Chennai	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Doebelin. E.A	Measurement Systems – Applications and Design	Tata McGraw Hill, New York	2000
2	Patranabis. D	Sensors and Transducers	PHI Learning Pvt. Ltd.	2003
3	John. P, Bentley	Principles of Measurement Systems	III Edition, Pearson Education	2000
4	Murthy.D.V.S	Transducers and Instrumentation	Prentice Hall of India	2001

16BEEE5E12 INTELLECTUAL PROPERTY RIGHTS L T P C 3 0 0 3

Course Objectives

- To study about the concept of intellectual property laws.
- To study about the trademarks and copy rights.
- To study trademarks and its importance
- To get the knowledge of principles of copyrights and the legal process
- To acquire the knowledge of Trade secrets and its security
- To gain various practical case studies of patent programme

Course Outcomes

- At the end of the course the student will be able to understand the concepts of IPR.
- Ability to need of trademarks and its importance
- To gain the knowledge of principles of copyrights and the legal process
- To acquire the knowledge of Trade secrets and its security
- To gain various practical case studies of patent programmes
- Ability of handling higher level management legality in patent and trading

UNIT I INTRODUCTION 9

Introduction to Intellectual Property Law – The Evolutionary Past - The IPR Tool KitPara -Legal Tasks in Intellectual Property Law – Ethical obligations in Para Legal Tasks in Intellectual Property Law - Introduction to Cyber Law – Innovations and Inventions Trade related Intellectual Property Right.

UNIT II TRADE MARK 9

Introduction to Trade mark – Trade mark Registration Process – Post registration Procedures – Trade mark maintenance - Transfer of Rights - Inter partes Proceeding – Infringement - Dilution Ownership of Trade mark – Likelihood of confusion - Trademarks claims – Trademarks Litigations – International Trade mark Law.

UNIT III COPY RIGHTS 9

Introduction to Copyrights – – Principles of Copyright Principles -The subjects Matter of Copy right – The Rights Afforded by Copyright Law – Copy right Ownership, Transfer and duration – Right to prepare Derivative works – Rights of Distribution – Rights of Perform the work Publicity Copyright Formalities and Registrations - Limitions - Copyright disputes and International Copyright Law – Semiconductor Chip Protection Act.

UNIT IV TRADE SECRET 9

Introduction to Trade Secret – Maintaining Trade Secret – Physical Secrurity – Employee Limitation - Employee confidentiality agreement - Trade Secret Law - Unfair Competation – Trade Secret Letigation – Breach of Contract – Applying State Law.

UNIT V CASE STUDIES 9

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	M.Ashok Kumar and Mohd.Iqbal Ali	Intellectual Property Right	Serials Publications	2008

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Arindam Ghosh, and Gerard Ledwich	Power Quality Enhancement usung Custom Power Electronic Devices	Springer, USA	2002

WEBSITES

1. www.iitk.ac.in/infocell/announce/electric_power
2. powerquality.eaton.com/india/?cx=203

ELECTIVE – III AND ELECTIVE- IV (ONLY APPLICABLE FOR SIXTH SEMESTER)

16BEEE6E01 COMPUTER ORGANIZATION AND ARCHITECTURE L T P C 3 0 0 3 Course Objectives

Course Outcomes:

- To study the various representations of data, register transfer language for micro operations and organizations and design of digital computer
- To teach the concept of micro program control unit ,CPU, stack and instruction formats
- To study the concepts of microprocessors, their principles and practices
- To study the write efficient programs in assembly language of the 8086 family of microprocessors.
- To illustrate the technique to communicate with input and output devices
- To study the organization and operation of various memories and memory

At the end of this course, students will demonstrate the ability to

1. Understand the concepts of microprocessors, their principles and practices.
2. Write efficient programs in assembly language of the 8086 family of microprocessors.
3. Organize a modern computer system and be able to relate it to real examples.
4. Develop the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes.
5. Implement embedded applications using ATOM processor.
6. Analysis the real time application of it.

UNIT I DATA REPRESENTATION, MICRO-OPERATIONS, ORGANIZATION AND DESIGN 9

Data representation: Data types, complements, fixed–point representation, floating-point representation, other binary codes, error detection codes. Register transfer and micro operations: Register transfer language, register transfer, bus and memory transfers, arithmetic micro- operations, logic micro-operations, shift micro-operations, arithmetic logic shift unit-Basic computer organization and design: Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, memory reference instructions, input output and interrupt. Complete computer description, design of basic computer, design of accumulator logic.

UNIT II CONTROL AND CENTRAL PROCESSING UNIT 9

Micro programmed control: Control memory, address sequencing, micro-program example, design of control unit-Central processing unit: General register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, reduced instruction set computer.

UNIT III COMPUTER ARITHMETIC, PIPELINE AND VECTOR PROCESSING 9

Computer arithmetic: Addition and subtraction, multiplication algorithms, division algorithms, floating-point arithmetic operations, decimal arithmetic unit, decimal arithmetic operations- Pipeline and vector processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, RISC pipeline, vector processing array processors.

UNIT IV INPUT-OUTPUT ORGANIZATION 9

Input-output organization: Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access, input-output processor, serial communication.

UNIT V MEMORY ORGANIZATION 9

Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Morris Mano	Computer System Architecture	3rd Edition, Pearson Education	2008
2	Vincent P.Heuring and Harry F.Jordan	Computer Systems Design and Architecture	Pearson Education Asia Publications, II Edition	2008.

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Andrew S.Tanenbaum	Structured Computer Organization’	V Edition, Prentice Hall of India/Pearson Education	2006
2	William Stallings	Computer Organization and Architecture’	VII Edition, Prentice Hall of India/Pearson Education	2008

16BEEE6E02 EMBEDDED SYSTEM L T P C 3 0 0 3

Course Objectives

- To provide a clear understanding of embedded system terminologies and its devices.
- Various Embedded software Tools
- Design and architecture of Memories.
- Architecture of processor and memory organizations.
- Input/output interfacing
- Various processor scheduling algorithms.
- Basics of Real time operating systems.
- Introduction to PIC and its applications

Course Outcomes

At the end of the course the student will be able to program using embedded

1. Understand overview of embedded systems architecture
2. Acquire knowledge on embedded system, its hardware and software.
3. Gain knowledge on overview of Operating system
4. Discuss about task Management
5. Gain knowledge about semaphore management and message passing.
6. Gain knowledge about memory management.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to embedded real time systems – The build process for embedded systems – Types of memory – Memory management methods.

UNIT II EMBEDDED SYSTEM ORGANIZATION 9

Structural units in processor , selection of processor & memory devices – DMA – I/O devices : timer & counting devices – Serial communication using I2C , CAN USB buses – Parallel communication using ISA , PCI ,PCI/X buses – Device drivers.

UNIT III PROGRAMMING AND SCHEDULING 9

Intel I/O instructions – Synchronization - Transfer rate, latency; interrupt driven input and output - Nonmaskable interrupts, software interrupts, Preventing interrupts overrun - Disability interrupts. Multithreaded programming –Context Switching, Preemptive and non-preemptive multitasking, semaphores. Scheduling-thread states, pending threads, context switching.

UNIT IV REAL-TIME OPERATING SYSTEMS 9

Introduction to basic concepts of RTOS, Unix as a Real Time Operating system – Unix based Real Time operating system - Windows as a Real time operating system – POSIX – RTOS-Interrupt handling - A Survey of contemporary Real time Operating systems:PSOS, VRTX, VxWorks, QNX, чC/OS-II, RT Linux – Benchmarking Real time systems – Basics.

UNIT V PIC MICROCONTROLLER BASED EMBEDDED SYSTEM DESIGN 9

PIC microcontroller – MBasic compiler and Development boards – The Basic Output and digital input – Applications.

TOTAL 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rajkamal	Embedded system- Architecture, Programming, Design	TataMcgraw Hill	2003
2	Daniel W. Lewis	Fundamentals of Embedded Software	Prentice Hall of India	2004

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jack R Smith	Programming the PIC microcontroller with MBasic	Elsevier	2007
2	Tammy Noergaard	Embedded Systems Architecture	Elsevier	2006
3	Rajib Mall	Real-Time systems Theory and Practice	Pearson Education	2007
4	Sriram. V.Iyer & Pankaj Gupta	Embedded real time systems Programming	Tata McGraw Hill	2004

16BEEE6E03 PROGRAMMABLE LOGIC CONTROLLER AND ITS APPLICATIONS

L T P C 3 0 0 3

Course Objectives

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To gain the knowledge of storage techniques in PLC
- To acquire the knowledge about how to handle the data and functions
- To study about flo charts of ladder and spray process system
- To understand the principles of PID.

Course Outcomes

- At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.
- To acquire the knowledge of storage techniques in PLC
- Students know how to handle the data and functions
- Students known about advanced controller in PLC applications
- Students gather real time industrial application of PLC
- Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION 9

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING 9

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS 9

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS 9

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES 9

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	JR Hackworth and F.D Hackworth – Jr	Programmable Logic Controllers – Programming Method and Applications	Pearson	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	2002
2	W.Bolton	Programmable Logic controller	Elsevier Newnes Publications, Fourth Edition	2006

WEBSITES

http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logic controller

16BEEE6E04 COMPUTER NETWORKS L T P C 3 0 0 3

Course Objectives

- To study about various network architecture
- To study and analyze about various switching.
- To study about web security and its need
- To study about protocols and its controls
- To study about subnetting and domains basics
- To study about real time need of network management

Course Outcomes

At the end of the course the student will be able

- To understand the computer networks and network protocols.
- To gain switching mechanisms of various interlink networks
- To know web securities and its need in real time digital world
- To gather D-link concepts
- To acquire wireless communication software and its related devices
- Gather protocols of dealing network accessories

UNIT I INTRODUCTION 9

Network architecture – layers – Physical links – Channel access on links – Hybrid multiple access techniques - Issues in the data link layer - Framing – Error correction and detection – Link-level Flow Control

UNIT II WIRELESS NETWORKS 9

Medium access – CSMA – Ethernet – Token ring – FDDI - Wireless LAN – Bridges and Switche

UNIT III SWITCHING 9

Circuit switching vs. packet switching / Packet switched networks – IP – ARP – RARP – DHCP – ICMP – Queueing discipline – Routing algorithms – RIP – OSPF – Subnetting – CIDR – Interdomain routing – BGP – Ipv6 – Multicasting – Congestion avoidance in network layer

UNIT IV NETWORK PROTOCOLS 9

UDP – TCP – Adaptive Flow Control – Adaptive Retransmission - Congestion control – Congestion avoidance – QoS

UNIT V WEB SECURITY 9

Email (SMTP, MIME, IMAP, POP3) – HTTP – DNS- SNMP – Telnet – FTP – Security – PGP - SSH

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Larry L. Peterson, Bruce S. Davie	Computer Networks: A Systems Approach	Third Edition, Morgan Kauffmann Publishers Inc	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
1	James F. Kuross, Keith W. Ross	Computer Networking, A Top-Down Approach Featuring the Internet	Third Edition, Addison Wesley	2004
2	Nader F. Mir	Computer and Communication Networks	Pearson Education	2007
3	Comer	Computer Networks and Internets with Internet Applications	Fourth Edition, Pearson Education	2003
4	Andrew S. Tanenbaum	Computer Networks	Fourth Edition	2003
5	William Stallings	Data and Computer Communication	Sixth Edition, Pearson Education	2000

16BEEE6E05 HIGH VOLTAGE ENGINEERING L T P C 3 0 0 3

Course

- To understand the various types of over voltages in power system and Protection methods.
- To study about generation of over voltages in laboratories.
- To know about measurement of over voltages.
- To study about the nature of Breakdown mechanism in solid, liquid and gaseous Dielectrics
- To study about discussion on commercial insulates.
- To study about testing of power apparatus and insulation coordination

Course Outcomes

1. Identify the causes of over voltages and its effects and estimate the reflection and refractions of travelling waves in transmission lines
2. Discuss the various types of breakdown mechanisms and analyze the breakdown mechanisms in solid, liquid, gases and composite dielectrics
3. Explain the generation and design of different types of Generating circuits for high voltage and currents of AC, DC and impulse
4. Measure AC and DC high voltage and current using high resistance with series ammeter, dividers, peak voltmeter and generating voltmeters
5. Discuss the testing methodologies related to various high voltage equipment with reference to national and international standards
6. Estimate the AC and DC high voltage and current using CVT, electrostatic voltmeters, sphere gaps, high current shunts and digital techniques in high voltage measurement

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9

Causes of over voltages and its effect on power system – Lightning, switching surges and temporary over voltages – protection against over voltages.

UNIT II ELECTRICAL BREAKDOWN IN GASES, LIQUIDS AND SOLIDS 9

Gaseous breakdown in uniform and non–uniform fields – corona discharges – Vacuum breakdown – conduction and breakdown in pure and commercial liquids – breakdown mechanisms in solid and composite dielectrics.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9

Generation of High DC, AC, impulse voltages and currents. Tripping and control of impulse generator.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

Measurement of High voltages and High currents – digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING AND INSULATION COORDINATION 9

High voltage testing of electrical power apparatus – power frequency, impulse voltage and DC testing – International and Indian standards – Insulation Coordination.

TOTAL 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Naidu, M. S. and Kamaraju, V	High Voltage Engineering	Tata McGraw Hill, New Delhi	2004
2	Kuffel, E. and Zaengl, W. S	High Voltage Engineering Fundamentals	Butterworth-Heinemann	2000

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Abdel–AlAm/Ani	High–Voltage Engineering: Theory and Practice	CRC , Colorado, USA	2000
2	Dieter Kind, Kurt Feser	High Voltage Test Techniques	Newnes, NSW, Australia	2000

WEBSITES

1. iopscience.iop.org
2. www.newagepublishers.com

16BEEE6E06 SPECIAL ELECTRICAL MACHINES L T P C 3 0 0 3

Course Objectives

- To expose the students to the concepts of special electrical machines and analyze their performance and to impart knowledge on
- Construction and performance of synchronous reluctance motors.
- Principle of operation and performance of stepping motors .
- To study the knowledge on construction and operation of permanent magnet brushless D.C. motors.
- To study the real time need of special machines
- Construction, principle of operation and performance of switched reluctance motors, permanent magnet synchronous motors.

Course Outcomes

1. Analyze and design controllers for special Electrical Machines.
2. Acquire the knowledge on construction and operation of stepper motor.
3. Understand the concept of construction and operation of stepper switched reluctance motors.
4. Acquire the knowledge on construction and operation of permanent magnet brushless D.C. motors.
5. Acquire the knowledge on construction and operation of permanent magnet synchronous motors.
6. Determine a special Machine for a particular application.

UNIT I SYNCHRONOUS RELUCTANCE MOTORS 9

Constructional features – Types – Axial and radial air gap motors – Operating principle – Reluctance – Phasor diagram – Characteristics – Vernier motor – Driver circuits – Applications of AC motors.

UNIT II STEPPING MOTORS 9

Construction and Principle of operation – Types: Permanent Magnet, Hybrid and Variable reluctance motor – Single and multi stack configurations – Theory of torque predictions – Dynamic Characteristics – Driver circuits – Applications of stepper motors.

UNIT III SWITCHED RELUCTANCE MOTORS 9

Construction and Principle of operation – Torque prediction – Power controllers – Non–linear analysis – Microprocessor based control – Characteristics – Driver circuits.

UNIT IV PERMANENT MAGNET BRUSHLESS DC MOTORS 9

Construction and Principle of operation – Electronic Commutator – Difference between electronic and Mechanical Commutator – Types of PMBLDC motors – Magnetic circuit analysis – EMF and torque equations – Power controllers – Motor characteristics and control – Applications of DC motors.

UNIT V PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Construction and Principle of operation – EMF and torque equations – Torque-speed characteristics – Reactance – Phasor diagram – Power controllers –Volt-ampere requirements of Converter – Self, Vector and Current control schemes.

TOTAL 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	P.P.Acarnley	Stepping Motors, A Guide to Modern theory and practice	Peter Peregrines, London	2002
2	B K Bose	Modern Power Electronics & AC drives	Pearson	2002
3	T.Kenjo	Stepping motors and their microprocessor controls	Oxford University press, New Delhi	2000
4	Sen.P.C	Principles of Electrical	John willey & Sons,	2008
		Machines and Power Electronics	Second edition	-

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hughes	Electric Motors and Drives	Affiliated East - West Press Pvt., Ltd	2007
2	S. Heier	Grid Integration of Wind Energy Conversion Systems	Wiley	2006
3	Ali Emadi (Ed)	Handbook of Automotive Power Electronics and Motor Drives	CRC Press	2005
4	H A Toliyat, S Campbell	DSP Based Electro Mechanical Motion Control	CRC Press	2004
5	Dubey.G.K	Fundamentals of Electric Drives	Alpha Science International Limited, Second revised edition	2008

16BEEE6E07 FIBRE OPTICS AND LASER INSTRUMENTS L T P C 3 0 0 3

Course Objectives

- To expose the students to the basic concepts of optical fibres and their properties.
- To provide adequate knowledge about the Industrial applications of optical fibres.
- To expose the students to the Laser fundamentals.
- To study the source and detectors in optical system
- To provide adequate knowledge about Industrial application of lasers.
- To provide adequate knowledge about holography and Medical applications of Lasers.

Course Outcomes

At the end of the course the student will be understand

- the concept of fibre optics and about laser instruments.
- Introduce the characteristics of laser for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Gain knowledge in industrial application about optical fibre
- Develop the new strategies in laser technology in industries
- Acquire knowledge in advanced medical system utility under this technology

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES 9

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors and splicers – Fiber termination – Optical sources – Optical detectors.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES 9

Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS 9

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS 9

Laser for measurement of distance, length, velocity, acceleration, current,voltage and Atmospheric effect – Material processing – Laser heating, welding,melting and trimming of material – Removal and vaporization.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS 9

Holography – Basic principle - Methods – Holographic interferometry and application, Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	J.M. Senior	Optical Fibre Communication – Principles and Practice'	Prentice Hall of India – 2nd edition	2013
2	J. Wilson and J.F.B. Hawkes	Introduction to Opto Electronics'	Prentice Hall of India	2001

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	G. Keiser	Optical Fibre Communication'	McGraw Hill – 4th edition	2012
2	M. Arumugam	Optical Fibre Communication and Sensors'	Anuradha **Publications**	2002

16BEEE6E08 MOBILE COMMUNICATION L T P C 3 0 0 3

Course Objectives

- To understand the mobile channel environment, communication techniques and wireless standards for mobile communication.
- To learn cellular concept including handoff mechanism, cell coverage and capacity.
- To understand the mobile radio propagation models for indoor and outdoor conditions.
- To study the digital modulation and equalization techniques suitable for mobile communication.
- To learn speech coding and multiple access techniques for mobile communication.
- To familiarize with the international wireless network standards.

Course Outcomes

At the end of the course the student will be able to understand the cellular concept, mobile propagation, wireless systems and standards.

- Understand past, present and future trends in mobile communication.
- Gain knowledge about mobile cellular communication
- Understand various standards in use for wireless communication and its application.
- Demonstrate some basic application of GPS.
- Gain knowledge about RADAR working and its applications
- Analysis the real time application of it.

UNIT I CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS 9

Introduction to wireless communication: Evolution of Mobile Communication, mobile radio systems – Examples, trends in cellular radio and personal communications. Cellular concept: Frequency reuse, channel assignment hand off, interference and system capacity, tracking and grade of service, improving coverage and capacity in cellular systems.

UNIT II MOBILE RADIO PROPAGATION 9

Free space propagation model, reflection, diffraction, scattering, link budget design, outdoor propagation models, indoor propagation models, small scale multipath propagation, impulse model, small scale multipath measurements, parameters of mobile multipath channels, types of small scale fading.

UNIT III MODULATION TECHNIQUES AND EQUALIZATION 9

Modulation techniques: Minimum Shift Keying (MSK), Gaussian MSK, M–array QAM, Performance of MSK modulation in slow–flat fading channels. Equalization: Survey of equalization techniques, linear equalization, non–linear equalization, algorithms for adaptive equalization. Diversity Techniques, RAKE receiver.

UNIT IV CODING AND MULTIPLE ACCESS TECHNIQUES 9

Coding: Vocoders, linear predictive coders, selection of speech coders for mobile communication, GSM coders. Multiple access techniques: FDMA, TDMA, CDMA, SDMA, capacity of cellular CDMA.

UNIT V WIRELESS SYSTEMS AND STANDARDS **9**

Second generation and third generation wireless network and standards, WLL, blue tooth, GSM, IS–95 and DECT.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rappaport, T. S	Wireless Communications: Principles and Practice	Prentice Hall of India, New Delhi	2003
2	Blake, R	Wireless Communication Technology	Thomson Delmar, New York	2003

REFERENCES

S. No.	Author(s) Name	Title of theBbook	Publisher	Year of Publication
1	Stephen G Wilson	Digital Modulation and Coding	Pearson Education, New Delhi	2003
2	Jochen Schiller	Mobile Communications	Addison Wesley, Boston	2003
3	Mischa Schwartz	Mobile Wireless Communications	Cambridge University Press, Cambridge, UK	2005

WEBSITES

1. www.pearson.ch/download/media/9780130422323.pdf
2. www.wtec.org/loyola/wireless/chapter02.pdf

16BEEE6E09 SWITCHED MODE POWER CONVERSION L T P C 3 0 0 3

Course Objectives

At the end of the course the student will be understand

- The concept of fibre optics and about laser instruments.
- Introduce the characteristics of laser for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Gain knowledge in industrial application about optical fibre
- Develop the new strategies in laser technology in industries
- Acquire knowledge in advanced medical system utility under this technology

Course Outcomes

- At the end of the course the student will be able to understand the concept of power converters, resonant converters and about harmonics.
- At the end of the course the student will be able to understand the concept of capacitors and inductor design.
- To understand the working of Power Converters and components of low-voltage electrical installation
- To acquire knowledge of Steady state and dynamic functions in various applications
- To know the importance of power quality system in advanced equipments
- To know the design of conversion ratio

UNIT I INTRODUCTION 9

Reactive elements in power electronics system- electromagnetics – design of inductor- design of transformer – capacitors for power electronic applications – types of capacitor

UNIT II POWER CONVERTERS 9

Switched mode power converters – continuous and discontinues mode of operation in buck, boost and boost-buck converter – isolated DC to DC: forward converter- pushpull converter – fly back converter

UNIT III STEADY STATE AND DYNAMIC FUNCTIONS 9

Pulse width modulated converter: average modeled of the converter – steady state solution – transfer function of the converter- generalized stste space mode of the converter – linear small signal model – dynamic functions of the converter.

UNIT IV RESONANT CONVERTERS 9

Resonant converters – ZCS Resonant converters – L and M type – ZVS Resonant converters- comparison between ZCS and ZVS converters – resonant switch converters – buck converter with zero current switching – operation of the circuit – conversion ratio of the converter – boost converter with zero voltage switching

UNIT V HARMONICS **9**

Sub harmonic instability in current programmed control – determination of duty ratio for current programmed control – power circuit of UPF rectifiers – average current mode control – resistor emulator UPF rectifiers

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Keng C. Wu	Switch-Mode Power Converters: Design and Analysis	Elsevier Academic Press	2006

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Issa Batarseh	Power Electronic Circuits	John Wiley	2004
2	Philip T Krein	Elements of Power Electronics	Oxford Press	2014

16BEEE6E10 BIOMEDICAL INSTRUMENTATION L T P C 3 0 0 3

Course Objectives

- The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance
- To study about instruments for physiological measurements
- To study about devices of non–electrical devices.
- To study about modern methods of imaging techniques.
- To study about nervous system
- To study about medical assistance / techniques and therapeutic

Course Outcomes

At the end of the course the student will be to

- Acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Methods of different transducers used.
- Understand the student to the various sensing and measurement devices of electrical origin.
- Analysis the latest ideas on devices of non–electrical devices.
- Analysis the important and modern methods of imaging techniques.
- Analysis latest knowledge of medical assistance / techniques and therapeutic equipment.
- Analysis the real time application of it

UNIT I PHYSIOLOGY AND TRANSDUCERS 9

Cell and its structure – Action and resting potential – Potential propagation of action potential – Sodium pump – Nervous system – CNS – PNS – Nerve cell – Synapse – Cardio pulmonary system – Physiology of heart and lungs – Circulation and respiration – Transducers – Different types – Piezo electric, ultrasonic, resistive, capacitive and inductive transducers – Selection criteria.

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS 9

Basic components of a biomedical system – Electrodes – Micro, needle and surface electrodes – Amplifiers – differential, chopper, Isolation and Pre-amplifiers. ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms.

UNIT III NON–ELECTRICAL PARAMETER MEASUREMENTS 9

Measurement of blood pressure – Cardiac output – Cardiac rate – Heart sound – Respiratory rate – Gas volume – Flow rate of CO_2, O_2 in exhaust air – pH of blood, ESR and GSR measurements – Plethysmography.

UNIT IV MEDICAL IMAGING AND PATIENT MONITORING SYSTEM 9

X–ray machine – Radiographic and fluoroscopic techniques – Computer Tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety.

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENT 9

Pacemakers – Defibrillators – Ventillators – Nerve and muscle stimulators – Diathermy – Heart-Lung machine – Audio meters – Dializers.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Leslie Cromwell, Fred J Weibell, Erich A Pfeiffer	Bio–Medical Instrumentation and Measurements	Pearson Education, India	2002
2	Khandpur, R. S	Handbook of Bio–Medical instrumentation	Tata McGraw Hill Publishing Co. Ltd., India	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Arumugam, M	Bio–Medical Instrumentation	Anuradha Agencies, Kumbakonam	2003
2	Webster, J	Medical Instrumentation	John Wiley and Sons, New York	1995
3	Rajarao.C. and Guha, S.K	Principles of Medical Electronics and Bio–medical Instrumentation	Universities Press India Ltd., India	2000
4	Khandpur, R. S	Biomedical Instrumentation: Technology and Applications	McGraw–Hill Education, Europe	2004

WEBSITES

1. www.biopac.com
2. www.britannica.com/EBchecked/topic/674616/transducer

16BEEE6E11 MODERN SEMICONDUCTOR DEVICES L T P C 3 0 0 3

Course Objectives

- To study the power semiconductor switches.
- To study about the characteristics and applications of Power diode, power BJT, Thyristor, GTO, IGBT, MOSFET.
- To study the real time application of it.
- To study the basics of thyristor technologies
- To study the new semiconductor material of power devices
- To study the safe operating area of the power devices

Course Outcomes

At the end of the course the student will be able to

- Understand the concepts of modern semiconductor devices
- Understand the different characteristics of conductor devices
- Analysis the real time application of it.
- To learn deep knowledge of thyristor technologies
- To study about real time applications of inverters and rectifiers
- To learn about protection of device circuits

UNIT I OVERVIEW OF POWER SEMICONDUCTOR SWITCHES 9

Introduction - Diodes, Thyristors, BJTs, JFETs, MOSFETs, GTOs, IGBTs, Comparison of these as switching devices, Drive and Protection circuit for these devices – New Semiconductor materials for Power devices.

UNIT II POWER DIODE AND POWER BJT 9

Basic structure and I-V & Switching characteristics of Power diode, Schottky diode - Structure and switching characteristics of Power BJT - Breakdown voltage considerations - Safe operating area - Drive circuits for BJT – Snubber design for Power diode.

UNIT III THYRISTORS AND GTOs 9

Basic structures - I-V characteristics - Physics of device operation - Switching characteristics of Thyristors and GTOs – Derive circuits - Snubber circuits for Thyristors and GTOs - Over current protection of GTO.

UNIT IV IGBT AND POWER JFET & MOSFETS 9

Basic structures - I-V characteristics, physics of device operation - Switching characteristics – Safe operating area of IGBT and Power JFET & MOSFET - Derive circuits and Protection.

UNIT V APPLICATIONS 9

Single phase rectifiers and Three phase rectifiers using Diodes and Thyristors, Choppers, Inverters using GTOs-IGBTs and power JFETs & MOSFETs.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mohan. Net al	Power Electronics: Converters, Applications and Design	John Wiley and Sons, New York, Third Edition	2002
2	Rashid M.H	Power Electronics Circuits, Devices and Applications	Prentice Hall India, Third edition, New Delhi	2004

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	M.D. Singh and K.B.Khanchandani	Power Electronics	Tata McGraw Hill, New Delhi, Second Edition	2008
2	Donald A.Neamen	Semiconductor Physics and Devices	Tata McGraw Hill, New Delhi, Fourth Edition	2011
3	Kassakian,J.G.et.al	Principles of Power Electronics	Pearson Education India	2010

PROFESSIONAL ELECTIVE- V

(ONLY APPLICABLE FOR SEVENTH SEMESTER)

16BEEE7E01 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS L T P C 3 0 0 3

Course Objectives

- To study about representing knowledge.
- To study the reasoning and decision making in uncertain world. To construct plans and methods for generating knowledge.
- To study the concepts of expert systems.
- To study the knowledge about the various searching strategies
- To study about first order logic
- To study the need of real time world about robotics

Course Outcomes

At the end of the course the student will be able to

- understand concepts about artificial intelligence, reasoning and also about expert tools.
- To understand about representing knowledge.
- To acquire knowledge about the reasoning and decision making in uncertain wor construct plans and methods for generating knowledge.
- To acquire knowledge about the concepts of expert systems.
- To acquire knowledge about the various searching strategies for solutions

UNIT I INTRODUCTION 9

Introduction to AI: Intelligent agents – Perception – Natural language processing – Problem solving agents – Searching for solutions: Uniformed search strategies – Informed search strategies.

UNIT II KNOWLEDGE AND REASONING 9

Adversarial search – Optimal and imperfect decisions – Alpha, Beta pruning – Logical agents: Propositional logic – First order logic – Syntax and semantics – Using first order logic – Inference in first order logic.

UNIT III UNCERTAIN KNOWLEDGE AND REASONING 9

Uncertainty – Acting under uncertainty – Basic probability notation – Axioms of probability – Baye's rule – Probabilistic reasoning – Making simple decisions.

UNIT IV PLANNING AND LEARNING 9

Planning: Planning problem – Partial order planning – Planning and acting in non–deterministic

domains.
Learning: Learning decision trees – Knowledge in learning – Neural networks – Reinforcement learning – Passive and active.

UNIT V EXPERT SYSTEMS **9**
Definition – Features of an expert system – Organization – Characteristics – Prospector – Knowledge Representation in expert systems – Expert system tools – MYCIN – EMYCIN.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Stuart Russel and Peter Norvig	Artificial Intelligence A Modern Approach	Prentice Hall India, New Delhi	2003
2	Donald A Waterman	A Guide to Expert Systems	Pearson Education, India	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	George Luger F	Artificial Intelligence – Structures and Strategies for Complex Problem Solving	Pearson Education, New Delhi	2002
2	Janakiraman, Sarukesi, K	Foundations of Artificial Intelligence and Expert Systems	Macmillan Series in Computer Science	2001
3	Patterson, W	Introduction to Artificial Intelligence and Expert Systems	Prentice Hallof India, New Delhi	2003
4	Michael Negnevitsky	Artificial Intelligence: A Guide to Intelligent Systems	Addison Wesley, Harlow, England	2005

WEBSITES
1. http://nptel.iitm.ac.in/video.php/courseId=1084
2. www.pes.edu

16BEEE7E02 HVDC AND EHVAC L T P C 3 0 0 3

Course Objectives

- To study about HVDC systems
- To study about HVDC control systems
- To Study the control strategies used in HVdc transmission system.
- To Study the improvement of power system stability using an HVdc system.
- To Study and Analysis the components of HVDC system
- To study about aspects of EHVAC systems

Course Outcomes

At the end of the course the student will

- Justify the advantages of dc transmission over ac transmission.
- Reproduce the operation of Line Commutated Converters and Voltage Source Converters.
- Evaluate the control strategies used in HVdc transmission system.
- Identify and propose the improvement of power system stability using an HVdc system.
- gain knowledge about HVDC transmission, converters used and about EHVAC systems.
- Analysis the real time application of it.

UNIT I EHV TRANSMISSION 9

Introduction-Necessity for EHV Transmission-Problems involved in EHV Transmission-Operational Aspects of EHV power transmission-Compensation of EHV systems-Gas insulated EHV lines-Environmental and biological aspects.

UNIT II GENERAL BACKGROUND OF EHVAC TRANSMISSION SYSTEMS 9

Standard Voltage levels for Transmission lines-Hierarchical levels of Transmission Network-Average values of line parameters-Power handling capacity and line losses-Cost of Transmission line and Equipments-Mechanical consideration in line performance-Comparison of Overhead and Underground lines-Examples of Giant power pools in the world.

UNIT III ASPECTS OF EHVAC SYSTEM 9

Power Transferability of Ac line – Line losses-Conductor cost -Transient stability of Ac line – control of power flow through line Right – of- way(Row)-Corona- Towers(support)-Insulation Coordination and surge arrester protection-Line insulation-Clearance and Creepage distances.

UNIT IV HVDC TRANSMISSION SYSTEMS 9

Choice of HVDC Transmission - Comparison of AC and DC Transmission – Economics of DC power Transmission, Technical Performance and Reliability – Description of HVDC Converter station- Types of HVDC Links- Merits and Limitations of HVDC System - Applications -Modern Trends in HVDC transmission –Case Studies of HVDC links in the world.

UNIT V CONVERTERS AND HVDC SYSTEM CONTROL 9

Pulse number – Choice of Converter Configuration – Simplified analysis of Graetz circuit –

Principles of HVDC link Control –DC Breaker - Harmonic Elimination – AC and DC Filter design –Protection Systems in HVDC Substation-HVDC Simulator.

TOTAL 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Naidu, M. S. and Kamaraju, V	High Voltage Engineering	Tata McGraw Hill, New Delhi	2004
2	Kuffel, E. and Zaengl, W. S	High Voltage Engineering Fundamentals	Butterworth-Heinemann	2000

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Abdel–AlAm/Ani	High–Voltage Engineering: Theory and Practice	CRC , Colorado, USA	2000
2	Dieter Kind, Kurt Feser	High Voltage Test Techniques	Newnes, NSW, Australia	2000

WEBSITES

1. iopscience.iop.org
2. www.newagepublishers.com

16BEEE7E03 POWER SYSTEM ECONOMICS L T P C 3 0 0 3

Course Objectives

- To study about the economic aspects.
- To study about the economic dispatch and operation.
- To study about stability constraints in a synchronous grid.
- To study the methods to control the voltage, frequency.
- To study the problem formulation of power flow
- To study the basics of power system economics

Course Outcomes

At the end of the course student will be able to .
1. Understand the concept of power generation economics
2. Understand stability constraints in a synchronous grid.
3. Understand methods to control the voltage, frequency.
4. Understand methods to control the power flow.
5. Understand the monitoring and control of a power system.
6. Understand the basics of power system economics.

UNIT I ECONOMIC CONSIDERATIONS 9

Cost of electrical energy-expressions for cost of electrical energy-capital-interest-depreciation-different methods-factors affecting cost of operation-number and size of generating units-importance of high load factor-importance of power factor improvement-most economical power factor-meeting the KW demand on power stations-power system tariffs.

UNIT II ECONOMIC DISPATCH 9

Economic scheduling of generators in a plant-economic coordination of generation among a number of plants-losses neglected, with generator limits, losses included-losses of economy in incremental cost data- automatic load dispatch in power systems-analog and digital computers for application to load dispatch.

UNIT III ECONOMIC OPERATION 9

General loss formula-evolution of incremental transmission loss rate-method of calculation of loss coefficients-systematic development of transmission loss formula-Transmission loss as a function of plant generation, voltage and phase angle-economic dispatch computers.

UNIT IV ECONOMIC CONTROL 9

Interconnected operation-economic operation of hydro thermal power plants-λ-γ iteration scheme-gradient approach-modeling and solution approach to short term and long term hydro-thermal scheduling problem using dynamic programming.

UNIT V OPTIMAL POWER FLOWS 9

Problem formulation-cost minimization-loss minimization-solution using NLP and successive LP methods.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Kirchmayer. L.K	Economic operation of power system	John Wiley & Sons, New York	1953
2	Kirchmayer. L.K	Economic control of Interconnected Systems	Tata McGraw Hill Publishing Company, New Delhi	1959

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Allen J Wood and B F Wollenberg	Power Generation, Operation and Control	John Wiley & Sons, New York	1984
2	I J Nagrath and D P Kothari	Modern Power System Analysis	Tata McGraw Hill, New Delhi.	-

16BEEE7E04 POWER SYSTEM RESTRUCTURING AND DEREGULATION

L T P C 3 0 0 3

Course Objectives

- To study about key issues in electric utilities restructuring.
- To study about open access same time information systems.
- Gain the knowledge about power system restructure.
- To study about ISO and its types, roles.
- To known about electricity markets
- To study about knowledge of various trades

Course Outcomes

At the end of the course student will be able to

- Analysis about electric energy trading, electric pricing.
- Analysis about open access same time information systems.
- Gain the knowledge about power system restructure.
- Analysis the real time application of it
- Acquiring knowledge of embedded cost and pricing models in various countries
- Acquiring knowledge of various trades

UNIT I **9**

Deregulation Of Electric Utilities - Introduction-Unbundling-Wheeling-Traditional Central utility model-Reform motivations-Separation of Ownership and operation- competition and direct access in the Electricity market –ISO-components of ISO-types of ISO-role of ISO-Electric utility market in different countries.

UNIT II **9**

Transmission Expansion In The New Environment - Introduction – role of transmission planning – vertically integrated utility – three models of electricity market – Profit transmission planning – pool – bilateral trades – multilateral trades.

UNIT III **9**

Transmission Pricing In Open Access System - Introduction – rolled in pricing methods – marginal pricing method – embedded cost recovery – pricing models in different countries.

UNIT IV **9**

Total transfer capability – CBM and TRM – Available transfer capability (ATC) – methods to compute ATC – concept of congestion management – inter and inter zone congestion – congestion pricing management – Transmission congestion contracts – Ancillary services.

UNIT V **9**

Salient features of Indian Electricity Act 2003 – TSO – Availability based tariff – Electric supply industry structure under deregulation in India – regulatory and policy development in Indian power Sector – Opportunities for IPPs and CPPs under electricity Act 2003.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Wood and Wollenberg	Power system operation control	second edition, John Wiley sons	1996
2	Loi Lei Lai	Power system Restructuring and Regulation	John Wiley sons	2001

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Michael Einhorn and Riaz Siddiqi	Electricity Transmission Pricing And Technology	Kluwer Academic publishers	1996
2	M.Illic, F.Galiana and L.Fink	Power Systems Restructuring : Engineering and Economics	Kluwer Academic Publishers	2000
3	M.Shahidehpour and M.Alomoush	Restructuring Electrical Power Systems	Marcel Decker Inc.	2001

16BEEE7E05 **POWER QUALITY** **L T P C 3 0 0 3**

Course Objectives

- To study the production of voltages sags, over voltages and harmonics and methods of control.
- To study various methods of power quality monitoring.
- To understand the concept of power and power factor in single phase and three phase systems supplying non linear loads
- To understand the conventional compensation techniques used for power factor correction and load voltage regulation.
- To understand the active compensation techniques used for power factor correction.
- To understand the active compensation techniques used for load voltage regulation.

Course Outcomes

At the end of the course the student will be able to

1.Evaluate the characteristics of ac transmission
2.Reproduce the effect of shunt and series reactive compensation.
3.Justify the working principles of FACTS devices and their operating characteristics.
4.Reproduce the basic concepts of power quality.
5.Rewrite the concept of Harmonics
6.Reproduce and justify the working principles of devices to improve power quality.

UNIT I INTRODUCTION TO POWER QUALITY 9

Terms and definitions: Overloading, under voltage, sustained interruption; sags and swells; waveform distortion, Total Harmonic Distortion (THD), Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT II VOLTAGE SAGS AND INTERRUPTIONS 9

Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

UNIT III OVER VOLTAGES 9

Sources of over voltages: Capacitor switching, lightning, ferro resonance; mitigation of voltage swells: Surge arresters, low pass filters, power conditioners – Lightning protection, shielding, line arresters, protection of transformers and cables, computer analysis tools for transients, PSCAD and EMTP.

UNIT IV HARMONICS 9

Harmonic distortion: Voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads, locating harmonic sources; power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

UNIT V POWER QUALITY MONITORING 9

Monitoring considerations: Power line disturbance analyzer, power quality measurement equipment, harmonic / spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

TOTAL 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Roger C Dugan, Mark, F., McGranagham, Surya Santoso, Wayne Beaty, H	Electrical Power Systems Quality	McGraw Hill, New York	2003
2	C. Sankaran	Power Quality	CRC Press, Florida	2002

Course Objectives

- To learn about the controlling of excitation system and speed governing system.
- To impart knowledge on dynamic modeling of a synchronous machine in detail
- To describe the modeling of excitation and speed governing system in detail.
- To understand the fundamental concepts of stability of dynamic systems and its classification.
- To understand and enhance small signal stability problem of power systems.Model different power system components for the study of stability
- To Study the methods to improve stability.

Course Outcomes

At the end of this course, students will demonstrate the ability to

1. Understand the problem of power system stability and its impact on the system.
2.Analyze linear dynamical systems and use of numerical integration methods.
3.Model different power system components for the study of stability.
Understand the methods to improve stability.
4. Understand real time difficulties in machine analysis
5. To get known about modelling system and its control
6. To understand the transient and dynamic stability of power systems.

UNIT I INTRODUCTION 9

Concept and importance of stability in power system operation and design- distinction between transient and dynamic stability- complexity of stability problem in large system- Need for reduced models- stability of interconnected systems.

UNIT II MACHINE MODELING 9

Park's transformation- flux linkage equations, current space model- per unit conversion- normalizing the equations- equivalent circuit- flux linkage state space model- Simplified models (one axis and constant flux linkage)- steady state equations and phasor diagrams.

UNIT III MACHINE CONTROLLERS 9

Exciter and voltage regulators- function of excitation systems, types of excitation systems- typical excitation system configuration-block diagram and state space representation of IEEE type 1 excitation system- saturation function- stabilizing circuit- Function of speed governing systems- block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

UNIT IV TRANSIENT STABILITY 9

State equation for multi machine simulation with one axis model- transient stability simulation of multi machine power system with one axis machine model including excitation system and speed governing system using R-K method of fourth order (Gill's technique)- power system stabilizer.

UNIT V DYNAMIC STABILITY 9

System response to small disturbances- Linear model of the unregulated synchronous machine and its modes of oscillation- regulated synchronous machine- distribution of power impact- linearization of the load equation for the one machine problem – Simplified linear model- effect of excitation on dynamic stability- approximate system representation- supplementary stabilizing signals- dynamic performance measure- small signal performance measures.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Anderson.P.M and Fouad.A.A	Power System Control and Stability	Galgotia Publications, New Delhi	2003

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Pai. M.A and Sauer.W	Power System Dynamics and Stability	Pearson Education Asia, India	2002

16BEEE7E07 COMPUTER AIDED ANALYSIS AND DESIGN OF ELECTRICAL APPARATUS **L T P C 3 0 0 3**

Course Objectives

- To study the structure and behaviour of processors, memories and input and output units and to study their interactions.
- To get basic knowledge on geometric modeling
- To study the graphic transformation needs
- To study about the basics of parametric design and object representation
- To get basic knowledge in product design and development.
- To study about 3D design introduction

Course Outcomes

At the end of the course the student will be able to

- Draw electrical drawings using CAD.
- Acquire basic knowledge on geometric modeling
- Acquire knowledge on graphic transformation needs
- Gaining CAD software application in engineering
- Gaining basics of parametric design and object representation
- Analyse the real time application of it

UNIT I INTRODUCTION **9**

Conventional design methodology overview – Computer aided design aspects – Need for CAD – Nature of design problems- Analysis and synthesis approaches-advantages.

UNIT II FINITE ELEMENT ANALYSIS **9**

Mathematical formulation – Discretisation – Shape functions – Stiffness matrix – Solution techniques – Post processing.

UNIT III CAD PACKAGES **9**

Recent developments – Preprocessing – Modeling - Meshing – Boundary conditions -Material characteristics – Problem formulation – Solution – Post processing.

UNIT IV CAD SOFTWARE **9**

Program files – Installation – Screen menu structure_ Fixing the size of a drawing – Set up option- On line help- Text fonts, Shapes – Blocks – Copy – Array- Erasing facilities -Editing – Fill – Zoom pan – Hatching – Isoplane – Elevation – View point – Dimension techniques – Introduction to 3D drawing.

UNIT V DESIGN EXAMPLES **9**

Design of actuator – Solenoid -Transformer - Induction motor – Synchronous machines - Switched reluctance motor.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication

1	P.P. Silvester and Ferrari	Finite Element for Electrical Engineers	Cambridge University Press, 3rd edition	2012
2	D.A. Lowther and P.P. Silvester	Computer Aided Design in Magnetics	Springer; Softcover reprint of the original 1st ed. 1986 edition	2011

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Sham Tickoo	AutoCAD 2002 with	Tata McGraw Hill	2001
		applications	Publishing Company limited, New Delhi	

16BEEE7E08 DIGITAL SYSTEM DESIGN USING VHDL L T P C 3 0 0 3

Course Objectives

- To introduce design concept and VHDL.
- To study implementation techniques using various PLDs.
- To study the design of various combinational, synchronous and asynchronous circuits.
- To study about design combinational and sequential circuits.
- To study about CAD tools
- To expose the students to design and testing.

Course Outcomes

At the end of the course the student will be able

- To understand the VHDL principles.
- Students will be able to design combinational and sequential circuits.
- Understand the implementation techniques using various PLDs.
- To analysis the design of various combinational, synchronous and asynchronous circuits.
- To analysis the students to design and testing.
- Analysis the real time application of it.

UNIT I INTRODUCTION TO DESIGN 9

Design concepts – Design Process, design of Digital hardware, Variables and functions, truth tables, Boolean Algebra – Synthesis using Gates – Introduction to CAD Tools – VHDL.

UNIT II IMPLEMENTATION TECHNOLOGY 9

MOS Logic gates – PLDs – practical aspects, implementation details for SPLDs, CPLDs and FPGAs, optimized implementation of logic functions - multilevel synthesis, analysis of multilevel circuits – minimization techniques.

UNIT III DESIGN OF COMBINATIONAL CIRUITS 9

Number representation – signed, unsigned, combinational circuits – adder, multiplier, multiplexer, decoder and encoder, code converters - using signal assignment statements - concurrent and sequential – process and case statements, operators.

UNIT IV DESIGN OF SEQUENTIAL CIRCUITS 9

Latch – Flip-flops, registers and counters, finite state machines using CAD tools. Basic design steps with examples - Design of simple processor, vending machine controller.

UNIT V DIGITAL SYSTEM DESIGN 9

Building block circuits – Design examples – clock synchronization, testing of logic circuits – fault model, test set – path sensitizing, testing of sequential circuits.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Stephen Brown, Zvonko Vranesic	Fundamentals of digital logic design with VHDL	Tata McGraw-Hill Publishing company limited	2009
2	Volnei.A.Pedroni	Circuit design with VHDL	PHI Learning Private Limited	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Douglas L. Perry	VHDL Programming by example	Tata McGraw-Hill Publishing company limited	2009
2	J.Bhasker	A VHDL primer	Prentice-Hall India Learning Private Limited	2003

16BEEE7E09 **OPTIMIZATION TECHNIQUES** **L T P C 3 0 0 3**

Course Objectives

- To have knowledge on optimization techniques applied to power systems
- To understand the different evolutionary computation techniques
- To study about optimal power flow problems
- To study about evolution computation techniques
- To study about the basics of MOOP
- To study about the solution of OPF

Course Outcomes

- At the end of the course the students will be able to understand the various optimization techniques.
- To get knowledge in optimization problems
- Acquire knowledge about power flow problem and solutions
- Experience in various algorithm and programming
- Gaining knowledge in velocity updation principle
- Gain knowledge about Economic emission dispatch

UNIT I OPTIMIZATION FUNDAMENTALS 9

Definition- Classification of optimization problems- Unconstrained and Constrained optimization- Optimality conditions- Classical Optimization techniques.

UNIT II OPTIMAL POWER SYSTEM OPERATION 9

Economic Dispatch problem-Unit commitment-Optimal Power Flow Problem- Solution Using Classical methods

UNIT III EVOLUTIONARY COMPUTATION TECHNIQUES 9

Evolution in nature-Fundamentals of Evolutionary algorithms-Working Principles of Genetic Algorithm- Evolutionary Strategy and Evolutionary Programming-Genetic Operators-Selection, Crossover and Mutation-Issues in GA implementation-GA solution of economic dispatch and unit commitment.

UNIT IV PARTICLE SWARM OPTIMIZATION 9

Fundamental principle-Velocity Updating-Advanced operators-Hybrid approaches Implementation issues-Solution of OPF problem

UNIT V MULTI OBJECTIVE OPTIMIZATION 9

Concept of pareto optimality-Conventional approaches for MOOP-Multi objective GA-Fitness assignment-Sharing function-Economic Emission dispatch using MOGA

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication

1	Kalyanmoy Deb	Multi objective optimization using Evolutionary Algorithms	John Wiley and Sons	2008
2	D.P.Kothari and J.S.Dhillon	Power System Optimization	2nd Edition, PHI learning private limited	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Carlos A.Coello Coello, Gary B.Lamont, David A.Van Veldhuizen	Evolutionary Algorithms for solving Multi Objective Problems	2 nd Edition, Springer	2007
2	Kwang Y.Lee,Mohammed A.El Sharkawi	Modern heuristic optimization techniques	John Wiley and Sons	2008

16BEEE7E10 REAL TIME OPERATING SYSTEM L T P C 3 0 0 3

Course Objectives

- To create an awareness on Operating Systems.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To study about memory management
- To study about integration of hardware and software
- To know about application procedures of RTOS

Course Outcomes

At the end of the course the students will be able to

- Understand overview of embedded systems architecture
- Acquire knowledge on embedded system, its hardware and software.
- Gain knowledge on overview of Operating system
- Discuss about task Management
- Gain knowledge about semaphore management and message passing.
- Gain knowledge about memory management.

UNIT I INTRODUCTION TO EMBEDDED SYSTEM 9

Introduction - Embedded systems description, definition, design considerations & requirements - Overview of Embedded system Architecture (CISC and RISC) -Categories of Embedded Systems - Embedded processor selection & tradeoffs - Embedded design life cycle - Product specifications - Hardware/software partitioning - Iterations and implementation - Hardware software integration - Product testing techniques – ARM 7.

UNIT II OPERATING SYSTEM OVERVIEW 9

Introduction –Advantage and Disadvantage of Using RTOS – Multitasking – Tasks - Real Time Kernels – Scheduler - Non-pre-emptive Kernels - Pre-emptive Kernels – Re-entrancy- Re-entrant Functions – Round Robin Scheduling - Task Priorities - Static Priorities – Mutual Exclusion – Deadlock – Intertask Communication – Message Mailboxes – Message Queues - Interrupts - Task Management – Memory Management -Time Management – Clock Ticks.

UNIT III TASK MANAGEMENT 9

Introduction - µC/OS-II Features - Goals of µC/OS-II - Hardware and Software Architecture – Kernel Structures: Tasks –Task States – Task Scheduling – Idle Task – Statistics Task – Interrupts Under µC/OS-II – Clock Tick - µC/OS-II Initialisation. Task Management: Creating Tasks – Task Stacks – Stack Checking – Task's Priority – Suspending Task – Resuming Task. Time Management: Delaying a Task – Resuming a Delayed Task – System Time. Event Control Blocks- Placing a Task in the ECB Wait List – Removing a Task from an ECB wait List.

UNIT IV SEMAPHORE MANAGEMENT 9

Semaphore Management Overview – Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox – Deleting Mailbox – Waiting for a Message box – Sending Message to a Mailbox- Status of Mailbox Message Queue Management: Creating Message Queue – Deleting a Message Queue – Waiting for a Message at a Queue – Sending Message to a Queue – Flushing a Queue.

UNIT V MEMORY MANAGEMENT 9

Memory Control Blocks – Creating Partition- Obtaining a Memory Block – Returning a Memory Block .Getting Started with µC/OS-II – Installing µC/OS-II – Porting µC/OS-II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with µC/OS-II – µC/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Analyze the Multichannel ADC with help of µC/OS-II.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jean J. Labrosse	MicroC/OS – II The Real Time Kernel	CMP Books, II Edition	2002
2	Colin Walls,	Building a Real Time Operating System	Elsevier Science	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	David Seal	ARM Architecture Reference Manual	Addison Wesley	2000
2	Steve Furbe ,	ARM System-on-Chip Architecture	Pearson Education, II Edition	2001

16BEEE7E11 ADVANCES IN SOFT COMPUTING L T P C 3 0 0 3

Course Objectives

- To study basics of Fuzzy logic and modeling.
- To study various Genetic algorithms
- To educate how to use Soft Computing to solve real-world problems
- To study about the perception concept in design
- To study basics of various Neural networks.
- To expose the students to Neuro fuzzy modeling and its applications.

Course Outcomes

- At the end of the course the students will gain knowledge in various soft computing techniques and also analyse the genetic algorithm approach.
- The students will know the applications of various soft computing techniques.
- Gaining knowledge about use of Soft Computing to solve real-world problems
- Acquire knowledge about the perception concept in design
- Experience in fuzzy models preparation
- Experience about automobile fuel efficiency improvements

UNIT I FUZZY LOGIC 9

Introduction to Neuro – Fuzzy and soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic operations – Member Function Formulation and parameterization – Fuzzy Rules and Fuzzy Reasoning - Extension principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models-Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT II GENETIC ALGORITHM 9

Derivative-based Optimization – Descent Methods – The Method of steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT III NEURAL NETWORKS 9

Introduction -Supervised Learning Neural Networks – Perceptrons - Adaline – Back propagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT IV NEUROFUZZY MODELING 9

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro-Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT V APPLICATIONS 9

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency prediction – Soft Computing for Color Recipe Prediction.

AL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	J.S.R.Jang, C.T.Sun and E.Mizutani	Neuro-Fuzzy and Soft Computing	PHI, Pearson Education	2004
2	Davis	Genetic Algorithms:Search,	Addison Wesley,	2004
3	E.Goldberg	Optimization and Machine Learning	N.Y	-

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	S.Rajasekaran and G.A.V.Pai	Neural Networks, Fuzzy Logic and Genetic Algorithms	PHI, Pearson Education	2003

PROFESSIONAL ELECTIVE- VI (ONLY APPLICABLE FOR VIII SEMESTER)

16BEEE8E01 FLEXIBLE AC TRANSMISSION SYSTEMS L T P C 3 0 0 3

Course Objectives

- To study the various FACTS controllers and its applications.
- To study the characteristics of ac transmission
- To study the effect of shunt and series reactive compensation.
- To study the controllers of FACTS
- To study the coordination of FACT controlling systems
- To study about the reactive compensation according to the need

Course Outcomes

- At the end of the course the student will gain knowledge about various FACTS controller and its applications.
- At the end of the course the student will gain knowledge about various FACTS controller and its applications.
- Evaluate the characteristics of ac transmission
- Reproduce the effect of shunt and series reactive compensation.
- Justify the working principles of FACTS devices and their operating characteristics
- Getting knowledge in FACTS controller and its coordination
- Real time application studied about FACTS

UNIT I INTRODUCTION TO FACTS 9

Reactive power control in electrical power transmission lines - series compensation -Concepts of SVC, TCSC and UPFC.

UNIT II SVC AND ITS APPLICATIONS 9

Objective of shunt compensation – Principle and operating characteristics of Thyristor Controlled Reactor(TCR) – Thyristor Switched Capacitor(TSC)-Voltage control by SVC – Advantages of slope in dynamic characteristics – Applications: Enhancement of transient stability – steady state power transfer – Enhancement of power system damping – prevention of voltage instability.

UNIT III TCSC AND ITS APPLICATIONS 9

Series compensation and it **Course Objectives**-Operation of the TCSC – Different modes of operation Application: Improvement of the system stability limit -Enhancement of system damping –Voltage collapse prevention

UNIT IV EMERGING FACTS CONTROLLERS 9

Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics – Unified Power Flow Controller (UPFC) – Principle of operation –Modes of Operation-Applications – Modeling of UPFC for Power Flow – Studies.

UNIT V COORDINATION OF DIFFERENT FACTS CONTROLLERS 9
Controller interactions – SVC – SVC interaction – Co-ordination of multiple controllers using linear control techniques – Control coordination using genetic algorithms.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mohan Mathur. R., Rajiv.K.Varma	Thyristor–Based Facts Controllers for Electrical Transmission Systems	IEEE press and John Wiley & Sons, Inc, New York	2002
2	Narain G. Hingorani, Laszio. Gyugyl	Understanding FACTS : Concepts and Technology of Flexible AC Transmission Systems	Standards publishers, New Delhi	2001

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Narin G. Hingorani	High Power Electronics and Flexible AC Transmission Systems	IEEE High Power Engineering Review volume 8: issue 7	2002

WEBSITES
1. www.uni–due.de
2. www.chetanasprojects.com

16BEEE8E02 **POWER SYSTEM STABILITY** **L T P C 3 0 0 3**

Course Objectives

- To study the generation of switching transients and their control using circuit – theoretical concept. To study the mechanism of lightning strokes and the production of lightning surges.
- To study the propagation, reflection and refraction of travelling waves.
- To study the problem of power system stability and its impact on the system.
- To study the different power system components for the study of stability.
- To understand the methods to improve stability.
- To study the impact of voltage transients caused by faults, circuit

Course Outcomes

At the end of the course the student will be able to understand and observe the generation of switching transients and their control using circuit– theoretical concept.

- The students will be able to analyze mechanism of lighting strokes and the production of lighting surges and design the propagation, reflection and refraction
- Understand the problem of power system stability and its impact on the system.
- Analyze linear dynamical systems and use of numerical integration methods.
- Model different power system components for the study of stability. Understand the methods to improve stability.
- Understand real time difficulties in machine analysis
- To get known about modelling system and its control

UNIT-I

Concept and importance of stability in power system operation and design. Steady state, transient and dynamic stability. The swing equation of machines connected to infinite bus bar and machines connected together

UNIT -II

Swing curves-Solution by point by point and Euler’s method. Qualitative treatment of stability studies on Network analyzers and digital computers..

UNIT -III

Equal area criterion, calculation of critical clearing angle by equal area criterion of various fault conditions. Effect of reclosure. Factors affecting transient stability and its improvement.

UNIT-IV

Types of excitation systems, AVR, calculation of exciter response by graphical integration and step-by-step methods. Effect of speed governing system inertia and damping on steady state and transient stability.

UNIT-V

Significance of steady state stability, power limit of transmission systems. Clarke's diagram of two machine systems with and without losses. Steady stability of one machine connected to an infinite bus bar.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	K.A. Gangadhar	Analysis and stability of Electrical power system	Khanna Publishers	2001

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of
1	E.W.Kimbark	Power System Stability	Vol-I and II, Wiley Eastern Ltd.	-
2	Olle.I.Elgerd	Electric Energy Systems Theory-An Introduction	Tata McGraw-Hill Pub.co.Ltd., New Delhi	2003
3	S.S.Vadhera	Power System Analysis and Stability	Hanna Publishers, New Delhi.	-

16BEEE8E03 POWER GENERATION SYSTEMS L T P C 3 0 0 3

Course Objectives

- To learn generation of electrical power from different types of power plants like thermal nuclear and hydro power stations.
- To understand the concepts of generation of electrical power using non conventional energy resources.
- To learn the economics connected with power generation.
- To understand the measurements of various parameter in power plant and their control.
- To study about Power plant instrumentation
- To acquire knowledge of renewable power system

Course Outcomes

- At the end of the course the student will gain knowledge about economics of power generation, layout and working of thermal, nuclear and hydropower plants.
- The student also gain knowledge about distributed generation, boiler turbine monitoring sytem.
- To get knowledge in Powerplant instrumentation
- Students acquire knowledge of renewable power system
- Acquire knowledge about economics in power generation
- Knowledge in Load demand and factor

UNIT I ECONOMICS OF GENERATION 9

Load and load duration curve – Load, demand and diversity factors – Plant capacity and plant use factors – choice of type of generation – choice of size and number of unit – cost of energy generated – Tariffs.

UNIT II THERMAL, NUCLEAR AND HYDRO POWER PLANTS 9

Location, Layout and working of steam ,diesel and gas power plants - Principles of nuclear power generation, Types of nuclear power plants and their comparison, Layout and working of nuclear power plants, Advantages and disadvantages of nuclear energy- Layout and working, Types of hydroelectric power plants, Advantages of hydro generation, Environmental issues.

UNIT III POWER PLANT INSTRUMENTATION 9

Importance of instrumentation in power plants, UP & I diagram of boiler- Measurements of non electrical parameters, flow of feed water, air, steam, radiation detector, smoke density measurement-analyzers, flue gas oxygen analyzer, chromatography, PH meter, pollution monitoring instruments.

UNIT IV BOILER, TURBINE-MONITORING AND CONTROL 9

Combustion control - furnace draft control-drum level control- de-aerator control- boiler interlocks-speed, vibration, temperature monitoring control of turbine lubrication and cooling system of turbine.

UNITV DISTRIBUTED GENERATION AND NON CONVENTIONAL PLANTS 9

Introduction to the concept of distributed generation –basics on distributed generation

Technologies- Effect on system operation. Basic concepts, Principle of working and layout of MHD, Solar, Wind, Tidal, Biomass and Geothermal Power Generation Systems.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Nagpal.G.R	Power plant engineering	Khanna Publishers, New Delhi	2001

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Wadhwa, C.L	Generation, Distribution and Utilization of Electric Energy	New Age International Ltd.,3rd edition	2011
2	Nagrath.I.J,and Kothari.D.P	Modern Power System Analysis	Tata Mc Graw Hill,3rd edition	2003
3	Anne-Marie Borbely, Jan F.Kreider	Distributed Generation	CRC Press LLc	2001
4	Gupta.B.R	Generation of Electrical energy	Eurasia Publishing House(p) Ltd,New Delhi	2003

16BEEE8E04 TOTAL QUALITY MANAGEMENT L T P C 3 0 0 3

Course Objectives

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.
- To study the fundamentals of quality controls.
- To study the concepts of total quality management.
- To study the concepts of total education

Course Outcomes

At the end of this course, students will demonstrate the ability to

1. Understand the principles and basic concepts.
2. Understand the fundamentals of quality controls.
3. Explain the concepts of total quality management.
4. Explain the concepts of total education
5. Diagnose problems in the quality improvement process, SPC etc.
6. Diagnose problems in the production planning, control and decision making.

UNIT I INTRODUCTION 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs – Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management (TQM), Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT II TQM PRINCIPLES 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Triology, PDSA Cycle, 5S Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy and Performance Measures.

UNIT III STATISTICAL PROCESS CONTROL 9

The seven QC tools, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT IV TQM TOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits. TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Dale H Besterfiled	Total Quality Management	Pearson Education, Inc., New Delhi	2003
2	Narayana, V. and Sreenivasan, N.S	Quality Management – Concepts and Tasks	New Age International, New Delhi - reprint	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	James R Evans and William M Lidsay	The Management and Control of Quality	South–Western Thomson Learning, United States – 8th edition	2011

WEBSITE

www.management.about.com

16BEEE8E05 VIRTUAL INSTRUMENTATION L T P C 3 0 0 3

Course Objectives

- To introduce concepts of Lab view software.
- To study graphical programming, interfacing instruments and its protocols.
- To introduce data acquisition methods.
- To introduce signal processing and network automation tools.
- To study about data cards in instrumentation
- To study the interface bus and signals

Course Outcomes

- At the end of the course the student will be able understand the concepts of virtual instrumentation.
- Knowledge about VI programming
- Gain experience in Standards and protocols of instrumentation
- Real time automation activity in instrumentation
- DSP based instrumentation control and its applications
- Gain Knowledge of automated control in instrumentation

UNIT I REVIEW OF DIGITAL INSTRUMENTATION 9

Representation of analog signals in the digital domain – Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.

UNIT II GRAPHICAL PROGRAMMING AND LABVIEW 9

Concepts of graphical programming – LABVIEW software – Concept of VIs and sub VI - Display types – Digital – Analog – Chart and Graphs. Loops - structures - Arrays – Clusters. Local and global variables – String and file I/O. Timers and dialog controls.

UNIT III INSTRUMENT INTERFACES AND PROTOCOLS 9

RS232, RS 422, RS 485 and USB standards - IEEE 488 standard – Introduction to bus protocols of MOD bus and CAN bus. Electronic standards for signals – noise and EMI effects. Signal conditioning chassis and extension modules. Image acquisition cards.

UNIT IV PC BASED DATA ACQUISITION 9

Concept of PC based data acquisition – Typical on board DAQ card – Resolution and sampling frequency - analog inputs and outputs – Single-ended and differential inputs –DAQ cards terminal boxes - Use of timer-counter and analog outputs on the universal DAQ card.

UNIT V SIGNAL PROCESSING AND NETWORK BASED AUTOMATION 9

Mathematical tools for statistical calculation – Signal processing tools- Windowing and filtering tools –Control system tools – PID controller – CRO – function generator –illustration and case study – Web publishing tool –configuring VI server.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Sanjeev Gupta	Virtual Instrumentation using LabVIEW’	TMH	2004
2	Jovitha Jerome	Virtual Instrumentation using LabVIEW	Prentice Hall	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Gary W. Johnson, Richard Jennings	Lab-view Graphical Programming	Tata McGraw Hill Professional Publishing, IV Edition	2006
2	Robert H. Bishop	Learning with Lab-view	Prentice Hall	2009
3	Kevin James	PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control	Newness	2000

16BEEE8E06 ROBOTICS AND AUTOMATION L T P C 3 0 0 3

Course Objectives

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots.
- To study the Euler, Lagrangian formulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the sensors of robot
- To study the control of robots for some specific applications.

Course Outcomes

Upon completion of the course, the student should be able to:

- Explain the basic concepts of working of robot
- Analyze the function of sensors in the robot
- Write program to use a robot for a typical application
- Use Robots in different applications
- Experience in various power source availability in real time application
- Get experience in robots in manufacturing plant

UNIT I BASIC CONCEPTS 9

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov's laws of robotics – dynamic stabilization of robots.

UNIT II POWER SOURCES AND SENSORS 9

Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS 9

Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

UNIT IV KINEMATICS AND PATH PLANNING 9

Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill Climbing Techniques – robot programming languages

UNIT V CASE STUDIES 9

Mutiple robots – machine interface – robots in manufacturing and non- manufacturing applications– robot cell design – selection of robot.

TOTAL: 45 PERIODS

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Mikell P. Weiss G.M., Nagel R.N., Odraj N.G	Industrial Robotics	Mc Graw-Hill Singapore	1996
2	Ghosh	Control in Robotics and Automation: Sensor Based Integration	Allied Publishers, Chennai	1998

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Deb. S.R.	Robotics Technology and flexible Automation	John Wiley, USA	1992
2	Klafter R.D, Chimielewski T.A., Negin M	Robotic Engineering – An integrated approach	Prentice Hall of India, New Delhi	1994
3	Mc Kerrow P.	Introduction to Robotics	Addison Wesley, USA	1991
4	Issac Asimov	Robot	Ballantine Books, New York	1986
5	Barry Leatham – Jones	Elements of industrial Robotics	PITMAN Publishing	1987
6	Mikell P.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey	Industrial Robotics Technology, Programming and Applications	McGraw Hill Book Company	1986
7	Fu K.S. Gonzaleaz R.C. and Lee C.S.G	Robotics Control Sensing, Vision and Intelligence	McGraw Hill International Editions	1987

LIST OF OPEN ELECTIVES

LIST OF OPEN ELECTIVES OFFERED BY OTHER DEPARTMENTS

SCIENCE AND HUMANITIES

16BESHOE01 PROBABILITY AND RANDOM PROCESS L T P C 3 0 0 3

Course Objectives

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.
- To study statistical methods of the sample data.

Course Outcomes

1. Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
2. The students will have an exposure of various distribution functions, correlation and spectral densities.
3. To understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
4. To understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
5. To apply the concept random processes in engineering disciplines.
6. To understand and apply the concept of correlation and spectral densities

UNIT- I MEASURES OF CENTRAL TENDENCY AND PROBABILITY 9

Measures of central tendency – Mean, Median, Mode - Standard Deviation
Probability - Random variable - Axioms of probability - Conditional probability - Total probability – Baye's theorem.

UNIT- II STANDARD DISTRIBUTIONS 9

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma(one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – Chebyshev's inequality.

UNIT -III TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions - Marginal and conditional distributions - Probability mass function - Probability density functions – Covariance - Correlation and regression

UNIT- IV CLASSIFICATION OF RANDOM PROCESS 9

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT -V CORRELATION AND SPECTRAL DENSITIES 9

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TOTAL : 45 HOURS

TEXT BOOK

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peebles Jr, P.Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Publishers, New Delhi.	2002

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ross, S	A first Course in Probability	Pearson Education, New Delhi (Chap 2 to 8)	2012
2	Gupta, S.C. and Kapoor, V.K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2014

3	Veerarajan,T.	Probability, Statistics and Random process	Tata McGraw-Hill Education pvt. Ltd., New Delhi	2008
4	Henry Stark and John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002

WEBSITES

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld. Wolfram.com

16BESHOE02 **FUZZY MATHEMATICS** **L T P C 3 0 0 3**

Course Objectives

- Be able to understand basic knowledge of fuzzy sets and fuzzy logic
- Be able to apply basic knowledge of fuzzy operations.
- To know the basic definitions of fuzzy relations
- Be able to apply basic fuzzy inference and approximate reasoning
- To know the applications of fuzzy Technology.
- To study and acquire the knowledge to comprehend the concepts of fuzzy relations

Course Outcomes

- To gain the main subject of fuzzy sets.
- To understand the concept of fuzziness involved in various systems and fuzzy set theory.
- To gain the methods of fuzzy logic.
- To comprehend the concepts of fuzzy relations.
- To analyze the application of fuzzy logic control to real time systems.
- The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

UNIT I FUZZY SETS 9

Fuzzy Sets : Basics Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations – Level Sets – Fuzzy functions - Zadeh's Extension Principle

UNIT II OPERATIONS ON FUZZY SETS 9

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III FUZZY RELATIONS 9

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNIT IV FUZZY MEASURES 9

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures vs Possibility Measures

UNIT V FUZZY INFERENCE 9

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

TOTAL : 45 HOURS

TEXT BOOK

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	George J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic : Theory and Applications	Prentice Hall of India, New Delhi.	2003

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Zimmermann H.J.	Fuzzy Set Theory and its Applications	Kluwer Academic publishers, USA.	2001
2	Michal Baczynski and Balasubramaniam Jayaram	Fuzzy Implications	Springer-Verlag publishers, Heidelberg	2008
3	Kevin M Passino and Stephen Yurkovich	Fuzzy Control	Addison Wesley Longman publishers, USA	1998

WEBSITES

1. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

16BESHOE03 LINEAR ALGEBRA L T P C 3 0 0 3

Course Objectives

- To introduce the basic concepts of vector space
- To know the fundamentals of linear Algebra
- To solve system of linear equations
- To study about the linear transformations
- To introduce the concepts of inner product spaces

Course Outcomes

student will be able to

- To explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- To describe the fundamental concepts of Eigen values and Eigen vectors by using Power method.
- To apply the fundamental concepts in their respective engineering fields
- To visualize linear transformations as matrix form
- To recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
- To articulate the importance of Linear Algebra and its applications in branches of Mathematics

UNIT I VECTOR SPACES 9

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II EIGEN VALUES AND EIGEN VECTORS 9

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

UNIT III SYSTEM OF LINEAR EQUATIONS 9

Direct methods, Gauss elimination method, Gauss Jordan method, Crout’s method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNIT IV LINEAR TRANSFORMATIONS 9

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigen values and Eigenvectors Eigen values and Eigen vectors – Diagonalization

UNIT V INNER PRODUCT SPACES **9**

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

TOTAL : 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com

16BESHOE04 ENGINEERING ACOUSTICS L T P C 3 0 0 3

Course Objectives

- To disseminate the fundamentals of acoustic waves. (K)
- To inculcate the characteristics of radiation and reception of acoustic waves. (K)
- To divulge knowledge on the basics of pipe resonators and filters.(S)
- To introduce the features of architectural acoustics
- To impart the basic knowledge of transducers and receivers.(K)
- To study about the pipes resonant and filters

Course Outcomes

- Develop the idea of the fundamentals of acoustic waves.
- Apply the concepts of radiation and reception of acoustic waves.
- Explain the basic ideas of pipe resonators and filters.
- Illustrate the basics of architectural acoustics..
- Illustrate the transducers and receivers and its applications in various electronic devices.
- Apply the knowledge inputs of the course for engineering applications.

UNIT I INTRODUCTION 9

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves - Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales. Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence –method of images.

UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES 9

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers. Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III PIPES RESONATORS AND FILTERS 9

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

UNIT IV ARCHITECTURAL ACOUSTICS 9

Sound in endosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design. Environmental Acoustics: Highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

UNIT V TRANSDUCTION 9

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

TOTAL : 45 HOURS

TEXT BOOK

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lawerence E.Kinsler, Austin R.Frey,	Fundamentals of Acoustics	John Wiley & Sons	2000

REFERENCE

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	F. AltonEverest &	Master Handbook of Acoustics	McGraw Hill Professional	2014

WEBSITES

1. www. acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www. ocw.mit.edu

16BESHOE05 SOLID WASTE MANAGEMENT L T P C 3 0 0 3

Course Objectives

- To make the students conversant with basics of Solid wastes and its classification.
- To make the student acquire sound knowledge of different treatments of solid wastes.
- To acquaint the student with concepts of waste disposals.
- To develop an understanding of the basic concepts of Hazardous waste managements.
- To acquaint the students with the basics of energy generation from waste materials.
- To understand about the solid waste and to get the information on energy conservation.

Course Outcomes:

- Outline the basic principles of Solid waste and separation of wastes (K)
- Identify the concepts of treatment of solid wastes (S)
- Identify the methods of wastes disposals. (S)
- Examine the level of Hazardousness and its management. (S)
- Examine the possible of the energy production using waste materials. (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I SOLID WASTE 9

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

UNIT II WASTE TREATMENT 9

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNIT III WASTE DISPOSAL 9

Sanitary Land Fill Method of Solid Waste Disposal – Land Fill Classification, Types, Methods & Siting Consideration – Layout & Preliminary Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfill Remediation

UNIT IV HAZARDOUS WASTE MANAGEMENT 9

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure, Remediation, risk assessment.

UNIT V ENERGY GENERATION FROM WASTE 9

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, Energy recovery systems. Biological & Chemical conversion technologies – Aerobic composting, low solids. Anaerobic digestion, high solids anaerobic digestion, Energy production from biological conversion products, other biological transformation processes. Chemical transformation processes.

TOTAL : 45 HOURS

TEXT BOOK

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dara.S.S,Mishra.D.D	A Text book of Environmental Chemistry and Pollution Control	S.Chand and Company Ltd., New Delhi.	2011

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Naomi B. Klinghoffer and Marco J. Castaldi	Waste to Energy Conversion Technology (Woodhead Publishing Series in Energy)	Woodhead Publishing Ltd., Cambridge, UK	2013
2.	Frank Kreith, George Tchobanoglous	Hand Book of Solid Waste Management- 2nd edition	McGraw Hill Publishing Ltd., Newyork	2002
3.	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall (P) Ltd., New Delhi.	1999

WEBSITES

1. www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.
2. http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/
3. www.alternative-energy-news.info/technology/garbage-energy/
4. nzic.org.nz/ChemProcesses/environment/

16BESHOE06 **GREEN CHEMISTRY** **L T P C 3 0 0 3**

Course Objectives

1. To make the students conversant about the green chemistry
2. To make the student acquire sound knowledge of the atom efficient process and synthesis elaborately.
3. To acquaint the student with concepts of green technology.
4. To develop an understanding of the basic concepts of renewable energy resources.
5. To acquaint the students with the basic's information on catalysis.
6. To gain knowledge on the green technology and renewable energy resources

Course Outcomes

- Outline the basic principles of green chemistry (K)
- Examine the different atom efficient process and synthesis elaborately (S)
- Apply the concepts combustion of green technology (S)
- Identify and apply the concepts of renewable energy (S)
- Apply the concepts of green catalysts in the synthesis (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO GREEN CHEMICAL PRINCIPLES **9**

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

UNIT II ATOM EFFICIENT PROCESSES **9**

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

UNIT III BIOTECHNOLOGY AND GREEN CHEMISTRY **9**

Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

UNIT IV RENEWABLE RESOURCES **9**

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

UNIT V CATALYSIS IN GREEN CHEMISTRY 9

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

TOTAL : 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Sanjay K. Sharma, Ackmez Mudhoo	Green Chemistry for Environmental Sustainability	CRC Press , London	2010
2.	Ahluwalia V. K. and M.Kidwai	New Trends in Green Chemistry 2nd edition	Anamaya publishers., New Delhi.	2007

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons., New Delhi.	2012
2.	Mukesh Doble. Ken Rollins, Anil Kumar	Green Chemistry and Engineering, 1st edition	Academic Press, Elesevier., New Delhi.	2007
3.	Desai K. R.	Green Chemistry	Himalaya Publishing House, Mumbai.	2005
4.	Matlack A. S.	Introduction to Green Chemistry	Marcel Dekker: New York	2001

WEBSITES

1. http://www.organic-chemistry.org/topics/green-chemistry.shtm

2.http://www.essentialchemicalindustry.org/processes/green-chemistry.html

3. http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm

4. http://www.epa.gov/research/greenchemistry/

5. http://www.amazon.in/Green-Chemistry-Catalysis

16BESHOE07 APPLIED ELECTROCHEMISTRY L T P C 3 0 0 3

Course Objectives

- To get the information on electrochemical material.
- To study about the conducting polymers.
- To acquaint the student with concepts of Energy storage devices.
- To gain knowledge on the batteries and power sources.
- To develop energy storage devices.
- To study and identify the concepts of storage devices and its applications. (S)

Course Outcomes

1. Outline the basic principles of chemistry in **electrochemical material (K).**
2. Examine the properties of conducting polymers (S).
3. Apply the concepts of electrochemistry in storage devices. (S)
4. Identify the concepts of storage devices and its applications. (S)
5. Apply the suitable materials for the manufacturing of storage devices. (S)
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I METAL FINISHING 9

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electroplating for electronic industry- Alloy plating, brass plating- Electro less plating of nickel- anodizing – Electroforming – Electro winning.

UNIT II CONDUCTING POLYMERS AND ELECTROCHEMICALS 9

Electro polymerisation- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene- Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNIT III BATTERIES AND POWER SOURCES-I 9

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNIT IV BATTERIES AND POWER SOURCES-II 9

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteries-construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

UNIT V ELECTROCHEMICAL MATERIAL SCIENCE **9**

Solar cells- Preparation of CdS/Cu_2S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

TOTAL : 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Cynthia G. Zoski	Hand Book of Electrochemistry	Academic Press, Elesevier., UK	2007
2.	D.Pletcher and F.C.Walsh	Industrial Electrochemistry	Chapman and Hall, London	1990

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M. Barak	Electrochemical Power Sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
2.	Bruno Scrosati	Applications of Electroactive Polymers	Chapman & Hall, London	1993
3.	K.L. Chopra and I. Kaur	Thin Film Devices and their Application	Plenum Press, New York.	1983
4.	M.M.Baizer	Organic Electrochemistry	Dekker Inc. New York	1983

WEBSITES

1. http://www.anoplate.com/finishes/
2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html
3. http://inventors.about.com/od/sstartinventions/a/solar_cell.htm

16BESHOE08 **INDUSTRIAL CHEMISTRY** **L T P C 3 0 0 3**

Course Objectives

- To make the students conversant with **cement and lime** and its uses.
- To make the student acquire sound knowledge of abrasives and refractories.
- To acquaint the student with concepts of inorganic chemicals.
- To develop an understanding of the basic concepts **explosives**.
- To acquaint the students with the basics of **agriculture chemicals**.
- To study the concepts of explosives and smoke screens(S)

Course Outcomes

- Outline the basic chemistry of **cement and lime (K)**
- Examine the uses of abrasives and refractories (S)
- Identify the usage of the inorganic chemicals. (S)
- Identify the concepts of explosives and smoke screens (S)
- Identify the usage of the **agriculture** chemicals (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I CEMENT AND LIME **9**

Manufacture of Portland cement – settling of hardening of portland cement – regauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials- manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – magnesium lime – dolomitic lime – hydraulic lime.

UNIT II ABRASIVES AND REFRACTORIES **9**

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories – definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

UNIT III INORGANIC CHEMICALS **9**

Common salt and soda ash – manufacture – different grades – products – alkalis – Na_2CO_3, caustic soda and chlor-alkali industry – manufacture principles of electrolytic process – chlorine – storage. Hydrochloric acid – manufacture – absorption – uses, sulphur and sulphuric acid – extraction of sulphur – manufacture of H_2SO_4 – chamber – contact processes – industrial uses.

UNIT IV EXPLOSIVES **9**

Explosives – uses – properties and tests – explosives for war – nitrocellulose – picric acid and T.N.T. – industrial explosives – nitroglycerin and dynamites – black powder – smoke screens – incendiaries – gas mask.

UNIT V AGRICULTURE CHEMICALS 9

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

TOTAL : 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Harikrishan	Industrial Chemistry	Goel Publishing House, Meerut.	2014
2.	B.K. Sharma	Industrial Chemistry	Goel Publishing House, Meerut.	2000

REFERENCE BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH Publishing CO. New Delhi.	1998
2.	James A. Kent	Hand Book of Industrial Chemistry, 9th edition	Van Nostrand Reinhold, New York.	1992
3.	R.N. Sherve	Chemical Process Industries	McGraw-Hill, Kugakuisha Ltd., Tokyo.	1984
4.	S.D. Shukla and G.N. Pandy	A Text book of Chemical Technology	Vikas Publishing House (P) Ltd, New Delhi.	1979

WEBSITES

1. http://en.wikipedia.org/wiki/Cement
2. http://www.hon.ch/HONselect/Selection/D01.html
3. http://fas.org/man/dod-101/navy/docs/fun/part12.htm

4. http://toxics.usgs.gov/topics/agchemicals.html

COMPUTER SCIENCE ENGINEERING

16BECSOE01 **INTERNET PROGRAMMING** **L T P C 3 0 0 3**

Course Objectives

- To study concepts of Internet, IP addresses and protocols
- To explain the concept of web page development through HTML
- To introduce the PERL and explore its current strengths and Weaknesses
- To write working Java code to demonstrate the use of applets for client-side programming
- To study Internet telephony and various multimedia applications
- To Elaborate on the principles of web page development

Course Outcomes

Upon completion of this course, the student will be able to:

- Learn the advanced concepts& techniques of Internet and Java.
- Analyze the requirements for and create and implement the principles of web page development
- Understand the concepts of PERL
- Implement client-side programming using java applets
- Generate internet telephony based upon advanced concepts
- Develop applications on internet programming based on java applets and scripts

UNIT I INTRODUCTION **9**

Introduction - Network of Networks, Intranet, Extranet and Internet. World Wide Web- Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. TCP/IP- Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing- Classful and Classless Addressing, Subnetting

UNIT II HTML **9**

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue. Image Maps- map, area, attributes of image area- Extensible Markup Language (XML)- Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts- Introduction- Environment Variable, GET and POST Methods.

UNIT III PERL **9**

Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling- JavaScript- Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies- Definition of cookies, Create and Store a cookie with example. Java Applets-Container Class, Components, Applet Life Cycle, Update method, Applications.

UNIT IV CLIENT-SERVER PROGRAMMING **9**

Client-Server programming In Java - Java Socket, Java RMI. Threats - Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks- Network security techniques- Password and Authentication- VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH). Firewall- Introduction, Packet filtering, Stateful, Application layer, Proxy.

UNIT V INTERNET TELEPHONY 9

Introduction, VoIP- Multimedia Applications- Multimedia over IP: RSVP, RTP, RTCP and RTSP- Streaming media, Codec and Plugins, IPTV- Search Engine and Web Crawler- Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Paul Deitel, Harvey Deitel and Abby Deitel	Internet and World Wide Web-How to Program	5th Edition	2011
2	N.P. Gopalan and J. Akilandeswari	Web Technology: A Developer's Perspective	PHI Learning, Delhi	2013

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Rahul Banerjee	Internetworking Technologies, An Engineering Perspective	PHI Learning, Delhi	2011
2	Robert W. Sebesta	Programming the World Wide Web	Pearson Education	2016

16BECSOE02 **MULTIMEDIA AND ANIMATION** **L T P C 3 0 0 3**

Course Objectives

- To impart the fundamental concepts of Computer Animation and Multimedia
- To study the graphic techniques and algorithms using flash
- Explain various concepts available in 3D animation
- Explain various devices available for animation
- To study the multimedia concepts and various I/O technologies for concept development
- To understand the three-dimensional graphics and their transformations

Course Outcomes

Upon completion of this course, the student will be able to:

- Develop their creativity using animation and multimedia
- Understand the concepts of Flash and able to develop animation using it
- Understand about various latest interactive 3D animation concepts
- Know the various devices and software available in motion capture
- Understand the concept development process
- Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.

UNIT I INTRODUCTION **9**

What is mean by Animation – Why we need Animation – History of Animation– Uses of Animation – Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects -Creating Animation.

UNIT II CREATING ANIMATION IN FLASH **9**

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers - Action script.

UNIT III 3D ANIMATION & ITS CONCEPTS **9**

Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation.

UNIT IV MOTION CAPTION **9**

Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage – Different Language of Script Animation Among the Software.

UNIT V Concept Development **9**

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Malay K. Pakhira	Computer Graphics, Multimedia and Animation	PHI Learning PVT Ltd	2010

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ranjan Parekh	Principles of Multimedia	TMH	2007
2	Ashok Banerji, Ananda Mohan Ghosh	Multimedia Technologies	McGraw Hill Publication	--
3	Pankaj Dhaka	Encyclopedia of Multimedia and Animations	Anmol Publications	2011

16BECSOE03 PC HARDWARE AND TROUBLE SHOOTING L T P C 3 0 0 3

Course Objectives

- To study the basic parts of computer in detail
- Introduce various peripheral devices available for computer and its detailed working concepts
- Overview of various interfaces and other hardware overview
- Assemble/setup and upgrade personal computer systems and discuss about power supplies and the skills to trouble-shoot various power-related problems.
- To study basic concepts and methods in troubleshooting
- To study the installation/connection and maintenance of computer and its associated peripherals.

Course Outcomes

Upon completion of this course, the student will be able to:

- Identify the main components for the PC, familiarize themselves with PC memories such as RAM and ROM devices and so on.
- Identify various peripheral devices available and its working
- Understand various concepts of hardware and its interface and control
- Perform basic installation of PC. Importance of maintenance is understood
- Understand Various faults and failures are identified and troubleshooting in detail
- Understand overall PC hardware, interfacing, maintenance and troubleshooting

UNIT I INTRODUCTION 9

Introduction - Computer Organization – Number Systems and Codes – Memory – ALU – CU – Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques – Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC and User.

UNIT II PERIPHERAL DEVICES 9

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices – FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNIT III PC HARDWARE OVERVIEW 9

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC.

UNIT IV INSTALLATION AND PREVENTIVE MAINTENANCE 9

Introduction – system configuration – pre installation planning – Installation practice – routine checks

– PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery.

UNIT V Troubleshooting **9**

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LSI's – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.

TOTAL: 45 HOURS

TEXT BOOK

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	B. Govindarajalu	IBM PC Clones Hardware, Troubleshooting and Maintenance	2/E, TMH	2002

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peter Abel, Niyaz Nizamuddin	IMB PC Assembly Language and Programming	Pearson Education	2007
2	Scott Mueller	Repairing PC's	PHI	1992

16BECSOE04 **JAVA PROGRAMMING** **L T P C 3 0 0 3**

Course Objectives

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads, generics classes and swings
- To explain the need for generic programming
- To design and build simple Graphical User Interfaces

Course Outcomes

- Develop Java programs using OOP principles
- Develop Java programs with the concepts of inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generics classes and swings
- Understand various aspects for motivation of generic programming
- Develop various interactive Java programs using OOP concepts of Java

UNIT I INTRODUCTION TO JAVA **9**

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members –constructors – finalize method

UNIT II PACKAGES **9**

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy –polymorphism – dynamic binding – final keyword – abstract classes

UNIT III I/O STREAMS **9**

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes.

UNIT IV EXCEPTION HANDLING **9**

Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions – Using exceptions for debugging

UNIT V THREADS **9**

Introduction, Creating Threads, The Life Cycle of a Thread, Thread Methods, Using Threads, Synchronization of Threads, Summary

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Cay S. Horstmann and Gary Cornell	Core Java: Volume I – Fundamentals	Sun Microsystems Press	2008

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	K. Arnold and J. Gosling	The JAVA programming language	Third edition, Pearson Education	2009
2	Timothy Budd	Understanding Object-oriented programming with Java Updated Edition	Pearson Education	2002
3	C. Thomas Wu	An introduction to Object-oriented programming with Java Fourth Edition	Tata McGraw-Hill Publishing company Ltd	2008

WEBSITES

1. http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/
2. http://www.winprog.org/tutorial/msvc.html
3. http://www.tutorialized.com/tutorials/Visual-C/1
4. http://www.freeprogrammingresources.com/visualcpp.html

16BEECOE01 REAL TIME EMBEDDED SYSTEMS L T P C 3 0 0 3

Course Objectives

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing
- To study about memory management
- To imparts knowledge on

Course Outcomes

At the end of the course the students will be able to

- Understand overview of embedded systems architecture
- Acquire knowledge on embedded system, its hardware and software.
- Gain knowledge on overview of Operating system
- Discuss about task Management
- Gain knowledge about semaphore management and message passing.
- Gain knowledge about memory management.

UNIT - I INTRODUCTION TOEMBEDDED SYSTEM 9

Introduction - Embedded systems description, definition, design considerations & requirements - Overview of Embedded system Architecture (CISC and RISC) - Categories of Embedded Systems - embedded processor selection &tradeoffs - Embedded design life cycle - Product specifications - hardware/software partitioning - iterations and implementation - hardware software integration - product testing techniques – ARM 7

UNIT - II OPERATING SYSTEM OVERVIEW 9

Introduction –Advantage and Disadvantage of Using RTOS – Multitasking – Tasks - Real Time Kernels – Scheduler - Non-preemptive Kernels - Preemptive Kernels – Reentrancy- Reentrant Functions – Round Robin Scheduling - Task Priorities - Static Priorities – Mutual Exclusion – Deadlock – Intertask Communication – Message Mailboxes – Message Queues - Interrupts - Task Management – Memory Management - Time Management – Clock Ticks.

UNIT - III TASK MANAGEMENT 9

Introduction - µ C/OS-II Features - Goals of µ C/OS-II - Hardware and Software Architecture – Kernel Structures: Tasks –Task States – Task Scheduling – Idle Task – Statistics Task – Interrupts Under µ C/OS-II – Clock Tick - µ C/OS-II Initialization. Task Management: Creating Tasks – Task Stacks – Stack Checking – Task's Priority – Suspending Task – Resuming Task. Time Management: Delaying a Task – Resuming a Delayed Task – System Time. Event Control Blocks- Placing a Task in the ECB Wait List – Removing a Task from an ECB waits List.

UNIT - IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING 9

Semaphore Management: Semaphore Management Overview – Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox – Deleting Mailbox – Waiting for a Message box – Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue – Deleting a Message Queue – Waiting for a Message at a Queue – Sending Message to a Queue –

Flushing a Queue.

UNIT - V MEMORY MANAGEMENT **9**

Memory Management: Memory Control Blocks – Creating Partition- Obtaining a Memory Block – Returning a Memory Block .Getting Started with µ C/OS-II – Installing µ C/OS-II – Porting µ C/OS-II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with µ C/OS-II - µ C/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Analyze the Multichannel ADC with help of µ C/OS-II.

TOTAL: 45 HOURS

REFERENCES

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Jean J. Labrosse	MicroC/OS – II The Real Time Kernel	CMP BOOKS	2009
2	David Seal	ARM Architecture Reference Manual	Addison-Wesley	2008
3	Steve Furbe	ARM System-on-Chip, Architecture	Addison-Wesley Professional California	2000

16BEECOE02 **CONSUMER ELECTRONICS** **L T P C 3 0 0 3**

Course Objectives

- To study about various speakers and microphone
- To learn the fundamental of television systems and standards
- To learn the process of audio recording and reproduction
- To study various telephone networks
- To discuss about the working of home appliances
- To familiarize with TV services like ISDN.

Course Outcomes

- Understand working of various type of loud speakers
- Acquire knowledge on various types of picture tubes
- Demonstrate the working of various optical recording systems
- Distinguish various standards for color TV system
- Acquire knowledge on various telecommunication networks
- Demonstrate the working of various home appliances

UNIT I LOUDSPEAKERS AND MICROPHONES **9**

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNIT – II TELEVISION STANDARDS AND SYSTEMS **9**

Components of a TV system – interlacing – composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL, SECAM - Components of a Remote Control.

UNIT – III OPTICAL RECORDING AND REPRODUCTION **9**

Audio Disc – Processing of the Audio signal –read out from the Disc – Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems.

UNIT – IV TELECOMMUNICATION SYSTEMS **9**

Telephone services - telephone networks – switching system principles – PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellular modems

UNIT – V HOME APPLIANCES **9**

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

TOTAL: 45 HOURS

TEXT BOOK

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	S.P.Bali	Consumer Electronics	Pearson Education	2005

16BEECOE03 NEURAL NETWORKS AND ITS APPLICATIONS L T P C 3 0 0 3

Course Objectives

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.
- To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
- To gain exposure in the field of neural networks and relate the human neural system into the digital world
- To provide knowledge of computation and dynamical systems using neural networks

Course Outcomes:

At the end of the course the students will be able to

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks
- Apply perception concept in design
- Design using ART phenomena
- Gain knowledge on SOM concepts
- Ability to develop the use of Soft Computing to solve real-world problems

UNIT I INTRODUCTION TO NEURAL NETWORKS **9**

Introduction - biological neurons and their artificial models - learning, adaptation and neural network's learning rules - types of neural networks- single layer, multiple layer- feed forward, feedback networks

UNIT II LEARNING PROCESS **9**

Error – correction learning – memory based learning - hebbian learning-competitive learning-Boltzmann learning- supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT III PERCE PTION **9**

Single layer perception-Adaptive filtering-unconstrained optimization-Least-mean square algorithm-Leaning curve-Annealing Technique-perception convergence theorem-Relationship between perception and Baye’s classifier-Back propagation algorithm

UNIT IV ATTRACTOR NEURAL NETWORK AND ART **9**

Hopfield model-BAM model- BAM stability-Adaptive BAM -Lyapunov function-effect of gain-Hopfield design-Application to TSP problem-ART- layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP

UNIT V SELF ORGANIZATION 9

Self organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical vector Quantization. Applications of self-organizing maps: The Neural Phonetic Typewriter Learning Ballistic Arm Movements

TOTAL: 45 HOURS

TEXT BOOKS

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Simon Haykin	Neural Networks and Learning Machines	3/E - Pearson/ Prentice Hall	2009
2	Satish Kumar	Neural Networks : A Classroom Approach	TMH	2008
3	Freeman J.A., Skapura D.M.	Neural networks, algorithms, applications, and programming techniques	Addition Wesley	2005
4	Laurene Fausett	Fundamentals of Neural Networks: Architectures, Algorithms, and Applications	Pearson/ Prentice Hall	
5	Robert J Schalkoff	Artificial Neural Networks	McGraw Hill	1997

16BEECOE04 FUZZY LOGIC AND ITS APPLICATIONS L T P C 3 0 0 3

Course Objectives

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.
- Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
- To learn about applications on Fuzzy based systems
- To familiarize with fuzzy fiction and de fuzzy fiction procedures

Course Outcomes:

At the end of the course the students will be able to

- Understand the basic concepts of Fuzzy logic and its applications in various domain
- Gain knowledge on theory of Reasoning
- Develop fuzzy controllers
- Understand concepts of adaptive fuzzy control
- Ability to develop how to use Fuzzy computation to solve real- world problems
- Design fuzzy based model for any application

UNIT – I **9**

Basics Of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT – II **9**

Theory Of Approximate Reasoning**:** Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference-fuzzy models

UNIT – III **9**

Fuzz y Knowledge Based Controllers (Fkbc**):** Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures – Design of Fuzz y Logic Controller

UNIT – IV **9**

Adaptive Fuzz y Control: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

UNIT V FUZZY BASED SYSTEMS **9**

Simple applications of FKBC -washing machines- traffic regulations -lift control-fuzz y in medical applications-Introduction to ANFIS.

TOTAL: 45 HOURS

TEXT BOOKS

S. NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	D. Diankar, H. Hellendoom and M. Reinfrank	An Introduction to Fuzz y Control	Narosa Publishers India	1996
2	G. J. Klir and T. A. Folger	Fuzzy Sets Uncertainty and Information	PHI IEEE	1995

BIO TECHNOLOGY

16BTBTOE01 **BIOREACTOR DESIGN** **L T P C 3 0 0 3**

Course Objectives

- To impart basic knowledge in bioprocess Engineering
- To design the bioreactors for various operations.
- To understand the principle and working of heat transfer equipments.
- To extend the knowledge in principle of heat transfer inside a bioreactor
- To construct the equipments used in mass transfer operations.
- To learn the equipments used in separation process.

Course Outcomes

- Summarize the basic concepts in bioprocess Engineering.
- Ability to design the bioreactors for various operations.
- Ability to develop the heat transfer equipments for Bioprocess Engineering.
- Ability to construct the equipments used in mass transfer operations.
- To acquire the knowledge of regulatory constraints in bioprocess
- Categorize the equipments used in separation process

UNIT I ENGINEERING PROPERTIES AND STORAGE TANK 9

Introduction to various mechanical properties of material to be used material of construction, design of cylindrical storage tank.

UNIT II REACTOR DESIGN 9

Design of Airlift fermentor, Bubble column reactor and Continuous stirred tank reactor.

UNIT III HEAT TRANSFER EQUIPMENTS 9

Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulation evaporator.

UNIT IV MASS TRANSFER EQUIPMENTS 9

Design of Bollmann extractor, fractionating column, packed tower and spray tray absorber

UNIT V SEPARATION EQUIPMENTS 9

Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rotart drum drier and Swenson –walker crystallizer.

TOTAL: 45 HOURS

TEXT BOOKS

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATI
1	James Edwin Bailey, David F. Ollis	Biochemical Engineering Fundamentals	McGraw-Hill	2007

2	Don W. Green, Robert H. Perry	Chemical Engineer Hand book	The McGraw- Hill Companies,	2008

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Pauline. M. Doran	Bioprocess Engineering Principles	Academic Press	2013

16BTBTOE02 FOOD PROCESSING AND PRESERVATION L T P C 3 0 0 3

Course Objectives

- To understand the importance of food processing
- To impart basic knowledge in different food processing methods carried out in the food tech companies.
- To extend the brief knowledge in food conservation operations.
- To study the methods of food preservation by cooling.
- To familiarize the students on the concepts of preservation methods for fruits.
- To create deeper understanding on preservation methods for vegetables.

Course Outcomes

- Describe the scope and importance of food processing.
- Outline the various processing methods for foods.
- Extend the knowledge in food conservation operations.
- Describe the methods of food preservation by cooling.
- Summarize the preservation methods for fruits.
- Demonstrate the preservation methods for vegetables.

UNIT I SCOPE AND IMPORTANCE OF FOOD PROCESSING 9

Properties of food- Physical, thermal, mechanical, sensory. Raw material Preparation - Cleaning, sorting, grading, peeling.

UNIT II PROCESSING METHODS 9

Heating- Blanching and Pasteurization. Freezing- Dehydration- canning- additives- fermentation- extrusion cooking- hydrostatic pressure cooking- dielectric heating- micro wave processing and aseptic processing – Infra red radiation processing- Concepts and equipment used.

UNIT III FOOD CONVERSION OPERATIONS 9

Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membrane separation- filtration- equipment and application.

UNIT IV FOOD PRESERVATION BY COOLING 9

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Water activity, methods to control water activity.

UNIT V PRESERVATION METHODS FOR FRUITS AND VEGETABLES 9

Pre processing operations - preservation by reduction of water content: drying / dehydration and concentration – chemical preservation – preservation of vegetables by acidification, preservation with sugar - Heat preservation– Food irradiation- Combined preservation techniques.

TOTAL: 45 HOURS

TEXT BOOKS

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIONS
1	R. Paul Singh, Dennis R.Heldman	Introduction to food engineering.	Academic Press	2001
2	P.Fellows.	Food Processing Technology, Principles and practice.	Wood head Publishing Ltd	2000
3	Mircea Enachescu Dauthy	Fruit and Vegetable Processing	FAO agricultural services bulletin	1995

REFERENCES

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIONS
1	M.A. Rao, Syed S.H. Rizvi, Ashim K. Datta	Engineering properties of foods	CRC Press	2005
2	B. Sivasankar	Food processing and preservation	PHI Learning Pvt. Ltd	2002

16BTBTOE03 BASIC BIOINFORMATICS L T P C 3 0 0 3

Course Objectives

- To enable the students to get aware of available tools and databases for performing research
  in bioinformatics.
- To provide the thorough understanding of protein structure in detail.
- To construct the phylogenetic trees for evolution.
- To get familiar with the 3D structure of protein and classification.
- To acquire basic knowledge in protein secondary structure prediction.
- To extend the brief knowledge in Micro array data analysis.

Course Outcomes

- Summarize the basic concepts and importance of Bioinformatics in various sectors.
- Demonstrate the sequence alignment tool in bioinformatics.
- Construct the phylogenetic trees for evolution.
- Analyze the three dimensional protein structure and classification using various tools.
- Illustrate the protein secondary structure prediction by comparative modeling.
- Extend the knowledge in micro array technology and applications of bioinformatics in various sectors.

UNIT I OVERVIEW OF BIOINFORMATICS 9

The scope of bioinformatics; bioinformatics & the internet; useful bioinformatics sites. Data acquisition: sequencing DNA, RNA & proteins; determination of protein structure; gene & protein expression data; protein interaction data. Databases – contents, structure & annotation: file formats; annotated sequence databases; miscellaneous databases.

UNIT II RETRIEVAL OF BIOLOGICAL DATA 9

Data retrieval with Entrez & DBGET/ LinkDB; data retrieval with SRS (sequence retrieval system).Searching sequence databases by sequence similarity criteria: sequence similarity searches; amino acid substitution matrices; database searches, FASTA & BLAST; sequence filters; iterative database searches & PSI-BLAST. Multiple-sequence alignment, gene & protein families: multiple-sequence alignment & family relationships; protein families & pattern databases; protein domain families.

UNIT III PHYLOGENETICS 9

Phylogenetics, cladistics & ontology; building phylogenetic trees; evolution of macromolecular sequences. Sequence annotation: principles of genome annotation; annotation tools & resources.

UNIT IV STRUCTURAL BIOINFORMATICS 9

Conceptual models of protein structure; the relationship of protein three-dimensional structure to protein function; the evolution of protein structure & function; obtaining, viewing & analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure: CATH & SCOP; introduction to protein structure prediction; structure prediction by comparative modeling; secondary structure prediction; advanced protein structure prediction & prediction strategies.

UNIT V MICROARRAY DATA ANALYSIS 9

Microarray data, analysis methods; microarray data, tools & resources; sequence sampling & SAGE. Bioinformatics in pharmaceutical industry: informatics & drug discovery; pharma informatics resources. Basic principles of computing in bioinformatics: running computer software; computer operating systems; software downloading & installation; database management.

TOTAL: 45 HOURS

TEXTBOOK

S. NO.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dan E. Krane, Micha L. Rayme	Fundamental Concepts of Bioinformatics	Pearson education	2004
2	Andreas D. Baxevanis, B. F. Francis Ouellette	Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins	Wiley-Interscience	2004
3	David W. Mount	Sequence and Genome Analysis	Cold Spring Harbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

REFERENCE BOOKS

S. NO.	AUTHOR (S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Michael J. Korenberg	Microarray Data Analysis: Methods and Applications	Springer Science & Business Media	2007

16BTBTOE04 FUNDAMENTALS OF NANOBIOTECHNOLOGY L T P C 3 0 0 3

Course Objectives

- To develop skills of the students in the field of nano biotechnology and its applications in various fields.
- The course will serve as an effective course to understand Socio-economic issues of nano biotechnology.
- To extend the knowledge in types and application of nano particles in sensors.
- To define the concepts of biomaterials through molecular self assembly.
- To equip students with clinical applications of nano devices.
- To describe deeper understanding of the socio-economic issues in nanobiotechnology

Course Outcomes

- Develop skills in the field of nano biotechnology and its applications.
- Summarize the nanoparticles and its significance in various fields.
- Extend the knowledge in types and application of nano particles in sensors.
- Define the concepts of biomaterials through molecular self assembly.
- Outline the clinical applications of nano devices.
- Describe the socio-economic issues in nanobiotechnology.

UNIT I INTRODUCTION 9

Introduction, Scope and Overview, Length scales , Importance of Nanoscale and Technology, History of Nanotechnology, Future of Nanotechnology: Nano Technology Revolution, Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concept, Controversies and confusions, Understanding advanced capabilities, Nanotechnology in Different, Fields: Nanobiotechnology, Materials, Medicine, Dental care.

UNIT II NANO PARTICLES 9

Introduction, Types of Nanoparticles, Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Applications, Toxic effects of Nanomaterials, Significance of Nanoparticles Nanofabrications- MEMS/NEMS, Atomic Force Microscopy, Self assembled monolayers/ Dip- pen Nanolithography, Soft Lithography, PDMS Molding, Nano Particles, Nano wires and Nanotubes.

UNIT III APPLICATIONS 9

Nanomedicine, Nanobiocensor and Nanofludics. Nanocrystals in biological detection, Electrochemical DNA sensors and Integrated Nanoliter systems. Nano-Biodevices and Systems.Fabrication of Novel Biomaterials through molecular self assembly- Small scale systems for in vivo drug delivery- Future nanomachine.

UNIT IV NANOBIOTECHNOLOGY 9

Clinical applications of nanodevices. Artificial neurons. Real-time nanosensors- Applications in cancer biology.Nanomedicine. Synthetic retinyl chips based on bacteriorhodopsins. High throughput DNA sequencing with nanocarbon tubules.Nanosurgical devices.

UNIT V ETHICAL ISSUES IN NANOTECHNOLOGY 9

Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology: With Especial Reference to Nanomedicine, Nanomedicine Applied in Nonmedical Contexts, Social Issues Relating to Nanomedicine. Social and Ethical Issues, Economic Impacts, Other Issues, Nanotechnology and Future Socio-economic challenges.

TEXT BOOKS

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIONS
1	Niemeyer, C.M. and Mirkin, C.A	Nanobiotechnology: Concepts, Applications and Perspectives	Wiley-VCH	2004
2	Goodsell, D.S.	Bionanotechnology	John Wiley and Sons, Inc	2004

REFERENCE BOOKS

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIONS
1	Shoseyov, O. and Levy, I	Nanobiotechnology: Bioinspired Devices and Materials of the Future	Humana Press	2007
2	Bhushan, B.	Springer Handbook of Nanotechnology	Springer-Verlag Berlin Heidelberg	2004
3	FreitasJr R.A	Nanomedicine	Landes Biosciences	2004
4	Kohler, M. and Fritzsche, W.	Nanotechnology – An Introduction to Nanostructuring Techniques	Wiley-VCH	2004

16BEMEOE01 COMPUTER AIDED DESIGN L T P C 3 0 0 3

Course Objective

1. To apply basic concepts to develop construction (drawing) techniques.
2. To ability to manipulate drawings through editing and plotting techniques.
3. To understand geometric construction and Produce template drawings.
4. To understand and demonstrate dimensioning concepts and techniques.
5. To understand Section and Auxiliary Views.
6. To become familiar with Solid Modelling concepts and techniques.

Course Outcomes

Upon completion of the course, the students will be able to

1. Apply basic concepts to develop construction (drawing) techniques.
2. Ability to manipulate drawings through editing and plotting techniques.
3. Understand geometric construction and Produce template drawings.
4. Understand and demonstrate dimensioning concepts and techniques
5. Understand Section and Auxiliary Views
6. Become familiar with Solid Modelling concepts and techniques.

UNIT I OVERVIEW OF CAD SYSTEMS 9

Conventional and computer aided design processes-advantages and disadvantages. Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations. Networking of CAD systems.

UNIT II INTERACTIVE COMPUTER GRAPHICS AND GRAPHICS TRANSFORMATIONS 9

Generative, cognitive and image processing graphics. Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Two- and Three – Dimensional graphics concepts, Graphical input technique, Geometric transformations, Visual Realism, Computer animation, customizing graphics software.

UNIT III GEOMETRIC MODELING 9

Wireframe, surface, NURBS and solid modeling-applications and advantages. Creating primitive solids, sweeping solids, boolean operations. Extracting entities from a solid. Filleting of edges of solids. Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

UNIT IV PARAMETRIC DESIGN AND OBJECT REPRESENTATION 9

Types of co-ordinate systems. Parametric design - definition and advantages. Parametric representation of analytic and synthetic curves. Parametric representation of surfaces and solids - manipulations.

UNIT V PRODUCT DESIGN AND DEVELOPMENT 9

Automated 2D drafting - basics, mechanical assembly - bill of materials generation. Mass property calculations.

TOTAL:45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Vera B Anand	Computer Graphics and Geometric Modeling for Engineers	John Wiley & Sons, New York	2000
2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	Dhanpat Rai & Sons, New Delhi	2002
2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	William M Newman and Robert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994
5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998
6	Rao S S	Optimisaiton Techniques	Wiley Eastern, New Delhi	2003

16BEMEOE02 INDUSTRIAL SAFETY AND ENVIRONMENT L T P C 3 0 0 3

Course Objective

1. To recognize and evaluate occupational safety and health hazards in the workplace.
2. To determine appropriate hazard controls following the hierarchy of controls.
3. To analyses the effects of workplace exposures, injuries and illnesses, fatalities.
4. To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
5. To teach student the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
6. To prevent or mitigate harm or damage to people, property, or the environment.

Course Outcome

At the end of the course, student will be able to

1. Recognize and evaluate occupational safety and health hazards in the workplace.
2. Determine appropriate hazard controls following the hierarchy of controls.
3. Analyse the effects of workplace exposures, injuries and illnesses, fatalities.
4. Prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
5. Understand the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
6. Prevent or mitigate harm or damage to people, property, or the environment.

UNIT I INTRODUCTION TO LOGISTICS 9

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNIT II PHASES OF SUPPLY CHAIN 9

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAIN MODELS 9

Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain with customer.

UNIT IV SUPPLY CHAIN ACTIVITIES 9

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNIT V SCM ORGANISATION AND INFORMATION SYSTEM 9

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERP Software's

TOTAL:45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Shari.P.B and Lassen.T.S	Managing the global supply chain	Viva books, New Delhi	2000
2	Ayers.J.B	Hand book of supply chain management	The St. Lencie press	2000

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Nicolas.J.N	Competitive manufacturing management - continuous improvement, Lean production, customer focused quality	McGrawHill, New York	1998
2	Steudel.H.J and Desruelle.P	Manufacturing in the nineteen - How to become a mean, lean and world class competitor	Van No strand Reinhold, New York	1992

16BEMEOE03 **TRANSPORT PHENOMENA** **L T P C 3 0 0 3**

Course Objective

1. To generalized equations for mass, momentum and heat.
2. To understand the concepts of Reynolds and Gauss theorems.
3. To learn combined diffusive and convective transport.
4. To apply Film- and penetration models for mass and heat transfer.
5. To apply Stefan-Maxwells equations for multi-component diffusion.
6. To Solve the given set of equations either analytically or numerically.

Course Outcomes

Upon completion of this course, the students can be able to

1. Generalized equations for mass, momentum and heat.
2. Understand the concepts of Reynolds and Gauss theorems.
3. Learn combined diffusive and convective transport.
4. Apply Film- and penetration models for mass and heat transfer.
5. Apply Stefan-Maxwells equations for multi-component diffusion.
6. Solve the given set of equations either analytically or numerically.

UNIT I INTRODUCTION AND BASIC CONCEPTS **9**

General overview of transport phenomena including various applications, Transport of momentum, heat and mass , Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II PROPERTIES, UNITS AND OTHER PHYSICAL PARAMETERS **9**

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III MOMENTUM TRANSPORT **9**

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNIT IV ENERGY TRANSPORT **9**

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heat transfer

UNIT V MASS TRANSPORT **9**

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion- Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

TOTAL: 45 HOURS

REFERENCE

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

WEBSITES

1. https://laulima.hawaii.edu/portal

16BEMEOE04 **INTRODUCTION TO BIOMECHANICS** **L T P C 3 0 0 3**

Course Objective

1. To describe the principles of the study of human movement.
2. To describe the range of factors that influence the initiation, production and control of human movement.
3. To identify the body's lever systems and their relationship to basic joint movement and classification.
4. To distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
5. To explain joint and muscle function and the forces acting upon the human body during various sporting activities.
6. To relate the different body systems necessary for human movement to occur.

Course Outcomes

Upon completion of this course, the students will be able to,

1. Describe the principles of the study of human movement.
2. Describe the range of factors that influence the initiation, production and control of human movement.
3. Identify the body's lever systems and their relationship to basic joint movement and classification.
4. Distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
5. Explain joint and muscle function and the forces acting upon the human body during various sporting activities.
6. Relate the different body systems necessary for human movement to occur.

UNIT I INTRODUCTION **9**

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNIT II KEY MECHANICAL CONCEPTS **9**

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY **9**

Gross (Whole-Body) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups - Anthropometric Data

UNIT IV ANATOMICAL DESCRIPTION **9**

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNIT V MECHANICS OF THE MUSCULOSKELETAL SYSTEM **9**

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit - Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle - Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control

TOTAL: 45 HOURS

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Duane Knudson	Fundamentals of Biomechanics	Springer Science+ Business Media, LLC	2007
2	C. Ross Ethier Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

16BEAEOE01 **AUTOMOBILE ENGINEERING** **L T P C 3 0 0 3**

Course Objectives:

- To impart knowledge on the constructional details and principle of operation of various automobile components.
- To learn the function and working of various components in transmission and drive lines.
- To study the concept and working of steering and suspension systems in an automobile.
- To give knowledge on the wheels, tyres and brakes of automobiles.
- To provide information on the current and future trends in automobiles.
- Identify and explain the types of steering system.

Course Outcomes:

Upon successful completion of the course, the students should be able to:

- Demonstrate the operating principles and constructional details of various automobile components.
- Explain the function and working of components in transmission and drive lines.
- Identify and explain the types of steering system.
- Identify and explain the types of suspension system.
- Classify and describe the types of wheels, tyres and brakes of automobiles.
- Discuss the current and future trends in the automobiles.

UNIT I ENGINE AND FUEL FEED SYSTEMS 9

Classification of Engine, construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburettor working principle, requirements of an automotive carburettor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNIT II TRANSMISSION SYSTEMS 9

Requirements of transmission system.Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. **Course Objectives** of the gearbox - Determination of gear ratios for vehicles.Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propeller Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

UNITIII SUSPENSION SYSTEM 9

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension – Pneumatic suspension – Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

UNITIV BRAKES 9

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theory, Brake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System (ABS).

UNITV ELECTRICAL SYSTEM 9

Principle and construction of lead acid battery. Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.Starting System and charging system.

TOTAL: 45 HOURS

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2.	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., New Delhi	2003
3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publisher	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
2.	Crouse.W.H	Automobile Electrical Equipment, 3rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAEInc	2001

16BEAEOE02 BASICS OF TWO AND THREE WHEELERS L T P C 3 0 0 3

Course Objectives

- The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.

- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.

Course Outcomes

Upon successful completion of the course, the students should be able to:

- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
- Explain the servicing of two and three wheelers.

UNIT I INTRODUCTION 9

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNITII POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS 9

2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHES AND TRANSMISSION 9

Types of clutches for 2 and 3 wheelers.Design of clutch system.Gears for two and three wheelers.Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES 9

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS 9

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TOTAL: 45 HOURS

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992
2.	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century book house.	1988

REFERENCES:

SL. NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Griffin.M.M	Motor cycles from inside and outside.	Prentice Hall Inc, New Jersey.	1978
2.	Bruce A. Johns, David D. Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAEOE03 AUTOMOBILE MAINTENANCE L T P C 3 0 0 3

Course Objectives

- The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems in Automobile.

- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.

Course Outcomes

Upon successful completion of the course, the students should be able to:

- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.
- Explain the fault diagnosis in the electrical and air conditioner systems.

UNIT I MAINTENANCE OF RECORDS AND SCHEDULES 9

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE 9

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE 9

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE 9

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY 9

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TOTAL: 45 HOURS

TOTAL: 45 HOURS

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	John Doke	Fleet Management	McGraw Hill Co	1984
2.	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011
3.	Service Manuals from Different Vehicle Manufacturers			

16BEAEOE04 INTRODUCTION TO MODERN VEHICLE TECHNOLOGY L T P C 3 0 0 3

Course Objectives:

- To impart knowledge on trends in the vehicle power plants.
- To learn the various advanced driver assistance systems.
- To study the working of advanced suspension and braking systems in an automobile.
- To give information about motor vehicle emission and noise pollution control.
- To provide knowledge of the vehicle telematics.
- To give information about the noise control techniques

Course Outcomes:

Upon successful completion of the course, the students should be able to:

- Distinguish and describe the various modern vehicle power plant systems.
- List and explain the various driver assistant mechanisms.
- Identify and describe the working of advanced suspension and braking systems.
- Apply the knowledge of motor vehicle emission and noise pollution control.
- Describe the noise control techniques
- Describe the vehicle telematics and its applications.

UNIT I TRENDS IN POWER PLANTS 9

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNIT II DRIVER ASSISTANCE SYSTEMS 9

Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNIT III SUSPENSION BRAKES AND SAFETY 9

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT IV NOISE & POLLUTION 9

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT V TELEMATICS 9

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

TOTAL: 45 HOURS

TEXT BOOKS

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	LjuboVlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001
2.	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems –Progress in Technology	Automotive Electronics Series,SAE, USA.	1998

REFERENCES

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William B Riddens	Understanding Automotive Electronics, 5^{th} Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold,	Understanding Automotive Electronics	SAE	1998
3.	Robert Bosch	Automotive HandBook, 5^{th} Edition	SAE	2000

CIVIL ENGINEERING

16BECEOE01 HOUSING, PLAN AND MANAGEMENT L T P C 3 0 0 3

COURSE OBJECTIVES

1. To examine the role and tasks of basic housing policies and building bye laws
2. Understand the process of integrated service delivery in the context of economic, social, environmental and institutional factors
3. Analyze the Innovative construction methods and Materials
4. Analyze city management strategies and strengthen the urban governance through a problem solving approach
5. To know the Importance of basic housing policies and building bye laws
6. To use Housing Programmes and Schemes

COURSE OUTCOME

The students will be able to

1. Know the Importance of basic housing policies and building bye laws
2. Use Housing Programmes and Schemes
3. Plan and Design of Housing projects
4. Examine Innovative construction methods and Materials
5. Know Housing finance and loan approval procedures
6. Understand Construction as well as managing techniques

UNIT I INTRODUCTION TO HOUSING 9

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, **Course Objectives** and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II HOUSING PROGRAMMES 9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems).

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Meera Mehta and Dinesh Mehta	Metropolitan Housing Markets	Sage Publications Pvt. Ltd., New Delhi	2002
2	Francis Cherunilam and Odeyar D Heggade	Housing in India Communication	Himalaya Publishing House, Bombay.	2001

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	-	Development Control Rules for Chennai Metropolitan Area	CMA, Chennai	2002
2	-	UNCHS, National Experiences with Shelter Delivery for the Poorest Groups	UNCHS (Habitat), Nairobi	2000

16BECEOE02 **BUILDING SERVICES** **L T P C 3 0 0 3**

COURSE OBJECTIVES

1. Defining and identifying of eng. services systems in buildings.
2. The role of eng. services systems in providing comfort and facilitating life of users of the building.
3. The basic principles of asset management in a building & facilities maintenance environment
4. Importance of Fire safety and its installation techniques
5. To Know the principle of Refrigeration and application
6. To Understand Electrical system and its selection criteria

COURSE OUTCOME

The students will be able to

1. Machineries involved in building construction
2. Understand Electrical system and its selection criteria
3. Use the Principles of illumination & design
4. Know the principle of Refrigeration and application
5. Importance of Fire safety and its installation techniques
6. Know the principle behind the installation of building services and to ensure safety in buildings

UNIT I MACHINERIES **9**

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS **9**

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN **9**

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS **9**

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant –

Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION **9**

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	E.R.Ambrose	Heat Pumps and Electric Heating	John and Wiley and Sons, Inc., New York	2002
2	-	Handbook for Building Engineers in Metric systems	NBC, New Delhi	2005

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	-	Philips Lighting in Architectural Design	McGraw-Hill, New York	2000
2	A.F.C. Sherratt	Air-conditioning and Energy Conservation	The Architectural Press, London	2005

16BECEOE03 MANAGEMENT OF IRRIGATION SYSTEMS L T P C 3 0 0 3

OBJECTIVES

1. To enable the students for a successful career as water management professionals.

2. To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.

3. To expose the students the need for an interdisciplinary approach in irrigation water management

4. To providing a platform to work in an interdisciplinary team.

5. To provide students an ability to understand the applications of mathematical and scientific concepts to analyse intricate technical, social and environmental problems in irrigation water management and finding solutions for them.

6. To promote student awareness for a life-long learning process and inculcate professional ethics and codes of professional practice in water management.

OUTCOME

At the end of this the students will be in a capacity to

1. Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.

2. Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management

3. Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach.

4. Gain insight on local and global perceptions and approaches to participatory water resource management

5. Learn from successes and failures in the context of both rural and urban communities of water management.

6. Exposure on the use of economic concepts in irrigation development and to impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector.

UNIT I IRRIGATION SYSTEM REQUIREMENTS 9

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNIT II IRRIGATION SCHEDULING 9

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III MANAGEMENT 9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV OPERATION 9

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V INVOLVEMENT OF STAKE HOLDERS 9

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dilip Kumar Majumdar	Irrigation Water Management – Principles and Practice	Prentice Hall of India Pvt. Ltd., New Delhi	2000
2	R.T. Gandhi, et. al.	Hand book on Irrigation Water Requirement	Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi	-

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Maloney, C. and Raju, K.V	Managing Irrigation Together", Practice and Policy in India	Stage Publication, New Delhi, India	2000
2	-	Hand Book on Irrigation System Operation Practices	Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi	2000

16BECEOE04 ADVANCED CONSTRUCTION TECHNOLOGY L T P C 3 0 0 3

OBJECTIVE:

1. To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
2. To study different methods of construction to successfully achieve the structural design with recommended specifications.
3. To involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. To study of construction equipment's, and temporary works required to facilitate the construction process
5. To provide a coherent development to the students for the courses in sector of Advanced construction technology.
6. To present the new technology of civil Engineering and concepts related Advanced construction technology.

OUTCOMES:

1. Implementation of new technology concepts which are applied in field of Advanced construction.
2. Different methods of construction to successfully achieve the structural design with recommended specifications.
3. Application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. Will gain the Knowledge of construction equipment's, and temporary works required to facilitate the construction process
5. Development to the students for the courses in sector of Advanced construction technology.
6. The new technology of civil Engineering and concepts related Advanced construction technology.

UNIT - I MODERN CONSTRUCTION METHODS 9

Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT - II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES 9

Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines

UNIT - III MODERN CONSTRUCTION EQUIPEMENTS -I 9

Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting,Tunneling and hoisting

UNIT - IV MODERN CONSTRUCTION EQUIPEMENTS -II 9

Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant

UNIT - V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES 9

Principles and Practices of Temporary structures, Shoring, and Strutting,Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipments

TOTAL: 45 HOURS

TEXT BOOKS

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peurifoyu , R. L., , Ledbette, W.B	Construction Planning , Equipment and Methods	Mc Graw Hill Co	2000
2	Antill J.M	PWD, Civil Engineering Construction	Mc Graw Hill Book Co	2005

REFERENCE

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Varma.M	Construction Equipment and its Planning & Applications	, Metropolitan Book Co	2000
2	Nunnaly.S.W	Construction Methods and Management	Prentice – Hall	2000
3	Ataev, S.S	Construction Technology	MIR , Pub	2000

LIST OF OPEN ELECTIVES OFFERED BY

ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT

16BEEEOE01 ELECTRIC HYBRID VEHICLE L T P C 3 0 0 3

Course Objectives

- To understand the basic concepts of electric hybrid vehicle.
- To gain the knowledge about electric propulsion unit.
- To gain the concept of Hybrid Electric Drive-Trains.
- To gain the different Energy Management Strategies.
- To study about the efficiency manipulation in drives
- To understand and gain the knowledge about various energy storage devices

Course Outcomes:

- Summarize the basic concepts in bioprocess Engineering.
- Explain the concept of Hybrid Electric Vehicles.
- Understand the concept of Hybrid Electric Drive-Trains.
- Identify the different Energy Management Strategies.
- Understand the concept of different Energy Storage devices.
- Analyze the different motor drives used in Hybrid Electric Vehicles.

UNIT I INTRODUCTION 9

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II HYBRID ELECTRIC DRIVE-TRAINS 9

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT 9

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE 9

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENT STRATEGIES 9

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press – 2nd edition	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	Standards media – 2nd edition	2009
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley – 2nd edition	2012

16BEEEOE02 ENERGY MANAGEMENT AND ENERGY AUDITING L T P C 3 0 0 3

Course Objectives:

- To gain the knowledge about energy management.
- To understand the basic concepts in economic analysis in energy management.
- To understand the basic principles of energy audit.
- To gain the knowledge about the basic concept of types of Energy Audit
- To gain and Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- To study about the behaviour changes of PF requirement in motor currents

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the concept of Energy Management.
- Analyze the different methods for economic analysis
- Knowledge about the basic concept of Energy Audit and types.
- Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- Investigate the different methods to improve power factor.

UNIT I ENERGY MANAGEMENT 9

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS 9

Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worth method.

UNIT III BASIC PRINCIPLES OF ENERGY AUDIT 9

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT IV ENERGY EFFICIENT MOTORS 9

Electric Motors: Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation –over motoring – motor energy audit-

Energy conservation: Importance-energy saving measures in DG set-fans and blowers pumps-air conditioning system- energy efficient transformers.

UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS 9

Power factor - methods of improvement, location of capacitors, p.f with non linear loads, effect of harmonics on p.f,- p.f motor controllers –Energy efficient lighting system design and practice- lighting control– Measuring Instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLCs.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Murphy W.R. and G.Mckay Butter worth	Energy Management	Heinemann Publications	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John.C.Andreas	Energy Efficient Electric Motors	Marcel Dekker Inc Ltd – 3rd edition	2005
2	W.C.Turner Steve Doty	Energy Management Handbook	(b) Lulu Enterprises, Inc. - 8th Edition Volume II	2013

16BEEEOE03 PROGRAMMABLE LOGIC CONTROLLER L T P C 3 0 0 3

Course Objectives

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To gain the knowledge of storage techniques in PLC
- To acquire the knowledge about how to handle the data and functions
- To study about flowcharts of ladder and spray process system
- To understand the principles of PID.

Course Outcome

- At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.
- To acquire the knowledge of storage techniques in PLC
- Students know how to handle the data and functions
- Students known about advanced controller in PLC applications
- Students gather real time industrial application of PLC
- Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION 9

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING 9

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS 9

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS 9

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES 9

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	JR Hackworth and F.D Hackworth – Jr	Programmable Logic Controllers – Programming Method and Applications	Pearson	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	2004
2	W.Bolton	Programmable Logic controller	Elsevier Newnes Publications, 5th Edition	2009

WEBSITE

http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logic controller

16BEEEOE04 RENEWABLE ENERGY RESOURCES L T P C 3 0 0 3

Course Objectives

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
- To understand the basic principles fuel cell, Geo thermal power plants.
- To gain the knowledge about hydro energy.
- To study about solar energy collectors and its storages
- To study about the inter connected system in wind power

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Analyze the Energy Scenario in india
- Understand the concept of Solar Energy
- Understand the concept of Wind Energy
- Understand the concept of Hydro Energy
- Analyze the different energy sources
- Students gathered the real time inter connected system modelling in wind power

UNIT I INTRODUCTION 9

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

UNIT II SOLAR ENERGY 9

Introduction to solar energy: solar radiation, availability, measurement and estimation– Solar thermal conversion devices and storage – solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

UNIT III WIND ENERGY 9

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNIT IV HYDRO ENERGY 9

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V OTHER SOURCES 9

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rai.G.D	Non-conventional sources of energy	Khanna publishers	2011
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rao.S. & Parulekar	Energy Technology	Khanna publishers, Eleventh Reprint	2013
2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis – 3rd edition	2015

WEBSITES

1. www.energycentral.com

2. www.catelelectricpowerinfo.com

B.E. MECHANICAL ENGINEERING

CURRICULUM AND SYLLABI
(2016 AND ONWARDS)

(REGULAR PROGRAMME)

Department of Mechanical Engineering
FACULTY OF ENGINEERING

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University Established Under Section 3 of UGC Act 1956)

Eachanari Post, Coimbatore – 641 021.INDIA

B. E. MECHANICAL ENGINEERING (REGULAR)
COURSE OF STUDY AND SCHEME OF EXAMINATIONS
(2016 and onwards)

SEMESTER I

Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA 40	ESE 60	Total 100
16BECC101	Communicative English	1	1,2,3	3	0	0	3	40	60	100
16BECC102	Engineering Mathematics I	1	1,2,8,9	3	2	0	4	40	60	100
16BEPH103 16BECH103	Engineering Physics / Engineering Chemistry	1, 3	1,2,3,5,8,9	3	0	0	3	40	60	100
16BEME104	Basic Mechanical Engineering	1, 2	1,2,3,8,9,12	3	0	0	3	40	60	100
16BEME105A 16BEME105B	Basic Electrical and Electronics Engineering / Elements of Civil Engineering	1, 3	1,2,3,8,9,11	3	0	0	3	40	60	100
16BEPH111 16BECH111	Engineering Physics Laboratory / Engineering Chemistry Laboratory	1	1,2,5, 10	0	0	4	2	40	60	100
16BEME112	Engineering Workshop Practice	1, 2	1,2,3,5	0	0	4	2	40	60	100
16BEME113	Engineering Graphics – I	1, 2	1,2,3,5,9	0	0	4	2	40	60	100
			Total	**15**	**2**	**12**	**22**	**320**	**480**	**800**
VALUE ADDED COURSE										
16BECC151	Human Values	-	--	1	0	0	-	100	0	100

SEMESTER II

Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA 40	ESE 60	Total 100
16BECC201A 16BECC201B	Business Communication / Technical English	2	4,5, 10	3	0	0	3	40	60	100
16BECC202	Engineering Mathematics II	1	1,2,8,9	3	2	0	4	40	60	100
16BEPH203 16BECH203	Engineering Physics / Engineering Chemistry	1, 3	1,2,3,5,8,9	3	0	0	3	40	60	100
16BECC204	Environmental Sciences	1	1,2,3,4,10	3	0	0	3	40	60	100
16BEME205A 16BEME205B	Basic Electrical and Electronics Engineering / Elements of Civil Engineering	1, 3	1,2,3,8,9,11	3	0	0	3	40	60	100
16BEPH211 16BECH211	Engineering Physics Laboratory / Engineering Chemistry Laboratory	1	1,2,5, 10	0	0	4	2	40	60	100
16BEME212	Computer Practice and Programming Laboratory	1	1,2,9	1	0	4	3	40	60	100
16BEME213	Engineering Graphics – II	1, 2	1,2,3,5,9	0	0	3	2	40	60	100
Total				**16**	**2**	**11**	**23**	**320**	**480**	**800**
VALUE ADDED COURSE										
16BEME251	Aptitude Training	-	--	1	0	0	-	100	0	100

SEMESTER III										
Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA 40	ESE 60	Total 100
16BEME301	Methods of Applied Mathematics	1	1,3,5,6,7,8	3	2	0	4	40	60	100
16BEME302	Engineering Mechanics	1	1,2,3,4,10,11	3	1	0	4	40	60	100
16BEME303	Manufacturing Technology – I (HC)	1	1,2,3,4,10	3	0	0	3	40	60	100
16BEME304	Fluid Mechanics and Machinery (HC)	1	1,2,3,4,10	3	2	0	4	40	60	100
16BEME305A 16BEME305B	Electrical Drives and Controls/ Electronics andMicroprocessor	1,2	1,2,3,4,6,9,10	3	0	0	3	40	60	100
16BEME311	Fluid Mechanics and Machinery Laboratory (HC)	1	1,2,3,4,5,6,9	0	0	3	2	40	60	100
16BEME312	Machine Drawing(HC)	1	1,2,3,4,10	0	0	3	2	40	60	100
16BEME313	Electrical Drives and Microprocessor Laboratory	1,2	1,2,3,4,6,9,12	0	0	3	2	40	60	100
Total				15	5	9	24	320	480	800
VALUE ADDED COURSE										
16BEME351	Soft Skills	-	--	1	0	0	-	100	0	100

SEMESTERIV										
Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA 40	ESE 60	Total 100
16BEME401	Strength of Materials (HC)	1	1,2,3,4,10	3	2	0	4	40	60	100
16BEME402	Manufacturing Technology – II (HC)	1	1,2,3,6,8,9	3	0	0	3	40	60	100
16BEME403	Engineering Thermodynamics	1	1,2,3,4,10	3	2	0	4	40	60	100
16BEME404A 16BEME404B	Industrial Metallurgy (SC)/ Engineering Materials(SC)	1	1,2,3,4,10	3	0	0	3	40	60	100
16BEME405A 16BEME405B	Kinematics of Machinery (SC) / Industrial Engineering (SC)	1	1,2,3,4,10	3	0	0	3	40	60	100
16BEME406A 16BEME406B	Engineering Metrology (SC) / Industrial Metrology (SC)	1	1,2,3,6,8,9	3	0	0	3	40	60	100
16BEME411	Strength of Materials and Metallurgy Laboratory (HC)	1	1,2,3,5,9,10	0	0	3	2	40	60	100
16BEME412	Manufacturing Technology Laboratory (HC)	1	1,2,3,6,8,9,12,14	0	0	4	2	40	60	100
Total				18	4	7	24	320	480	800
VALUE ADDED COURSE										
16BEME451	Production Drawing and Cost Estimation	-	--	1	0	0	-	100	0	100

SEMESTERV

Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA	ESE	Total
								40	60	100
16BEME501	Heat Power Engineering (HC)	1	1,2,3,4,10	3	0	0	3	40	60	100
16BEME502	Design of Machine Elements (HC)	1	1,2,3,4,9	3	2	0	4	40	60	100
16BEME503A 16BEME503B	Dynamics of Machinery (SC) / Theory of Machines (SC)	1	1,2,3,4,9,12	3	0	0	3	40	60	100
16BEME5E– –	Professional Elective I	--	--	3	0	0	3	40	60	100
16BEME5E– –	Professional Elective II	--	--	3	0	0	3	40	60	100
16BEME511	Scientific Computing Laboratory	1	1,3,5,6,7,8,10	2	0	2	3	40	60	100
16BEME512	Dynamics and Metrology Laboratory	1	1,2,3,4,6,9,12	0	0	4	2	40	60	100
16BEME513	Thermal Engineering Laboratory I	1	1,2,3,4,7,11	0	0	4	2	40	60	100
Total				**17**	**2**	**10**	**23**	**320**	**480**	**800**
VALUE ADDED COURSE										
16BEME551	In–plant training	-	--	-	-	-	-	100	0	100
16BEME552	Geometrical Dimensioning and Tolerance	-	--	1	0	0	-	100	0	100

SEMESTERVI

Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA	ESE	Total
								40	60	100
16BEME601	Operations Research	1	1,3,5,6,7,8	3	2	0	4	40	60	100
16BEME602	Design of Transmission System	1	1,2,3,4,8,9,10	3	0	0	3	40	60	100
16BEME603	Heat and Mass Transfer	1	1,2,3,4,5	3	2	0	4	40	60	100
16BEME604	Economics for Engineers	1	1,2,3,5,7	3	0	0	3	40	60	100
16BEME6E– –	Professional Elective III	--	--	3	0	0	3	40	60	100
16BEME6E– –	Professional Elective IV	--	--	3	0	0	3	40	60	100
16BEME611	Computer Aided Modeling & Simulation Laboratory	1	1,2,3,4,5,8,9	0	0	3	2	40	60	100
16BEME612	Thermal Engineering Laboratory II			0	0	3	2	40	60	100
Total				**18**	**4**	**6**	**24**	**320**	**480**	**800**
VALUE ADDED COURSE										
16BEME651	Mini Project	-	--	0	0	1	-	100	0	**100**
16BEME652	Technical Presentation	-	--	0	0	1	-	100	0	**100**

SEMESTERVII										
Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA	ESE	Total
								40	60	100
16BECC701	Professional Ethics, Principles of Management andEntrepreneurship Development	1	1,2,3,4,5, 10,11	3	0	0	3	40	60	100
16BEME702	Mechatronic Systems	1	1,2,3,4,5	3	0	0	3	40	60	100
16BEME7E– –	Professional Elective V	--	--	3	0	0	3	40	60	100
	Open Elective I	--	--	3	0	0	3	40	60	100
	Open Elective II	--	--	3	0	0	3	40	60	100
16BEME711	CAE / CAM Laboratory	1	1,2,3,4,8,9	0	0	3	2	40	60	100
16BEME712	Mechatronics Laboratory	1	1,2,3,4,5,7	0	0	3	2	40	60	100
16BEME791	Project Work - Phase I	-	--	0	0	8	4	40	60	100
Total				**15**	**0**	**14**	**23**	**320**	**480**	**800**
VALUE ADDED COURSE										
16BEME751A 16BEME751B	Robotics and Automation / Motors and Pumps	-	--	1	0	0	-	100	0	100

SEMESTERVIII										
Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA	ESE	Total
								40	60	100
16BEME801	Total Quality Management	1	1,2,3,4,5,8,9	3	0	0	3	40	60	100
16BEME8E– –	Professional Elective VI	--	--	3	0	0	3	40	60	100
16BEME891	Project Work - Phase II & Viva-voce	--	--	0	0	32	16	120	180	300
				6	**0**	**32**	22	**200**	**300**	**500**

LIST OF ELECTIVES

PROFESSIONAL ELECTIVES (PE)

SEMESTER V
Elective I & II

Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA	ESE	Total
								40	60	100
16BEME5E01	Material Aspects in Design	1,3	1,2,3,7,9,13	3	0	0	3	40	60	100
16BEME5E02	Computer Integrated Manufacturing	1,2	1,2,3,7,9,13	3	0	0	3	40	60	100
16BEME5E03	Automobile Engineering	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BEME5E04	Hydraulics and Pneumatics Power Control	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BEME5E05	Design of Jigs, Fixtures and Press Tools	1,3	1,2,3,7,9,12	3	0	0	3	40	60	100
16BEME5E06	Renewable Energy Sources	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BEME5E07	Industrial Robotics	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BEME5E08	Design and Analysis of Experiments	1	1,2,3,7,9,13	3	0	0	3	40	60	100

SEMESTER VI
Elective III & IV

Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA	ESE	Total
								40	60	100
16BEME6E01	Power Plant Engineering	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BEME6E02	Advanced Manufacturing Processes	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BEME6E03	Computational Fluid Dynamics	1,3	1,2,3,7,9,12	3	0	0	3	40	60	100
16BEME6E04	Manufacture and Inspection of Gears	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BEME6E05	Design for Manufacture and Assembly	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BEME6E06	Gas Dynamics and Jet Propulsion	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BEME6E07	Advanced I.C. Engines	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BEME6E08	Finite Element Methods	1	1,2,3,7,13,15	3	0	0	3	40	60	100

SEMESTER VII
Elective V

Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA	ESE	Total
								40	60	100
16BEME7E01	Machine Tool Design	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BEME7E02	Additive Manufacturing	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BEME7E03	Composite Materials	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BEME7E04	Refrigeration and Air Conditioning	1	1,2,3,7,9,12	3	0	0	3	40	60	100

SEMESTER VIII
Elective VI

Course Code	Course title	Objectives & Outcomes		Instruction Hours / Week			Credits	Maximum Marks		
		PEO	PO	L	T	P		CIA	ESE	Total
								40	60	100
16BEME8E01	Quality Control and Reliability Engineering	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BEME8E02	Production Planning and Control	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BEME8E03	Cogeneration and Waste Heat Recovery Systems	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BEME8E04	Energy Conservation Methods and Energy Audit	1	1,2,3,7,9,15	3	0	0	3	40	60	100

OPEN ELECTIVES

COURSES OFFERED BY OTHER DEPARTMENTS

SUB. CODE	TITLE OF THE COURSE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
SCIENCE AND HUMANITIES										
16BESHOE01	Probability and Random Process	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BESHOE02	Fuzzy Mathematics	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BESHOE03	Linear Algebra	1,3	1,2,3,7,9,12	3	0	0	3	40	60	100
16BESHOE04	Engineering Acoustics	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BESHOE05	Solid Waste Management	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BESHOE06	Green Chemistry	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BESHOE07	Applied Electrochemistry	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BESHOE08	Industrial Chemistry	1	1,2,3,7,13,15	3	0	0	3	40	60	100
COMPUTER SCIENCE AND ENGINEERING										
16BECSOE01	Internet Programming	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BECSOE02	Multimedia and Animation	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BECSOE03	PC Hardware and Trouble shooting	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BECSOE04	Java Programming	1	1,2,3,7,9,15	3	0	0	3	40	60	100
ELECTRICAL AND ELECTRONICS ENGINEERING										
16BEEEOE01	Electric Hybrid Vehicles	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BEEEOE02	Energy Management & Energy Auditing	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BEEEOE03	Programmable Logic Controller	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BEEEOE04	Renewable Energy Resources	1	1,2,3,7,9,12	3	0	0	3	40	60	100
ELECTRONICS AND COMMUNICATION ENGINEERING										
16BEECOE01	Real Time Embedded Systems	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BEECOE02	Consumer Electronics	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BEECOE03	Neural Networks and its Applications	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BEECOE04	Fuzzy Logic and its Applications	1	1,2,3,7,9,12	3	0	0	3	40	60	100
BIOTECHNOLOGY										
16BTBTOE01	Bioreactor Design	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BTBTOE02	Food Processing and Preservation	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BTBTOE03	Basic Bioinformatics	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BTBTOE04	Fundamentals of Nano Biotechnology	1	1,2,3,7,9,15	3	0	0	3	40	60	100
AUTOMOBILE ENGINEERING										
16BEAEOE01	Automobile Engineering	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BEAEOE02	Basics of Two and Three Wheelers	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BEAEOE03	Automobile Maintenance	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BEAEOE04	Introduction to Modern Vehicle Technology	1	1,2,3,7,9,15	3	0	0	3	40	60	100
CIVIL ENGINEERING										
16BECEOE01	Housing, Plan and Management	1	1,2,3,7,9,15	3	0	0	3	40	60	100
16BECEOE02	Building Services	1	1,2,3,7,13,15	3	0	0	3	40	60	100
16BECEOE03	Management of Irrigation Systems	1	1,2,3,7,9,13	3	0	0	3	40	60	100
16BECEOE04	Advanced Construction Technology	1	1,2,3,7,9,15	3	0	0	3	40	60	100

COURSES OFFERED TO OTHER DEPARTMENTS

SUB. CODE	TITLE OF THE COURSE	PEO	PO	L	T	P	C	CIA	ESE	TOTAL
16BEMEOE01	Computer Aided Design	1	1,2,3,7, 9,15	3	0	0	3	40	60	100
16BEMEOE02	Industrial Safety and Environment	1	1,2,3,7, 13,15	3	0	0	3	40	60	100
16BEMEOE03	Transport Phenomena	1	1,2,3,7, 9,13	3	0	0	3	40	60	100
16BEMEOE04	Introduction to Biomechanics	1	1,2,3,7, 9,15	3	0	0	3	40	60	100

Total number of credits: 185

L:LectureHour **T:TutorialHour** **CIA: Continuous Internal Assessment**

P:PracticalHour **C: No.ofCredits** **ESE: End SemesterExaminations**

Note:

1. Thepassingminimumforvalueaddedcourseis50marksoutof100marks.Therewillbetwotests,ofwhichonewill be class test covering 50% of syllabus for 50 marks and other for 50marks.
2. Credits for value added courses are not counted for computation ofCGPA.
3. Interestedstudentscanoptoneselfstudycourseineighthsemesterfromopenelectives which willbereflectedinthe mark sheet only if he / shepasses

Programme Educational Objectives (PEO's)

1:Graduates will more conscious about their profession with social awareness and responsibility.

2:Graduates will be engineering experts, who would help solve industry's technological problems.

3:Graduates will be engineering professionals, consultants or entrepreneurs engaged in technology development.

4:Graduates will interact with their peers in other disciplines in industry and society and contribute to the economic growth of the country.

Programme Outcomes (PO's)

1: Ability to apply knowledge of mathematics and science in solving engineering problems.

2: In-depth knowledge on the fundamental principles, construction and auxiliary systems of mechanical sciences.

3: To understand the principles involved in evaluating the structural, functional and safety requirements of mechanical systems.

4: Hands on knowledge to develop analytical skills for designing and analyzing various mechanical components and processes.

5: To understand and apply appropriate techniques and IT tools for the design and analysis of mechanical systems.

6: Understanding the mechanism of pollutant formation and its control techniques.

7: Understanding of human and ethical responsibilities towards the profession and society.

8: Ability to understand the economics and cost analysis in order to take economically sound decisions.

9: Ability to apply modem techniques and tools necessary for engineering practice with appropriate considerations for public health, safety, cultural and environmental limitations.

10: Understand the impact of engineering solutions in a societal context and to be able to respond effectively to the needs for sustainable development.

11: Function effectively as an individual, and as a member or a leader in diverse teams, and in multi-disciplinary situations.

12: To recognize the need for, and have the ability to engage in independent and lifelong learning.

ProgrammeSpecific Outcomes (PSO's)

13: Ability to design a mechanical system, component, or process to meet desired needs of the nation, industries, institutions within realistic constraints such as economic, environmental, social, political, ethical, health care, and safety, manufacturability, and sustainability.

14: Ability to develop and use of software tools and Information Technology for mechanical engineering domain.

15: Ability to perform effectively first level managerial responsibilities for large or medium engineering organizations.

Programme Educational Objectives	**Programme Objectives**														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1			✓			✓	✓	✓	✓	✓			✓		
2	✓	✓	✓	✓	✓				✓					✓	
3	✓	✓	✓	✓	✓				✓		✓	✓		✓	
4								✓			✓				✓

SEMESTER I

16BECC101 **COMMUNICATIVEENGLISH** **3 0 0 3 100**

COURSE OBJECTIVES

1. To enable students to attain fluency and accuracy to inculcate proficiency in professionalcommunication.
2. To make the students to meet the growing demand in the field of Globalcommunication.
3. To help students acquire their ability to speak effectively in real lifesituations.
4. To inculcate the habit of reading and to develop their effective readingskills.
5. To ensure that students use dictionary to improve their active and passivevocabulary.
6. To enable students to improve their lexical, grammatical and communicativecompetence.

COURSE OUTCOMES

Students undergoing this course will be able to

1. Use English language for communication: verbal & non –verbal.
2. Enrich comprehension and acquisition of speaking & writingability.
3. Ensure students proficiency in professionalcommunication.
4. Developed their active and passivevocabulary.
5. Gain confidence in using English language in real lifesituations.
6. Improve word power: lexical, grammatical and communication competence

UNIT I **9**

Listening – Types of listening - Listening to class reading - Video tapes/ Audio tapes. **Speaking** – Introduction on self - Introduction on one's friend. **Reading** - Reading for comprehension – Reading different kind of passages like descriptive, narrative,objective,conversationalandargumentative.**Writing**–FormalandInformalletters-Freewritingonanytopic –My favorite place, hobbies, dreams, goals, etc- - To fill in different application forms. **Grammar** – Articles- WH questions –Yes/No Question - Subject Verb agreement. **Vocabulary** - Word Formation – Word expansion (Root word) - Prefix and Suffix.

UNIT II **10**

Listening – Understanding the passage in English –Pronunciation practice. **Speaking** – Asking and answering questions - Telephone etiquette. **Reading** – Critical reading – Finding key information in a given text (Skimming - Scanning). **Writing**– Coherence and cohesion in writing – Short paragraph writing – Writing short messages. **Grammar** – Parts of speech – Noun – Verb – Adjectives - Adverbs. **Vocabulary** – Compound Nouns/Adjectives – Irregular verbs.

UNIT III **10**

Listening – Listening for specific task – Fill in the gaps. **Speaking** – Phonemes – Syllables – Role play – Conversation Practice. **Reading** – Reading and Comprehension. **Writing** - Autobiographical writing – Biographical writing - Instruction writing. **Grammar** – Preposition – Infinitive – Gerund – Tenses. **Vocabulary** – Foreign words used in English – British and American usage.

UNIT IV **8**

Listening – Responding to questions – Reading in class for complete understanding and for better pronunciation. **Speaking** – Debate- Presentations in seminars. **Reading** – Making inference from the reading passage – Predicting the content of reading passages. **Writing** - Interpreting visual materials (tables, graphs, charts, etc) Letters to the Editor. **Grammar** – Sentence pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

UNITV **8**

Listening -Listening to different accents, speeches/presentations. **Speaking**- Extemporetalk –Just-a-minute talk. **Reading**-Reading strategies–Intensive reading – Text analysis. **Writing** - Creative writing – Writing circulars andnotices – Writing proposal. **Grammar** – Direct and Indirect speech – Conditional sentences - Auxiliary verbs. **Vocabulary** – Abbreviations & Acronyms.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

TOTAL **45**

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Sangeeta Sharma, MeenakshiRaman	Technical Communication: Principles And Practice 2^{nd} Edition	OUP	2015

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2009
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEB REFERENCES

1. www.learnerstv.com – Listening/ Speaking/Presentation
2. www.usingenglish.com – Writing/Grammar
3. www.englishclub.com – Vocabulary Enrichment/Speaking
4. www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/Speaking
5. www.teachertube.com – WritingTechnically

16BECC102 ENGINEERING MATHEMATICS – I 3 2 0 4 100

COURSE OBJECTIVES

The objective of this course is

1. To familiarize the prospective engineers with techniques in calculus, and multivariate analysis.
2. To familiarize the prospective engineers with techniques in linear algebra.
3. To equip the students with standard concepts and tools at an intermediate to advanced level.
4. To equip the students will serve them to wards tackling more advanced level of mathematics.
5. To make the students will serve them to find the useful applications in their disciplines.
6. To make the students to solve the real time problems using standard concepts and tools.

COURSE OUTCOMES

The students will learn:

1. To apply differential and integral calculus to notions of curvature and to improperintegrals.
2. Apart from some other applications they will have a basic understanding of Beta and Gammafunctions.
3. The tool of power series and Fourier series for learning advanced EngineeringMathematics.
4. To deal with functions of several variables that are essential in most branches ofengineering.
5. The essential tool of matrices and linear algebra in a comprehensivemanner.
6. Students can solve real time problems using standard concepts and tools

UNITI MATRICES 12

Review of Matrix Algebra - Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction to canonical form through orthogonalreduction.

UNITII DIFFERENTIALCALCULUS 12

Overview of Derivatives - Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes- Evolutes as Envelope of normals – Maxima and Minima of functions of two or more Variables – Method of Lagrangian Multipliers

UNITIII DIFFERENTIALEQUATIONS 11

Linear Differentialequations of second and higher order with constant coefficients - Euler's form of Differential equations – Method of variation parameters.

UNITIV FUNCTIONS OFSEVERALVARIABLES 12

Partial derivatives – Euler's theorem for homogeneous functions – Total derivatives – Differentiation of implicit functions – Jacobians –Maxima and Minima of functions of two or more Variables - Method of Lagrangian multipliers.

UNITV SEQUENCES ANDSERIES 13

Sequences: Definition and examples – **Series:** Types and Convergence – Series of positive terms – Tests of convergence: Comparision test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.

TOTAL 60

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hemamalini. P.T	Engineering Mathematics	McGraw Hill Education (India) Private Limited, New Delhi	2014
2	Sundaram, V and Balasubramanian,R.	Engineering Mathematics for first year.	Vikas Publishing Home , New Delhi	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Grewel . B. S.	Higher Engineering Mathematics	Khanna Publications, New Delhi.	2014
2	Bhaskar Rao. P. B, Bhujanga Rao. M	Engineering Mathematics I	BS Publications, India.	2010
3	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
4	Shahnaz Bathul	Text book of Engineering Mathematics	PHI Publications, New Delhi.	2009
5	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEB REFERENCES

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.intmath.com/matrices-determinants

16BEPH103 **ENGINEERING PHYSICS** **3 0 0 3 100**

COURSE OBJECTIVES

1. To introduce the basic physics concepts relevant to different branches of Engineering and Technology.
2. To acquire the knowledge of Electromagnetic field theory.
3. To make the student to learn scientific, mathematical and engineeringprinciples.
4. To make the students to understand the basics of vacuum science.
5. To make the students to understand the process of production and measurement.
6. To make the students to understand the working of Gauges like Pirani, McLeod and Penning

COURSE OUTCOMES

1. Formulate potential problems within electrostatics, magneto statics.
2. Formulate stationary current distributions in linear, isotropic media.
3. Acquire knowledge on properties of matter, quantum physics.
4. Understand the basics of vacuum science.
5. Understand the process of production and measurement.
6. Understand the working of Gauges like Pirani, McLeod and Penning

UNITI PROPERTIES OF MATTERANDTHERMODYNAMICS 9

Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniform bending

Concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNITII LASER ANDFIBEROPTICS 9

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER -CO_2, Semiconductor LASER- Applications of LASER in industry and medicine.

Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNITIII QUANTUM PHYSICS 9

Introduction to quantum theory – Black body radiation-Photo electric effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electronmicroscope.

UNITIV CRYSTALPHYSICS 9

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures- crystal defects – point, line and surfacedefects

UNITV ULTRASONICS AND NUCLEARPHYSICS 9

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmissionandreflectionmodes-A,BandC–scandisplays,Medicalapplications–SonogramIntroduction – basics about nuclear fission and fusion, nuclear composition –Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Serway and Jewett	Physics for Scientists and Engineers with Modern Physics	Thomson Brooks/Cole, Indian reprint, New Delhi	2010
2	Gaur, R.K. and Gupta. S.C	Engineering Physics	Dhanpat Rai Publications,New Delhi.	2011
3	M.N. Avadhanulu and PG Kshirsagar	A Text book of Engineering Physics	S.Chand and company, Ltd., New Delhi	2011

WEB REFERENCES

1. www.nptel.ac.in
2. www.physicsclassroom.com
3. www.oyc.yale.edu

16BECH103 ENGINEERING CHEMISTRY 3 0 0 3 100

COURSEOBJECTIVES

1. To understand the terminologies of atomic and molecularstructure
2. To study the basics of Periodic properties, Intermolecularforces
3. To study about spectroscopictechnique
4. To understand the working of electromagnetic spectrum and spectroscopictechniques
5. To understand the thermodynamicfunctions
6. To comprehend the basic organic chemistry and to synthesis simpledrug.

COURSEOUTCOMES

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecularforces.
2. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states andelectronegativity.
3. Understand the ranges of the electromagnetic spectrum used for exciting different molecular energy levels.
4. Understand the concept of various spectroscopictechniques.
5. Rationalise bulk properties and processes using thermodynamicconsiderations.
6. List major chemical reactions that are used in the synthesis ofmolecules

UNIT I WATERTECHNOLOGY 9

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverseosmosis.

UNIT II ELECTROCHEMISTRY ANDSTORAGEDEVICES 9

Electrochemical cells – EMF – Measurement of EMF – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - Fe^{2+}vs dichromate) –Electrolytic conductance-application (conductometric titration)-Batteries- Primary batteries-Leclanche cell-Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H_2-O_2 Fuel Cell.

UNIT III FUELSANDCOMBUSTION 9

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method - Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, Combustion of fuel-Introduction-GCV-NCV-Flue gas analysis.

UNIT IV CORROSIONSCIENCE 9

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings – Organic coatings-Paints - Constituents and functions –Inorganic coatings- Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating - Hotdipping.

UNIT V SURFACE CHEMISTRY ANDPHASERULE 9

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm- Role of adsorbents in industries (catalysis and water softening).

Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dr.S.Vairam	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2	A.Ravikrishnan	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company Private Ltd., Chennai.	2012

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3rd Reprint NewDelhi.	2013
2	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5th edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010

WEB REFERENCES

1. http://www.studynotes.ie/leaving-cert/chemistry/
2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html

16BEME104 BASIC MECHANICAL ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES

1. To impart the basic knowledge of various basic fields of mechanicalengineering.
2. To Study about basic manufacturing and machiningprocesses.
3. To study about powerplants.
4. To study about automobileengineering
5. To study about boiler and hydraulic machines.
6. To study about Refrigeration and Airconditioning

COURSE OUTCOMES

1. Design different sheet metal working processes
2. Select appropriate Joining Processes to join Work piece.
3. Differentiate various metal forming processes such as Hot and Cold Working, Rolling, Forging, Extrusion and Drawing Processes.
4. Students will be able to apply these basics in the designing of the automotive components and engines.
5. Students will be able to get employed in Private Companies like Automotive Sector involving Manufacturing and Design as Graduate Trainees Engineer also in government firms like pollution control board.
6. Students should be able to calculate cooling load for air conditioning systems used for various applications

INTRODUCTION (Not included forexamination) **3**

Engineering and Technology - History of Mechanical Engineering- Mechanics - Statics and dynamics - Broad areas in Mechanical Engineering.

UNIT I MANUFACTURINGPROCESSES 8

FOUNDRY - Principles - Patterns - Types, Molding Processes, Cupola and Induction Furnaces. METAL FORMING - Principles - Hot and cold working of metals - Forging, rolling, extrusion and wire drawing, sheet metal operations. WELDING - Principles - Oxy-Acetylene Welding and Manual Metal Arc Welding, Brazing and Soldering.

UNIT II MACHINETOOLS 8

Machining principles - Construction and working principles of basic machine tools - Lathe, Drilling, Shaper, Planer and Milling machine. Introduction to CNC machines.

UNIT III AUTOMOBILEENGINEERING 8

Working principle of petrol and diesel engines - Four stroke and two stroke cycles - Comparison between four stroke and two stroke engines - Working principle of simple carburetor - Lubrication system and coolingsystem.

UNIT IV ENERGY ENGINEERING &HYDRAULIC MACHINES 9

Introduction to Boilers - Working principle of Thermal, Hydro - Electric and Nuclear Power Plants - Merits and demerits. Solar – Wind power plants.

Turbines - Impulse turbine - Pelton wheel, Reaction turbines - Kaplan and Francis turbines - Pumps - Working principle of Reciprocating pumps and Centrifugal pumps.

UNIT V REFRIGERATION ANDAIR-CONDITIONING 9

Terminology of Refrigeration and Air Conditioning - Basic principles of Vapour Compression and Absorption Refrigeration System – Window and Split Room Air Conditioners.

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Shanmugam, G	Basic Mechanical Engineering	Tata McGraw Hill Publishing company Limited, New Delhi	2008
2	Rajput, R.K	Basic Mechanical Engineering	Laxmi Publications (P) Ltd, New Delhi	2008

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	K.R.Gopalkrishna	A text Book of Elements of Mechanical Engineering	Subhash Publishers, Bangalore	2012
2	Pravin Kumar	Basic Mechanical Engineering	Pearson	2013

16BEME105A BASIC ELECTRICAL AND ELECTRONICS ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES

1. To impart the basic knowledge about the Electriccircuits.
2. To understand the working of Electrical Machines andTransformers.
3. To understand the working of Power Converters and components of low-voltage electricalinstallations.
4. To understand and analyze basic electric and magnetic circuits.
5. To study the working principles of electrical machines and power converters.
6. To introduce the components of low-voltage electrical installations.

COURSE OUTCOMES

1. Gain the basic knowledge about the Electriccircuits.
2. Understand the working of Electrical Machines andTransformers.
3. Understand the working of Power Converters and components of low-voltage electricalinstallations
4. Understand and analyze basic electric and magneticcircuits.
5. Acquire knowledge on the working principles of electrical machines and powerconverters.
6. Understand the components of low-voltage electricalinstallations

UNITI ELECTRIC CIRCUITS& MEASUREMENTS 9

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits WaveformsandRMSValue–PowerandPowerfactor–SinglePhaseandThreePhasebalancedCircuits.

UNITII ELECTRICALMACHINES 9

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNITIII MEASURINGINSTRUMENTS 9

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNITIV SEMICONDUCTOR DEVICESANDAPPLICATIONS 9

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics

UNITV DIGITALELECTRONICS 9

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts).

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mittle, V.M	Basic Electrical Engineering	Tata McGraw Hill Edition, New Delhi	2004
2	SedhaR.S	Applied Electronics	S. Chand & Co	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Muthusubramanian R, and Muraleedharan K A	Basic Electrical, Electronics and Computer Engineering	Tata McGraw Hill, Second Edition	2006
2	Nagsarkar T K and Sukhija M S	Basics of Electrical Engineering	Oxford press	2005
3	Mahmood Nahvi and Joseph A. Edminister	Electric Circuits	Schaum' Outline Series, McGraw Hill	2002
4	Premkumar N	Basic Electrical Engineering	Anuradha Publishers	2003

16BEME105B ELEMENTS OF CIVIL ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES

1. To know about different materials and theirproperties
2. To know about engineering aspects related tobuildings
3. To know about importance of surveying and the transportationsystems
4. To get exposed to the rudiments of engineering related to dams, water supply, and sewagedisposal
5. To know about importance of drawings
6. To know about importance of electrical fittings.

COURSE OUTCOMES

1. Students are able to understand the property, use, advantage and disadvantage of different material used in construction
2. Students are able to understand the component of building with their function
3. Students are able to understand construction procedure of different components
4. After completion of this students will able to understand basic principles of building design and planning.
5. They will explore building drawing as a way of discovering and developing ideas for designing residential, commercial and public buildings.
6. Students will identify suitable method of irrigation and drainage of waterlogged area.

UNITI BUILDINGMATERILAS 9

Introduction – Civil Engineering – Materials: Bricks – composition – classifications – properties – uses. Stone – classification of rocks – quarrying – dressing –properties –uses. Timber – properties – uses –ply wood. Cement – grades –types – properties –uses. Steel – types –properties – uses – market forms. Concrete – grade – properties –uses.

UNITII BUILDINGCOMPONENTS 9

Building – selection of site – classification – components. Foundations –functions – classifications – bearing capacity. Flooring – requirements – types – cement concrete – marble – terrazzo floorings. Roof – types and requirement

UNITIII SURVEYING 9

Surveying – objectives – classification – principles of survey – survey instruments , their care and adjustments – Ranjing and Chaining .Compass – types –Prismatic Compass. Bearing – types. Levelling –Levels and staves – types. Contouring

UNITIV WATER SUPPLY AND SEWAGE DISPOSAL 9

Dams – purpose – selection of site – types –gravity dam (cross section only). Water supply – objective – quantity of water – sources – standards of drinking water – distribution system. Sewage – classification — septic tank – components andfunctions.

UNITV BUILDINGDRAWING 9

Types of drawing with appropriate scale & Uses of index map, key plan, village map, site plan, Layout plan –Types of Projection adopted in Building Drawing (Plan, Elevation and sections) – Scales for various types of Drawings– Working drawing, large scale drawing– Symbols, Conventions and Abbreviations for – Electrical fittings , water supply ,sanitary fittings, materials of construction – Sizes of various standard papers.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Raju K.V.B, Ravichandran P.T	Basics of Civil Engineering	Ayyappa Publications, Chennai	2012
2	V. B. Sikka	Civil engineering drawing	B. D. KatariaSons , Ludhiana	2009

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Civil Engineering	Ramesh Babu	VRB Publishers, Chennai	2010
2	-	Building Materials	National Building Code of India, Part V	2005
3	Engineering Materials	Rangwala S.C	Charotar Publishing House, Anand	2012

16BEPH111 ENGINEERING PHYSICS LABORATORY 0 0 4 2 100

COURSE OBJECTIVES

1. To learn the basic concepts in physics relevant to different branches of Engineering andTechnology.
2. To study the concept of semiconductor andconductivity.
3. To learn the properties ofmaterials.
4. To learn the basic concept of Numerical Aperture and acceptanceangle.
5. To make the students to determination of wavelength usinggrating.
6. To learn the basic concept about viscosity of liquids.

COURSE OUTCOMES

1. Understand the basic concepts in physics relevant to different branches of Engineering andTechnology.
2. Understand the concept of semiconductor andconductivity.
3. Acquire knowledge on the properties ofmaterials.
4. Understand the basic concept of Numerical Aperture and acceptanceangle.
5. Understand the students to determination of wavelength usinggrating.
6. Acquire knowledge on the basic concept about viscosity of liquids

LIST OF EXPERIMENTS

PHYSICS

1. Determination of velocity of sound and compressibility of liquid – Ultrasonicinterferometer.
2. Determination of wavelength of mercury spectrum – spectrometergrating.
3. Determination of Young’s modulus of the material – Non uniform bending (or) Uniformbending.
4. Determination of Viscosity of liquid – Poiseuille’smethod.
5. Spectrometer Dispersive power of aprism.
6. Torsional pendulum – Determination of Rigiditymodulus.
7. Particle size determination using DiodeLaser
8. Determination of Laser parameters – Wavelength, and angle ofdivergence.
9. Determination of acceptance angle in an opticalfiber.
10. Determination of thickness of a thin wire – Air wedgemethod
11. Determination of Band Gap of a semiconductormaterial.
12. Determination of Specific resistance of a given coil of wire – WheatstoneBridge

TOTAL 45

16BECH111 ENGINEERING CHEMISTRY LABORATORY 0 0 4 2 100

COURSEOBJECTIVES

1. To understand the terminologies of atomic and molecularstructure
2. To study the basics of Periodic properties, Intermolecularforces
3. To study about spectroscopictechnique
4. To understand the working of electromagnetic spectrum and spectroscopictechniques
5. To understand the thermodynamicfunctions
6. To comprehend the basic organic chemistry and to synthesis simpledrug.

COURSEOUTCOMES

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecularforces.
2. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states andelectronegativity.
3. Understand the ranges of the electromagnetic spectrum used for exciting different molecular energy levels.
4. Understand the concept of various spectroscopictechniques.
5. Rationalise bulk properties and processes using thermodynamicconsiderations.
6. List major chemical reactions that are used in the synthesis ofmolecules

LIST OF EXPERIMENTS

CHEMISTRY

1. Estimation of alkalinity of Watersample
2. Estimation of hardness of Water byEDTA
3. Estimation of Chloride in Water sample (Argentometricmethod)
4. Determination of corrosion rate by weight lossmethod.
5. Determination of molecular weight and degree of polymerization usingviscometry.
6. Conductometric Titration (Simple acidbase).
7. Conductometric Titration (Mixture of weak and strongacids).
8. Conduct metric Titration using $BaCl_2$ vs Na_2SO_4.
9. pH Titration (acid &base).
10. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or$K_2Cr_2O_7$).
11. Determination of water of crystallization of a crystalline salt (Coppersulphate).
12. Estimation of Ferric ion byspectrophotometry.
13. Determination of Chemical OxygenDemand.

TOTAL 45

16BEME112 ENGINEERING WORKSHOP PRACTICE 0 0 4 2 100

COURSE OBJECTIVES

1. To prepare the students to design a system, component, or process.
2. To meet desired needs within realistic constraints such as economic, environmental, social, and ethical.
3. To make the component with health and safety, manufacturability, andsustainability
4. To prepare the students to communicate effectively and to use the techniques, and skills.
5. To make the students to use modern engineering tools necessary for engineeringpractice.
6. To make the students to assemble different components.

COURSE OUTCOMES

Upon completion of this course,

1. The students will gain knowledge of the different manufacturing processes.
2. To fabricate components using differentmaterials.
3. Students will be able to fabricate components with their ownhands.
4. They will also get practical knowledge of the dimensional accuracies and dimensionaltolerances
5. By assembling different components with different processes.
6. They will be able to produce small devices of theirinterest

PART – A (CIVIL & MECHANICAL)

1. WELDING **6**

i. Preparation of arc welding of butt joints, lap joints and teejoints.

2. BASICMACHINING **6**

i. Simple Turning and Taperturning
ii. Drilling andTapping

3. SHEETMETALWORK **6**

i. Model making – Trays, funnels,etc.

4. DEMONSTRATIONON **4**

i. Smithyoperations
ii. Foundryoperations
iii. PlumbingWorks
iv. CarpentaryWorks

PART –B (ELECTRICAL & ELECTRONICS)

5. ELECTRICALENGINEERING **10**

i. Study of electrical symbols and electricalequipments.
ii. Construct the wiring diagram for Stair case wiring and Fluorescent lampwiring.
iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energymeter.
iv. Measurement of electrical quantities – voltage, current, power & power factor in Rload.
v. Measurement of energy using single phase energymeter.

6. ELECTRONICSENGINEERING **13**

i. Study of Electronic components– Resistor (color coding), capacitors andinductors.
ii. Soldering practice – Components Devices and Circuits – Using general purposePCB.
iii. Study of logic gates AND, OR, NOT, NOR andNAND.
iv. Study of HWR andFWR.

TOTAL 45

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Jeyachandran, K. and Balasubramanian, S	A Premier on Engineering Practices Laboratory	Anuradha Publications, Kumbakonam	2007
2	Jeyapoovan, T., Saravanapandian, M	Engineering Practices Lab Manual	Vikas Puplishing House Pvt. Ltd, Chennai	2006
3	Bawa, H.S	Workshop Practice	Tata McGraw – Hill Publishing Company Limited, New Delhi	2007

16BEME113 ENGINEERING GRAPHICS – I 0 0 4 2 100

COURSE OBJECTIVES

1. To make the students to design a system, component, or process to meet desired needs.
2. To prepare the students to design the components with realistic constraints.
3. To make the students to consider economic, environmental, ethical, health and safety when they design.
4. To make the students to design the components with considering manufacturability, andsustainability
5. To prepare the students to communicate effectively using the techniques, skills, and modern engineering tools.
6. To make the students to understand to use necessary for engineeringpractice.

COURSE OUTCOMES

The student will alsolearn:

1. Introduction to engineering design and its place insociety
2. Exposure to the visual aspects of engineering design and engineering graphicsstandards
3. Exposure to engineeringcommunication effectively.
4. Exposure to 3D free hand sketching.
5. Acquired the knowledge of projections of points, lines and plane surfaces.
6. Understand the basic concept of projection of solids

UNITI INTRODUCTION 9

Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

UNITII SCALES ANDPLANECURVES 8

SCALES: Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

UNITIII FREEHANDSKETCHING 9

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNITIV PROJECTION OF POINTS, LINES ANDPLANESURFACES 9

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

UNITV PROJECTIONOFSOLIDS 9

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venugopal K and Prabhu Raja V	Engineering Graphics	New Age International Publishers	2009
2	VTU	A Primer on Computer Aided Engineering Drawing	Belgaum	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kumar M S	Engineering Graphics	D D Publications, Chennai	2007
2	Bureau of Indian Standards	Engineering Drawing Practices for Schools and Colleges SP 46-2003	BIS, New Delhi	2003
3	Luzadder W J	Fundamentals of Engineering Drawing	Prentice Hall Book Co., New York	1998

WEB REFERENCES

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawingsheets.
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation –Lettering.
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technicaldrawings.
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of TechnicalDrawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – ProjectionMethods.

16BECC151 **HUMAN VALUES** **1 0 0 -100**

COURSE OBJECTIVES

1. To know the value of being a human being and the value of being a usefulcitizen
2. To develop a critical ability to distinguish between essence and form, or between what is of value and what is superficial, in life.
3. To move from discrimination to commitment.
4. To recognize and determine the role of engineers in the economic and social development of the society.
5. To develop social responsibility &human professional ethics.
6. To develop the knowledge of social impact of economic liberalization and technology.

COURSE OUTCOMES

1. Identify and analyze an ethical issue in the subject matter under investigation or in arelevant field
2. Identify the multiple ethical interests at stake in a real-world situation or practice
3. Articulate what makes a particular course of action ethically defensibleAssess their own ethical values and the social context of problems
4. Identify ethical concerns in research and intellectual contexts, including academic integrity,use and citation of sources, the objective presentation of data, and the treatment of humansubjects
5. Demonstrate knowledge of ethical values in non-classroom activities, such as servicelearning, internships, and field work
6. Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

UNIT I **3**

Human life on Earth - Concept of Human Values - Value Education - Aim of education and value education - Types of values - Components of values – Attitudes – types of attitudes

UNIT II **3**

Self Development :Self analysis – Goal Setting - Thought Analysis – Guarding against Anger - Respect to age, experience, maturity, family members, neighbors,co-workers

UNIT III **3**

Individual Qualities– Truthfulness – Constructivity – Sacrifice – Sincerity - Self Control – Altruism– Tolerance - Scientific Vision – Regulating Desire

UNIT IV **3**

Mind Culture - Modern Challenges of Adolescent - Emotions and behavior - Sex and spirituality - Adolescent Emotions - Meditation

UNIT V **3**

Body and Mind Fitness : (a) Physical Exercises (b) Activities: (i) Moralization of Desires (ii) Neutralization of Anger (iii) Eradication of Worries (iv) Benefits of Blessings

TOTAL **15**

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Subramanian. R	Professional Ethics	Oxford, New Delhi	2013
2	Govindarajan. M, Natarajan. S,	Engineering Ethics	Prentice Hall of India, New Delhi	2004
3	Tripathi. A.N	Human Values	New Age International	2009
4	Pope. G. U.	Thirukkural with English Translation	Uma Publication, Thanjavur.	2002

SEMESTER II

16BECC201A **BUSINESS COMMUNICATION** **3 0 0 3 100**

COURSE OBJECTIVES

1. To help students comprehend the role of listening skills in effectivecommunication
2. To familiarize students with verbal and non-verbalcommunication
3. To expose students to neutralaccent
4. To develop emotional intelligence skills in them for enhancing theirself-esteem
5. To assist them in setting goals and developing positiveattitude
6. To enable students to acquire decision making skills, problem solving skills and assertiveskills

COURSE OUTCOMES

1. CO1. To be familiar with the complete course outline/Course Objectives/Learning Outcomes/ Evaluation Pattern & Assignments
2. To participate in an online learning environment successfully by developing the implication-based understanding of Paraphrasing, deciphering instructions, interpreting guidelines, discussion boards & Referencing Styles.
3. To demonstrate his/her ability to write error free while making an optimum use of correct Business Vocabulary & Grammar.
4. To distinguish among various levels of organizational communication and communication barriers while developing an understanding of Communication as a process in an organization.
5. To draft effective business correspondence with brevity and clarity.
6. To stimulate their Critical thinking by designing and developing clean and lucid writing skills.

UNIT I **9**

What is Business Communication? - Types of Communication – Formal and informal communication – Process of Communication- modes of Communication – Barriers to communication.

UNIT II **9**

Written Business Communication – Style- word-usage- organisation of Ideas – mechanics of writing and fill up of forms - Cover Letter- Letter for Job Application- Letter of Complaint - Memos - Resumes - Email- Reports Revising and proofreading- Advertising slogans- jargons- Description of Graphics and visual aids - interpretation of graphs using expressions of comparison and contrast .

UNIT III **9**

Reading and Understanding the news articles - Oral Business Communication - First Impressions - Attire – Effective Presentation strategies- Nuances of delivery – Controlling nervousness and stage fright- Visual aids Presentations- Capturing Audience - Tone - Behavior - Telephone Etiquette- Non - verbal communication - Eye contact - Facial expressions - Posture - Gestures - Body langage – Etiquette- Organization of presentation – brain storming-Negotiations.

UNIT IV **9**

Difference between goals and dreams - SMART goal setting - 3 Ds of goal setting- Determination, Discipline and Direction - Developing the right attitude - Motivation - Intrinsic and Extrinsic motivation - Dealing with change - Dedication - Taking responsibilities - Decision making.

UNITV **9**

Intrapersonal skills - Self-analysis - Thought process – Interpersonal skills - Confidence building - Resolving conflicts- Analytical skills - Team Building - Leadership skills - Planning/organizing - Ability to work independently - Professional ethics - Communicating via e-mail. Ethical perspectives and their implications for responsible communication - Proposal Presentation

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Meenakshi Raman ; Prakash Singh	Business Communication	Oxford University Press	2012

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Murthy, G .R. K.	Soft Skills for Success.	The ICFAI University Press, Hyderabad.	2008
2	Jagadeesan, G & Santanakrishnan,R.	Soft Skills Development: Training and Evaluation.	The ICFAI University Press, Hyderabad.	2008
3	Sherfield, Robert M., Rhonda J. Montgomery, & Patricia G. Moody	Developing Soft Skills.	Pearson Education, New Delhi.	2005

WEBREFERENCES

1. http://tribehr.com/social-hr-software/talent-management/skills-tracking
2. www.ispeakyouspeak.blogspot.com
3. https://alison.com/subjects/6/Personal-Development-Soft-Skills

16BECC201B **TECHNICAL ENGLISH** **3 0 0 3 100**

COURSE OBJECTIVES

1. To enable students to attain fluency and accuracy to inculcate proficiency in professionalcommunication.
2. To make the students to meet the growing demand in the field of Globalcommunication.
3. To help students acquire their ability to speak effectively in real lifesituations.
4. To inculcate the habit of reading and to develop their effective readingskills.
5. To ensure that students use dictionary to improve their active and passivevocabulary.
6. To enable students to improve their lexical, grammatical and communicativecompetence.

COURSE OUTCOMES

Students undergoing this course will be able to

1. Use English language for communication: verbal & non –verbal.
2. Enrich comprehension and acquisition of speaking & writingability.
3. Ensure students proficiency in professionalcommunication.
4. Developed their active and passivevocabulary.
5. Gain confidence in using English language in real lifesituations.
6. Improve word power: lexical, grammatical and communication competence

UNITI **10**

Listening - Difference between Hearing & Listening –Listening to informal conversation. **Speaking** - Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., **Reading** – Extensive and Intensive reading. **Writing** – Report writing - Writing a Covering letter. **Grammar** – Regular & Irregular verbs - Kinds of sentence - Question tags. **Vocabulary** – Homonyms and Homophones.

UNIT II **8**

Listening – Note Taking- Improving grasping ability. **Speaking** – Welcome Address - Vote of thanks - Master of ceremony. **Reading** – Active and Passive reading - Reading for vocabulary- Reading for a purpose. **Writing** - Writing a review (Film review) - Summary of a story. **Grammar** - Modal verbs – Conjunction - Expression of cause and effect. **Vocabulary** - Phrasal verbs - Idioms.

UNIT III **9**

Listening - Barriers to listening (Physical, Psychological, Linguistic & Cultural). **Speaking** – Stress, Pause and Intonation. **Reading** – Rapid Reading – Skimming, Scanning and Surveying. (SQ3R)**Writing**- Essay writing -Minutes of Meeting - Agenda – **Grammar** - Active and Passive voice - Purpose Expression. **Vocabulary** - Same words used as noun and verb - often misspelt and confusedwords.

UNIT IV **8**

Listening – Listening to telephone conversation - Viewing model interviews. **Speaking** – Group Discussion - Correlation between verbal & non - verbal communication. **Reading** – Reading Comprehension (short & long text) - Reading job advertisements and profile of a company. **Writing** – Job Application - Resume Writing - Checklist Preparation. **Grammar** - Numerical Expressions – Collocations - **Vocabulary** - Singular and Plural(Nouns)

UNITV **10**

Listening – Types of Listening- Improving listening comprehension**. Speaking** - Oral presentation - Vocal communication techniques - voice, quality, volume, pitch etc., **Reading** -Note Making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation Writing – Short Essays Writing- **Grammar**- Transformation of sentences (Simple, Compound & Complex). **Vocabulary** - Collection of Technical Vocabulary with their meanings.

TOTAL **45**

Note:Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Sangeeta sharma, Meenakshi Raman	Technical Communication: PrinciplesAnd Practice 2nd Edition	OUP	2015

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2008
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea,J.	Basic Communication Skills for Technology 2nd Edition	Pearson Education, New Delhi.	2006

WEB REFERENCES

1. www.learnerstv.com
2. www.usingenglish.com
3. www.englishclub.com

16BECC202 ENGINEERING MATHEMATICS – II 3 2 0 4 100

COURSE OBJECTIVES

The objective of this course is

1. To familiarize the prospective engineers with techniques in Multivariate integration.
2. To familiarize the concept of ordinary and partial differential equations and complex variables.
3. To equip the students to deal with advanced level of mathematics and applications.
4. To make the students to formulate and solve problems involving random variables.
5. To equip the students to Understand the basic concepts of one- and two-dimensional random variables.
6. To understand the concept of testing of hypothesis for small and large samples in real life problems.

COURSE OUTCOMES

The students will learn:

1. The mathematical tools needed in evaluating multiple integrals and theirusage.
2. The effective mathematical tools for the solutions of differential equations that model physicalprocesses.
3. The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineeringProblems.
4. Understand the basic concepts of one- and two-dimensional random variables and apply in engineering applications.
5. They can also formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data
6. Apply the concept of testing of hypothesis for small and large samples in real life problems

UNITI MULTIPLEINTEGRALS 11

Double integral – Cartesian coordinates – Polar coordinates – Change of order of integration – Triple integration in Cartesian co-ordinates – Area as double integrals.

UNITI VECTORCALCULUS 13

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem, Gauss divergence theorem and Stoke's theorems (Statement Only)- Surfaces : hemisphere and rectangular parallelopipeds.

UNITIII PARTIALDIFFERENTIALEQUATIONS 11

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNITIV ANALYTIC FUNCTIONS 12

Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms – Sufficient condition for an analytic function (Statement Only) - Properties of analytic functions – Constructions of an analytic function - Conformal mapping: w = z+a, az, 1/z, and bilinear transformation.

UNITV COMPLEXINTEGRATION 13

Complex Integration - Cauchy's integral theorem and integral formula (Statement Only) – Taylor series and Laurent series - Residues – Cauchy's residue theorem (Statement Only) - Applications of Residue theorem to evaluate real integrals around unit circle and semi circle (excluding poles on the real axis).

TOTAL 60

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hemamalini. P.T	Engineering Mathematics I & II	McGraw-Hill Education Pvt.Ltd, New Delhi	2014
2	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2011

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Erwin Kreyszig	Advanced Engineering Mathematics.	John Wiley & Sons. Singapore	2011
2	Venkataraman, M. K.	Engineering Mathematics.	The National Publishing Company, Chennai	2005
3	Narayanan. S, and Ramaniah.G	Advanced Mathematics for Engineering Students.	Viswanathan S.(Printers and Publishers) Pvt. Ltd. Chennai.	2002
4	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEB REFERENCES

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.sosmath.com/diffeq/laplace/basic/basic.html
4. www.mathworld.wolframe.com

16BECC204 ENVIRONMENTAL SCIENCES 3 0 0 3 100

COURSE OBJECTIVES

1. To create the awareness about environmental problems amongpeople.
2. To develop an attitude of concern for theenvironment.
3. To motivate public to participate in environment protection andimprovement.
4. To demonstrate proficiency in quantitative methods, qualitative analysis, and critical thinking.
5. To develop writing and oral communication needed to conduct high-level work as interdisciplinary scholars and / orpractitioners.
6. To Learn about the systems concepts and methodologies to analyze and understand interactions.

COURSE OUTCOMES

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problemsolving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies andinstitutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to globalscales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnectedworld

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Definition, Scope and Importance – Need for public awareness -Forest resources: Use and over-exploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources- Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources- role of an individual in conservation of natural resources.

UNIT II ECOSYSTEM 9

Chemistry and Environment- Environmental segments, Composition and Structure of atmosphere- Concept of an ecosystem- Structure, components and function of an ecosystem Energy flow in the ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marine ecosystem)

UNIT III BIODIVERSITY 9

Introduction to biodiversity,Definition-Genetic diversity,Species diversityand Ecosystem diversity, Biogeographical classification of India, Importance of biodiversity-Value of biodiversity - Hot Spots of biodiversity- Threats to biodiversity - Endangered and Endemic Species of India – Conservation of biodiversity- In-Situ and Ex-Situ conservation ofbiodiversity.

UNIT IV ENVIRONMENTALPOLLUTION 9

Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control measures of urban and industrial wastes– Role of an individual in prevention of pollution–Disaster management-earthquake, tsunami, cyclone and landslides.

UNIT V SOCIAL ISSUESAND ENVIRONMENT 9

From Unsustainable to Sustainable development,Urban problems related to energy sources, Water conservation, Rain water harvesting and Watershed management, Resettlement and rehabilitation of people, its problems and concerns, Environmental ethics- Issues and possible solutions- Climate change- Green house effect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation- Environment Protection Act- Human Rights-Value education, Role of Information Technology in Environment and Human health-Population growth, Variation of population among nations-Population explosion.

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ravikrishnan, A	Environmental Science	Sri Krishna Hi tech Publishing Company Private Ltd., Chennai	2012
2	Anubhakaushik C.P. Kaushik	Environmental Science and Engineering	New Age International (p) Ltd., New Delhi.	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William P.Cunningham	Principles of Environmental Science	Tata Mc Graw -Hill Publishing Company, New Delhi.	2008
2	Linda D. Williams	Environmental Science Demystified	Tata Mc Graw -Hill Publishing Company Limited, New Delhi.	2005

WEB REFERENCES

1. http://people.eku.edu/ritchisong/envscinotes1.html
2. http://nptel.ac.in/courses.php?disciplineId=1203.www.newagepublishers.com/samplechapter/001281.
3. www.unesco.org/ext/field/beijing/scienceb.htm,
4. www.infinitepower.org/education.htm

16BEME212 COMPUTER PRACTICEANDPROGRAMMING LABORATORY 1 0 4 3 100

COURSE OBJECTIVES

1. To provide an awareness to Computing and CProgramming
2. To know the correct and efficient ways of solvingproblems
3. To learn to develop algorithm for simple problemsolving.
4. To Study, analyze and understand logical structure of a computer program
5. To be able to declare pointers of different types and use the mind defining self- referential structures.
6. To be able to create, read and write to and from simple textfiles.

COURSE OUTCOMES

1. To formulate the algorithms for simpleproblems
2. To translate given algorithms to a working and correctprogram
3. To be able to correct syntax errors as reported by thecompilers
4. To be able to identify and correct logical errors encountered at runtime
5. To be able to write iterative as well as recursiveprograms
6. To be able to represent data in arrays, strings and structures and manipulate them through a program

THEORY:

What is computer- Computer Components- What is C- C Character set- Constants, Variables and Keywords- General form of C Program - Relational and Logical Operators - Selection Structures- If and nested if - Switch Case - Loops-Definition and types- Functions- Arrays- Introduction to Strings-Pointers.

PRACTICALS:

1. Working with word Processing, Spreadsheet and presentation software inLinux

2. Programming inScratch:
   Practicing fundamental concepts of programming like sequence, selection decision statements, working of loops and event driven programming

3. CProgramming:
   Practicing programs to get exposure to basic data types, algebraic expressions, Conditional statements, Input and Output Formatting, Decision Statements, Switch Case, Control structures, arrays, Strings and function, implementation of pointers.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	E. Balagurusamy	Computing Fundamentals and C Programming	TMH Education, 5th Edition	2014
2	YashavantKanetkar	Let us C	BPB Publications	2013

16BEME213 ENGINEERING GRAPHICS – II 0 0 3 2 100

COURSE OBJECTIVES

1. To prepare the students to make section of solids like Prism, Cylinder, and Pyramid.
2. To prepare true shape of section.
3. To gain the knowledge on lateral surfaces.
4. To acquire the knowledge about development of surfaces like Prisms, pyramids, cylinders and cones.
5. To gain the knowledge on 2D drawing using CAD software.
6. To acquire the knowledge on basics of 3D modeling packages.

COURSE OUTCOMES

1. The students to draw section of solids like Prism, Cylinder, and Pyramid.
2. Students can prepare true shape of section.
3. Students gain the knowledge on lateral surfaces.
4. Students acquire the knowledge about development of surfaces like Prisms, pyramids, cylinders and cones.
5. Students gain the knowledge on 2D drawing using CAD software.
6. Students acquire the knowledge on basics of 3D modeling packages

UNITI SECTIONOFSOLIDS 9

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.

UNITII DEVELOPMENTOFSURFACES 9

Developmentoflateralsurfacesofsimpleandtruncatedsolids–Prisms,pyramids,cylindersandcones– Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNITIII ISOMETRIC PROJECTIONS 9

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

UNITIV PERSPECTIVEPROJECTIONS 9

Perspective projection of prisms, pyramids, cylinders and cone by visual ray method and vanishing point method.

UNITV COMPUTERGRAPHICS 9

Introduction to 3D modeling packages. Drafting practices - modeling of simple engineering components, sections and extraction of 2D drawings.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venugopal K and Prabhu Raja V	Engineering Graphics	New Age International Publishers	2007
2	VTU	A Primer on Computer Aided Engineering Drawing	Belgaum	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kumar M S	Engineering Graphics	D D Publications, Chennai	2007
2	Bureau of Indian Standards	Engineering Drawing Practices for Schools and Colleges SP 46-2003	BIS, New Delhi	2003
3	Luzadder W J	Fundamentals of Engineering Drawing	Prentice Hall Book Co., New York	1998

WEB REFERENCES

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2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation –Lettering.
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technicaldrawings.
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of TechnicalDrawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – ProjectionMethods.

16BEME251 **APTITUDE TRAINING** **1 0 0 -100**

COURSE OBJECTIVES

1. To understand the basic concepts of QUANTITATIVE ABILITY
2. To understand the basic concepts of LOGICAL REASONING Skills
3. To acquire satisfactory competency in use of VERBAL REASONING
4. To solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
5. To solve off-campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
6. To compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

COURSE OUTCOMES

1. Understand the basic concepts of QUANTITATIVE ABILITY
2. Understand the basic concepts of LOGICAL REASONING Skills
3. Acquire satisfactory competency in use of VERBAL REASONING
4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
5. Solve off-campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability.
6. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc

UNIT I **5**

Introduction, Speed Math's, Problems on Numbers, Averages, Ratios and Proportions, Problems on Ages

UNIT II **5**

Percentage, Data Interpretation, Profit and loss, Simple and Compound Interest

UNIT III **5**

Time Speed and Distance, Time and Work, Pipes and Cistern, Geometry, Probability, Permutation and Combination

TOTAL **15**

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Agarwal.R.S	Quantitative Aptitude for Competitive Examinations	S.Chand Limited	2011
2	Abhijit Guha	Quantitative Aptitude for Competitive Examinations	Tata McGraw Hill	2011
3	Edgar Thrope	Test Of Reasoning for Competitive Examinations	Tata McGraw Hill, 4th Edition	2012

SEMESTER III

16BEME301 METHODS OFAPPLIEDMATHEMATICS 3 2 0 4 100

COURSE OBJECTIVES

1. To introduce the basic concepts of PDE for solving standard partial differentialequations
2. To acquaint the student with Fourier series techniques in solving heat flow problems used in varioussituations.
3. To provide an overview of probability and statistics toengineers
4. To introduce the basic concepts of two-dimensional randomvariables
5. To acquaint the knowledge of testing of hypothesis for small and large samples.
6. To apply testing of hypothesis in important role in real lifeproblems.

COURSE OUTCOMES

After successfully completing the course, the student will have a good understanding of the following topics and their applications

1. Thefundamentalconceptsofpartialdifferentialequationsandthevarioussolutionproceduresforsolvingthefirst order non-linear partial differentialequations.
2. Appreciate the physical significance of Fourier series techniques in solving one- and two-dimensional heat flow problems and one-dimensional waveequations.
3. Understand the basic concepts of one knowledge of the concepts of probability and have knowledge of standard distribution which can describe real life phenomenon.
4. Understand the basic concepts of one- and two-dimensional random variables and apply in engineeringapplications.
5. They can also formulate and solve problems involving random variables and apply statistical methods for analyzing experimentaldata
6. Apply the concept of testing of hypothesis for small and large samples in real lifeproblems

UNITI LAPLACETRANSFORM 13

Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals – Initial and final value theorems. Inverse Laplace transforms – Convolution theorem (statement only) – Solution of Ordinary Differential Equations with constant coefficients using Laplace transforms – Transform of periodic functions.

UNITII FOURIERSERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNITIII FOURIERTRANSFORM 12

Fourier integral theorem (Statement Only) – Fourier transform pair –Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity – Relation between Fourier and Laplace transforms

UNITIV APPLICATIONS OF PARTIALDIFFERENTIALEQUATIONS 12

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded)

UNITV Z -TRANSFORM ANDDIFFERENCEEQUATIONS 11

Z-transform - Elementary properties – Inverse Z- transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL 60

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2013
2	Erwin Kreyszig	Advanced Engineering Mathematics.	John Wiley & Sons. Singapore	2014

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venkateswarlu S	Engineering Mathematics, Vol I	Anuratha Agencies and Publishers, Kumbakonam.	2007
2	Narayanan, S., and Ramaniah, G	Advanced Mathematics for Engineering Students. Volumes II and III,	Viswanathan S Printers and Publishers Pvt. Ltd. Chennai.	2002
3	Bali N P.	A text book of Engineering Mathematics	Laxmi Publications Pvt. Ltd.	2006
4	Ramana B V	Higher Engineering Mathematics	Tata Mc Graw Hill Publishing Co. Ltd. New Delhi.	2008

WEB REFERENCE

1. www.sosmath.com
2. http://mathworld.wolfram.com/FourierSeries.html
3. www.nptel.ac.in

16BEME302 **ENGINEERING MECHANICS** **3 1 0 4 100**

COURSE OBJECTIVES

1. To develop capacity to predict the effect of force and motion.
2. To understand the importance of free body diagram for complex machine structure.
3. To perform force analysis using law of mechanics.
4. To introduce the concepts of static equilibrium condition for particles and rigid bodies
5. To Understand the concepts of kinematics of particles and friction.
6. To make the students conversant to solve the problems using equation of motions.

COURSE OUTCOMES

At the end of the course the students will be able to

1. Understand the basic concepts of force and laws of mechanics.
2. Develop free body diagram for complex machine structure and to perform force analysis.
3. Apply static equilibrium condition for particles and rigid bodies.
4. Locate the center of gravity and moment of inertia for planes and solids.
5. Understand the concepts of kinematics of particles and friction.
6. Solve the problems using equation of motions

UNIT I STATICSOFPARTICLES **12**

Forces – system of forces – concurrent forces in plane and space– resultant – problems involving the equilibrium of a particle–free body diagram–equilibrium of particle in space.

UNIT II STATICS OF RIGID BODIES INTWODIMENSIONS **12**

Rigid bodies–moment of force about an axis–moments and couples–equivalent system of coplanar forces–Rigid body in equilibrium–problems involving equilibrium of rigid body–types of supports–reactions of beams.

UNIT III CENTROID, CENTRE OF GRAVITY AND MOMENTOFINERTIA **12**

Centroids of areas, composite areas, determination of moment of inertia of plane figures, polar moment of inertia – radius of gyration – mass moment of inertia of simple solids.

UNIT IV KINEMATICS OFPARTICLES **12**

Introduction – plane, rectilinear motion – time dependent motion – rectangular coordinates – projectilemotion.

UNIT V KINETICS OF PARTICLESANDFRICTION **12**

KINETICS OF PARTICLES: Equations of motion–rectilinear motion–Newton's II law – D'Alembert's principle – Energy – potential energy–kinetic energy–conservation of energy–work done by a force – work energy method.

TOTAL **60**

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Beer F P and Johnson E.R	Vector Mechanics for Engineers–Statics and Dynamics	Tata Mc–Graw Hill Publishing Co. Ltd., New Delhi	2015
2	Rajasekaran.S and Sankarasubramanian G	Engineering Mechanics–Statics and Dynamics	Vikas Publishing House Pvt. Ltd., New Delhi	2009

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Bansal R K	Engineering Mechanics	Laxmi Publications Pvt. Ltd., New Delhi	2015
2	Young D H and Timashenko S	Engineering Mechanics	Tata McGraw–Hill, New Delhi	2013
3	JivanKhachane and Ruchi Shrivastava	Engineering Mechanics: Statics and Dynamics	ANE Books, New Delhi	2006

WEB REFERENCES

1. http://nptel.iitm.ac.in/courses/Webcourse–contents/IIT%20Guwahati/engg_mechanics/index.htm
2. http://nptel.iitm.ac.in/video.php?subjectId=112103108
3. http://web.mit.edu/emech/dontindex–build/index.html
4. http://www.indiabix.com/engineering–mechanics/questions–and–answers/

16BEME303 MANUFACTURING TECHNOLOGY I 3 0 0 3 100

COURSE OBJECTIVES

1. To familiarize the students to apply suitable molding and casting methods for producing components.
2. To develop anunderstanding of types of metal joining processes.
3. To explain types of deformation processes.
4. To understand the concept of sheet metal operations and metal forming processes.
5. To provide an overview of various plastic component manufacturing processes for various applications.
6. To Study and acquire knowledge of process variables to manufacture defect free products.

COURSE OUTCOMES

Upon completion of this course, the students can able to

1. Apply suitable molding and casting methods for producing components.
2. Decide the type of metal joining processes.
3. Select the type of deformation processes.
4. Work with various sheet metal operations and metal forming processes.
5. Select the various plastic component manufacturing processes for various applications.
6. Identify the effect of process variables to manufacture defect free products

UNITI METALCASTINGPROCESSES 9

Introduction to Sand casting – Sand moulds – Type of patterns – Pattern materials – Pattern allowances – Types of Moulding sand – Properties – Core making – Types – CO_2 process - Moulding machines – Types of moulding machines – Types of melting furnaces (cupola, induction) – Working principle of Special casting processes – Shell moulding, Investment casting, Pressure die casting, Centrifugal casting – Casting defects – Inspectionmethods.

UNITII JOININGPROCESSES 9

Fusion welding processes – Types of Gas welding – Equipments used – Flame characteristics – Filler and Flux materials and properties – Arc welding equipments – Electrodes – Coating and specifications – Principles of Resistance welding – Gas metal arc welding – Submerged arc welding – TIG, MIG welding – Friction Stir Welding – Weld defects – Brazing and soldering process.

UNITIII BULKDEFORMATIONPROCESSES 9

Hot working and cold working of metals – Ingots – Forging processes – Open, impression and closed die forging – Types of Forging Machines – Rolling of metals – Types of Rolling mills – Defects in rolled parts – Principle of rod and wire drawing – Tube drawing — Principles of Extrusion – Types of Extrusion – Hot and Cold extrusion — Equipments used.

UNITIV SHEETMETALPROCESSES 9

Sheet metal characteristics – Press – Types of press – Principle of punching, blanking, coining, piercing, notching, embossing – Typical shearing operations, bending, drawing and deep drawing operations – Metal spinning, Stretch forming operations – Formability of sheet metal – Test methods.

UNITV MANUFACTURING OFPLASTIC COMPONENTS 9

Types of plastics – Characteristics of the forming and shaping processes – Moulding of Thermoplastics – Working principles and typical applications of – Injection moulding – Plunger and screw machines – Compressionmoulding,Transfermoulding–Typicalindustrialapplications–IntroductiontoBlowmoulding – Rotational moulding – Film blowing – Extrusion – Thermoforming – Bonding of Thermoplastics.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	SeropeKalpajian, Steven R.Schmid	Manufacturing Engineering and Technology (Second Indian Reprint)	Pearson Education, Inc., New Delhi	2013
2	S.Gowri, P.Hariharan, and A.Suresh Babu	Manufacturing Technology 1	Pearson Education, Inc., New Delhi	2008

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	P.N. Rao	Manufacturing Technology Second Edition	Tata McGraw–Hill Publishing Limited, New Delhi	2013
2	P.C. Sharma	A text book of production technology Fourth Edition	S. Chand and Company, New Delhi	2007
3	Begman	Manufacturing Process Eighth Edition	John Wilely and Sons	2005

WEB REFERENCES

1. www.themetalcasting.com
2. www.industrialmetalcastings.com
3. www.purolator–lp.com
4. www.manufacturercompanies.com/manufacturers

16BEME304 FLUID MECHANICS AND MACHINERY 3 2 0 4 100

COURSE OBJECTIVES

1. To enrich the understanding of fluid properties
2. To make the students conversant with types of flow and calculate Major and minor loses in pipes.
3. To acquaint the student with the concepts of Buckingham's π theorem.
4. To explain the working of different pumps
5. To explain the working of different turbines.
6. To equip students with skills to produce analytical solutions to various simple problems

COURSE OUTCOMES

Upon completion of this course, the students can able to

1. Demonstrate basic knowledge of fluid properties
2. Find types of flow and calculate Major and minor loses in pipes.
3. Apply Buckingham's π theorem for problem solving.
4. Understand the working of different pumps
5. Understand the working of different turbines.
6. produce analytical solutions to various simple problems

UNITI FLUID PROPERTIES ANDFLOW CHARACTERISTICS 12

Fluid properties: Mass density, weight density, specific gravity, viscosity, compressibility, surface tension and capillarity. Buoyancy and floatation– metacentre and metacentric height (definition only)

Flow characteristics: concepts of system and control volume, application of control volume to continuity equation, energy equation, momentum equation and moment ofmomentum equation.

UNITII FLOW THROUGHCIRCULARPIPES 12

Hydraulic and energy gradient – Types of fluid flow – Laminar flow through circular conduits – Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor – Moody diagram – commercial pipes – minor losses – Flow through pipes in series and parallel.

UNITIII DIMENSIONALANALYSIS 12

Dimension and units, dimensional homogeneity, applications of Buckingham's π theorem, model and similitude, similaritylaws.

UNITIV HYDRAULIC TURBINES 12

Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner – draft tube. Specific speed - unit quantities – performance curves for turbines – governing of turbines.

UNITV HYDRAULICPUMPS 12

Classification of pumps – centrifugal pump–working principle–head, discharge, efficiencies and losses – performance curves – specific speed. Reciprocating pump–components and working–slip–indicator diagram – air vessel – Jet pump – Gear pump – Submersible pump.

TOTAL 60

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Streeter V.L, Wylie E.B	Fluid Mechanics	McGraw–Hill, New Delhi	1998
2	Kumar K.L	Engineering Fluid Mechanics	S. Chand	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Bansal. R.K	Fluid Mechanics and Hydraulics Machines	Laxmi publications (P) Ltd, New Delhi	2015
2	White. F.M	Fluid Mechanics	Tata McGraw–Hill, New Delhi	2010
3	Fox and McDonald	Fluid Mechanics	John Wiley	2015

WEB REFERENCES

1. www.imeche.org
2. openlibrary.org
3. nptel.iitg.ernet.in
4. www.tecquipment.com

16BEME305A ELECTRICAL DRIVES AND CONTROLS 3 0 0 3 100

COURSE OBJECTIVES

1. To understand the basic concepts of different types of electrical machines and theirperformance.
2. To study the different methods of starting D.C motors and inductionmotors.
3. To study the conventional and solid-statedrives
4. To expose students to the operation, application and control of power conversion systems employing electric drive to cater to industrial needs.
5. To familiarize the operation principles, and design of starting, braking, and speed control arrangements for electric motors and their applications.
6. To provide strong foundation to asses performance of different industrial drives considering issues such as, energy efficiency, power quality, economic justification, environmental issues, and practical viabilities.

COURSE OUTCOMES

1. Examine various applications in industrial and domestic areas where use of electric drives isessential.
2. Classify types of electric drives systems based on nature of loads, control objectives,performance and reliability.
3. Combine concepts of previously learnt courses such as, electrical machines, Control and powerelectronics to cater to the need of automations in industries.
4. Select most suitable type and specification of motor drive combination for efficient conversionand control of electric power.
5. Identify the critical areas in application levels, and derive typical solutions.
6. Design and justify new control and power conversion schemes for implementing alternativesolutions considering the critical and contemporary issues.

UNITI INTRODUCTION 9

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors. Multi quadrant operation.

UNITII DRIVEMOTORCHARACTERISTICS 9

Mechanical and electrical characteristics of various types of load and drive motors – Braking of Electrical motors – DC Shunt, series Motors – Three phase induction motors.

UNITIII STARTINGMETHODS 9

Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors.

UNITIV SPEED CONTROLOFD.C.DRIVES 9

SpeedcontrolofDCseriesandshuntmotors–Armatureandfieldcontrol,Ward-Leonardcontrolsystem– Using controlled rectifiers and DC choppers –applications.

UNITV SPEED CONTROL OFA.C.DRIVES 9

Speed control of three phase induction motor – Voltage control, voltage / frequency control, Rotor resistance control –slip power recovery scheme

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vedam Subramaniam	Electric Drives (concepts and applications)	Tata McGraw-Hill, New Delhi.	2001
2	Nagrath I.J. and Kothari D.P,	Electrical Machines	Tata McGraw- Hill, New Delhi	2004

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Pillai.S.K,	A first course on Electric drives	Wiley Eastern Limited, New Delhi.	1998.
2	Singh M.D and Khanchandani K.B,	Power Electronics	Tata McGraw-Hill, New Delhi.	2003
3.	Gopal K.Dubey	Fundamentals of Electrical drives	Narosa Publishing House	2003

16BEME305B ELECTRONICS AND MICROPROCESSORS 3 0 0 3 100

COURSE OBJECTIVES

1. To provide an overview of various analogdevice
2. To provide an overview of Digitalconcepts
3. To learn working of amplifier and its application.
4. To understand the concept of RC-timing circuits.
5. To learn cellular concept and block diagram of GSM system.
6. To provide a review of communicationsystem

COURSE OUTCOMES

At the end of the course the students will be able to

1. Understand the principles of semiconductor devices and theirapplications.
2. Understand the concept of voltageregulators
3. Design an application using Operationalamplifier.
4. Understand the working of timing circuits andoscillators.
5. Understand logic gates, flip flop as a building block of digitalsystems.
6. Learn the basics of Electronic communicationsystem.

UNITI SEMICONDUCTORSANDRECTIFIERS 9

Classification of solids based on energy band theory-Intrinsic semiconductors-Extrinsic semiconductors-P type and N type-PN junction-Zenor effect-Zenor diode characteristicsHalf wave and full wave rectifiers -Voltage regulation

UNITII TRANSISTORSANDAMPLIFIERS 12

Bipolar junction transistor- CB, CE, CC configuration and characteristics-Biasing circuits Class A, B and C amplifiers- Field effect transistor-Configuration and characteristic of FET amplifier-SCR, Diac, Triac, UJT-Characteristics and simple applications.

UNITIII DIGITALELECTRONICS 9

Binary number system - AND, OR, NOT, NAND, NOR circuits-Boolean algebra Exclusive OR gate - Flip flops-Half and full adders-Registers-Counters-A/D and D/A conversion.

UNITIV 8085MICROPROCESSOR 9

Block diagram of microcomputer-Architecture of 8085-Pin configuration-Instruction setAddressing modes-Simple programs using arithmetic and logical operations.

UNITV INTERFACING AND APPLICATIONSOFMICROPROCESSOR 6

Basic interfacing concepts - Interfacing of Input and Output devices-Applications of microprocessor Temperature control, Stepper motor control, traffic light control.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Milman and Halkias	Integrated Electronics	Tata McGraw-Hill publishers	1995
2	Ramesh Goankar	Microprocessor Architecture - Programming and Applications with 8085	Wiley Eastern	1998

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Malvino and Leach	Digital Principles and Applications	Tata McGraw-Hill	1996
2	Mehta V.K	Principles of Electronics	S. Chand and Company Ltd	1994
3.	DouglesV.Hall	Microprocessor and Interfacing	Tata McGraw-Hill	1999
4	Salivahanan S, Suresh Kumar N, Vallavaraj A	Electronic Devices and Circuits	Tata McGraw-Hill	1999

16BEME311 FLUID MECHANICS AND MACHINERYLABORATORY 0 0 3 2 100

COURSE OBJECTIVES

1. To supplement the theoretical knowledge gained in Fluid Mechanics and Machinery with practical testing
2. To understand the concepts of coefficient of discharge for Orifice meter and Venturi meter.
3. To explain the Calibration of Rotameter.
4. To understand the importance of friction factor for flow through pipes.
5. To impart knowledge on the performance of various pumps.
6. To impart knowledge on the performance of turbines.

COURSE OUTCOMES

1. Calculate the coefficient of discharge for Orifice meter and Venturimeter.
2. Calibrate the Rotameter
3. Estimate the friction factor for flow through pipes.
4. Asses the performance of centrifugal pump and submergible pump.
5. Asses the performance of reciprocating pump and gear pump.
6. Asses the performance of turbines

LIST OF EXPERIMENTS

1. Determination of the Coefficient of discharge of given Orificemeter.
2. Determination of the Coefficient of discharge of givenVenturimeter.
3. Calculation of the rate of flow using Rotameter.
4. Determination of friction factor for a given set ofpipes.
5. Conducting experiments and drawing the characteristic curves of centrifugalpump
6. Conducting experiments and drawing the characteristic curves of submersiblepump
7. Conducting experiments and drawing the characteristic curves of reciprocatingpump.
8. Conducting experiments and drawing the characteristic curves of Gearpump.
9. Conducting experiments and drawing the characteristic curves of Peltonwheel.
10. Conducting experiments and drawing the characteristics curves of Francisturbine.

TOTAL 45

16BEME312 **MACHINE DRAWING** **0 0 3 2 100**

COURSE OBJECTIVES

1. To explain the surfaces for sheet metal working applications.
2. To Understand the representation of details in machine drawing.
3. To introduce tolerances and fits of machine elements.
4. To equip them with skills to Construct an assembly drawing using part drawings of machine components.
5. To equip them with skills to Construct an assembly drawing of machine components using 2D drafting.
6. To equip them with skills to develop employability.

COURSEOUTCOMES

Learners should be ableto

1. Express the importance of machine drawing andGD&T.
2. Interpret drawings of machinecomponents.
3. Create assembled machinedrawings.
4. Make part drawings from an assemblydrawing.
5. Interpret the details of complex parts in cross sectionviews.
6. Sketch production drawing from assemblydrawing.

INTRODUCTION **3**

Introduction to machine drawing. Importance of sectional views. Computer-aided drafting.

CONVENTIONS **6**

Code of practice for engineering drawing-conventional representation of details- drilled and tapped holes, countersunk and counter bored holes, internal and external threads, undercuts, grooves, chamfers, fillet radii and keyways. Conventions to represent standard components-bolts, nuts, washers, screws, cotters, pins, circlips, bearings, gears, springs andflanges.

FITSANDTOLERANCES **6**

Limits, fits and tolerances-need, types, representation of tolerances on drawing, calculation of minimum and maximum clearances and allowances. Geometric tolerance-uses, types of form and position tolerances, symbols, method of indicating geometric tolerances on part drawings.

ASSEMBLY DRAWINGPRACTICE **15**

Making free hand sketches of typical subassemblies-flange coupling, stuffing box, journal bearings, rolling element bearings, keyed joints, cotter joints, C clamp.

ASSEMBLY USING2DDRAFTING **15**

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies: Lathe Tail stock, Machine vice, Pedestal bearing and Drill jigs and Milling fixture.

TOTAL **45**

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Gopalakrishna K R	Machine Drawing	Subhas Stores, Bangalore	2003
2	Bhatt N. D and Panchal V.M	Machine Drawing	Charotar Publishing House, Chennai	2007
3	ASME Y 14.5M-1994	Dimensioning and Tolerancing	ASME, New York	1995

16BEME313 ELECTRICAL DRIVES AND MICROPROCESSORLABORATORY 0 0 3 2 100

COURSE OBJECTIVES

1. **To provide students the creative application of scientific principles to design or develop structures, machines, apparatus or works.**
2. To train students with good scientific and technical breadth so as to embody inventions and put his ideas in concrete terms and design something that promotes and helps in fulfilling the ever expanding energy requirements.
3. To inculcate in students professional and ethical attitude, Communication Skills, teamwork Skills, computer programming skill and an ability to relate engineering issues to broader social context.
4. To provide the excellent learning environment, which can enhance the learning ability of student to generate awareness of surrounding, attentiveness to details, experimental analysis.
5. To impart knowledge on Performance of the fundamental control practices associated with AC and DC machines (starting, reversing, braking, plugging, etc.) using power electronics
6. To evaluate the use of computer-based analysis tools to review the major classes of machines and their physical basis for operation

COURSE OUTCOMES

1. Graduates will demonstrate an ability to identify, formulate, pinpoint and solve Electrical engineering problems keeping in view the present-day power and energy requirement and its future prospect.
2. Graduates will demonstrate an ability to design study and analyze the digital and analog systems and components that serve as the fundamental components of the power engineering methods being increasingly used with the new technological advances.
3. Graduate will understand the impact of engineering solutions on the society and also be aware of contemporary issues relating to the exhausting resources and alternatives to continue uninterrupted power supply.
4. Graduate will be able to communicate effectively in both verbal and written form. They will develop a better presentation skill on academic and personal grounds that will enhance their personality in all aspects.
5. Graduates will demonstrate knowledge of professional and computer language skills that will eventually develop them into skilled researchers in an atmosphere that is technically advanced and conductive.

Graduates will demonstrate knowledge of advanced mathematics, science and electrical engineering with the ability to apply the theoretical knowledge and concepts to the disciplines of electrical engineering.

LIST OF EXPERIMENTS

ELECTRICAL MACHINES

1. Load Test on DC ShuntMotor
2. Load Test on DC SeriesMotor
3. Load Test on DC CompoundMotor
4. Speed control of D.C. motor. (Armature and Fieldcontrol)
5. Speed control of three phase Induction motor. (VoltageControl)
6. Speed control of three phase Induction motor. (Voltage / frequencyControl)
7. Load test on single phase InductionMotor.
8. Load test on three phase InductionMotor.
9. Speed control of three phase slip ring InductionMotor.

MICROPROCESSOR

1. Addition of two 8 – bit numbers, sum of 8 – bits and 16bits.
2. 8 - bitsubtraction.
3. Additional of two 16 – bit numbers, Sum: 16 bits ormore.
4. 8 – bit Multiplication.
5. 8 – bit Division.

TOTAL	**45**

16BEME351 SOFTSKILLS 1 0 0 -100

COURSE OBJECTIVES

1. To enable students to attain fluency and accuracy to inculcate proficiency in professionalcommunication.
2. To make the students to meet the growing demand in the field of Globalcommunication.
3. To help students acquire their ability to speak effectively in real lifesituations.
4. To inculcate the habit of reading and to develop their effective readingskills.
5. To ensure that students use dictionary to improve their active and passivevocabulary.
6. To enable students to improve their lexical, grammatical and communicativecompetence.

COURSE OUTCOMES

Students undergoing this course will be able to

1. Use English language for communication: verbal & non –verbal.
2. Enrich comprehension and acquisition of speaking & writingability.
3. Ensure students proficiency in professionalcommunication.
4. Developed their active and passivevocabulary.
5. Gain confidence in using English language in real lifesituations.
6. Improve word power: lexical, grammatical and communication competence.

UNIT I **4**

Overview to communication, self Introduction, Presentation on their own topic, Extempore, Group Activity

UNIT II **3**

Group Discussion, Do's and Don'ts of Group Discussion, Body language, Grooming and Resume, Resume correction

UNIT III **4**

Introduction to HRM – Questions - Do's and Don't's - Interview - Mock GD - Stress Management

UNIT IV **4**

Personality Development - Presentation skills, Interpersonal skills, Critical thinking, Confidence building and Stress management.

TOTAL 15

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Barun K Mitra	Personality Development and Soft Skills	Oxford University Press-New Delhi	2012
2	Rajiv K. Mishra	Personality Development	Rupa & Co.	2012

SEMESTER IV

16BEME401 STRENGTHOFMATERIALS 3 2 0 4 100

COURSE OBJECTIVES

1. To understand the concepts of stress and strain on deformation of solids.
2. To introduce the Concepts of safe working stresses and load carrying capacity of beams.
3. To enrich the understanding of deflection in beams and columns in engineering applications.
4. To understand the importance of the effect of torsion on shafts and springs.
5. To provide knowledge on principal stresses and analyze thin cylinders and shells subjected to pressure forces.
6. To provide knowledge on components subjected to various loadings with the help of various theories of failures.

COURSE OUTCOMES

Upon completion of this course, the students can able to

1. Determine stress and strain on deformation of solids.
2. Compute safe working stresses and load carrying capacity of beams.
3. Estimate the deflection in beams and columns in engineering applications.
4. Analyze the effect of torsion on shafts and springs.
5. Determine principal stresses and analyze thin cylinders and shells subjected to pressure forces.
6. Design the components subjected to various loadings with the help of various theories of failures

UNIT I STRESS, STRAIN AND DEFORMATIONOF SOLIDS 12

Rigid and Deformable bodies – Strength, Stiffness and Stability – Stresses; Tensile, Compressive and Shear – Deformation of simple and compound bars under axial load – Thermal stress – Elastic constants – Strain energy and unit strain energy – Strain energy in uniaxialloads.

UNITII BEAMS – LOADSAND STRESSES 12

Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever, Simply supported and Overhanging beams – Relationship between load, shear force and bending moment – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section.

UNIT III BEAMDEFLECTION 12

Elastic curve of Neutral axis of the beam under normal loads – Evaluation of beam deflection and slope: Macaulay Method – Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine's formula forcolumns

UNITIV TORSION 12

Analysis of torsion of circular bars – Torsional Shear stress – Bars of solid and hollow circular section – Stepped shaft – Torsional rigidity – Compound shafts – Fixed and simply supported shafts – Application to close–coiled helical springs – Maximum shear stress in spring section including Wahl Factor – Deflection of helical coil springs under axial loads – Design of helical coil springs – stresses in helical coil springs under torsion loads

UNITV ANALYSIS OF STRESSES INTWODIMENSIONS 12

Biaxial state of stresses – Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells – Biaxial stresses at a point – Stresses on inclined plane – Principal planes and stresses.

TOTAL 60

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Punmia B.C and Jain A.K	Strength of Materials and Theory of Structures – Vol.1	Laxmi Publications New Delhi	2015
2	Ramamrutham S and Narayan R	Strength of Materials	Dhanpat Rai and Sons., New Delhi	2008

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Jindal U C	Textbook on Strength of Materials	Asian Books Pvt, Ltd, Chennai	2012
2	Don H Morris, and Leroy D Sturges	Mechanics of Materials	John Wiley and Sons Inc	2006
3.	Bedi D S	Strength of Materials	S Chand and Co. Ltd., New Delhi	1984

WEB REFERENCES

1. www.engineersedge.com
2. http://en.wikiversity.org
3. www.globalsources.com
4. www.dspace.cusat.ac.in

16BEME402 MANUFACTURING TECHNOLOGY II 3 0 0 3 100

COURSE OBJECTIVES

1. To Explain the mechanics of metal cutting, cutting tool materials, tool wear and cutting fluids.
2. To understand the concept of constructional features of different types of lathe and their operations.
3. To provide knowledge on construction & working of shaping, milling &drilling machines and gear cutting & finishing process.
4. To expose students to various types of grinding machines and broaching machines.
5. To Explain the construction features of different types of CNC machine and manual part programming for a given component.
6. To Perform part programming for CNC machines.

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Explain the mechanics of metal cutting, cutting tool materials, tool wear and cutting fluids.
2. Discuss about the constructional feature of different types of lathe and their operations.
3. Describe the construction & working of shaping, milling &drilling machines and gear cutting & finishing process.
4. Illustrate the various types of grinding machines and broaching machines.
5. Explain the construction feature of different types of CNC machine and manual part programming for a given component.
6. Perform part programming for CNC machines

UNIT I THEORY OF METAL CUTTING ANDCUTTING TOOLS 9

Introduction: material removal processes, types of machine tools – theory of metal cutting: chip formation, orthogonal cutting, oblique cutting – Cutting tool materials, tool wear, tool life, surface finish, cutting fluids, heat generation, Merchant circle.

UNITII CENTRE LATHE AND SEMI AUTOMATICLATHES 9

Centre lathe– constructional features, various operations, taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes – automats – single spindle, Swiss type, automatic screw type, multi spindle – Tool layout for Capstan, Turret and Automats.

UNIT III RECIPROCATING MACHINE TOOLS &MILLING MACHINES 9

Shaper – construction, working, work and tool holding device, quick return mechanism, planer – construction, working, mechanism, operations. Slotter – construction, working.
Milling machine – constructions, types, Indexing mechanism, operations, milling cutter, gear hobbing – principle.

UNITIV OTHER MACHINETOOLS 9

Drilling – types, radial drilling machine, construction, operations, Boring, types, Jig boring machine – construction, operations, Broaching – types, construction, Grinding – grinding wheel, specifications and selection, cylindrical grinding, surface grinding, centreless grinding – honing, lapping, super finishing, polishing and buffing.

UNITV CNC MACHINES 9

CNC Machines – Construction – Types of control systems, Manual Part Programming – Computer assisted part programming – Computer aided part programming, Machining centers – principle, Turning centers – principle, CAD/CAM & Integration, Application of CNC Machines.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hajra Choudhury	Elements of Workshop Technology Vol– II	Media Promotors Pvt Ltd., Mumbai	2010
2	HMT	Production Technology	Tata McGraw–Hill	2008

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	P.C. Sharma	A text book of production technology	S. Chand and Co. Ltd	2014
2	Shrawat N.S. and Narang J.S	CNC Machines	Dhanpat Rai and Co	2002
3.	P.N.Rao	CAD/CAM Principles and Applications’	TATA Mc Craw Hill	2012
4	Milton C.Shaw	Metal Cutting Principles Second Edition	Oxford University Press	2005

WEB REFERENCES

1. www.steelonline.co.in
2. http://mmu.ic.polyu.edu.hk
3. www.waterjetindiana.com
4. www.teskolaser.com
5. www.cncinformation.com
6. www.cncmachineprogramming.net

16BEME403 **ENGINEERING THERMODYNAMICS** **3 2 0 4 100**

COURSE OBJECTIVES

1. To understand the Model of physical systems into relevant thermodynamic system and apply energy balance equation for closed and open system.
2. To provide knowledge on entropy change in thermodynamic processes.
3. To Study and acquire knowledge on various thermodynamic properties of pure substances in real time problems.
4. To establish the basic thermodynamic relations and properties of ideal and real gases for physical systems.
5. To facilitate the understanding of properties of air using psychometric chart.
6. To acquaint the student with the concepts and applications of the thermodynamics to the various real-life systems.

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Model the physical systems into relevant thermodynamic system and apply energy balance equation for closed and open system.
2. Determine entropy change in thermodynamic processes.
3. Identify the various thermodynamic properties of pure substances in real time problems.
4. Establish the basic thermodynamic relations and properties of ideal and real gases for physical systems.
5. Calculate the properties of air using psychometric chart.
6. Explain the basic principles and applications of the thermodynamics to the various real life systems

UNIT I BASIC CONCEPTS ANDFIRSTLAW 12

Basic concepts - Classical and Statistical approaches - Thermodynamic systems - closed, open, isolated. Property – State - Process-adiabatic - Quasi-static process – Cycle - Point and Path function – Energy - Work transfer - Concept of temperature and heat- Zeroth law of thermodynamics - Concept of ideal gases - First law of thermodynamics –PMM1, internal energy, specific heat capacities, enthalpy, and its application to closed system and open system-steady flow energyequation.

UNITII SECOND LAWAND ENTROPY 12

Physical description of the second law - Kelvin-Planck and Clausius statements –Equivalence - Reversible processes and cycles- Carnot cycle – Corollaries - Absolute temperature scale – Clausius Theorem, inequality - Entropy- Principle, transfer, generation, balance - Third law of thermodynamics

UNIT III PROPERTIES OF PURE SUBSTANCE ANDGASMIXTURES 12

Puresubstance-Phasechangeprocess-Propertydiagrams-PVTsurface-Steam–types,drynessfraction-Avogadro's law - Ideal Gas - Equations of state-Vander Waal's equation - Real Gas - Compressibility and its chart - Mixtures ofGases – Properties.

UNITIV THERMODYNAMIC AVAILABILITYANDRELATIONS 12

Basics-Dead state, quality of energy, degradation of energy - Reversible processes – Maximum work - Exergy – Closed system - Steady flow system – Irreversibility - Exergy Balance - Second law efficiency – Exact differentials - Tds Relations - Maxwell's Relation – Clausius – Clapeyron Equation - Joule-Thompson Coefficient.

UNITV PSYCHROMETRY 12

Psychrometry - Psychrometric charts - Property calculations of air vapour mixtures- Psychrometric process-Adiabatic mixing - Evaporative cooling.

TOTAL 60

(Permitted to use standard thermodynamic table, Mollier diagram, and Psychometric chart in the examination)

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nag P K	Engineering Thermodynamics	Tata McGraw-Hill, New Delhi	2013
2	Cengel	Thermodynamics-An Engineering Approach	Tata McGraw-Hill, New Delhi	2014

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Holman J P	Thermodynamics	McGraw-Hill, NewDelhi	1988
2	Venwylen and Sontag	Classical Thermodynamics	Wiley Eastern, New Delhi	1994
3.	Kothandaraman C P and Domkundwar S	Engineering Thermodynamics	Dhanpatrai& Sons, New Delhi	2004

WEB REFERENCES

1. http://nptel.iitm.ac.in/courses/Webcourse–contents/IIT%20Guwahati/engg_mechanics/index.htm
2. http://nptel.iitm.ac.in/video.php?subjectId=112103108
3. http://web.mit.edu/emech/dontindex–build/index.html
4. http://www.indiabix.com/engineering–mechanics/questions–and–answers/

16BEME404A INDUSTRIAL METALLURGY 3 0 0 3 100

COURSE OBJECTIVES

1. To impart knowledge on metallurgical aspects ofmetals.
2. To understand heat treatment processes on different grades ofsteel.
3. To familiarize on selection of ferrous and non-ferrous materials for variousapplications.
4. To impart knowledge on non-metallicmaterials
5. To learn about the strengthening mechanisms for Non-ferrousalloys.
6. To comprehend the significance of Non-Destructive Testing (NDT)methods

COURSEOUTCOMES

Learners should be ableto

1. Identify the metallurgical aspects ofmetals.
2. Identify suitable heat treatment processes for variousapplications.
3. Select appropriate ferrous and non-ferrous materials for variousapplications.
4. Identify and select suitable non-metallicmaterials.
5. Identify suitable strengthening mechanisms for Non-ferrousalloys.
6. Work with non-destructive testingmethods

UNITI CONSTITUTION OF ALLOYS ANDPHASEDIAGRAMS 9

Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, peritectic, eutectoid and peritectoid reactions, Iron – Iron carbide equilibrium diagram -Classification of steel and cast Iron, microstructure, properties and applications.

UNITII HEATTREATMENT 9

Definition – Full annealing, stress relief, recrystallisation and spheroidizing –normalising, hardening and tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on TTT diagram,CCT - Hardenability, Jominy end quench test – Austempering, martempering – case hardening - carburising, nitriding, cyaniding, carbonitriding – Flame and Induction hardening, Microstructure study and specimen preparation.

UNITIII FERROUS AND NONFERROUS METALS 9

Effect of alloying elements on steel (Mn, Si, Cr, Mo, V, Ti& W) - stainless and tool steels – HSLA - maraging steels – Gray, White malleable, Spheroidal Graphite irons - Copper and Copper alloys – Brass, Bronze and Cupronickel – Aluminum and Al-Cu – precipitation, strengthening treatment – Bearing alloys.

UNITIV NON-METALLIC MATERIALS 9

Polymers – types of polymer, commodity and engineering polymers – Properties and Applications of thermoplastics (PP, PVC, ABS, and PMMA) and thermosetting plastics (PF, UF, MF) –Engineering Ceramics.

UNITV TESTING OF MECHANICAL PROPERTIESANDINSPECTION 9

Mechanism of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Impact test - Izod and Charpy, Fatigue and creep test, S-N curve.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kenneth G.Budinski and MichaelK.Budinski	Engineering Materials	Prentice-Hall of India Private Limited, New Delhi	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William D. Callister &David G. Rethwisch	Material Science and Engineering	John Wiley and Sons, Delhi	2013
2	Raghavan.V	Materials Science and Engineering	Prentice Hall of India Pvt., Ltd, New Delhi	2015
3.	Shackelford. J.F	Introduction to Materials Science for Engineers	Pearson Edition	2014

WEB REFERENCES:

1. www.materials.unsw.edu.au
2. ocw.MIT.edu
3. www.istl.org
4. metalurgy-screw-tutorial.tobyavujo.com

16BEME404B **ENGINEERING MATERIALS** **3 0 0 3 100**

COURSE OBJECTIVES

1. To impart knowledge on metallurgical aspects ofmetals.
2. To understand heat treatment processes on different grades ofsteel.
3. To familiarize on selection of ferrous and non-ferrous materials for variousapplications.
4. To impart knowledge on non-metallicmaterials
5. To learn about the strengthening mechanisms for Non-ferrousalloys.
6. To comprehend the significance of Non Destructive Testing (NDT)methods.

COURSE OUTCOMES

Learners should be ableto

1. Identify the metallurgical aspects ofmetals.
2. Identify suitable heat treatment processes for variousapplications.
3. Select appropriate ferrous and non-ferrous materials for variousapplications.
4. Identify and select suitable non-metallicmaterials.
5. Identify suitable strengthening mechanisms for Non-ferrousalloys.
6. Work with non destructive testingmethods.

UNITI INTRODUCTION TO ENGINEERINGMATERIALS 9

Atomic bonding and Crystal structure of engineering materials. Chemical and Physical properties of engineering materials. Mechanical Properties and Behaviours of Materials – Stress - Strain Relationships, Tensile Strength, Hardness, Impact Strength, Fatigue & Stress Rupture, Creep & Stress Rupture, Comparison of Material Properties

UNITII FERROUS METALS ANDTHEIR PROPERTIES 9

Iron - Carbon Equilibrium Diagram, Carbon Steel & AISI Numerical Identification Systems. Properties, processing and applications of Alloy Steel, Tool Steel, Stainless Steel. General characteristics of metal alloys, Fundamentals of heat treatment and the use of TTT diagrams. Production, forming, and joining of metals.

UNITIII NONFERROUSMETALS 9

Properties, processing and applications of Aluminum, Magnesium & Titanium, Copper and its Alloys, Low Melting Temperature Alloys. Production, forming, and joining of metals. The Chemistry and prevention of corrosion

UNITIV CERAMICMATERIALS 9

Microstructural features of ceramics and glasses - Mechanical properties of ceramics and glasses - Production, forming, and joining of ceramics

UNITV POLYMERS ANDCOMPOSITES 9

Microstructural features of polymers and composites - Mechanical behaviour of polymers and composites - Production, forming, and joining of polymers and composites.

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ganesan.S and Baskar.T	Engineering Physics II	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William D Callister Jr	Material Science and Engineering-An Introduction	John Wiley ans Sons Inc., , New York,	2013
2	James F Shackelford	Introduction to materials Science for Engineers	Macmillan Publication Company, New York	2014
3	Charles Kittel	Introduction to Solid State Physics	John Wiley & sons, Singapore.	2007

WEB REFERENCES

1. www.nptel.ac.in
2. www.physicsclassroom.com
3. www.oyc.yale.edu
4. www.physics.org

16BEME405A **KINEMATICS OF MACHINERY** **3 0 0 3 100**

COURSE OBJECTIVES

1. To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism and cam mechanisms for specified outputmotions.
2. To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machinecomponents.
3. To understand the force-motion relationship in components subjected to external forces and analysis of standardmechanisms.
4. To understand the concept of inertia force and inertia torque.
5. To understand the undesirable effects of unbalances resulting from prescribed motions inmechanism.
6. To understand the effect of Dynamics of undesirablevibrations.

COURSE OUTCOMES

Upon completionof this course, the students can able to

1. Identify the type and mechanism and will be able to perform velocity and accelerationanalysis
2. Classify the types of friction and understand the friction applications used in screw threads, clutches, brakes.
3. Specify the gear terminology and to select appropriate gear trains for engineeringapplications.
4. Perform force analysis of reciprocating engine and balancing of rotating & reciprocatingmasses.
5. Describe the vibration phenomenon and its types along with the vibrationterminologies.
6. Analyze the systems subjected tovibration

UNITI BASICSOFMECHANISMS 9

Terminology and Definitions–Degree of Freedom – Mobility–Kutzbach criterion–Grashoff's law–Kinematic Inversions of four bar chain and slider crank –Mechanical Advantage–Transmission angle –-Single, double and offset slider mechanisms – Quick return mechanisms – Ratchets and escapements – Indexing Mechanisms – Straight line generators.

UNITII KINEMATICS 9

Displacement, velocity and acceleration – analysis in simple mechanisms – Graphical Method –velocity and acceleration polygons – Kinematic analysis by Complex Algebra methods–Vector Approach, Instantaneous center – Coriolis Acceleration.

UNITIII KINEMATICSOFCAM 9

Classifications – Displacement diagrams–parabolic, Simple harmonic and Cycloidal motions – Layout of plate cam profiles – Derivatives of Follower motion – High speed cams – circular arc and tangent cams – Standard cam motion – Pressure angle and undercutting.

UNITIV GEARS 9

Spur gear - Terminology and definitions–Fundamental Law of toothed gearing and involute gearing–Interchangeable gears–gear tooth action – Terminology – Interference and undercutting–Non standard gear teeth– Helical, Bevel, Worm, Rack and Pinion gears (Basics only)–Gear trains–Parallel axis gear trains–Epicyclic gear trains.

UNITV FRICTIONIN DRIVES 9

Surface contacts–Sliding and Rolling friction – Friction drives – Friction in screw threads – Friction clutches– Belt and rope drives, Friction aspects in Brakes.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rattan S.S	Theory of Machines	Tata McGraw–Hill, New Delhi	2009
2	Shigley J.E, Uicker J J	Theory of Machines and Mechanisms	McGraw–Hill, Inc, New York	2011

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Thomas Bevan	Theory of Machines	CBS Publishers and Distributors, New Delhi	2011
2	Ghosh A, Mallick A.K	Theory of Mechanisms and Machines	Affiliated East–West Pvt. Ltd., New Delhi	1998
3.	Rao J.S, DukkipatiR.V	Mechanics of Machines	Wiley–Eastern Ltd., New Delhi	2007

STANDARDS

IS 2458 : 2001, Vocabulary of Gear Terms – Definitions Related to Geometry
IS 3756 : 2002, Method of Gear correction – Addendum modification for External Cylindrical Gears with Parallel Axes.
IS 5267 : 2002 Vocabulary of Gear Terms – Definitions Related to Worm Gear Geometry.
IS 12328 : Part 1: 1988 Bevel Gear Systems Part – 1 Straight Bevel Gears.
IS 12328 : Part 2: 1988 Bevel Gear Systems Part – 2 Spiral Bevel Gears

16BEME405B **INDUSTRIAL ENGINEERING** **3 0 0 3 100**

COURSE OBJECTIVES

1. To Understand and apply the principles of science, technology, engineering, and math to solve industry–relatedproblems.
2. To Understand the concepts and terminologies inIndustries
3. To Study and acquire knowledge in creating an industrial designlayout
4. To introduce the methods involved in materialshandling
5. To understand the knowledge in analysis of work processing happening inindustries
6. To equip them with skills to perform work measurement in anindustry

COURSE OUTCOMES

Upon completion of this course, the student can able to

1. Understand the concepts and terminologies inIndustries
2. apply their knowledge in creating an industrial designlayout
3. understand the methods involved in materialshandling
4. apply their knowledge in analysis of work processing happening inindustries
5. perform work measurement in anindustry
6. understand the role of human involvement in industrial work systemdesign

UNITI INTRODUCTION TOINDUSTRIALENGINEERING 9

for layout study – types of layout. Plant location analysis – factors, costs, location decisions – simple problems in single facility location models, network location problems.

UNITII LAYOUTDESIGN 9

Design cycle – SLP procedure manpower, machinery requirements – computer algorithms – ALDEP, CORELAP, CRAFT

UNITIII QUANTITATIVE METHODS ANDMATERIALS HANDLING 9

Group technology – Production Flow analysis (PFA), ROC (Rank Order Clustering) – Line balancing. Principles, unit load concept, material handling system design, handling equipment types, selection and specification, containers and packaging, Material Handling—Automatic Storage and Retrieval System (ASRS)

UNITIV OPERATIONS ANALYSIS ANDWORKMEASUREMENT 9

Productivity and living standards, Productivity measurement, work design and Productivity – processplanning – types. Total time for a job or operation, total work content and ineffective time, methods and motions, graphic tools.

UNITV HUMAN FACTORS IN WORKSYSTEM DESIGN 9

Human factors Engineering/Ergonomics, human performance in physical work, anthropometry, design of work station, design of displays and controls.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	O.P. Khanna	Industrial Engineering And Management	Dhanpat rai and Co	2012
2	M.Mahajan	Industrial Engineering and Production Management	Dhanpat rai and Co	2008

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Tompkins .J.A. and J.A. White	Facilities planning	John Wiley	2010
2	James Apple,M.Plant	Material Handling	John Wiley	1977
3	Barnes,R.M	Motion and Time study	John Wiley	1980
4	Bridger R.S	Introduction to Ergonomics	McGraw Hill	2008

WEB REFERENCES

1. http://www.websukat.com/PAOM–plant–layout.htm
2. http://www.du.ac.in/fileadmin/DU/Academics/course_material/EP_07.pdf
3. http://www.scribd.com/doc/60109160/8/Rank–Order–Clustering–Method
4. http://www.zalzala.info/IKMA/LinkedDocuments/GAManufacturing/sld006.htm
5. http://www.wrebv.nl/l6.pdf

16BEME406A ENGINEERING METROLOGY 3 0 0 3 100

COURSE OBJECTIVES

1. To provide knowledge on various Metrological equipments available to measure the dimension of the components.
2. To provide knowledge on the correct procedure to be adopted to measure the dimension of the components.
3. To enrich the understanding of principles of measuring instruments and gauges
4. To give exposure to inspection of spur gear and thread elements.
5. To equip them with skills to linear measurements using various measuringinstruments
6. To give exposure toprocedures involved in erectingmachineries

COURSE OUTCOMES

Upon completion of this course, the students will able to

1. Understand the basics of measurements and qualitystandards.
2. Perform linear measurements using various measuringinstruments
3. Perform the geometrical measurements of variouscomponents
4. Measure the various dimensions of a screwthread
5. Measure the dimensions of the simple spurgear.
6. Know the procedures involved in erectingmachineries

UNITI CONCEPTOFMEASUREMENT 9

General concept – Generalised measurement systems – units and standards–measuring instruments–sensitivity, readability, range of accuracy, precision–static and dynamic response–repeatability–systematic and random errors – correction, calibration, interchangeability – Basics of Measurement SystemAnalysis.

UNITII LINEAR ANDANGULARMEASUREMENT 9

Definition of metrology–Linear measuring instruments: Vernier, micrometer, interval measurement, Slip gauges and classification, limit gauges– Comparators: Mechanical, pneumatic and electrical types,applications – Angular measurements: –Sine bar, auto-collimeter, angle Decker.

UNITIII FORMMEASUREMENT 9

Measurement of screw threads – Thread gauges, floating carriage micrometer–measurement of gears–tooth thickness – constant chord and base tangent method – Eccentricity Measurements – radius measurements–surface finish, straightness, flatness and roundness measurements.

UNITIV LASER AND ADVANCESINMETROLOGY 9

Precision instruments based on laser–Principles– laser interferometer–application in linear, angular measurements and machine tool metrology - Coordinate measuring machine (CMM) – computer aided inspection - Nano metrology, techniques and applications.

UNITV MEASUREMENT OF POWER, FLOW ANDTEMPERATURERELATED PROPERTIES 9

Force, torque, strain:–mechanical and electrical type – Flow measurement: Venturi, orifice, rotometer, – Electrical pressure transducers, Temperature: Thermocouples, Resistance temperature detectors, bimetallic strip thermometers, thermister,pyrometry

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Jain R.K	Engineering Metrology	Khanna Publishers, Delhi	2003
2	Alan S. Morris	The Essence of Measurement	Prentice Hall of India, New Delhi	1997
3	N.V. Raghavendra and L. Krishnamurthy	Engineering Metrology and Measurements	Oxford University press of India	2013

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Gupta S.V	Engineering Metrology	Dhanpat rai Publications, New Delhi	2012
2	Tayal A.K	Instrumentation and Mechanical Measurements	Galgotia Publications, New Delhi	2013
3.	Beckwith T.G and N. Lewis Buck N	Mechanical Measurements	Addison Wesley, New york	2007

WEB REFERENCES

1. www.tms.org
2. www.arci.res.in/
3. www.fbh–berlin.com
4. www.lasermetrology.com/
5. www.lasermetrology.com/

16BEME406B INDUSTRIAL METROLOGY 3 0 0 3 100

COURSE OBJECTIVES

1. To provide knowledge on various Metrological equipments available to measure the dimension of the components.
2. To provide knowledge on the correct procedure to be adopted to measure the dimension of the components.
3. To enrich the understanding of principles of measuring instruments and gauges
4. To give exposure to inspection of spur gear and thread elements.
5. To equip them with skills to linear measurements using various measuringinstruments
6. To give exposure to procedures involved in erectingmachineries

COURSE OUTCOMES

Upon completion of this course, the students will able to

1. Understand the basics of measurements and qualitystandards.
2. Perform linear measurements using various measuringinstruments
3. Perform the geometrical measurements of variouscomponents
4. Measure the various dimensions of a screwthread
5. Measure the dimensions of the simple spurgear.
6. Know the procedures involved in erectingmachineries

UNITI BASICS OF MEASUREMENT, DEVICES ANDQUALITY STANDARDS 12

Definition of metrology, economics of measurement, measurement as a comparative process, dimensional properties, terminology and accuracy of measurement, measuring errors, Abbe’s Principle, Principle of interferometry- flatness testing, optical interferometer, laser interferometer. Holography and speckle metrology.

General cares and rules in measurement, International standardization, SI units and quantities, BIS- NPL – advantages, ISO 9000 quality standards, QS 9000 standards, Environment standards, metrology room measuring standards room.

UNITII LINEARMEASUREMENTS 8

Material length standards –line and end measurement – calibration of end bars, datum and reference surfaces, surface plates, gauges – feeler gauges, micrometers, dial test indicator, slip gauges, care of gauge blocks, Comparators- mechanical, electrical, optical and pneumatic, optical projector.

UNITIII GEOMETRICALMEASUREMENT 9

Angular measurement – plain vernier and optical protractors, sine bar, optical instruments, flatness, parallelism and roundness measurement, need for limit gauge, design of plug gague, Taylor’s principle, three basic types of limit gauges, surface texture, reasons for controlling surface texture, parameters used , specification of surface texture, drawing and symbols, Tomilson surface meter.CMM.

UNITIV METROLOGY OFMACHINEELEMENTS 8

Types of screw threads, terminology, proportions of ISO metric thread, measurement of major, minor and effective diameters. Gear terminology and standard proportions, spur gear measurement, checking of composite errors, base pitch measurement, clean roomenvironment.

UNITV MACHINE INSTALLATIONANDTESTING 8

Equipment erection, commissioning, testing procedure for lathe, milling, continuous process line. First aid, safety precautions in installation of equipment, protocol for repair and testing, inspection check list.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Gupta I C	A text book of Engineering Metrology	Dhanpat Rai publications, New Delhi	2006
2	Jain R K	Mechanical and Industrial Measurements	Khanna Publishers Co Ltd., New Delhi	2014
3	Holmen J P	Experimental Methods for Engineers	Tata McGraw Hill Publications Co Ltd	2012

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Narayana K	Engineering Metrology	Scitech Publication	2006
2	KaniskaBedi	Quality Management	Oxford University Press, Chennai	2007

WEB REFERENCES

1. www.tms.org
2. www.arci.res.in/
3. www.fbh–berlin.com
4. www.lasermetrology.com/
5. www.lasermetrology.com/

16BEME411 STRENGTH OF MATERIALS AND METALLURGYLABORATORY 0 0 3 2 100

COURSE OBJECTIVES

1. To perform different destructivetesting
2. To learn the characteristicmaterials.
3. To understand the stress and strain relationship.
4. To determine the shear force for various materials.
5. To determine the impact load for various materials.
6. To determine the hardness for various materials

COURSE OUTCOMES

1. Ability to perform different destructivetesting
2. Ability to characteristicmaterials
3. Understand the stress and strain relationship.
4. Determine the shear force for various materials.
5. Determine the impact load for various materials.
6. Determine the hardness for various materials

LIST OF EXPERIMENTS

1. Tensile test on metals–stress straincharacteristics
2. Cupping test on metal sheets–load deformation characteristics, cupping load, cuppingnumber.
3. Hardness test on metals–Brinell and Rockwell Hardnesstests.
4. Impact test on metals–Charpy, Izod impacttests.
5. Shear test on metals–direct shear strength, single shear, doubleshear.
6. Tests on helical springs–compression, tension springs–load deformation characteristics, stiffness, shear stress, modulus of rigidity,energy.
7. Torsion test on beams–torque and angle of twist characteristics, shear stress, modulus of rigidity,energy.
8. Microscopic examination of i) Hardened samples ii) Hardened and temperedsamples.
9. Tempering – Improvement of Mechanical properties –Comparison for i) Unhardenedspecimen ii) Quenched specimen iii) Quenched and tempered specimen.
10. Study of low carbon steel and medium carbonsteel.

TOTAL 45

16BEME412 MANUFACTURING TECHNOLOGY LABORATORY 0 0 4 2 100

COURSE OBJECTIVES

1. To facilitate the understanding of shaping operation in shaper.
2. To provide practical knowledge on Preparing a flat and contour surface using milling machine.
3. To provide practical knowledge on Preparing holes with higher finish by Drilling / Tapping / Reaming.
4. To facilitate the understanding of surface and cylindrical grinding operations for surface finish.
5. To introduce single and multi point cutting tools.
6. To impart knowledge on the operations in Capstan and Turret Lathe.

COURSE OUTCOMES

1. Perform shaping operation in shaper.
2. Prepare a flat and contour surface using milling machine.
3. Prepare holes with higher finish by Drilling / Tapping / Reaming.
4. Perform surface and cylindrical grinding operations for surface finish.
5. Prepare the single and multi point cutting tools.
6. Perform operations in Capstan and Turret Lathe.

LIST OF EXERCISES

1. Exercises inshaping.
2. Exercises inMilling.
3. Exercises inslotting.
4. Exercises in Drilling / Tapping /Reaming.
5. Exercises in Surface grinding and cylindrical grindingprocess.
6. Exercises in Tool grinding – single point and multi pointtools.
7. Exercises in Capstan and TurretLathe.

TOTAL 45

16BEME451 PRODUCTION DRAWING ANDCOSTESTIMATION 1 0 0 -100

COURSE OBJECTIVES

1. To gain knowledge in sequence of process planning and cost estimation of variousproducts.
2. To introduce the concepts of dimensional and toleranceanalysis
3. To expose students to manufacturingdrawings
4. To equip them with skills to apply their knowledge in re-dimensioning and tolerancecharting
5. To understand the process chart for a givencomponent
6. To Estimate the cost of a givencomponent

COURSE OUTCOMES

Upon completion of this course, the student can able to

1. Apply the various standards and conventions used in a drawingsheet
2. Perform dimensional and toleranceanalysis
3. Understand the manufacturingdrawings
4. Apply their knowledge in re-dimensioning and tolerancecharting
5. Prepare process chart for a givencomponent
6. Estimate the cost of a givencomponent

UNIT I **5**

Geometric Dimensioning and Representation - Tolerancing, Tolerancing of form, orientation, location and run-outs, Datums and Datum Systems.

UNIT II **5**

Surface texture indication on drawing. Welds - Symbolic representing ofdrawings. Preparation of process - Chart for a given component.

UNIT III **5**

Cost Estimation of setting time and machining time - estimation of material cost, labour cost and overhead cost based on supplied data.

TOTAL 15

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Siddeshwar and Kanniah	Machine Drawing	Tata McGraw Hill	2001
2	Gopalakrishna, K.R	Machine Drawing, 16th Edition	Subhas Stores	2002
3	Wade, O	Tolerance Control in design and manufacturing	Industrial Press	1972

SEMESTER V

16BEME501 **HEATPOWERENGINEERING** **3 0 0 3 100**

COURSE OBJECTIVES

1. To incorporate the concepts and laws in thermodynamic analysis of cyclicprocesses.
2. To impart the mechanisms of combustion offuels.
3. To apply the thermodynamic concepts in steam turbines andnozzles.
4. To learn about the performance ofcompressors.
5. To understand the concept of cogeneration and waste heat recovery in engineeringapplications.
6. To introduce concepts of refrigeration and air conditioning in engineeringapplications

COURSE OUTCOMES

Learners should be able to

1. Calculate the efficiency of various gas powercycles.
2. Calculate the performance characteristics ofengines.
3. Analyze combustion mechanism in ICengines.
4. Evaluate the characteristic of steam turbines andnozzles.
5. Evaluate the performance characteristics ofcompressors.
6. Identify and utilize the concepts of refrigeration and air conditioning in engineeringapplications

UNITI GAS POWER CYCLES ANDICENGINES 9

Otto, Diesel, Dual, Brayton cycles – Calculation of mean effective pressure and air standard efficiency – actual and theoretical PV and TS diagrams of two stroke and four stroke engines–valve timing diagram and port timing diagram – calculation of engine performance, heat balance sheet, retardation – Morse test.

UNITII BOILER AND STEAMPOWERCYCLES 9

Generation of steam, Boiler–Classification, fire tube boiler, water tube boiler, comparison, boiler mountings and accessories, performance of steam boilers – dryness fraction, properties of steam, T–S diagram, Mollier diagram, steam tables, Rankine Cycle – incomplete evaporation – superheated steam –modified cycle.

UNITIII STEAM NOZZLES ANDSTEAM TURBINES 9

Steam nozzles – flow through steam nozzles, effect of friction, critical pressure ratio, super saturated flow – Steam turbines– impulse and reaction turbine, compounding, velocity diagram, condition for maximum efficiency – multi stage turbines, cycles with reheating and regenerating heating – reheat factor, degree of reaction - governing of turbines.

UNITIV AIR COMPRESSORS 9

Classifications of compressors – Reciprocating air compressor – performance characteristics, effect of clearance volume, free air delivery and displacement, intercooler, after cooler – Rotary compressor – vane type, centrifugal and axial, flow performancecharacteristics.

UNITV REFRIGERATION ANDAIR CONDITIONING 9

Fundamentals of refrigeration – COP – Vapour compression refrigeration system – cycle, p–h chart, Vapour absorption system – comparison, properties of refrigerants. Fundamentals of air conditioning system, cycle, controls, air handling and distribution, simple cooling and heat load estimation

TOTAL 45

(Permitted to use standard thermodynamic table, Mollier diagram, Psychometric chart and Refrigeration property table in the examination)

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rajput R.K	Thermal Engineering, Sixth edition	Laxmi Publications, New Delhi	2015
2	Arora C.P	Refrigeration and Air conditioning	Tata McGraw–Hill, New Delhi	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kothandaraman C.P, and DomkundwarA.V	A course in Thermal Engineering, Fifth Edition	Dhanpat Rai and Sons, Delhi	2006
2	Ganesan V	Internal Combustion Engines	Tata McGraw–Hill, New Delhi	2012
3.	Yunus A Cengel	Thermodynamics' An Engineering Approach	Tata McGraw Hill, New Delhi	2015

WEB REFERENCES

1. www.kruse–ltc.com
2. www.grc.nasa.gov
3. www.poweronsite.org
4. www.machinerylubrication.com
5. www.tpub.com

16BEME502 DESIGN OF MACHINE ELEMENTS 3 2 0 4 100

COURSE OBJECTIVES

1. To understand the various types of stresses induced in different machine members.
2. To Study and acquire knowledge on design shaft and couplings for effective transmission of power.
3. To study the features of welded joints and fasteners required for various industrial applications.
4. To give exposure to design springs and flywheels for various engineering applications.
5. To understand the importance design bearings and levers for engineering applications.
6. To make the students conversant to implement design procedure for designing a machine.

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Determine various types of stresses induced in different machine members.
2. Design shaft and couplings for effective transmission of power.
3. Select the type of welded joints and fasteners required for various industrial applications.
4. Design springs and flywheels for various engineering applications.
5. Design bearings and levers for engineering applications.
6. Implement design procedure for designing a machine

UNITI STEADY STRESSES AND VARIABLE STRESSESIN MACHINE MEMBERS 12

Introduction to the design process – factors influencing machine design, selection of materials based on mechanical properties – Factor of safety. Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – Design of curved beams – crane hook and 'C' frame – theories of failure – stress concentration – design for variable loading – Soderberg, Goodman and Gerber relations.

UNITII DESIGN OF SHAFTS ANDCOUPLINGS 12

Design of solid and hollow shafts based on strength, rigidity and critical speed – Design of keys and keyways – Design of rigid and flexible couplings – Introduction to gear and shock absorbing couplings – design of knuckle joints.

UNITIII DESIGN OF FASTENERS ANDWELDEDJOINTS 12

Threaded fasteners – Design of bolted joints including eccentric loading – Design of welded joints for pressure vessels and structures – theory of bonded joints.

UNITIV DESIGN OF SPRINGS 12

Design of helical, leaf, disc and torsional springs under constant loads and varying loads – Concentric torsion springs – Belleville springs.

UNITV DESIGN OF BEARINGS 12

Selection of bearings – sliding contact and rolling contact types – Cubic mean load – Selection of journal bearings – McKees equation – Lubrication in journal bearings – calculation of bearing dimensions.

TOTAL 60

(Permitted to use PSG design data book in the examination)

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Juvinall R.C and Marshek K.M	Fundamentals of Machine Component Design Third Edition	John Wiley and Sons, New Delhi	2011
2	Bhandari V.B	Design of Machine Elements	Tata McGraw–Hill Book Co, New Delhi	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Norton R.L	Design of Machinery	Tata McGraw–Hill Book Co., New Delhi	2011
2	Orthwein W	Machine Component Design	Jaico Publishing Co., New Delhi	2003
3.	Ugural A.C	Mechanical Design – An Integral Approach	McGraw–Hill Book Co., New York	2004
4	Spotts M.F, ShoupT.E	Design and Machine Elements	Pearson Education, New Delhi	2004

WEB REFERENCES:

1. www.roymech.co.uk
2. www.ncbi.nlm.nih.gov
3. www.engineersedge.com
4. www.bearings.machinedesign.com
5. www.efunda.com

16BEME503A DYNAMICS OF MACHINERY 3 0 0 3 100

COURSE OBJECTIVES

1. To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism and cam mechanisms for specified outputmotions.
2. To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machinecomponents.
3. To understand the force-motion relationship in components subjected to external forces and analysis of standardmechanisms.
4. To understand the concept of inertia force and inertia torque.
5. To understand the undesirable effects of unbalances resulting from prescribed motions inmechanism.
6. To understand the effect of Dynamics of undesirablevibrations.

COURSE OUTCOMES

Upon completionof this course, the students can able to

1. Identify the type and mechanism and will be able to perform velocity and accelerationanalysis
2. Classify the types of friction and understand the friction applications used in screw threads, clutches, brakes.
3. Specify the gear terminology and to select appropriate gear trains for engineeringapplications.
4. Perform force analysis of reciprocating engine and balancing of rotating & reciprocatingmasses.
5. Describe the vibration phenomenon and its types along with the vibrationterminologies.
6. Analyze the systems subjected tovibration

UNITI FORCEANALYSIS 9

Rigid Body dynamics in general plane motion – Equations of motion – Dynamic force analysis – Inertia force and Inertia torque – D'Alemberts principle – The principle of superposition – Dynamic Analysis in Reciprocating Engines – Gas Forces – Equivalent masses – Bearing loads – Crank shaft Torque – Turning moment diagrams – Fly wheels.

UNITII BALANCING 9

Static and dynamic balancing – Balancing of rotating masses – Balancing a single cylinder Engine – Balancing Multi–cylinder Engines – Partial balancing in locomotive Engines.

UNITIII FREEVIBRATION 9

Basic features of vibratory systems – idealized models – Basic elements and lumping of parameters – Degrees of freedom – Single degree of freedom – Free vibration – Equations of motion – natural frequency – Damping Types of Damping – Damped vibration, critical speeds of simple shaft.

UNITIV FORCED VIBRATION ANDTORSIONALVIBRATION 9

Response to periodic forcing – Harmonic Forcing – Forcing caused by unbalance – Support motion – Force transmissibility and amplitude transmissibility – Vibration isolation.

UNITV MECHANISMSFOR CONTROL 9

Governors – Types – Centrifugal governors – Gravity controlled and spring controlled centrifugal governors – Characteristics – Effect of friction – Controlling Force – other Governor mechanisms.
Gyroscopes – Gyroscopic forces and Torques – Gyroscopic stabilization – Gyroscopic effects in Automobiles, ships and airplanes

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rattan S.S	Theory of Machines	Tata McGraw–Hill Publishing Company Ltd., New Delhi	2014
2	Shigley J.E, UickerJ.J	Theory of Machines and Mechanisms	McGraw–Hill, New York	2011

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rao J.S., DukkipatiR.V	Mechanism and Machine Theory	Wiley– Eastern Limited, New Delhi	2007
2	John Hannah and Stephens R.C	Mechanics of Machines	Viva Books Pvt Ltd	2005
3.	Thomas Bevan	Theory of Machines	CBS Publishers and Distributors, New Delhi	2011

WEB REFERENCES

1. http://freevideolectures.com/Course/2364/Dynamics–of–Machines
2. http://en.wikipedia.org/wiki/Balancing_of_rotating_masses
3. http://www.efunda.com/formulae/vibrations/sdof_free_damped.cfm
4. http://www.roymech.co.uk/Useful_Tables/Vibrations/Free_Vibrations.html

16BEME503B **THEORY OF MACHINES** **3 0 0 3 100**

COURSE OBJECTIVE

1. To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism and cam mechanisms for specified outputmotions.
2. To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machinecomponents.
3. To understand the force-motion relationship in components subjected to external forces and analysis of standardmechanisms.
4. To understand the concept of inertia force and inertia torque.
5. To understand the undesirable effects of unbalances resulting from prescribed motions inmechanism.
6. To understand the effect of Dynamics of undesirablevibrations.

COURSE OUTCOMES

Upon completionof this course, the students can able to
1. Identify the type and mechanism and will be able to perform velocity and accelerationanalysis
2. Classify the types of friction and understand the friction applications used in screw threads, clutches, brakes.
3. Specify the gear terminology and to select appropriate gear trains for engineeringapplications.
4. Perform force analysis of reciprocating engine and balancing of rotating & reciprocatingmasses.
5. Describe the vibration phenomenon and its types along with the vibrationterminologies.
6. Analyze the systems subjected tovibration

UNITI KINEMATIC ANALYSIS **9**
Introduction- General concepts, Introduction of Simple mechanism, Different types of Kinematics pair, Grublers rule for degree of freedom, Grashof's Criterion for mobility determination.
Kinematic Analysis- Concepts of vectorial analysis. Velocity and Acceleration Analysis of planar mechanisms

UNITII CAMS ANDGEARS **9**
Cams- Classifications – Displacement diagrams–parabolic, Simple harmonic and Cycloidal motions – Layout of cam profiles – Knife and Roller followers.
Gears- Geometry of tooth profiles, Law of gearing, Involute profile, interference, helical, spiral and worm gears, simple, compound gear trains. Epicyclic gear trains

UNITIII DYNAMICANALYSIS **9**
Dynamic Analysis of Slider-crank mechanisms, turning moment computations.
Balancing- Static and Dynamic balancing Balancing of revolving & reciprocating masses in single and multi-cylinder engines.

UNITIV VIBRATION **9**
Vibration analysis of SDOF systems, Natural, damped forced vibrations, Based-excited vibrations, transmissibility ratio.

UNITV MECHANISMSFOR CONTROL **9**
Governors – Types – Centrifugal governors – Gravity controlled and spring controlled centrifugal governors – Characteristics – Effect of friction – Controlling Force – other Governor mechanisms.
Gyroscopes – Gyroscopic forces and Torques – Gyroscopic stabilization – Gyroscopic effects in Automobiles, ships and airplanes

TOTAL **45**

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rattan S.S	Theory of Machines	Tata McGraw–Hill Publishing Company Ltd., New Delhi	2014
2	Shigley J.E, UickerJ.J	Theory of Machines and Mechanisms	McGraw–Hill, New York	2011

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rao J.S., DukkipatiR.V	Mechanism and Machine Theory	Wiley– Eastern Limited, New Delhi	2007
2	John Hannah and Stephens R.C	Mechanics of Machines	Viva Books Pvt Ltd	2005
3.	Thomas Bevan	Theory of Machines	CBS Publishers and Distributors, New Delhi	2011

WEB REFERENCES

1. http://freevideolectures.com/Course/2364/Dynamics–of–Machines
2. http://en.wikipedia.org/wiki/Balancing_of_rotating_masses
3. http://www.efunda.com/formulae/vibrations/sdof_free_damped.cfm
4. http://www.roymech.co.uk/Useful_Tables/Vibrations/Free_Vibrations.html

16BEME5E-- PROFESSIONAL ELECTIVEI 3 0 0 3 100

16BEME5E-- PROFESSIONAL ELECTIVEII 3 0 0 3 100

16BEME511 SCIENTIFICCOMPUTINGLABORATORY 2 0 2 3 100

COURSE OBJECTIVES

1. To introduce the scientific computing, covering some important aspects of solving algebraic equations, IVP,BVP.
2. To implement the methods using the spread sheet inExcel.
3. To make students familiar with the concepts of programming and the get them accustomed with high-level languages like Matlab, Mathematica, etc.
4. To provide an overview of some of the issues and problems that arise in scientific computation, such as (non-)linear systems, numerical and symbolic integration
5. To provide an overview of some of the issues and problems that arise in scientific computation, such as (non-)linear systems, numerical and differential equations and simulation.
6. To make students to get knowledge about real-time problem-solving skill.

COURSE OUTCOMES

1. Apply numerical methods to find our solution of algebraic equations using different methods.
2. Understand the different conditions, and numerical solution of system of algebraic equations.
3. Apply various interpolation methods and finite difference concepts.
4. Can apply numerical differentiation and integration whenever and wherever routine methods are not applicable.
5. Work numerically on the ordinary differential equations using different methods through the theory of finite differences.
6. Work numerically on the partial differential equations using different methods through the theory of finite differences.

LIST OF EXPERIMENTS

1. Finding solution of Transcendentalequation
   i) Newton – RaphsonMethod
   ii) Bisectionmethod
   iii) Iterative method by reducing the equation to the form x=f(x)

2. Finding the dominant eigenvalue and eigenvector by powermethod

3. Numericalintegration
   i) Gauss 2 point and 3 pointformulae
   ii) Trapezoidal method
   iii) Simpson’s 1/3rule

4. Solution of initial value problems governed byODE
   i) Runge - Kutta 4^{th} ordermethod
   ii) Modified Euler’smethod
   iii) Milne’smethod
   iv) Adam – Bashforthmethod

5. Solution of BVP governed byPDE
   i) LaplaceEquation
   ii) One – dimensional heat equation
      a) Explicit method : Bender – Schmidt’smethod
      b) Implicit method : Crank - Nicolson’smethod
   iii) One dimensional wave equation Implicitmethod

TOTAL 60

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Curtis F. Gerald and Patrick O. Wheatley	Applied Numerical Analysis	Pearson Education, South Asia	2009
2	Steven C. Chapra, Raymond P. Canale	Numerical Methods for Engineers	McGraw - Hill Pub. Co. Ltd	2014

16BEME512 DYNAMICS AND METROLOGY LABORATORY 0 0 4 2 100

COURSE OBJECTIVE

1. To Understand the working of various governors.
2. To introduce jump speed and profile of the cam
3. To understand the importance of moment of inertia by oscillation method for connecting rod and flywheel.
4. To introduce the concepts to Characterize and calibrate measuring devices.
5. To expose students to measuring taper angle straightness, flatness, surface finfish and thread parameters.
6. To explain the limits of dimensional tolerances using comparators

COURSE OUTCOME

1. Understand the working of various governors.
2. Determine of jump speed and profile of the cam
3. Determine moment of inertia by oscillation method for connecting rod and flywheel.
4. Characterize and calibrate measuring devices.
5. Measure taper angle straightness, flatness, surface finfish and thread parameters
6. Examine the limits of dimensional tolerances using comparators

LIST OF EXPERIMENTS

DYNAMICS

1. Governors – Determination of sensitivity, effort, etc. for Watt, Porter, Proell, and springcontrolled Governors
2. Cam – Determination of jump speed and profile of thecam.
3. Motorized Gyroscope–Verification of laws –Determination of gyroscopiccouple.
4. Whirling of shaft–Determination of critical speed of shaft with concentratedloads.
5. Balancing of rotating and reciprocatingmasses.
6. Determination of moment of inertia by oscillation method for connecting rod andflywheel.
7. Vibrating system – spring mass system – Determination of damping co–efficient of single degree of freedomsystem
8. Determination of torsional frequencies for compound pendulumand flywheel system with lumped moment ofinertia.
9. Transverse vibration –free– Beam. Determination of natural frequency and deflection ofbeam.
10. Strain gauge measurementsystem.

METROLOGY

1. Calibration of Vernier / Micrometer / Dialgauge
2. Checking dimensions of part using slipgauges
3. Measurement of gear tooth dimensions – addendum, dedendum, pitch circle diameter and tooththickness
4. Measurement of taper angle using sine bar / tool makersmicroscope
5. Measurement of straightness andflatness
6. Measurement of threadparameters
7. Checking the limits of dimensional tolerances using comparators (Mechanical / Pneumatic /Electrical)
8. Surface finish measurement

TOTAL 45

16BEME513 THERMAL ENGINEERINGLABORATORYI 0 0 4 2 100

COURSE OBJECTIVES

1. To impart knowledge on valve timing diagram and port timing diagram for single cylinder four stroke diesel engine and two stroke petrol engine.
2. To understand the importance of mechanical efficiency of four stroke SI engine by Morse test.
3. To provide an overview of performance of four stroke single cylinder CI engine.
4. To provide an overview of performance of steam generator and steam turbines.
5. To expose students to the flash and fire point of various fuel
6. To expose students to the flash and fire point of various lubricants

COURSE OUTCOMES

1. Sketch the valve timing diagram for four stroke diesel engine andpetrol engines.
2. Sketch the port timing diagramfor single cylinder two stroke diesel engine andpetrol engines.
3. Calculate the mechanical efficiency of four stroke SI engine by Morse test.
4. Evaluate the performance of four stroke single cylinder CI engine.
5. Evaluate the performance of steam generator and steam turbines.
6. Measure the flash and fire point of various fuel/lubricants.

LIST OF EXPERIMENTS

1. Valve Timing and Port TimingDiagrams.
2. Performance Test on 4–stroke DieselEngine.
3. Heat Balance Test on 4–stroke DieselEngine.
4. Load test on 4–stroke DieselEngine.
5. Morse Test on multicylinder PetrolEngine.
6. Retardation Test to find Frictional Power of a DieselEngine.
7. Determination of Viscosity – Red WoodViscometer.
8. Determination of Flash Point and FirePoint.
9. Study of Steam Generators andTurbines.
10. Performance and energy balance test on a steamgenerator

TOTAL 45

16BEME551 IN–PLANTTRAINING --100

COURSE OBJECTIVES

1. To expose students to problem definitions
2. To understand the Fabricate device/system/component (s) for problem solving.
3. To equip them subject knowledge to solve real world problems.
4. To acquaint the student to newer techniques to improve the performance of a device/system.
5. To develop the skill to prepare the project reports
6. To develop the skill to prepare power point presentation and to face reviews and viva voce examination.

COURSE OUTCOMES

1. Formulate problem definitions
2. Fabricate device/system/component (s) for problem solving.
3. Apply subject knowledge to solve real world problems.
4. Implement newer techniques to improve the performance of a device/system.
5. Develop the skill to prepare the project reports
6. Develop the skill to prepare power point presentation and to face reviews and viva voce examination.

Students will undergo industrial training for four weeks during the vacation at the end of IV semester and a report with the training completion certificate from the industry will be subsequently submitted to the department with in a week after completion. Viva – Voce exam will be conducted at the end of V semester and 100 marks will be awarded.

16BEME552 GEOMETRICAL DIMENSIONINGANDTOLERANCE 1 0 0 -100

COURSE OBJECTIVES

1. To understand the concepts of geometrical dimensioning andTolerancing
2. To study the physical importance of them in industrial point ofview
3. To know the various types of Tolerancing, its measurement anddesign.
4. To translate geometric callouts into plain English with one meaning.
5. To explain the major rules found in ASME Y14.5-2009
6. To understand the hierarchy of geometric tolerancing.

COURSE OUTCOMES

1. Ability to learn and apply geometric dimensioning and tolerance standards to communicate designintent
2. Ability to Learn how the knowledge of certain processes can affect part design anddocumentation
3. Gain added insight on working in a team designenvironment.
4. Translate geometric callouts into plain English with one meaning.
5. Explain the major rules found in ASME Y14.5-2009
6. Understand the hierarchy of geometric tolerancing

UNITI INTRODUCTION TO GDANDT 5

Introduction to Geometric dimensioning and Tolerancing – working of geometric system – Terms and definitions – Common symbols and Terminology – Fundamental Rules (Drawing)– Feature definition – With Size and Without Size – Material Condition (Maximum, Least, Regard of Material Condition)– Limit Tolerancing – Dimension Origin –Limits of Size, Rule 1 or Envelope Principle – Go– No Go Gauges.

UNITII FORM ANDORIENTATIONTOLERANCE 5

and design considerations – Flatness and Circularity measurement concepts – Orientation tolerance specification and application design.

UNITIII POSITION ANDRUNOUTTOLERANCE 5

Profile of surface and line tolerance design and application – Location tolerance, Position, applied and material condition consideration – Coaxial controls and design – Concentricity, Symmetry – Measurement and application – Design considerations – Position, Composite tolerance concept, design and Measurement – Runout, Total Runout tolerances – Measurement and considerations.

TOTAL 15

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Siddeshwar and Kanniah	Machine Drawing	Tata McGraw Hill	2001
2	Gopalakrishna, K.R	Machine Drawing	, Subhas Stores	2002
3.	Wade. O	Tolerance Control in design and manufacturing	Industrial Press	1972

WEB REFERENCE

1. IS :10714,10715,10716,10717,11669,10719,813,919,2709,8000 pt 1 to 10721,11158 andAWS/ISO

SEMESTER VI

16BEME601 OPERATIONSRESEARCH 3 2 0 4 100

COURSE OBJECTIVE

1. To Formulate and solve engineering and managerial situations as LPP.
2. To understand the Engineering and Managerial situations in Transportation.
3. To Study and acquire knowledge on engineering and Managerial solutions in Assignment and scheduling problems.
4. To give exposure to inventory in industry.
5. To make the student acquire sound knowledge on sequences to perform operation among various alternatives.
6. To provide an overview of various tools in various sections of industries like marketing, material handling etc.

COURSE OUTCOMES

At the end of the course, student will be able to understand the

1. Formulate and solve engineering and managerial situations as LPP.
2. Solve Engineering and Managerial situations in Transportation.
3. Give Engineering and Managerial solutions in Assignment and scheduling problems.
4. Manage inventory in industry.
5. Select better sequence to perform operation among various alternatives.
6. Apply the various tools in various sections of industries like marketing, material handling etc

UNITI INTRODUCTION TOOPERATIONS RESEARCH 12

Operations research and decision–making – types of mathematical models and constructing the model – Role of computers in operations research –Linear Programming Techniques: Formulation of linear programming problem, applications and limitations, graphical method, simplex method – The Big –M method – the two–phase method.

UNITII TRANSPORTATIONPROBLEMS 12

Least cost method, North west corner rule, Vogel's approximation method, modified distributionmethod, optimization models, unbalance and degeneracy in transportation model.

UNITIII ASSIGNMENT MODELSANDSCHEDULING 12

Assignment models - Hungarian algorithm, unbalanced assignment problems - maximization case in assignment problems, traveling salesman problem. Scheduling – processing n jobs through two machines, processing n jobs through three machines, processing two jobs through 'm' machines, processing n jobs through m machines.

UNITIV INVENTORY CONTROL ANDQUEUINGTHEORY 12

Variables in inventory problems, inventory models with penalty, shortage and quantity discount, safety stock, multi item deterministic model.

Queuing Models: Queues – Notation of queues, performance measures, The M/M/1 queue, The M/M/m queue, batch arrival queuing system, queues with breakdowns.

UNITV PROJECT MANAGEMENT, GAME THEORY,REPLACEMENTMODELS 12

Basic terminologies, constructing a project network, network computations in CPM and PERT, cost crashing – Replacement Models: Replacement of Items due to deterioration with and without time value of Money, Group replacement policy, Staff replacement

TOTAL 60

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kanti Swarup, Gupta P.K and Manmohan	Operations Research	Sultan Chand and Sons, New Delhi	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Viswanathan N and Narahari Y	Performance Modeling of Automated Manufacturing Systems	Prentice Hall Inc, Newyork	2000
2	Prem kumar Gupta and Hira D.S	Operation Research	S Chand and Company Limited, New Delhi	2015

WEB REFERENCES

1. http://www.scienceofbetter.org/what/index.htm
2. http://www.informs.org/Pubs/OR
3. http://www.me.utexas.edu/~jensen/ORMM/models/unit/network/subunits/special_cases/transportation.html
4. http://www.projectmanagement.com/

16BEME602 DESIGN OF TRANSMISSION SYSTEMS 3 0 0 3 100

COURSE OBJECTIVES

1. To Study and acquire knowledge on design the power transmission components like belts, pulleys, ropes, chains and sprockets.
2. To Study and acquire knowledge on design spurs and parallel axis helical gears.
3. To give exposure to dimensions for bevel and worm gears.
4. To provide an overview of design procedures of gear boxes for industrial applications.
5. To provide an overview of clutches and brakes for engineering applications.
6. To make the student acquire sound knowledge of mechanical system

COURSE OUTCOMES

Upon completion of this course, the students will able to

1. Design the power transmission components like belts, pulleys, ropes, chains and sprockets.
2. Design spurs and parallel axis helical gears.
3. Estimate the dimensions for bevel and worm gears.
4. Practice the design procedures of gear boxes for industrial applications.
5. Design clutches and brakes for engineering applications.
6. Design a mechanical system

UNITI DESIGN OF TRANSMISSION SYSTEMS FORFLEXIBLEELEMENTS 9

Design of V belts and pulleys – Selection of Flat belts and pulleys – Wire ropes and pulleys – Selection of Transmission chains and Sprockets – Design of sprockets.

UNITII DESIGN OF SPUR ANDHELICALGEARS 9

Gear Terminology – Speed ratios and number of teeth–Force analysis – Tooth stresses – Dynamic effects – Fatigue strength – Factor of safety – Gear materials – Module and Face width–power rating calculations based on strength and wear considerations – Parallel axis Helical Gears – Pressure angle in the normal and transverse plane– Equivalent number of teeth–forces and stresses – Estimating the size of the helical gears.

UNITIII DESIGN OF BEVEL ANDWORMGEARS 9

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears. Worm Gear: Merits and demerits– terminology – Thermal capacity, materials–forces and stresses, efficiency, estimating the size of the worm gear pair – Cross helical: Terminology–helix angles–Estimating the size of the pair of cross helical gears.

UNITIV DESIGN OFGEARBOXES 9

Geometric progression – Standard step ratio – Ray diagram, kinematics layout –Design of sliding mesh gear box –Constant mesh gear box. – Design of multi speed gear box.

UNITV DESIGN OF CLUTCHESANDBRAKES 9

Design of plate clutches –axial clutches–cone clutches–internal expanding rim clutches–internal and external shoe brakes.

TOTAL 45

(Permitted to use PSG design data book in the examination)

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	JuvinallR. C, MarshekK.M	Fundamentals of Machine component Design	John Wiley and Sons., London	2011
2	Bhandari, V.B	Design of Machine Elements	Tata McGraw–Hill Publishing Company Ltd, New York	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Maitra G.M., Prasad L.V	Hand book of Mechanical Design	Tata McGraw–Hill, New Delhi	2009
2	Shigley J.E, Mischke C.R	Mechanical Engineering Design	McGraw–Hill International Editions, New Delhi	2014
3	Prabhu. T.J	Design of Transmission Elements	Mani Offset, Chennai	2002

WEB REFERENCES

1. http://en.wikipedia.org/wiki/Gear
2. http://www.physicsforums.com/showthread.php?t=292163
3. http://www.seminarprojects.com/Thread–design–and–fabrication–of–gearbox–full–report
4. http://www.cs.cmu.edu/~rapidproto/mechanisms/chpt6.htm

16BEME603 HEAT AND MASS TRANSFER 3 2 0 4 100

COURSE OBJECTIVES

1. To Study and acquire knowledge on heat transfer for conduction.
2. To introduce the concepts of heat transfer coefficients for natural and forced convection for different fluid flows.
3. To understand the performance of heat exchanger.
4. To study the features of radiation heat transfer between the surfaces.
5. To give exposure to mass transfer.
6. To make the students conversant to solve complex problems where heat and mass transfer takes place.

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Determine the rate of heat transfer for conduction.
2. Evaluate heat transfer coefficients for natural and forced convection for different fluid flows.
3. Analyze performance of heat exchanger.
4. Estimate the radiation heat transfer between the surfaces.
5. Calculate the coefficient of mass transfer.
6. Solve complex problems where heat and mass transfer takes place

UNITI CONDUCTION 12

Basic Concepts – Mechanism of Heat Transfer – Conduction, Convection and Radiation – General Differential equation of Heat Conduction – Fourier Law of Conduction – Cartesian and Cylindrical Coordinates – One Dimensional Steady State Heat Conduction – Conduction through Plane Wall, Cylinders and Spherical systems – Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis – Use of HeislersChart.

UNITII CONVECTION 12

Basic Concepts – Convective Heat Transfer Coefficients – Boundary Layer Concept – Types of Convection – Forced Convection – Dimensional Analysis – External Flow – Flow over Plates, Cylinders and Spheres – Internal Flow – Laminar and Turbulent Flow – Combined Laminar and Turbulent – Flow over Bank of tubes – Free Convection – Dimensional Analysis – Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders andSpheres.

UNITIII PHASE CHANGE HEAT TRANSFER ANDHEATEXCHANGERS 12

Nusselts theory of condensation–pool boiling, flow boiling, correlations in boiling and condensation. Types of Heat Exchangers – LMTD Method of heat Exchanger Analysis – Effectiveness – NTU method of Heat Exchanger Analysis – Overall Heat Transfer Coefficient – Fouling Factors.

UNITIV RADIATION 12

Basic Concepts, Laws of Radiation – Stefan Boltzman Law, Kirchoff Law –Black Body Radiation –Grey body radiation - Shape Factor Algebra – Electrical Analogy – Radiation Shields –Introduction to Gas Radiation.

UNITV MASS TRANSFER 12

Basic Concepts – Diffusion Mass Transfer – Fick’s Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations

TOTAL 60

(Permitted to use standard Heat and Mass Transfer Table in the examination)

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Sachdeva R.C	Fundamentals of Engineering Heat and Mass Transfer	New Age International, New Delhi	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Frank P. Incropera and David P. DeWitt	Fundamentals of Heat and Mass Transfer	John Wiley and Sons, New Delhi	2011
2	OzisikM.N	Heat Transfer	McGraw–Hill Book Co, New Delhi	1994
3	KothandaramanC.P	Fundamentals of Heat and Mass Transfer	New Age International, New Delhi	2012

WEB REFERENCES

1. http://nptel.iitm.ac.in/courses/Webcourse–contents/IISc–BANG/Heat%20and%20Mass%20Transfer/New_index1.html
2. http://www.learnerstv.com/Free–Engineering–Video–lectures–ltv084–Page1.htm
3. http://en.wikipedia.org/wiki/Heat_transfer

16BEME604 ECONOMICS FOR ENGINEERS 3 0 0 3 100

COURSE OBJECTIVES

1. To enable students to understand the fundamental economic concepts applicable to engineering
2. To learn the techniques of incorporating inflation factor in economic decision making.
3. To Understand the measures of national income, the functions of banks and concepts of globalization
4. To Apply the concepts of financial management for project appraisal
5. To Understand accounting systems and analyze financial statements using ratio analysis
6. To Understand Financial planning, economic basis for replacement.

COURSE OUTCOMES

1. Evaluate the economic theories, cost concepts and pricing policies.
2. Understand the market structures and integration concepts
3. Understand the measures of national income, the functions of banks and concepts of globalization
4. Apply the concepts of financial management for project appraisal
5. Understand accounting systems and analyze financial statements using ratio analysis
6. Understand the impact of inflation, taxation, depreciation. Financial planning, economic basis for replacement, project scheduling, and legal and regulatory issues are introduced and applied to economic investment and project-management problems

UNIT1 FUNDAMENTALS OF ENGINEERINGECONOMICS 9

Introduction to Engineering Economics – Definition, Scope and Significance – Demand and supply analysis – Definition – Law of Demand – Elasticity of Demand – Demand Forecasting – Supply – Law of supply – Elasticity of Supply.

UNITII COMMERCIALBANKING 9

Law of contracts, negotiable instruments, its types and regulations there on – New Industrial Policy – MSME sector – Development financial institutions and their relevance – Export Promotion - DICGC, ECGCI, EXIM Bank - Import and export concepts - Letter of credit, forward contracts / hedging.

UNITIII CAPITALMARKET 9

Stock Exchanges – Functions – Listing of Companies – Role of SEBI – Capital Market Reforms. Money and banking - Money – Functions –Inflation and deflation – Commercial Bank and its functions – Central bank and its functions.

UNITIV FINANCIALCONCEPTS 9

Introduction, scope and objectives of basic financial concepts – time value of money – Interest - simple & compound interest, annuity and effective rate of interests. Appraisal of project for profitability, internal rate of return – payback period – net present value. NPV comparison – cost benefit analysis. Sources of finance – internal and external.

UNITV COST ANALYSIS AND BREAKEVENANALYSIS 9

Cost analysis - Basic cost concepts – Financial accounting, account posting rules, Trial balance, Profit and loss account and Balance sheet aspects – Cost output in the short and long run. Depreciation -meaning – Causes – Methods of computing Depreciation (simple problems in Straight Line Method, Written Down Vale Method). Meaning – Break Even Analysis - Managerial uses ofBEA.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	RamachandraAryasri V. V.RamanaMurthy	Engineering Economics & Financial Accounting	Tata McGraw Hill,–,New Delhi	2007
2	Varshney R. L., and K.L Maheshwari	Managerial Economics	Sultan Chand & Sons, New Delhi	2001

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M.L.Jhingan	Principles of Economics	Konark Publications	2010
2	Prasanna Chandra	Fundamentals of Financial Management	Tata McGraw Hill, New Delhi.	2007
3	D.M.Mithani	Money, Banking, International Trade & Public Finance	Himalaya Publishing House	2004

WEB REFERENCES

1. http://economictimes.indiatimes.com
2. http://www.economist.com/
3. http://www.managementstudyguide.com/financial-management.htm

16BEME6E - - **PROFESSIONAL ELECTIVE III** **3 0 0 3 100**

16BEME6E -- **PROFESSIONALELECTIVEIV** **3 0 0 3 100**

16BEME611 **COMPUTER AIDED MODELINGANDSIMULATION LABORATORY** **0 0 3 2 100**

COURSE OBJECTIVE

1. To gain practical experience in handling 2D drafting and 3D modeling softwaresystems.
2. To impart training on SOLID WORKS for modelling
3. To provide knowledge on assembly ofcomponents
4. To facilitate the understanding of manufacturing drawings from the modelscreated
5. To understand the importance of MAT Lab for simulating different systems
6. To acquaint the student with the concepts of MAT lab for performing various mathematical operations

COURSE OUTCOME

Upon completion of this course, the students can able to

1. use computer and CAD software's for modeling of mechanicalcomponents
2. use various options in SolidWorks for modeling of givencomponents
3. create assembly ofcomponents
4. prepare manufacturing drawings from the modelscreated
5. Use MAT Lab for simulating different systems like hydraulic and pneumaticcircuits
6. Use mat lab for performing various mathematicaloperations

COMPUTER AIDED DESIGN

1. 3D modeling of various machine elements using various options like protrusion, cut,sweep, draft, loft, blend,rib.
2. Assembly – creating assembly from parts – assemblyconstraints
3. Conversion of 3D solid model to 2D drawing – different views, sections, isometric view and dimensioning.
4. Introduction to SurfaceModeling.
5. Introduction to File Import, Export – DXF, IGES, STL,STEP

Note: Any one of the 3D MODELING software's like SOLIDWORKS, CREO, CATIA, NX Software, AutoCADetc.

COMPUTER AIDED SIMULATION

1. Simulation of Air conditioning system with condenser temperature and evaporatortemperatures as input to get COP usingSoftware
2. Simulation of Hydraulic / Pneumatic cylinder usingSoftware
3. Simulation of cam and follower mechanism usingSoftware
4. MATLAB basics, Dealing with matrices, Graphing-Functions of one variable and twovariables
5. Use of MATLAB to solve simple problems invibration

TOTAL **45**

16BEME612 THERMAL ENGINEERING LABORATORY II 0 0 3 2 100

COURSE OBJECTIVE

1. To impart knowledge on thermal conductivity of various engineering materials.
2. To acquaint the student with the concepts of heat transfer rate in free and forced convection environment.
3. To Study and acquire knowledge of grey surface.
4. To study the features of Stefan–Boltzmann constant.
5. To provide an overview of the effectiveness of parallel and counter flow heat exchanger.
6. To provide an overview of COP of refrigeration and air conditioning system and performance of air compressor and fluidized bed cooling tower

COURSE OUTCOME

1. Conduct a test to find thermal conductivity of various engineering materials.
2. Measure heat transfer rate in free and forced convection environment.
3. Measure emissivity of grey surface.
4. Determine Stefan–Boltzmann constant.
5. Measure the effectiveness of parallel and counter flow heat exchanger.
6. Measure COP of refrigeration and air conditioning system and performance of air compressor and fluidized bed cooling tower

LIST OF EXPERIMENTS

HEAT TRANSFER

1. Heat transfer through a compositewall
2. Thermal conductivity measurement by guarded platemethod
3. Natural convection heat transfer from a verticalcylinder
4. Heat transfer from pin–fin (natural and forced convectionmodes)
5. Effectiveness of Parallel/counter flow heat exchanger
6. Determination of Stefan–Boltzmannconstant
7. Determination of emissivity of a greysurface

REFRIGERATION AND AIR CONDITIONING

1. Performance test on single/two stage reciprocating aircompressor.
2. Determination of COP of a refrigerationsystem
3. Experiments on air–conditioningsystem

TOTAL 45

16BEME651 MINI PROJECT 0 0 1 -100

COURSE OBJECTIVE

1. To expose students to problem definitions
2. To understand the Fabricate device/system/component (s) for problem solving.
3. To equip them subject knowledge to solve real world problems.
4. To acquaint the student to newer techniques to improve the performance of a device/system.
5. To develop the skill to prepare the project reports
6. To develop the skill to prepare power point presentation and to face reviews and viva voce examination.

COURSEOUTCOMES

1. Formulate problem definitions
2. Fabricate device/system/component (s) for problem solving.
3. Apply subject knowledge to solve real world problems.
4. Implement newer techniques to improve the performance of a device/system.

5. Develop the skill to prepare the project reports
6. Develop the skill to prepare power point presentation and to face reviews and viva voce examination.

The students may be grouped into 2 to 4 and work under a project supervisor. The device/ system/component(s) to be fabricated may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

16BEME652 TECHNICALPRESENTATION 1 0 0 -100

COURSE OBJECTIVES

1. To equip the students with effective technicalpresentation
2. To understand the barriers and bridges tocommunication
3. To improve the public speaking capabilities, body language andposture.
4. To improve the literature survey skill.
5. To develop presentation skill using power point presentation
6. To improve skill to face viva voce examination.

COURSE OUTCOMES

1. Develop the ability to fabrication skill.
2. Ability to make literature review till the successful solution.
3. Ability to identify specific problems.
4. Gain the knowledge about data collection and conducting experiments.
5. Develop the skill to prepare the project reports
6. Develop the skill to prepare power point presentation and to face reviews and viva voce examination

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.

Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models.

TOTAL 15

SEMESTER VII

16BECC701 PROFESSIONAL ETHICS, PRINCIPLESOFMANAGEMENT AND ENTREPRENEURSHIPDEVELOPMENT 3 0 0 3 100

COURSE OBJECTIVE

1. To understand objectives, Strategies, Policies and Plan.
2. To introduce pans by directing and controlling.
3. To Understand the need of Engineering Ethics.
4. To Understand the forces that shape culture.
5. To develop the entrepreneurial skills.
6. To make the students conversant to execute an engineering plan with ethics

COURSE OUTCOME

1. Prepare objectives, Strategies, Policies and Plan.
2. Execute plans by directing and controlling.
3. Understand the need of Engineering Ethics.
4. Understand the forces that shape culture.
5. Show the entrepreneurial skills.
6. Execute an engineering plan with ethics

UNITI HISTORICAL DEVELOPMENT,PLANNING, ORGANISING 9

Definition of Management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies and Planning Premises– Forecasting – Decision–making – Formal and informal organization – Organization Chart –.

UNITII DIRECTINGANDCONTROLLING 9

Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment –Process of Communication – System and process of Controlling – Requirements for effective control – Control of Overall Performance – Direct and Preventive Control – Reporting

UNITIII ENGINEERINGETHICS 9

Senses of 'Engineering Ethics' – variety of moral issued – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – Models of ProfessionalRoles – theories about right action – Self–interest – customs and religion – uses of ethical theories.

UNITIV FACTORSOFCHANGES 9

Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws. Social changes – Meaning and nature – Theories.

UNITV ENTREPRENEURSHIPANDMOTIVATION 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need,Objectives.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harold Kooritz and Heinz Weihrich	Essentials of Management	Tata McGraw Hill, New Delhi	2010
2	Khanka S.S	Entrepreneurial Development	S.Chand and Co. Ltd., NewDelhi	2013
3	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw–Hill, NewYork	2005

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Tripathy P.C and Reddy P.N	Principles of Management	Tata McGraw Hill, New Delhi	2012
2	Rabindra N Kanungo	Entrepreneurship and innovation	Sage Publications, New Delhi	1998
3	Charles E Harris, and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, New Delhi	2013

WEB REFERENCES

1. http://www.managementstudyguide.com/taylor_fayol.htm
2. http://tutor2u.net/business/gcse/people_motivation_theories.htm
3. http://lfkkb.tripod.com/eng24/gilliganstheory.html
4. http://www.developingeyes.com/five–types–of–entrepreneurs/

16BEME702 **MECHATRONIC SYSTEMS** **3 0 0 3 100**

COURSE OBJECTIVE

1. To impart knowledge about the elements and techniques involved in Mechatronics systems which are very much essential to understand the emerging field ofautomation.
2. To understand the concepts of sensors andtransducers.
3. To provide an overview of actuationsystems.
4. To expose students to controller model for electrical, mechanical and thermalsystems.
5. To provide knowledge about various types ofcontrollers
6. To facilitate the understanding of PLC program using ladderlogic.

COURSE OUTCOME

Upon completion of this course, the students can able to
1. Implement the concepts of sensors andtransducers.
2. Design the actuationsystems.
3. Develop the controller model for electrical, mechanical and thermalsystems.
4. Explain about various types ofcontrollers
5. Create the PLC program using ladderlogic.
6. Design Mechatronicssystem.

UNITI MECHATRONICS SENSORSANDTRANSDUCERS 9

Introduction to Mechatronics – Systems – Measurement Systems – Control Systems –Traditional design – Microprocessor based Controllers. Introduction to sensors – Performance Terminology – Static and Dynamic characteristics – Displacement – Position and Proximity – Velocity and Motion – Fluid Pressure – Temperature Sensors – Light Sensors – Selection of Sensors – Signal processing – Servosystems.

UNITII ACTUATORS ANDSYSTEM MODELS 9

Pneumatic and Hydraulic Systems – Directional Control Valves – Rotary Actuators. Mechanical Actuation Systems – Cams – Gear Trains – Ratchet and pawl – Belt and Chain Drives – Bearings. Electrical Actuation Systems – Mechanical Switches – Solid State Switches – Solenoids – D.C Motors – A.C Motors – Stepper Motors.

Introduction to system models– Building block of Mechanical, Electrical, Fluid and Thermal Systems.

UNITIII MICROPROCESSORS INMECHATRONICS 9

Introduction – Architecture – pin configuration Instruction set – Programming of Microprocessors using 8085 instructions – Interfacing. Input and output devices – interfacing D/A converters and A/D converters – Application – Temperature control – Stepper motor control.

UNITIVCONTROLLERS 9

Introduction –Continuous and discrete process Controllers – Control Mode – Two – Step mode – Proportional Mode –Derivative Mode – Integral Mode – PID Controllers –Digital Controllers – Adaptive Control – Digital Logic Control – Micro Processors Control. Introduction to PLC – Basic Structure – Input / Output Processing – Programming – Mnemonics – Timers, Internal relays and counters – Data Handling – Analog Input / Output – Selection of aPLC.

UNIT V DESIGN OFMECHATRONICSYSTEMS 9

StagesindesigningMechatronicsSystems–TraditionalandMechatronicDesign–PossibleDesignSolutions
– Case Studies of Mechatronics Systems, Pick and place robot – automatic Car Park Systems – Engine Management Systems – Introduction to MEMS.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Bolton W	Mechatronics	Pearson Education, Delhi	2013

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Michael B. Histand David G. Alciatore	Introduction to Mechatronics and Measurement Systems	McGraw–Hill International Editions, New York	2012
2	Bradley D, Buru N.C and Loader A.J	Mechatronics	Chapman and Hall, Pearson Education Asia, New Delhi	2000
3	Ghosh P.K and Sridhar P.R	Introduction to Microprocessors for Engineers and Scientist	Prentice Hall of India, New Delhi	2009

WEB REFERENCE

1. www.cs.indiana.edu

16BEME7E -- PROFESSIONALELECTIVEV 3 0 0 3 100

OPENELECTIVE I 3 0 0 3 100

OPENELECTIVE II 3 0 0 3 100

16BEME711 CAE /CAMLABORATORY 0 0 3 2 100

COURSE OBJECTIVE

1. To study the features of the software tools needed to analyze engineering problems.
2. To introduce the concepts of the different applications of simulation and analysis tools.
3. To familiarize the students to understand the features of CNC Machine Tool.
4. To make the student acquire sound knowledge on part programming for machining a work.
5. To make the students to perform operations in CNC lathe using Siemens
6. To make the students to perform operations in CNC Vertical Machining Centre using Fanuc

COURSE OUTCOME

1. Describe the software tools needed to analyze engineering problems.
2. Describe the different applications of simulation and analysis tools.
3. Understand the features of CNC Machine Tool.
4. Prepare part programming for machining a work.
5. Perform operations in CNC lathe using Siemens.
6. Perform operations in CNC Vertical Machining Centre using Fanuc

LIST OF EXPERIMENTS

COMPUTER AIDED ENGINEERING (Simple Analysis using ANSYS Tool)

1. Stress analysis of rectangular Lbracket
2. Stress analysis of beams (Cantilever, Simply supported, Fixedends)
3. Mode frequency analysis of beams (Cantilever, Simply supported, Fixedends)
4. Harmonic analysis of a 2Dcomponent
5. Thermal stress analysis of a 2Dcomponent
6. Modeling a 3D component. (Single point cutting tool, I beams,etc.,)

COMPUTER AIDED MANUFACTURING (CAM)

1. MANUAL PART PROGRAMMING (Using G and M Codes) in CNCMachine.
2. Part programming for Linear, Circular interpolation, and Contourmotions.
3. Part programming using standard canned cycles for Thread cutting, Drilling, Peck drilling, andBoring.
4. NC code generation using software’s like Edge CAM, CREO, etc. CNC Controllers likeFANUC, Siemens, and Hiedenhain etc.

TOTAL 45

16BEME712 MECHATRONICSLABORATORY 0 0 3 2 100

COURSE OBJECTIVE

1. To introduce the program for arithmetic functions and the program for sorting, code conversion functions.
2. To enrich the understanding of the program codes to interface with stepper motor.
3. To understand the importance of set speed with actual speed of DC motor by interfacing suitable speed sensors.
4. To introduce the concepts of all the hydraulic, pneumatic and electro pneumatic circuits by using simulation software.
5. To understand the concept of displacement, force and temperature measurement.
6. To understand the concept of Computerized data logging system

COURSE OUTCOME

1. Create the program for arithmetic functions and the program for sorting, code conversion functions.
2. Formulate the program codes to interface with stepper motor.
3. Compare the set speed with actual speed of DC motor by interfacing suitable speed sensors.
4. Integrate all the hydraulic, pneumatic and electro pneumatic circuits by using simulation software.
5. Perform the displacement, force and temperature measurement.
6. Perform the process like pressure and flow control using computerized data logging system

LIST OF EXPERIMENTS

1. Design and testing of fluid power circuits tocontrol
   (i) Velocity (ii) direction and (iii) force of single and double actingactuators
2. Design of circuits with logic sequence using Electro pneumatic trainerkits.
3. Simulation of basic Hydraulic, Pneumatic and Electric circuits usingsoftware
4. Circuits with multiple cylinder sequences in Electro pneumatic usingPLC.
5. Servo controller interfacing for open loop
6. PID controllerinterfacing
7. Stepper motor interfacing with 8051 Microcontroller
   (i) Full step resolution (ii) Half stepresolution
8. Modeling and analysis of basic electrical, hydraulic and pneumatic systems using LABVIEW
9. Computerized data logging system with control for process variables like pressure, flow andtemperature
10. Measurement of displace usingLVDT
11. Measurement of temperature usingThermocouples
12. Measurement of Force using StrainGage

TOTAL 45

16BEME791 PROJECT WORKPHASEI 0 0 8 4 100

COURSE OBJECTIVES

1. To expose students to problem definitions
2. To understand the Fabricate device/system/component (s) for problem solving.
3. To equip them subject knowledge to solve real world problems.
4. To acquaint the student to newer techniques to improve the performance of a device/system.
5. To develop the skill to prepare the project reports
6. To develop the skill to prepare power point presentation and to face reviews and viva voce examination.

COURSE OUTCOMES

1. Formulate problem definitions
2. Fabricate device/system/component (s) for problem solving.
3. Apply subject knowledge to solve real world problems.
4. Implement newer techniques to improve the performance of a device/system.
5. Develop the skill to prepare the project reports
6. Develop the skill to prepare power point presentation and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of theDepartment.

TOTAL 120

16BEME751A ROBOTICSANDAUTOMATION 1 0 0 -100

COURSE OBJECTIVES

1. To develop the student's knowledge in various robot structures and their workspace.
2. To develop student's skills in performing spatial transformations associated with rigid body motions.
3. To develop student's skills in perform kinematics analysis of robot systems.
4. To provide the student with knowledge of the singularity issues associated with the operation of robotic systems.
5. To provide the student with some knowledge and analysis skills associated with trajectory planning.
6. To provide the student with some knowledge and skills associated with robot control.

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Understand the fundamentals of therobots
2. Describe the robot celldesign
3. Know the safety considerations in roboticapplications.
4. The student with knowledge of the singularity issues associated with the operation of robotic systems.
5. The student with some knowledge and analysis skills associated with trajectory planning.
6. The student with some knowledge and skills associated with robot control.

UNIT I FUNDAMENTALSOF ROBOT 5

Robot – Definition – Robot Anatomy – Co–ordinate Systems, Work Envelope, types and classification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and Their Functions – Need for Robots – Different Applications. Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features. End Effectors – Grippers. Requirements of a sensor, Principles and Applications of sensors – Position of sensors, Proximity Sensors, Touch Sensors – Camera, Frame Grabber, Sensing and DigitizingImage.

UNITII ROBOTCELLDESIGN 5

Robotcelldesign–simulationsoftware(RoboWave).Robotcelllayouts–Multiplerobotsandmachineinterference– robot cell planning – robot cycle time analysis for assembly, welding and painting shop.

UNIT III SAFETY CONSIDERATIONS 5

Safety Considerations for Robot Operations, Economic Analysis of Robots – Pay back Method, EUAC Method, Rate of Return Method.

TOTAL 15

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Klafter R.D., and Negin M	Robotic Engineering - An Integrated Approach	Prentice Hall	2003
2	Groover M.P	Industrial Robotics -Technology Programming and Applications	McGraw Hill	2012

16BEME751B MOTORS ANDPUMPS 1 0 0 -100

COURSE OBJECTIVES

1. To understand the working principles ofpumps
2. To understand the working principles andmotors

UNIT I SINGLE PHASEINDUCTIONMOTOR 5

Constructional details of single phase induction motor – Principle of operation – Types – Losses and Efficiency – Performance analysis – Starting methods of single–phase induction motors. – Design aspects of motors for usage in submersible pumps– Motors Rating and selection criteria.

UNITII THREE PHASE INDUCTION MOTOR 5

Constructional details – Types of rotors – Principle of operation – Need for starters – Types of starters – DOL, Stator resistance and reactance, rotor resistance, autotransformer and star–delta starters – Speed control – Change of voltage, torque, number of poles and slip – Losses and Efficiency – Performance analysis – Design aspects of motors for usage in submersible pumps – Motors Rating and selection criteria.

UNIT III PUMPS 5

Pumps: definition and classifications – Sewage, fire fighting and Pressure boosting pumps
Classification, working principle, indicator diagram, work saved by air vessels and performance curves – cavitations in

pumps – rotary pumps: working principles of gear and vane pumps

TOTAL 15

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kothari, D. P., and Nagrath, I. J	Electric Machines	Tata McGraw Hill Publishing Company Ltd., New Delhi	2014
2	Bimbhra, P. S	Electrical Machinery	Khanna Publishers, New Delhi	2003

SEMESTER VIII

16BEME801 TOTALQUALITYMANAGEMENT 3 0 0 3 100

COURSE OBJECTIVE

1. To introduce the concepts of essentiality of quality.
2. To understand the importance of various TQM principles.
3. To introduce the concepts of the various TQM principles.
4. To Understand the techniques for quality management.
5. To introduce the standard quality systems in industries.
6. To familiarize the students to understand the various techniques to improve the quality in industries.

COURSE OUTCOMES

At the end of the course the student would be able to

1. Understand the essentiality of quality.
2. Summarize various TQM principles.
3. Understand the various TQM principles.
4. Understand the techniques for quality management.
5. Implement standard quality systems in industries.
6. Apply various techniques to improve the quality in industries.

UNIT I ESSENTIALSOF TQM 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs – Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNITII TQMPRINCIPLES 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT III TQMTOOLS 9

The new seven management tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma – APQP.

UNITIV TQMTECHNIQUES 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNITV QUALITY ANDENVIRONMENTSYSTEMS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2002 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 and ISO 18001 – Concept, Requirements and Benefits.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dale H.Besterfiled	Total Quality Management	Pearson Education, Delhi	2011

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Feigenbaum.A.V	Total Quality Control	McGraw Hill, New Delhi	2008
2	Oakland.J.S	Total Quality Management	Butterworth – Hcinemann Ltd., Oxford	2003
3	Narayana V. and SreenivasanN.S	Quality Management – Concepts and Tasks	New Age International Ltd., New Delhi	2007
4	Zairi	Total Quality Management for Engineers	WoodHead Publishers, New Delhi	1996

WEB REFERENCES:

1. http://auciello.tripod.com/14tqm.html
2. http://www.fkm.utm.my/~shari/download/toc%20paper%20hilma%20tqm%20dis06.pdf
3. http://www.businessgyan.com/node/5409
4. http://www.accelper.com/pdfs/SS_Measurements_Concepts.pdf
5. http://tutor2u.net/business/strategy/benchmarking.htm
6. http://www.trst.com/iso2a.htm

16BEME8E -- PROFESSIONALELECTIVEVI 3 0 0 3 100

16BEME891 PROJECT WORK - PHASE II&VIVA-VOCE 0 0 32 16 300

COURSE OBJECTIVE

1. To understand the concept and basics of thrust areas of Mechanical Engineering.
2. To explain the Review literature to identify gaps and define objectives & scope of the work.
3. To make the student appreciate the purpose of innovative ideas for social benefit.
4. To understand the importance of a prototypes/models, experimental set-up and software systems necessary to meet the objectives.
5. To familiarize the students to understand the methods and materials to carry out experiments/develop code.
6. To Reorganize the procedures with a concern for society, environment and ethics

COURSE OUTCOME

1. Identify thrust areas of Mechanical Engineering.
2. Review literature to identify gaps and define objectives & scope of the work.
3. Generate and implement innovative ideas for social benefit.
4. Develop a prototypes/models, experimental set-up and software systems necessary to meet the objectives.
5. Identify methods and materials to carry out experiments/develop code.
6. Reorganize the procedures with a concern for society, environment and ethics

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of theDepartment.

TOTAL 480

DEPARTMENT ELECTIVES

16BEME5E01 MATERIAL ASPECTSINDESIGN 3 0 0 3 100

COURSE OBJECTIVES

1. To select Material Properties have to suit the purpose of an application.
2. To designing a machine or component, many factors have to be considered and optimised.
3. To covers most issues for mechanical designoptimisation.
4. To know about the selective assembly process
5. To know about the fracture mechanism.
6. To know about spring design.

COURSE OUTCOMES

1. Sudents able to select material properties have to suit the purpose of an application.
2. create designing a machine or component, many factors have to be considered and optimised.
3. Solve most issues for mechanical designoptimisation.
4. selective assembly process
5. Finding of fracture mechanism of given material
6. Create spring design for Absorption system.

UNITI MATERIAL SELECTIONIN DESIGN 9

Introduction – relation of materials selection to design – general criteria for selection – performance characteristics of materials – materials selection process – design process and materials selection – economics of materials – recycling and materials selection

UNITII MATERIALS PROCESSINGANDDESIGN 9

Role of Processing in Designing – classification of manufacturing processes – types of processing systems – factors determining process selection. Design for manufacturability, assembly, machining, casting, forging and welding

UNITIII MANUFACTURING CONSIDERATIONSINDESIGN 9

Surface finish – texture – dimensional tolerances in fitting – interchangeability – selective assembly – geometric tolerance. Selection of fits and tolerances

UNITIV MATERIALS PROPERTIESANDDESIGN 9

Stress – Strain diagram – design for strength, rigidity – design under static loading, variable loading, eccentric loading – stress concentration. Design examples with shaft design, spring design and C frames.

UNITV MATERIALS INDESIGN 9

Design for brittle fracture, fatigue failure, corrosion resistance. Designing with plastics, brittle materials

TOTAL 45

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dieter George E	Engineering Design, A materials and processing approach, 3 rd Edition	McGraw Hill	2000
2	Bhandari	Design of Machine Elements	Tata McGraw Hill	2010

16BEME5E02 COMPUTER INTEGRATED MANUFACTURING 3 0 0 3 100

COURSE OBJECTIVE

1. To understand the application of computers in various aspects of Manufacturing viz., Design, proper planning, Manufacturing cost, Layout & Material Handlingsystem.
2. To know the application of principles of group technology in computer aided processplanning.
3. To impart knowledge on working of the shop floorcontrol
4. To Study and acquire knowledge on data collection system in FMS.
5. To familiarize the students to understand CIM architecture for practicalapplication.
6. To expose students to generate database for computer integrated manufacturingprocesses.

COURSE OUTCOME

Upon completion of this course, the student can able to
1. Implement computer integrated manufacturing concepts inindustries.
2. Apply the principles of group technology in computer aided processplanning.
3. Understand the working of the shop floorcontrol
4. Implement automated data collection system in FMS.
5. Develop CIM architecture for practicalapplication.
6. Generate database for computer integrated manufacturingprocesses

UNITI INTRODUCTION 9
The meaning and origin of CIM– the changing manufacturing and management scene – External communication – islands of automation and software–dedicated and open systems–manufacturing automation protocol – product related activities of a company– marketing engineering – production planning – plant operations – physical distribution– business and financial management.

UNITII GROUPTECHNOLOGY 9
Group technology– – part families – Classification and coding – Approaches to computer aided process planning –variant approach and generative approaches

UNITIII SHOP FLOOR CONTROL AND INTRODUCTIONOFFMS 9
Shop floor control–phases –factory data collection system –automatic identification methods– Bar code technology–automated data collection system. FMS–components of FMS – types –FMS workstation –material handling and storage systems– FMS layout –computer control systems–application and benefits.

UNITIV CIM IMPLEMENTATION ANDDATACOMMUNICATION 9
CIM and company strategy – system modeling tools –IDEF models – activity cycle diagram – CIM open system architecture (CIMOSA)– manufacturing enterprise wheel–CIM architecture – Product data management–CIM implementation software. Communication fundamentals– local area networks –topology – LAN implementations – network management and installations –MRP, ERP concepts

UNITV OPEN SYSTEM AND DATABASEFOR CIM 9
Open systems–open system inter connection – manufacturing automations protocol and technical office protocol (MAP /TOP).
Development of databases –database terminology– architecture of database systems–data modeling and data associations –relational data bases – database operators – advantages of data base and relational database.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mikell.P.Groover	Automation, Production Systems and computer integrated manufacturing	Pearson Education, Delhi	2015

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Yoremkoren	Computer Integrated Manufacturing system	McGraw-Hill, New York	2005
2	Kant Vajpayee S	Principles of computer integrated manufacturing	Prentice Hall India, New Delhi	2003
3	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM, 2nd Edition	New Age International (P) Ltd, New Delhi	2011

WEB REFERENCES

1. http://en.wikipedia.org/wiki/Computer-integrated_manufacturing
2. http://www.technologystudent.com/rmprp07/intman1.html
3. http://www.computerintegratedmanufacturing.com/

16BEME5E03 **AUTOMOBILE ENGINEERING** **3 0 0 3 100**

COURSE OBJECTIVES

1. To make the student acquire sound knowledge on the types of vehicle structures, cooling and lubrication systems required.
2. To acquaint the student with the concepts of type of engines to be used for modern automobiles.
3. To familiarize the students to Distinguish between the manual transmissions systems with automatic transmission systems.
4. To provide knowledge on appropriate transmission systems for the optimal power transmission.
5. To provide knowledge on steering, brakes and suspension systems for effective functioning.
6. To acquaint the student with advanced technologies in automotive Engineering.

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Identify the types of vehicle structures, cooling and lubrication systems required.
2. Determine the type of engines to be used for modern automobiles.
3. Distinguish between the manual transmissions systems with automatic transmission systems.
4. Select appropriate transmission systems for the optimal power transmission.
5. Select steering, brakes and suspension systems for effective functioning.
6. Implement the advanced technologies in automotive

UNITI AUTOMOBILE ARCHITECTUREANDPERFORMANCE 9

Automotive components, subsystems and their positions – Chassis, frame and body, front, rear and four wheel drives – Operation and performance – Traction force and traction resistance, Power required for automobile– Rolling, air and gradient resistance.

UNITII TYPES OFENGINES 9

Types of engines – multi valve engine – in–line engine, vee–engine, Petrol engine–direct – single point and multipoint injection, diesel engine–common rail diesel injection, supercharging and turbo charging.

UNITIII TRANSMISSIONSYSTEMS 9

Clutch : Types – coil spring and diaphragm type clutch, single and multi plate clutch, centrifugal clutch, Gear box : Types – constant mesh, sliding mesh and synchromesh gear box, layout of gear box, gear selector and shifting mechanism, overdrive, automatic transmission, Propeller shaft, universal joint, slip joint, differential and real axle arrangement, hydraulic coupling.

UNITIV WHEEL AND TYRES ANDSUSPENSIONSYSTEM 9

Types of wheels, construction, wired wheels, Tyres– construction, Radial, bias and belted bias, slip angle, Tread patterns, Tyre retreading - cold and hot, Tubeless tyres, Types–front and rear suspension, conventional and independent type suspension, leaf springs, coil springs, dampers, torsion bars, stabilizer bars, arms, air suspension systems – Balancing of Wheels.

UNITV STEERING SYSTEM ANDBRAKINGSYSTEM 9

Types of steering systems, Ackermann principle, Davis steering gear, steering gear boxes, steering linkages, power steering, wheel geometry–caster, camber, toe–in, toe out etc., wheel Alignment. Braking System – Forces on vehicles, tyre grip, load transfer, braking distribution between axles, stopping distance, Types of brakes, Mechanical, Hydraulic, Air brakes, Disc and Drum brakes, Engine brakes.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Gupta R.B	Automobile Engineering	Laxmi Publications, Chennai	2004
2	Kirpal Singh	Automobile Engineering Vol–I and II	Standard publishers, Delhi	2007

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Julian Happian Smith	An introduction to modern vehicle design	Butterworth Heinemann, New Delhi	2004
2	Crouse W H	Automotive transmissions and power trains	McGraw–Hill International Editions, New Delhi	1976
3.	Heniz Heisler	Vehicle and Engine Technology	Society of Automotive Engineers	2002

WEB REFERENCES:

1. http://en.wikipedia.org/wiki/Automotive_engineering
2. http://www.animatedengines.com/
3. http://www.automotive–online.com/transmission–system/
4. http://www.rqriley.com/suspensn.htm
5. http://en.wikipedia.org/wiki/Transmission_(mechanics)

16BEME5E04 HYDRAULICS AND PNEUMATICS POWER CONTROL 3 0 0 3 100

COURSE OBJECTIVES

1. To recognize symbols and fundamentals in fluid power generation anddistribution.
2. To identify power source for hydraulicsystems.
3. To select appropriate components used in various hydraulicsystems.
4. To design hydraulic circuits for givenapplications
5. To distinguish the components used in pneumaticcircuits.
6. To create the logic circuits for controlling electro-hydraulic/ pneumaticsystems.

COURSE OUTCOMES

At the end of the course, the students will be able to

1. Recognize symbols and fundamentals in fluid power generation anddistribution.
2. Identify power source for hydraulicsystems.
3. Select appropriate components used in various hydraulicsystems.
4. Design hydraulic circuits for givenapplications
5. Distinguish the components used in pneumaticcircuits.
6. Create the logic circuits for controlling electro-hydraulic/ pneumaticsystems.

UNITI FLUID POWER SYSTEMSANDFUNDAMENTALS 9

Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids – General types of fluids – Fluid power symbols. Basics of Hydraulics–Applications of Pascals Law– Laminar and Turbulent flow – Reynold's number – Darcy's equation – Losses in pipe, valves andfittings.

UNITII HYDRAULIC SYSTEMANDCOMPONENTS 9

Sources of Hydraulic Power: Pumping theory – Pump classification – Gear pump, Vane Pump, piston pump, Pressure boosting pumps, construction and working of pumps – pump performance – Variable displacement pumps. Fluid Power Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like tanden, Rodless, Telescopic, Cushioning mechanism, Construction of double acting cylinder, Rotary actuators.

UNITIII DESIGN OFHYDRAULICCIRCUITS 9

Construction of Control Components : Direction control valve – 3/2 way valve – 4/2 way valve – Shuttlevalve – check valve – pressure control valve – pressure reducing valve, sequence valve, Flow control valve – Fixed and adjustable, electrical control solenoid valves, Relays, ladder diagram. Accumulators and Intensifiers: Types of accumulators – Accumulators circuits, sizing of accumulators, intensifier – Applications ofIntensifier – Intensifiercircuit.

UNITIV PNEUMATIC SYSTEMSANDCOMPONENTS 9

Pneumatic Components: Properties of air – Compressors – Filter, Regulator and Lubricator UNIT Air control valves, Quick exhaust valves, pneumatic actuators. Fluid Power Circuit Design, Speed control circuits, synchronizing circuit, Penumo hydraulic circuit, Sequential circuit design for simple applications using cascade method.

UNITV DESIGN OFPNEUMATICCIRCUITS 9

Servo systems – Hydro Mechanical servo systems, Electro hydraulic servo systems and proportional valves. Fluidics – Introduction to fluidic devices, simple circuits, Introduction to Electro Hydraulic Pneumatic logic circuits, ladder diagrams, PLC applications in fluid power control.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Anthony Esposito	Fluid Power with Applications	Pearson Education, New Delhi	2013
2	Majumdar S.R	Oil Hydraulics	Tata McGraw–Hill, New Delhi	2002

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Majumdar S.R	Pneumatic systems – Principles and maintenance	Tata McGraw Hill, New Delhi	2006
2	Anthony Lal	Oil hydraulics in the service of industry	Allied publishers, New Delhi	1982
3	Michael J, Prinches and AshbyJ.G	Power Hydraulics	Prentice Hall of India, New Delhi	1996

WEB REFERENCES

1. http://www.g–w.com/PDF/SampChap/60525_0816_Ch02.pdf
2. http://www.engineeringtoolbox.com/classification–pumps–d_55.html

16BEME5E05 DESIGN OF JIGS, FIXTURES AND PRESS TOOLS 3 0 0 3 100

COURSE OBJECTIVES

1. To impart knowledge on the principles of locating and clamping devices in machining process.
2. To familiarize the students to understand design of jigs for a given component.
3. To Study and acquire knowledge on design fixtures for a given component.
4. To make the student acquire sound knowledge on appropriate type of press tool for a given component.
5. To expose students to drawing die for a given component.
6. To give exposure to the use computer aids for sheet metal forming analysis

COURSE OUTCOMES

Upon the completion of this course the students will be able to

1. Summarize the principles of locating and clamping devices in machining process.
2. Design jigs for a given component.
3. Design fixtures for a given component.
4. Design an appropriate type of press tool for a given component.
5. Develop a drawing die for a given component.
6. Use computer aids for sheet metal forming analysis

UNITI PURPOSE TYPES AND FUNCTIONS OF JIGSAND FIXTURES 9

Tool design objective – Production devices – Inspection devices – Materials used in Jigs and Fixtures – Types of Jigs – Types of Fixtures–Mechanical actuation–pneumatic and hydraulic actuation.

UNITII JIGS 9

Drill bushes –different types of jigs–plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs–Automatic drill jigs–Rack and pinion operated. Air operated Jigs components. Design and development of Jigs for given components.

UNITIII FIXTURES 9

General principles of boring, lathe, milling and broaching fixtures– Grinding, planning and shaping fixtures, assembly, Inspection and welding fixtures– Modular fixtures, Quick change fixtures.

UNITIV PRESS WORKING TERMINOLOGIES AND ELEMENTS OFDIESAND STRIP LAY OUT 9

Press working terminology–Presses and press accessories–Computation of capacities and tonnage requirements. Elements of progressive combination and compound dies:Die block–die shoe. Bolster plate–punch plate–punch holder–guide pins and bushes – strippers – knockouts–stops –pilots–Selection of standard die sets strip lay out–strip lay out calculations, SMEDtechnique.

UNIT V DESIGN AND DEVELOPMENTOFDIES 9

Design and development of progressive and compound dies for Blanking and piercing operations. Tool and DIE Materials, Bending dies – development of bending dies–forming and drawing dies.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Edward G Hoffman	Jigs and Fixture Design	Thomson – Delmar Learning, Singapore	2012
2	Donaldson C	Tool Design	Tata McGraw–Hill, New Delhi	2012

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kempster	Jigs and Fixtures Design	Tata McGraw–Hill Publishing, New Delhi	2004
2	Joshi P.H	Jigs and Fixtures Second Edition	Tata McGraw–Hill Publishing Company Limited, New Delhi	2010
3	Hiram E Grant	Jigs and Fixture	Tata McGraw–Hill, New Delhi	2003

WEB REFERENCES

1. www.wisetool.com
2. www.invert–a–bolt.com
3. www.diemech.com
4. www.schaefertools.com
5. www.steelsmith.com

16BEME5E06 RENEWABLE ENERGY SOURCES 3 0 0 3 100

COURSE OBJECTIVES

1. To explain importance of renewable energy resources.
2. To understand the importance of basic concepts of solar radiation and analyze the working of solar PV and thermal systems.
3. To understand the importance of principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas and hydrogen.
4. To study the features ofdesign principles of biogas plants.
5. Understand the concepts and applications of fuel cells, thermoelectric convertor and MHD generator.
6. To give exposure to power plants working with non-conventional energy

COURSE OUTCOMES

1. Understand the importance of renewable energy resources.
2. Understand the basic concepts of solar radiation and analyze the working of solar PV and thermal systems.
3. Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas and hydrogen.
4. Implement design principles of biogas plants.
5. Understand the concepts and applications of fuel cells, thermoelectric convertor and MHD generator.
6. Get exposure on the power plants working with non-conventional energy

UNITI ENERGYANDENVIRONMENT 9

Primary energy sources – world energy resources–Indian energy scenario–energy cycle of the earth – environmental aspects of energy utilisation, CO_2 emissions and Global warming–renewable energy resources and their importance. Potential impacts of harnessing the different renewable energy resources.

UNITII SOLARENERGY 9

Principles of solar energy collection – solar radiation – measurements – instruments – data and estimation– types of collectors – characteristics and design principles of different type of collectors – performance of collectors – testing of collectors.

UNITIII WIND, TIDAL AND GEOTHERMALENERGY 9

Energy from the wind – general theory of windmills – types of windmills – design aspects of horizontal axis windmills – applications. Energy from tides and waves – working principles of tidal plants and ocean thermal energy conversion plants – power from geothermal energy – principle of working of geothermal power plants.

UNITIV BIOENERGY 9

Energy from bio mass and bio gas plants –various types – design principles of biogas plants – applications. Energy from wastes – waste burning power plants – utilization of industrial and municipal wastes – energy from the agricultural wastes.

UNITV OTHER RENEWABLEENERGYSOURCES 9

Direct energy conversion (Description, principle of working and basic design aspects only) – Magneto hydrodynamic systems (MHD) – thermoelectric generators – thermionic generators – fuel cells – solar cells – types, Emf generated, power output, losses and efficiency and applications.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rai G.D	AnNon conventional Energy sources	Khanna Publishers, New Delhi	2011
2	Duffie and Beckmann	Solar Energy Thermal Processes	John Wiley, London	2013

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	SukhatmeS.P	Solar Energy	Tata McGraw Hill, New Delhi	2010
2	Garg. H. P and Prakash J	Solar Energy - Fundamentals and applications	Tata McGrawHill, New Delhi	2007
3	Ashok V Desai	Non–conventional Energy	Wiley Eastern Ltd, New Delhi	2011

WEB REFERENCES

1. http://www.apricus.com/html/solar_typesofsolar.htm
2. http://www.solarserver.de/wissen/sonnenkollektoren–e.html
3. http://earthsci.org/mineral/energy/wind/wind.html
4. http://www.biomassgasification.com/

16BEME5E07 INDUSTRIAL ROBOTICS 3 0 0 3 100

COURSE OBJECTIVES

1. To understand the anatomy, basic concepts and applications ofrobot.
2. To learn the drives and end effectors used inrobot.
3. To study the various types of sensors used inrobot.
4. To familiarize robot kinematics and robotprogramming
5. To provide knowledge on simple offline robot program
6. To impart knowledge on economic analysis ofrobots

COURSE OUTCOMES

Upon completion of this course, the students can able to

1. Identify the various types ofrobots.
2. Select appropriate drive systems and end effectors for industrialapplication.
3. Decide the types of sensors required according to the applications ofrobot.
4. To identify the different types of machine visiontechnologies
5. Develop simple offline robot program for differentapplications.
6. Calculate the economic analysis ofrobots

UNITI FUNDAMENTALS OFROBOT 9

Robot – Definition – Robot Anatomy – Co–ordinate Systems, Work Envelope, types and classification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and Their Functions – Need for Robots – Different Applications

UNITII ROBOT DRIVE SYSTEMS ANDENDEFFECTORS 9

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of all these Drives

End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers.

UNITIII SENSORS ANDMACHINEVISION 9

Requirements of a sensor, Principles and Applications of the following types of sensors – Position sensors (Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, Pneumatic Position Sensors), Range Sensors (Triangulation Principle, Structured, Lighting Approach, Time of Flight Range Finders, Laser Range Meters), Proximity Sensors (Inductive, Hall Effect, Capacitive, Ultrasonic and Optical Proximity Sensors), Touch Sensors, (Binary Sensors, Analog Sensors), Wrist Sensors, Compliance Sensors, Slip Sensors

Camera, Frame Grabber, Sensing and Digitizing Image Data – Signal Conversion, Image Storage, Lighting Techniques. Image Processing and Analysis – Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms.

UNITIV ROBOT KINEMATICS ANDROBOTPROGRAMMING 9

Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems.

UNITV IMPLEMENTATION AND ROBOTECONOMICS 9

RGV, AGV; Implementation of Robots in Industries – Various Steps; Safety Considerations for Robot Operations; Economic Analysis of Robots – Pay back Method, EUAC Method, Rate of Return Method, Process application of Robots and Collaborativerobots.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Groover M.P	Industrial Robotics – Technology Programming and Applications	McGraw–Hill, New Delhi	2012

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Fu.K.S., Gonzalz.R.C. and Lee C.S.G	Robotics Control, Sensing, Vision and Intelligence	McGraw–Hill Book Co., New Delhi	2008
2	Yoram Koren	Robotics for Engineers	McGraw–Hill Book Co., New Delhi	1992
3	Janakiraman. P.A	Robotics and Image Processing	Tata McGraw–Hill, New Delhi	1995

WEB REFERENCE

1. www.learnaboutrobots.com/industrial.htm

16BEME5E08 DESIGN AND ANALYSIS OF EXPERIMENTS 3 0 0 3 100

COURSE OBJECTIVE

1. To provide foundations on design of experiments and statistical analysis of experimental data obtained from laboratory and/or industrialprocesses.
2. To understand the important concepts of single factorial designs
3. To Study and acquire knowledge on various methodologies involved in single factorial designs
4. To know the application of testing of factorial experiment
5. To enrich the understanding of special experimental designs
6. To impart knowledge on basic concepts of Taguchi method in parameter design

COURSE OUTCOMES

Upon successful completion of the course, students will be able to:

1. Understand the knowledge of various techniques for experimentalplanning
2. Understand the concepts of single factorialdesigns
3. List the various methodologies involved in single factorialdesigns
4. Apply the concept of testing of factorialexperiment
5. Solve the partial and ordinary differential equations special experimentaldesigns
6. Apply the basic concepts of Taguchi method in parameterdesign

UNITI INTRODUCTION 9

Planning of experiments – Steps – Need - Terminology: Factors, levels, variables, experimental error, replication, Randomization, Blocking, Confounding.

UNITII SINGLEFACTOREXPERIMENTS 9

ANOVA rationale - Sum of squares – Completely randomized design, Randomized block design, effect of coding, Comparison of treatment means – Newman Kuel‘s test, Duncan‘s Multiple Range test, Latin Square Design, Graeco-Latin Square Design, Balanced incomplete design.

UNITIII FACTORIALEXPERIMENTS 9

Main and interaction effects –Two and three Factor full factorial Designs, 2 k deigns with Two and Three factors-Unreplicated design- Yate‘s Algorithm

UNITIV SPECIALEXPERIMENTALDESIGNS 9

Blocking in factorial design, Confounding of 2k design, nested design-Response Surface Methods.

UNITV TAGUCHI TECHNIQUES 9

Fundamentals of Taguchi methods, Quality Loss function, orthogonal designs, application to Process and Parameter design.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Montgomery, D.C	Design and Analysis of Experiments	John Wiley and Sons	2012

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hicks. C.R	Fundamental concepts in the Design of Experiments	Holt, Rinehort and Winston	2000
2	Bagchi. T.P	Taguchi Methods explained	PHI	2002
3	Ross. P.J	Taguchi Techniques for quality Engineering	Prentice Hall	2000

WEB REFERENCES

1. http://cran.r-project.org
2. http://www.itl.nist.gov/div898/handbook/
3. http://home.ubalt.edu/ntsbarsh/stat-data/Topics.htm

16BEME6E01 POWER PLANT ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES

1. To give exposure to accessories and layout required for a steam power plant depending upon the requirements.
2. To study performance of steam power plant.
3. To make the student acquire sound knowledge of working of nuclear and hydel power plant.
4. To study the features of gas turbine power plant.
5. To make the student acquire sound knowledge of economics of the power plant.
6. To make the student acquire sound knowledge on renewable energy technologies and availability.

COURSE OUTCOMES

Upon completion of this course, the students can able to

1. Select the accessories and layout required for a steam power plant depending upon the requirements.
2. Compute performance of steam power plant.
3. Explain the working of nuclear and hydel power plant.
4. Compute performance of gas turbine power plant.
5. Calculate the economics of the power plant.
6. Apply appropriate type of renewable energy technologies depending upon the application and availability.

UNITI INTRODUCTION TO POWER PLANTSANDBOILERS 9

LayoutofSteam,Hydel,Diesel,MHD,NuclearandGasTurbinePowerPlants–CombinedPowerCycles–Comparison and Selection, Load Duration Curves.

Steam Boilers and Cycles – High Pressure and Super Critical Boilers – Fluidised Bed Boilers – Industrial Standards.

UNITII STEAM POWERPLANT 9

Fuel and Ash Handling, Combustion Equipment for burning coal, Mechanical Stokers, Pulveriser, Electrostatic Precipitator, Draught – different types, Surface Condenser Types, Cooling Towers

UNITIII NUCLEAR AND HYDELPOWERPLANTS 9

Nuclear Energy – Fission, Fusion Reaction, Types of Reactors, pressurized water reactor, Boiling Water Reactor, Waste Disposal and safety.

Hydel Power Plant – Essential Elements, Selection of Turbines, Governing of Turbines– Micro Hydel developments.

UNITIV DIESEL AND GAS TURBINEPOWERPLANT 9

Types of Diesel Plants, Components, Selection of Engine Type, Applications Gas Turbine Power Plant –Fuels – Gas Turbine Material – Open and Closed Cycles – Reheating – Regeneration and Intercooling – Combined Cycle.

UNITV OTHER POWER PLANTS AND ECONOMICS OFPOWERPLANTS 9

Geo thermal –OTEC – Tidel – Pumped storage – Solar thermal central receiver system.

Safety aspects and Cost of Electric Energy – Fixed and operating Costs – Energy Rates – Types of Tariffs – Economics of load sharing, comparison of economics of various power plants.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Arora S.C and Domkundwar S	A course in Power Plant Engineering	Dhanpatrai Publishers, New Delhi	2013

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nag P.K	Power plant Engineering	Tata McGraw Hill, New Delhi	2014
2	Rajput R.K	Power Plant Engineering	Laxmi Publications, Chennai	2015
3	Morse Frederick T	Power Plant Engineering	Prentice Hall of India, New Delhi	1998

WEB REFERENCES

1. www.solarpaces.org
2. www.igcar.gov.in
3. ga.water.usgs.gov
4. www.mapsofindia.com

16BEME6E02 ADVANCED MANUFACTURING PROCESSES 3 0 0 3 100

COURSE OBJECTIVE

1. To provide knowledge on different aspects of powder metallurgy parameters.
2. To understand the importance of principle of advanced welding processes and its application.
3. To understand the importance of advanced forming processes and its application.
4. To familiarize the students to advanced manufacturing process for processing of different materials.
5. To acquaint the student to apply the suitable rapid prototyping mechanism for industry need.
6. To provide knowledge on optimum parametric for advanced manufacturing process.

COURSE OUTCOME

Upon the completion of this course, the students will be able to

1. Understand different aspects of powder metallurgy parameters.
2. Understand basic principle of advanced welding processes and its application.
3. Understand basic principle of advanced forming processes and its application.
4. Select the best suitable advanced manufacturing process for processing of different materials.
5. Apply the suitable rapid prototyping mechanism for industry need.
6. Select the optimum parametric for advanced manufacturing process

UNITI POWDERMETALLURGYPROCESS 9

Introduction to powder metallurgy process – preparation of powders – types and functions of binders – green compaction – sintering process and its effect on the product.

UNITII ADVANCEDWELDINGPROCESSES 9

Percussion Welding– Electro Slag Welding, Plasma Arc Welding – Thermit Welding – Electron Beam Welding – Friction and Inertia Welding – Friction Stir Welding – Under Water WeldingProcess.

UNITIII SHEET METAL ANDFORMINGPROCESS 9

Sheet metal process –Laser welding and Cutting, Working principle and application of special forming process – Hydro Forming– Rubber Pad Forming– Explosive Forming – Magnetic Pulse Forming– Peen Forming – Super Plastic Forming – Deep Drawing Process.

UNITIV ADVANCEDMACHININGPROCESS 9

Modern machining process: Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic Machining, Electro chemical Machining, Electro chemical Grinding, Electro Discharge Machining, wire cut EDM, Electron Beam Machining, plasma arc machining, Laser Beam Machining. Ultrasonic Machining, High speed machining process – deep hole drilling process

UNITV RAPIDPROTOTYPING 9

Introduction to Rapid Prototyping – Need for RPT– Stereo–lithography – Selective Laser Sintering, Fused Deposition Modeling, Laminated Object Manufacturing, Solid Ground Curing, Ballistic Particle Manufacturing

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Seropekalpakjian and Steven.R. Schmid	Manufacturing process for engineering materials	Pearson Education, Inc	2010
2	O.P.Khanna	A Textbook OfWWelding Technology	Dhanpat Rai Publications Pvt Ltd	2012

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	P.N. Rao	Manufacturing technology Volume I	TMH Ltd	2013
2	Singh, M.K	Unconventional Manufacturing Process	New age international	2010
3	Vijay.K Jain	Advanced Machining Processes	Allied Publishers Pvt. Ltd	2009

WEB REFERENCES

1. http://mfg.eng.rpi.edu/gmp/WebChapters/ch39.pdf
2. http://web.iitd.ac.in/~pmpandey/MEL120_html/RP_document.pdf
3. http://www.me.psu.edu/lamancusa/rapidpro/rpintro2.pdf
4. http://file.guiacnc.com.br/data/PDF/PrototypeeBook2.pdf

16BEME6E03 COMPUTATIONAL FLUID DYNAMICS 3 0 0 3 100

COURSE OBJECTIVES

1. To introduce Governing Equations of viscous fluidflows
2. To introduce numerical modeling and its role in the field of fluid flow and heattransfer
3. To enable the students to understand the various discretization methods, solution procedures and turbulencemodeling.
4. To create confidence to solve complex problems in the field of fluid flow and heat transfer by using high speedcomputers.
5. To equip them with skills to solve convection and diffusionproblems
6. To understand the importance continuity and momentum equations for different types of fluidflow

COURSE OUTCOMES

Upon completion of this course, the students can able

1. Identify, solve engineering problems by computational fluiddynamics.
2. Understand the importance of governing equations involved inCFD
3. Formulate and solve problems in the field of fluid flow and heattransfer.
4. Solve the heat conduction problems using finite differencemethod.
5. Analyze and provide solutions for convection and diffusionproblems.
6. Develop continuity and momentum equations for different types of fluidflow

UNITI GOVERNING EQUATIONS ANDBOUNDARY CONDITIONS 9

Basics of computational fluid dynamics – Governing equations of fluid dynamics – Continuity, Momentum and Energy equations – Chemical species transport – Physical boundary conditions – Time–averaged equations for Turbulent flow.

UNITII DISCRETIZATIONMETHOD 9

MethodsofDerivingtheDiscretizationEquations–TaylorSeriesformulation–Finitedifferencemethod– Control volume Formulation – Spectral method.

UNITIII HEATCONDUCTION 9

Finite difference and finite volume formulation of steady/transient one–dimensional conduction equation, Source term linearization, Incorporating boundary conditions, Finite volume formulations for two and three dimensional conduction problems

UNITIV CONVECTIONANDDIFFUSION 9

Finite volume formulation of steady one–dimensional convection and Diffusion problems, Central, upwind, hybrid and power–law schemes – Discretization equations for two dimensional convection and diffusion.

UNITV CALCULATION OFFLOWFIELD 9

Representation of the pressure – Gradient term and continuity equation – Staggered grid – Momentum equations – Pressure and velocity corrections – Pressure – Correction equation, SIMPLE algorithm and its variants. Turbulence models: mixing length model, two equation (k–ε) models.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Versteeg H.K and Malalasekera.W	An Introduction to Computational Fluid Dynamics	Pearson education ltd, UK	2010
2	GhoshdastidarP.S	Computer Simulation of flow and heat transfer	Tata McGraw–Hill Publishing Company Ltd., New Delhi	1998

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	PatankarS.V	Numerical Heat Transfer and Fluid Flow	McGraw–Hill book company, New Delhi	1980
2	Muralidhar K and Sundarajan T	Computational Fluid Flow and Heat Transfer	Narosa Publishing House, New Delhi	2013
3	BoseT.K. Jain	Numerical Fluid Dynamics	Narosa publishing House, New Delhi	2005

WEB REFERENCES

1. http://www.ams.org/mcom//.pdf
2. http://www.cham.co.uk/website/new/cfdintro.htm
3. http://www.mechartes.com/
4. http://www.technologystudent.com
5. http://web.njit.edu/topics/Prog_Lang_Docs/html/FLUENT/fluent/fluent5/ug/html/node594.htm

16BEME6E04 MANUFACTURE AND INSPECTION OF GEARS 3 0 0 3 100

COURSE OBJECTIVES

1. To gain knowledge in production, gear materialselection
2. To introduce the concepts of gear manufacturing
3. To Study and acquire knowledge on mechanism involve in conicalgears
4. To Study and acquire knowledge on the procedures that involves in gear materialselection
5. To expose students to detailed view of gear finishingmethods
6. To impart knowledge modern gear productionmethods

COURSE OUTCOMES

Upon the completion of this course the students will be able to

1. Understand the overview on classification of gears and itterminology
2. Explain the various methods of gear manufacturing
3. Understands the concepts and mechanism involve in conicalgears
4. Understand the procedures that involves in gear materialselection
5. Attain a detailed view of gear finishingmethods
6. Understanding the modern gear productionmethods

UNITI INTRODUCTIONTOGEARS 9

Types of gears-classification, application of gears, gearboxes, drawings for gears, gear production method an overview, types of blanks and blank preparation. Production Of Cylindrical Gears: Procedure of cutting gears and obtainable quality in hobbing and gear shaping, cutter selection and work holding methods, setting calculations. Rack type gear shaping machine description and application. Internal gear cutting methods, CNC gear hobbing and gear shapingmachines.

UNITII PRODUCTION OF CONICALGEARS 9

Production of straight bevel gears by bevel gear generator, duplex rotary cutter method, Gleason Reva cycle method, spiral and hybrid bevel gear generation. Description of machine, cutter and machine setting.

UNITIII GEAR MATERIAL SELECTION ANDHARDENINGMETHODS 9

Properties of gear materials-non-metallic, non-ferrous and plastic gears, selection of material for power transmission, high speed application. Selection of material for worm and wheel. Hardening by through hardening, case hardening, induction hardening, flame hardening, nitriding and tuftriding, hardening defects.

UNITIV GEARFINISHINGMETHODS 9

Gear finishing advantages, finishing of gears by grinding, shaving, lapping and honing methods, cold rolling of gears - description of process, machine, cutters and process parameters setting.

Gear Inspection: Type of gear errors-gear quality standards and allowable limits-tooth thickness, base tangent length measurement, pitch error, radial run out, involute profile error measurements methods and analysis, composite error measurement, computerized gear inspection, gear failure reasons and remedies.

UNITV MODERN GEARPRODUCTIONMETHODS 9

Gear production by stamping, die casting, powder metal process, injection and compression moulding of plastic gears, cold and hot rolling. Mass production methods, shear speed shaping, gear broaching, Gleayson G-TRAC – gear generation methods. Economical and Quality Production of Gears: Gear production systems – batch production, gear production cells, lean and agile production practices, automobile gear and gear boxes, heavy engineering gear production, gear for instruments and appliances, process and cutter selection for quantity, cost and qualitycriteria.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Watson	Modern Gear Production	Persman Press, Oxford	1984
2	HMT	Production Technology	Tata McGraw Hill Co., New Delhi	1992

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	SAE	Gear Design Manufacturing Inspection Manual	Persman Press, Oxford	1990
2	Weck .M	Hand Book of Machine Tools Technology and Sun Gear Technology	Magazine Back Volumes	1984

WEB REFERENCES

1. www.geartechnology.com
2. www.gearsolutions.com

16BEME6E05 DESIGN FOR MANUFACTURE AND ASSEMBLY 3 0 0 3 100

COURSE OBJECTIVES

1. To understand the importance of the DFM approach and guidelines
2. To enrich the understanding of the selective assembly and Datum systems
3. To introduce the concepts of demonstrate true Position tolerancing theory.
4. To develop an understanding of the standard techniques and redesigning cast members using weldments and plastic component manufacturing.
5. To equip them with skills on Tolerance Charting Technique.
6. To Study and acquire knowledge of the various factors influencing the manufacturability of components and the use of tolerances in manufacturing

COURSE OUTCOMES

Upon completion of this course, the students will be able to,

1. Understand the DFM approach and guidelines
2. Understand the selective assembly and Datum systems
3. Demonstrate true Position tolerancing theory.
4. Understand redesigning cast members using weldments and plastic component manufacturing.
5. Demonstrate the Tolerance Charting Technique.
6. Know the various factors influencing the manufacturability of components and the use of tolerances in manufacturing

UNITI DFM APPROACH, SELECTION AND SUBSTITUTION OFMATERIALSIN INDUSTRY 9

DFM approach, DFM guidelines, standardisation, group technology, value engineering, comparison of materials on cost basis, design for assembly, DFA index, Poka – Yoke principle; 6σ concept; Tolerance Analysis: Process capability, process capability metrics, Cp, Cpk, cost aspects, feature tolerances, geometric tolerances, surface finish, review of relationship between attainable tolerance grades and different machining process, cumulative effect of tolerances, sure fit law, normal law and truncated normal law.

UNITII SELECTIVEASSEMBLY 9

Interchangeable and selective assembly, deciding the number of groups, Model–I: group tolerances of mating parts equal; Model–II: total and group tolerances of shaft, control of axial play.

Datum Systems: Grouped datum systems–different types, two and three mutually perpendicular grouped datum planes, grouped datum system with spigot and recess, pin and hole, and tongue–slot pair, computation of translational and rotational accuracy.

UNITIII TRUE POSITIONTOLERANCINGTHEORY 9

Comparison between co–ordinate and convention method of feature location tolerancing and true position tolerancing, zero true position tolerance, virtual size concept, floating and fixed fasteners, projected tolerance zone, functional gauges, paper layout gauging, compound assembly, examples.

UNITIV FORM DESIGN OF CASTINGSANDWELDMENTS 9

Redesign of castings based on parting line considerations, minimising core requirements, redesigning cast members using weldments, use of welding symbols – design considerations for plastic component manufacturing.

UNITV TOLERANCECHARTING 9

Tolerance Charting Technique: Operation sequence for typical shaft type of components, preparation of process drawings for different operations, tolerance worksheets and centrality analysis, examples, design features to facilitate machining. Datum features – functional and manufacturing, component design–machining considerations, redesign for manufacture,examples.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harry Peck	Designing for Manufacture	Pitman Publications, London	1983
2	Matousek R	Engineering Design – A Systematic Approach	Blackie and Son Ltd., London	1974

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Spotts M F	Dimensioning and Tolerance for Quantity Production	Prentice Hall Inc., New Jersey, USA	1983
2	Oliver R Wade	Tolerance Control in Design and Manufacturing	Industrial press Inc., New York	1967
3	James G Bralla	Hand Book of Product Design for Manufacturing	McGraw Hill Publications, New Delhi	1986
4	Creveling C M	Tolerance Design – A Hand Book for Developing Optimal Specifications	Addison Wesley Longman Inc	1997

WEB REFERENCES

1. www.dfma.com
2. www.design4manufacturability.com

16BEME6E06 GAS DYNAMICS AND JET PROPULSION 3 0 0 3 100

COURSE OBJECTIVES

1. To understand the basic difference between incompressible and compressibleflow.
2. To understand the phenomenon of shock waves and its effect on flow. To gain some basic knowledge about jet propulsion and RocketPropulsion.
3. To introduce the concepts of various conditions of compressible fluidflows
4. To Study and acquire knowledge on performance analysis of subsonic and supersonicinlets, combustors, afterburners and exhaustnozzles
5. To understand the concept of working of various types of rocketengines
6. To study the features of thrust equation for rocket propulsionsystem

COURSE OUTCOMES

Upon completion of this course, the students can able to

1. Analyze various conditions of compressible fluidflows.
2. Calculate mass flow rate in flow through variable areaducts.
3. Carryout simple performance analysis of subsonic and supersonicinlets.
4. Perform performance analysis of combustors, afterburners and exhaustnozzles.
5. Understand the working of various types of rocketengines
6. Use thrust equation for rocket propulsionsystem

UNITI BASIC CONCEPTS ANDISENTROPICFLOWS 9

Energy and momentum equations of compressible fluid flows – Stagnation states, Mach waves and Machcone –Effect of Mach number on compressibility – Isentropic flow through variable area ducts – Nozzle and Diffusers –area ratio as a function of Mach number, mass flow rate through nozzles and diffusers, effect of friction in flow through nozzles. Use of Gas tables.

UNITII FLOW THROUGHDUCTS 9

Flow through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) – Variation of flow properties – Isothermal flow with friction in constant area ducts –Use of tables and charts – Generalised gas dynamics.

UNITIII NORMAL ANDOBLIQUESHOCKS 9

Governing equations – Variation of flow parameters across the normal and oblique shocks – Prandtl – Meyer relations – Use of table and charts – Applications.

UNITIV JETPROPULSION 9

Theory of jet propulsion – Thrust equation – Thrust power and propulsive efficiency – Operation principle, cycle analysis and use of stagnation state performance of ram jet, turbojet, turbofan and turbo prop engines – Aircraft combustors.

UNITV ROCKETPROPULSION 9

Types of rocket engines – Propellants – Ignition and combustion – Theory of rocket propulsion – solid and liquid propellants, comparison of different propulsion systems .Performance study – Staging – Terminal and characteristic velocity – Applications – Space flights.

TOTAL 45

(Permitted to use standard Gas Tables in the examination)

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Yahya.S.M	Fundamentals of Compressible flow	New Age International (P) Ltd., New Delhi	2009
2	Rathakrishnan.E	Gas Dynamics	Prentice Hall of India, New Delhi	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Patrich.H.Oosthvizen, WillamE.Carscallen	Compressible fluid flow	McGraw–Hill	1997
2	Zucker,R.D. and Biblarz,O	Fundamentals of Gas Dynamics	John Willey	2002
3	Ganesan .V	Gas Turbines	Tata McGraw–Hill, New Delhi	2010
4	P.Hill and C. Peterson	Mechanics and Thermodynamics of Propulsion	Addison –Wesley Publishing Company	1992

WEB REFERENCES

1. http://www.adl.gatech.edu/classes/ae3021/ae3021_f06_6.pdf
2. http://www.grc.nasa.gov/WWW/k–12/airplane/isndrv.html
3. http://panoramix.ift.uni.wroc.pl/~maq/papers/PM_Correct_Matyka.pdf
4. http://soliton.ae.gatech.edu/people/jseitzma/classes/ae3450/StudyProblems.pdf
5. http://www.sil.si.edu/smithsoniancontributions/AnnalsofFlight/pdf_lo/SAOF–0001.4.pdf

16BEME6E07 ADVANCED I.C. ENGINES 3 0 0 3 100

COURSE OBJECTIVES

1. To understand the underlying principles of operation of different IC Engines andcomponents.
2. To provide knowledge on pollutant formation, control, alternate fueletc.
3. To Study and acquire knowledge to Identify parts, terminology and fuel supply system of internal combustionengine
4. To introduce the concepts of cooling and lubrication systems of ICengines
5. To make the student acquire sound knowledge on combustion, knocking and super charging of internal combustionengines
6. To expose students to recent trends associated with ICengines

COURSE OUTCOMES

Upon completion of this course, the students can able to

1. Explain the construction and operation of internal combustionengine.
2. Identify parts, terminology and fuel supply system of internal combustionengine.
3. Recognize the component used in cooling and lubrication systems of ICengines.
4. Describe the function of combustion, knocking and super charging of internal combustionengines.
5. Implement strategies for pollution control.
6. Know about the recent trends associated with ICengines

UNITI SPARKIGNITIONENGINES 9

Mixture requirements – Fuel injection systems – Monopoint, Multipoint & Direct injection - Stages of combustion – Normal and Abnormal combustion – Knock - Factors affecting knock – Combustion chambers.

UNITII COMPRESSIONIGNITIONENGINES 9

Diesel Fuel Injection Systems - Stages of combustion – Knocking – Factors affecting knock – Direct and Indirect injection systems – Combustion chambers – Fuel Spray behaviour – Spray structure and spray penetration – Air motion - Introduction to Turbocharging.

UNITIII POLLUTANT FORMATIONANDCONTROL 9

Pollutant – Sources – Formation of Carbon Monoxide, Unburnt hydrocarbon, Oxides of Nitrogen, Smoke and Particulate matter – Methods of controlling Emissions – Catalytic converters, Selective Catalytic Reduction and Particulate Traps – Methods of measurement – Emission norms and Drivingcycles.

UNITIV ALTERNATIVEFUELS 9

Alcohol, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas and Bio Diesel - Properties, Suitability, Merits and Demerits - EngineModifications.

UNITV RECENTTRENDS 9

Air assisted Combustion, Homogeneous charge compression ignition engines – Variable Geometry turbochargers – Common Rail Direct Injection Systems - Hybrid Electric Vehicles – NOx Adsorbers - OnboardDiagnostics.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ramalingam. K.K	Internal Combustion Engine Fundamentals	Scitech Publications	2002
2	Ganesan	Internal Combustion Engines	TMH	2002

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mathur. R.B. and R.P. Sharma	Internal Combustion Engines	Dhanpat Rai & Sons	2007
2	Duffy Smith	Auto Fuel Systems	The Good Heart Willcox Company, Inc.	1987
3	Eric Chowenitz	Automobile Electronics	SAE Publications	1995

16BEME6E08 **FINITE ELEMENT METHODS** **3 0 0 3 100**

COURSE OBJECTIVE

1. To explain the steps involved in FEA and also the types of weight residual methods
2. To impart knowledge to formulate and solve problems in one dimensional structures including trusses, beams and frames.
3. To enrich the understanding of two dimensional thermal and torsion problems.
4. To enrich the understanding of axisymmetric bodies, plate and shell.
5. To develop an understanding of the standard techniques on matrix solution techniques to dynamic problems.
6. To impart knowledge on FE equation for structural, heat transfer and vibration problems.

COURSE OUTCOME

1. Explain the steps involved in FEA and also the types of weight residual methods
2. Formulate and solve problems in one dimensional structures including trusses, beams and frames.
3. Predict finite element equations for two dimensional thermal and torsion problems.
4. Predict finite element equations for axisymmetric bodies, plate and shell.
5. Apply matrix solution techniques to dynamic problems.
6. Formulate FE equation for structural, heat transfer and vibration problems.

UNITI INTRODUCTION 9

Historicalbackground–Matrixapproach–Applicationtothecontinuum–Discretization–Matrixalgebra–Governing equations for continuum – Classical Techniques in FEM – Weighted residual method – Ritzmethod

UNITII ONEDIMENSIONALPROBLEMS 9

Finite element modeling – Coordinates and shape functions– Potential energy approach – Galerkin approach – Assembly of stiffness matrix and load vector – Finite element equations – Quadratic shape functions – Applications to plane trusses

UNITIII TWODIMENSIONALCONTINUUM 9

Introduction – Finite element modeling – Scalar valued problem – Poisson equation –Laplace equation – Triangular elements – Element stiffness matrix – Force vector – Galerkin approach – Stress calculation – Temperature effects

UNITIV AXISYMMETRIC CONTINUUM 9

Axisymmetric formulation – Element stiffness matrix and force vector – Galerkin approach – Body forces and temperature effects – Stress calculations – Boundary conditions – Applications to cylinders under internal or external pressures

UNITV ISOPARAMETRIC ELEMENTS FOR TWODIMENSIONALCONTINUUM 9

The four node quadrilateral – Shape functions – Element stiffness matrix and force vector – Numerical integration – Stiffness integration – Stress calculations – Four node quadrilateral element.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rao S.S	The Finite Element Method in Engineering	Butter worth Heinemann imprint, USA	2011
2	Khanka S.S	A First course in the Finite Element Method	Cengage Learning, Stamford, USA	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Chandrupatla T.R., and BelegunduA.D	Introduction to Finite Elements in Engineering	Pearson Education, Delhi	2011
2	David V Hutton	Fundamentals of Finite Element Analysis	McGraw–Hill Int. Ed, New York	2007

WEB REFERENCES

1. http://nptel.iitm.ac.in/courses/Webcourse–contents/IIT–KANPUR/mathematics–2/node18.html
2. http://www.me.berkeley.edu/~lwlin/me128/FEMNotes.pdf
3. http://www.rose–hulman.edu/~fine/FE2004/Class2/Notes2.pdf
4. http://www.asiri.net/courses/meng412/m412sm04ex1sol.pdf
6. http://hyperphysics.phy–astr.gsu.edu/hbase/electric/laplace.html

16BEME7E01 MACHINE TOOL DESIGN 3 0 0 3 100

COURSE OBJECTIVE

1. To gain knowledge in design and material selection of various machinetools.
2. To provide an overview of regulation of speeds and feeds
3. To study the features of machine toolstructures
4. To understand the importance of constructional features of machine toolstructures
5. To expose students to design in machine tool structures, guide ways, power screws andspindles
6. To expose students to design spindles and spindlesupports
7.

COURSE OUTCOMES:

Upon the completion of this course the students will be able to

1. Discuss the basics machine tool drives andmechanisms
2. Get knowledge on regulation of speeds and feeds
3. Understand the importance of machine toolstructures
4. Explain the constructional features of machine toolstructures
5. Design in machine tool structures, guide ways, power screws andspindles
6. Design spindles and spindlesupports

UNITI INTRODUCTION TO MACHINE TOOL DRIVESANDMECHANISMS 9

Introduction to the course, Working and Auxiliary Motions in Machine Tools, Kinematics of Machine Tools, Motion Transmission

UNITII REGULATION OF SPEEDS ANDFEEDS 9

Aim of Speed and Feed Regulation, Stepped Regulation of Speeds, Multiple Speed Motors, Ray Diagrams and Design Considerations, Design of Speed Gear Boxes, Feed Drives, Feed Box Design

UNITIII DESIGN OF MACHINETOOLSTRUCTURES 9

Functions of Machine Tool Structures and their Requirements, Design for Strength, Design for Rigidity, Materials for Machine Tool Structures, Machine Tool Constructional Features, Beds and Housings, Columns and Tables, Saddles and Carriages

UNITIV DESIGN OF GUIDEWAYS, POWER SCREWSANDSPINDLES 9

Functions and Types of Guideways, Design of Guideways, Design of Aerostatic Slideways, Design of Anti-Friction Guideways, Combination Guideways, Design of Power Screws.

UNITV DESIGN OF SPINDLES ANDSPINDLESUPPORTS 9

Functions of Spindles and Requirements, Effect of Machine Tool Compliance on Machining Accuracy, Design of Spindles, Antifriction Bearings. Dynamics of Machine Tools - Machine Tool Elastic System, Static and Dynamic Stiffness

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Sen, G.C. and Bhattacharya, A	Principles of machine tools	New Central Book Agency, Calcutta	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Chernov N	Machine Tools	Mir publishers Moscow	1984
2	N.K. Mehta	Machine Tool Design and Numerical Control	TMH, New Delhi	2012
3	G.C. Sen and A. Bhattacharya	Principles of Machine Tools	New Central Book Agency	2009
4	D. K Pal, S. K. Basu	Design of Machine Tools	Oxford IBH	2008
5	N. S. Acherkhan	Machine Tool Design	MIR publications	1968

16BEME7E02 ADDITIVE MANUFACTURING 3 0 0 3 100

COURSE OBJECTIVES

1. To know the principle methods, areas of usage, possibilities and limitations as well as environmental effects of the Additive Manufacturingtechnologies
2. To be familiar with the characteristics of the different materials those are used in Additive Manufacturing.
3. To introduce process involved in Additive manufacturingtechnology
4. To understand the importance of knowledge on software's used in additive manufacturingtechnology
5. To enrich the understanding of the working of SLS and othertechniques
6. To provide an overview of additive manufacturing technology in medicalfield and biostream

COURSE OUTCOMES

On completion of this course, students will be able to

1. Understand the need for additive manufacturingtechnology
2. Explain the process involved in Additive manufacturingtechnology
3. Get knowledge on software's used in additive manufacturingtechnology
4. Describe the working of SLS and othertechniques
5. Apply the additive manufacturing technology in medicalfield
6. Applications of additive manufacturing technology in biostream

UNITI INTRODUCTION 9

Overview – History - Need-Classification -Additive Manufacturing Technology in product development-Materials for Additive Manufacturing Technology – Tooling - Applications.

UNITII CAD &REVERSEENGINEERING 9

Basic Concept – Digitization techniques – Model Reconstruction – Data Processing for Additive Manufacturing Technology: CAD model preparation – Part Orientation and support generation – Model Slicing –Tool path Generation – Softwares for Additive Manufacturing Technology: MIMICS,MAGICS.

UNITIII LIQUID BASED AND SOLID BASED ADDITIVEMANUFACTURINGSYSTEMS 9

Classification – Liquid based system – Stereolithography Apparatus (SLA)- Principle, process, advantages and applications - Solid based system –Fused Deposition Modeling - Principle, process, advantages and applications, Laminated Object Manufacturing

UNITIV POWDER BASED ADDITIVEMANUFACTURINGSYSTEMS 9

Selective Laser Sintering – Principles of SLS process - Process, advantages and applications, Three Dimensional Printing - Principle, process, advantages and applications- Laser Engineered Net Shaping (LENS), Electron BeamMelting.

UNITV MEDICAL ANDBIO-ADDITIVEMANUFACTURING 9

Customized implants and prosthesis: Design and production. Bio-Additive Manufacturing- Computer Aided Tissue Engineering (CATE) – Case studies

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Chua C.K., Leong K.F., and Lim C.S	Rapid prototyping: Principles and applications	World Scientific Publishers	2010
2	Gebhardt A	Rapid prototyping	Hanser Gardener Publications	2003

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Liou L.W., LiouF.W	Rapid Prototyping and Engineering applications	CRC Press	2007
2	Kamrani A.K. and Nasr E.A	Rapid Prototyping: Theory and practice	Springer	2015
3	Hilton P.D, Jacobs P.F	Rapid Tooling: Technologies and Industrial Applications	CRC press	2000

16BEME7E03 COMPOSITE MATERIALS 3 0 0 3 100

COURSE OBJECTIVES

1. To understand the fundamentals of composite material strength and its mechanicalbehavior
2. Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of thefiber.
3. Thermo-mechanical behavior and study of residual stresses in Laminates duringprocessing.
4. Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronicchips.
5. To introduce the concepts of carbon-carbon composite for different industrialapplication
6. To impart knowledge on various advances incomposites

COURSE OUTCOMES

Learners should be able to

1. Select the various types of composite matrix required for anapplication.
2. Choose appropriate manufacturing process for polymer matrix composite.
3. Opt appropriate manufacturing process for metal matrixcomposite.
4. Use the concepts of ceramic composites and its productiontechniques.
5. Identify the type of carbon-carbon composite for different industrialapplication.
6. Explain the various advances incomposites

UNITI INTRODUCTION TOCOMPOSITES 9

Fundamentalsofcomposites-needforcomposites–Enhancementofproperties-classificationofcomposites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) – Reinforcement – Particle reinforced composites, Fibre reinforced composites. Applications of various types ofcomposites.

UNITII POLYMERMATRIX COMPOSITES 9

Polymer matrix resins – Thermosetting resins, thermoplastic resins – Reinforcement fibres – Rovings – Woven fabrics – Non woven random mats – various types of fibres. PMC processes - Hand lay up processes – Spray up processes – Compression moulding – Reinforced reaction injection moulding - Resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass fibre reinforced plastics(GRP).

UNITIII METALMATRIX COMPOSITES 9

Characteristics of MMC, Various types of Metal matrix composites Alloys - MMC, Advantages of MMC, Limitations of MMC, Metal Matrix, Reinforcements – particles – fibres. Effect of reinforcement - Volume fraction – Rule of mixtures. Processing of MMC – Powder metallurgy process - diffusion bonding – stir casting – squeezecasting.

UNITIV CERAMICMATRIX COMPOSITES 9

Engineeringceramicmaterials–properties–advantages–limitations–Monolithicceramics-NeedforCMC – Ceramic matrix - Various types of Ceramic Matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres- whiskers. Sintering - Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing(HIPing).

UNITV ADVANCESINCOMPOSITES 9

Carbon /carbon composites – Advantages of carbon matrix – limitations of carbon matrix Carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Sol gel technique. Composites for aerospace applications.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mathews F.L and Rawlings R.D	Composite materials Engineering and Science	Wood head publishing Ltd, England	2006
2	Chawla K.K	Composite materials	Springer – Verlag, , New York	2012

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Clyne T.W and Withers P.J	Introduction to Metal Matrix Composites	Cambridge University Press, New York	1995
2	Strong A.B	Fundamentals of Composite Manufacturing	Society of Manufacturing Engineering	2008
3	Sharma S.C	Composite materials	Narosa Publications, New Delhi	2000

WEB REFERENCES

1. http://www.metu.edu.tr/~ckaynak/METE%20470.htm
2. http://www.springerlink.com/content/978–1–4020–8771–4
3. http://www.virginia.edu/bohr/mse209/chapter17.htm
4. http://www.virginia.edu/bohr/mse209/chapter10.htm

16BEME7E04 REFRIGERATION ANDAIRCONDITIONING 3 0 0 3 100

COURSE OBJECTIVES

1. To understand the underlying principles of operations in different Refrigeration & Air conditioning systems andcomponents.
2. To provide knowledge on design aspects of Refrigeration & Air conditioningsystems
3. To introduce the concepts on use of unconventional refrigerant system for industrialapplication
4. To expose students to properties of air using psychrometricchart
5. To provide knowledge on cooling load for a givensystem
6. To know the application of air conditioning system for industrial and domestic purpose

COURSE OUTCOMES

Learners should be able to

1. Calculate COP of various refrigerationcycles.
2. Choose appropriate refrigerants for variousapplications.
3. Identify the use of unconventional refrigerant system for industrialapplication.
4. Calculate the properties of air using psychrometricchart.
5. Calculate cooling load for a givensystem
6. Select the appropriate air conditioning system for industrial and domesticapplications

UNIT I REFRIGERATIONCYCLE 9

Review of thermodynamic principles of refrigeration. Concept of refrigeration system. Vapour compression refrigeration cycle – use of P–H charts – multistage and multiple evaporator systems – cascade system – COP comparison. Vapor absorption refrigeration system. Ammonia water and Lithium Bromide water systems. Steam jet refrigeration system

UNIT II REFRIGERANTS, SYSTEM COMPONENTSANDBALANCING 9

Compressors – reciprocating and rotary (elementary treatment.) – Condensers – evaporators – cooling towers. Refrigerants – properties – selection of refrigerants, Alternate Refrigerants, Refrigeration plant controls – testing and charging of refrigeration units. Balancing of system components. Applications to refrigeration systems – ice plant – food storage plants – milk –chilling plants – refrigerated cargo ships.

UNITIII PSYCHROMETRY 9

Psychrometric processes– use of psychrometric charts – – Grand and Room Sensible Heat Factors – bypass factor – requirements of comfort air conditioning – comfort charts – factors governing optimum effective temperature, recommended design conditions and ventilation standards

UNITIV COOLINGLOADCALCULATIONS 9

Types of load – design of space cooling load – heat transmission through building. Solar radiation –infiltration – internalheatsources(sensibleandlatent)–outsideairandfreshairload–estimationoftotalload– Domestic, commercial and industrial systems – central air conditioning systems.

UNIT V AIRCONDITIONING 9

Air conditioning equipments – air cleaning and air filters – humidifiers – dehumidifiers – air washers – condenser – cooling tower and spray ponds – elementary treatment of duct design – air distribution system. Thermal insulation of air conditioning systems. – Applications: car, industry, stores, and public buildings

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Manohar Prasad	Refrigeration and Air Conditioning	New Age International Ltd, New Delhi	2011
2	Arora. C.P	Refrigeration and Air Conditioning	Tata McGraw–Hill, New Delhi	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Roy.JDossat	Principles of Refrigeration	Pearson Education, New Delhi	2002
2	Jordon and Prister	Refrigeration and Air Conditioning	Prentice Hall of India PVT Ltd., New Delhi	1981
3	StoeckerN.F and Jerold W.Jones	Refrigeration and Air Conditioning	McGraw Hill, New Delhi	1986

WEB REFERENCES

1. http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Kharagpur/Refrigeration%20and%20Air%20Conditioning.htm
2. http://www.ashrae.org/
3. http://en.wikipedia.org/wiki/Thermal_comfort

16BEME8E01 **QUALITY CONTROL AND RELIABILITY ENGINEERING** **3 0 0 3 100**

COURSE OBJECTIVES

1. To Understand the concept of SQC.
2. To enrich the understanding of control charts to analyze for improving the process quality.
3. To familiarize the students to understand different sampling plans
4. To Understand the importance of need and types of life testing.
5. To introduce the reliability of a system.
6. To introduce the concepts of quality control and reliability techniques in industries.

COURSE OUTCOMES

Upon the completion of this course the students will be able to

1. Understand the concept of SQC.
2. Use control charts to analyze for improving the process quality.
3. Describe different sampling plans
4. Understand the need and types of life testing.
5. Improve the reliability of a system.
6. Implement quality control and reliability techniques in industries

UNITI INTRODUCTION AND PROCESS CONTROLFORVARIABLES 9

Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality cost–Variation in process– factors – process capability – process capability studies and simple problems – Theory of control chart– uses of control chart – Control chart for variables – X chart, R chart and σ chart.

UNITII PROCESS CONTROLFOR ATTRIBUTES 9

Control chart for attributes –control chart for proportion or fraction defectives – P chart and NP chart – control chart for defects – C and U charts, State of control and process out of control identification in charts.

UNITIII ACCEPTANCESAMPLING 9

Lot by lot sampling – Types – probability of acceptance in single, double, multiple sampling techniques – O.C. curves – producer's Risk and consumer's Risk. AQL, LTPD, AOQL concepts–standard sampling plans for AQL and LTPD– uses of standard sampling plans.

UNITIV LIFE TESTING– RELIABILITY 9

Life testing – objective: – failure data analysis, Mean failure rate, mean time to failure, mean time between failure, hazard rate, system reliability, series, parallel and mixed configuration – simple problems. Maintainability and availability – simple problems. Acceptance sampling based on reliability test – O.C Curves.

UNITV QUALITYANDRELIABLITY 9

Reliability improvements – techniques– use of Pareto analysis – design for reliability – redundancy unit and standby redundancy – Optimization in reliability – Product design – Product analysis – Product development – Product life cycles – Maintenance.

TOTAL 45

Note: Permitted to use approved statistical table in the examination.

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Grant. Eugene .L	Statistical Quality Control	McGraw–Hill, New Delhi	2008
2	Srinath L.S	Reliability Engineering	Affiliated East west press New Delhi	2002

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Manohar Mahajan	Statistical Quality Control	Dhanpat Rai and Sons, New Delhi	2003
2	Besterfield D.H	Quality Control	Prentice Hall, New Delhi	2004
3	Danny Samson	Manufacturing and Operations Strategy	Prentice Hall, New Delhi	1991
4	Connor P.D.T.O	Practical Reliability Engineering	John Wiley, New Delhi	2012

WEB REFERENCES

1. http://www.statsoft.com/textbook/stquacon.html
2. http://www.isixsigma.com/library/content/c010806a.asp
3. http://www.statgraphics.com/control_charts.htm
4. http://www.sqconline.com/sampling–plans.html
5. http://reliability.sandia.gov/Maintenance/Data_Failure_Analysis/data_failure_analysis.html
6. http://www.designinindia.net/everywhere/disciplines/product–design/index.html

16BEME8E02 PRODUCTION PLANNING AND CONTROL 3 0 0 3 100

COURSE OBJECTIVES

1. To impart knowledge of need for planning and control in various aspects.
2. To develop an understanding of the standard techniques in various work study methodologies.
3. To familiarize the students to understand the product and process plan.
4. To introduce the concepts of a production schedule based on different facets.
5. To enrich the understanding of the level of inventory
6. To understand the importance the recent advancements in production planning and control.

COURSE OUTCOMES

Student will be able to

1. Indicate the need for planning and control in various aspects.
2. Understand various work study methodologies.
3. Construct product and process plan.
4. Prepare a production schedule based on different facets.
5. Estimate the level of inventory
6. Understand the recent advancements in production planning and control

UNITI INTRODUCTION 9

Objectives: and benefits of planning and control–Functions of production control–Types of production–job–batch and continuous–Product development and design–Marketing aspect – Functional aspects–Operational aspect–Durability and dependability aspect–aesthetic aspect. Profit consideration–Standardization, Simplification and specialization–Break even analysis–Economics of a new design.

UNITII WORKSTUDY 9

Method study, basic procedure–Selection–Recording of process – Critical analysis, Development – Implementation – Micro motion and memo motion study – work measurement – Techniques of work measurement – Time study – Production study – Work sampling – Synthesis from standard data – Predetermined motion time standards.

UNITIII PRODUCT PLANNING ANDPROCESSPLANNING 9

Product planning–Extending the original product information–Value analysis–Problems in lack of product planning–Process planning and routing–Pre requisite information needed for process planning–Steps in process planning–Quantity determination in batch production–Machine capacity, balancing.

UNITIV PRODUCTIONSCHEDULING 9

Production Control Systems–Loading and scheduling–Master Scheduling–Scheduling rules–Gantt charts–Perpetual loading–Basic scheduling problems – Line of balance – Flow production scheduling–Batch production scheduling–Product sequencing – Production Control systems–Periodic batch control–Material requirement planning Kanban.

UNITV INVENTORY CONTROL AND RECENT TRENDSINPPC 9

Inventory control–Purpose of holding stock–Effect of demand on inventories–Ordering procedures.
Two bin system –Ordering cycle system–Determination of Economic order quantity and economic lot size–ABC analysis–Recorder procedure–Introduction to computer integrated production planning systems–elements of JIT Systems.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	MartandTelsang	Industrial Engineering and Production Management	S.Chand and Company, New Delhi	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Samson Eilon	Elements of production planning and control	Macmillan, India	1981
2	Elwood S.Buffa, and Rakesh K.Sarin	Modern Production Operations Management	John Wiley and Sons, New Delhi	2007
3	Jain C.K and Aggarwal L.N	Production Planning Control and Industrial Management	Khanna Publishers, New Delhi	1997

WEB REFERENCES

1. http://envfor.nic.in/divisions/iwsu/iwsu.html
2. http://src.edu/work–study
3. http://thequalityportal.com/articles/value.htm

16BEME8E03 COGENERATION AND WASTE HEAT RECOVERY SYSTEMS 3 0 0 3 100

COURSE OBJECTIVES

1. To study the significance of waste heat recovery systems and carry out its economicanalysis
2. To know the concepts of cogeneration, its types and probable areas ofapplications
3. To enrich the understanding of thermodynamics, heat transfer, and fluid Mechanics principles to design and analysis of thisemerging technology.
4. To impart knowledge on operational issues and challenges cogenerationtechnologies.
5. To Understand the impact of this technology in waste heat recoverysystems
6. To introduce the concepts of various systems involved in waste heat recoveryprocess

COURSE OUTCOMES

The student will be able to

1. Understand the various methods ofcogeneration.
2. Apply knowledge of thermodynamics, heat transfer, and fluid Mechanics principles to design and analysis of thisemerging technology.
3. Have thorough understanding, operational issues and challenges cogenerationtechnologies.
4. Understand the impact of this technology in waste heat recoverysystems
5. Get the knowledge over various systems involved in waste heat recoveryprocess
6. Begin a career as an engineer in an organization economicanalysis

UNITI INTRODUCTION 9

Introduction – principles of thermodynamics – cycles – topping - bottoming – combined cycle - organic rankine cycles – performance indices of cogeneration systems – waste heat recovery – sources and types – concept of trigeneration.

UNITII COGENERATIONTECHNOLOGIES 9

Configuration and thermodynamic performance – steam turbine cogeneration systems – gas turbine cogeneration systems – reciprocating IC engines cogeneration systems – combined cycles cogeneration systems – advanced cogeneration systems: fuel cell, Stirling enginesetc.,

UNITIII ISSUES AND APPLICATIONS OFCOGENERATIONTECHNOLOGIES 9

Cogeneration plants electrical interconnection issues – utility and cogeneration plant interconnection issues – applications of cogeneration in utility sector – industrial sector – building sector – rural sector – impacts of cogeneration plants – fuel, electricity and environment

UNITIV WASTE HEATRECOVERYSYSTEMS 9

Election criteria for waste heat recovery technologies - recuperators - Regenerators - Economizers - plate heat exchangers - thermic fluid heaters - Waste heat boilers classification, location, service conditions, design Considerations - fluidized bed heat exchangers - heat pipe exchangers - heat pumps – sorption systems.

UNITV ECONOMIC ANALYSIS 9

Investment cost – economic concepts – measures of economic performance – procedure for economic analysis – examples – procedure for optimized system selection and design – load curves - sensitivity analysis– regulatory and financial frame work for cogeneration and waste heat recovery systems.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	R.Kehlhofer, B. Rukes, F. Stirnimann	Combined-cycle gas & steam turbine power plants	PennWell Books	2009

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Steve Doty, Wayne C. Turner	Energy management handbook	The Fairmont Press, Inc	2009
2	A.Thumann, D. Paul Mehta	Handbook of energy engineering	The Fairmont Press Inc	2014
3	B.F.Kolanowski	Small-scale cogeneration handbook	Fairmont Press	2013
4	M.P. Boyce	Handbook for cogeneration and combined cycle power plants	ASME Press	2010
5	Educogen	The European Educational tool for cogeneration	Fairmont Press	2001

16BEME8E04 ENERGY CONSERVATION METHODS AND ENERGY AUDIT 3 0 0 3 100

COURSE OBJECTIVES

1. To understand and analyze the energy data ofindustries
2. To carryout energy accounting andbalancing
3. To conduct energy audit and suggest methodologies for energysavings
4. To utilize the available resources in optimalways
5. To make the students conversant with concepts of industrialfurnaces
6. To equip them with skills to perform Energyaudit

COURSE OUTCOMES

At the end of the course, student will be able to

1. Understand the Environmental aspects of energyutilization
2. Perform combustionanalysis
3. Explain the concepts of industrialboiler
4. understand how to work with the steam generated from the boilers in the industrial point ofview
5. Explain the concepts of industrialfurnaces
6. Perform Energyaudit

UNITI ENERGYSCENARIO 9

Present status, rate of growth, energy utilization (sector wise), concept of energy conservation, energy economics.

COMBUSTION: Fuel analysis, combustion calculations, air requirements, theoretical and excess air requirements, excess air control, flue gas analysis and measurement, types of draught, draught calculations, chimney size calculations. F.D and I.D fan draught requirements and power requirements, furnace pressure requirements.

UNITII INDUSTRIALBOILERS 9

Types and characteristics of industrial boilers, heat balance in boilers, efficiency trials in boilers, energy conservation opportunities in boilers operation and maintenance, water treatment requirements, soot blowing requirements, super heaters and superheat controls, waste heat recovery systems.

STEAM: Distribution requirements of steam and streamlines, efficient utilization of steam, steam trapping and air venting, flash steam recovery, condensate recovery, thermal insulation for systems including HVAC, stream balancecalculations.

UNITIII INDUSTRIALFURNACES 9

Furnace types and characteristics, heat balance in furnaces, furnace efficiency calculations, energy conservation opportunities in furnaces, refractories types and properties, waste heat recovery system, insulating refractories, ceramic fibers, heat loss reduction calculations, wall and stored heat lossreduction.

UNITIV DRYING 9

Principle of drying and types of driers, mass and heat balance in driers, energy conservation opportunities in drying operations.

EVAPORATION: Principle of evaporation and types of evaporations, mass and heat balance, single and multiple effect evaporation, capacity and steam economy calculations, vapour recompression system.

UNITV ENERGY AUDITANDAPPLICATIONS 9

Types, methodology, questionnaire development, specific energy consumption (unitwise/section wise), identification of energy conservation measures/ technologies, economic and cost benefit analysis, case studies, Energy rating for thermal equipment ,Energy saving measurement – Star status –National awards.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Turner, W. C., Doty, and Truner, W. C	Energy Management Hand book	Fairmont Press	2009
2	De. B. K.	Energy Management audit & Conservation	Vrinda Publication	2016

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Trinks M.H, W.Mawhinney	Industrial Furnaces	John Wiley Publications, London	2004
2	Prabir Basu, Cen Kefa, Louis Jestin	Boilers and Burners Design and Theory	Springer Publications, New Delhi	2012

WEB REFERENCES

1. www.energyconservation.co.in
2. www.energymanagertraining.com\
3. www.nrel.gov

OPEN ELECTIVES
(COURSES OFFERED BY OTHER DEPARTMENTS)
SCIENCE AND HUMANITIES

16BESHOE01 PROBABILITY ANDRANDOMPROCESS 3 0 0 3 100

COURSE OBJECTIVES

1. To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
2. To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
3. To understand the basic concepts of random processes which are widely used in IT fields.
4. To understand the concept of correlation and spectral densities.
5. To understand the significance of linear systems with random inputs.
6. To understand the response of random inputs to linear time invariant systems.

COURSE OUTCOMES

1. Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
2. The students will have an exposure of various distribution functions, correlation and spectral densities.
3. To understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
4. To understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
5. To apply the concept random processes in engineering disciplines.
6. To understand and apply the concept of correlation and spectral densities

UNITI MEASURES OF CENTRAL TENDENCY ANDPROBABILITY 9

Measures of central tendency – Mean, Median, Mode - Standard Deviation Probability - Random variable - Axioms of probability - Conditional probability - Total probability – Baye's theorem.

UNITII STANDARDDISTRIBUTIONS 9

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma(one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – Chebyshev'sinequality.

UNITIII TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions - Marginal and conditional distributions - Probability mass function - Probability density functions – Covariance - Correlation and regression

UNITIV CLASSIFICATION OFRANDOM PROCESS 9

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNITV CORRELATION ANDSPECTRALDENSITIES 9

Autocorrelation-Crosscorrelation-Properties–Powerspectraldensity–Crossspectraldensity–Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function Linear time invariant system - System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input andoutput.

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Peebles Jr, P.Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Pubishers, New Delhi.	2002

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Henry Stark and John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002
2	Ross, S	A first Course in Probability	Pearson Education, New Delhi (Chap 2 to 8)	2012
3	Gupta, S.C. and Kapur, V.K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2014
4	Veerarajan,T.	Probabilitiy, Statistics and Random process	Tata McGraw-Hill Publications, Second Edition, New Delhi	2012

WEB REFERENCES

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld.Wolfram.com

16BESHOE02 FUZZY MATHEMATICS 3 0 0 3 100

COURSE OBJECTIVES

1. Be able to understand basic knowledge of fuzzy sets
2. Be able to understand basic knowledge of fuzzy logic
3. Be able to apply basic knowledge of fuzzy operations.
4. To know the basic definitions of fuzzy relations
5. Be able to apply basic fuzzy inference and approximate reasoning
6. To know the applications of fuzzy Technology.

COURSE OUTCOMES

1. To gain the main subject of fuzzy sets.
2. To understand the concept of fuzziness involved in various systems and fuzzy set theory.
3. To gain the methods of fuzzy logic.
4. To comprehend the concepts of fuzzy relations.
5. To analyze the application of fuzzy logic control to real time systems.
6. The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

UNITI FUZZYSETS **9**

Fuzzy Sets: Basics Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations – Level Sets – F u z z y functions - Zadeh's Extension Principle

UNITII OPERATIONS ONFUZZYSETS **9**

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNITIII FUZZYRELATIONS **9**

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNITIV FUZZYMEASURES **9**

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures vs Possibility Measures

UNITV FUZZYINFERENCE **9**

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	George J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic : Theory and Applications	Prentice Hall NJ	2003

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	H.J. Zimmermann	Fuzzy Set Theory and its Applications	Allied Publishers, New Delhi	2001
2	Kevin M Passino and Stephen Yurkovich	Fuzzy Control	Addison Wesley Longman	1998
3	Michal Baczynski and Balasubramaniam	Fuzzy Implications	Springer Verlag, Heidelberg	2008

WEB REFERENCES

1. www.mathcentre.ac.uk
2. www.mathworld.Wolfram.com
3. www.doc.ic.ac.uk
4. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

16BESHOE03 **LINEAR ALGEBRA** **3 0 0 3 100**

COURSE OBJECTIVES

1. To introduce the basic concepts of vector space
2. To introduce the fundamental concepts in their respective engineering fields
3. To know the fundamentals of linear Algebra
4. To solve system of linear equations
5. To study about the linear transformations
6. To introduce the concepts of inner product spaces

COURSE OUTCOMES

1. To explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
2. To describe the fundamental concepts of Eigen values and Eigen vectors by using Power method.
3. To apply the fundamental concepts in their respective engineering fields
4. To visualize linear transformations as matrix form
5. To recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
6. To articulate the importance of Linear Algebra and its applications in branches of Mathematics.

UNITI VECTORSPACES 9

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space

UNITII EIGEN VALUES ANDEIGENVECTORS 9

Eigen values and Eigen vectors - diagonalization - Power method - QR decomposition

UNITIII SYSTEM OFLINEAR EQUATIONS 9

Direct methods, Gauss elimination method, Gauss Jordan method, Crout's method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNITIV LINEARTRANSFORMATIONS 9

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNITV INNERPRODUCTSPACES 9

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

TOTAL 45

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill	2008

WEB REFERENCES

1. www.sosmath.com
2. www.linear.ups.edu
3. www.mathworld.wolfram.com
4. www.tutorial.math.lamar.edu

16BESHOE04 ENGINEERING ACOUSTICS 3 0 0 3 100

COURSE OBJECTIVES

1. To disseminate the fundamentals of acoustic waves.
2. To inculcate the characteristics of radiation and reception of acoustic waves.
3. To teach the concepts of radiation and reception of acoustic waves
4. To divulge knowledge on the basics of pipe resonators and filters.
5. To introduce the features of architectural acoustics.
6. To impart the basic knowledge of transducers and receivers.

COURSE OUTCOMES

1. Develop the idea of the fundamentals of acoustic waves.
2. Apply the concepts of radiation and reception of acoustic waves.
3. Explain the basic ideas of pipe resonators and filters.
4. Illusrate the basics of architectural acoustics.
5. Illustrate the transducers and receivers and its applications in various electronic devices.
6. Apply the knowledge inputs of the course for engineering applications.

UNITI INTRODUCTION 9

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves -Energy density – Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales. Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence –method of images.

UNITII RADIATION AND RECEPTION OFACOUSTIC WAVES 9

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers. Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNITIII PIPES RESONATORS ANDFILTERS 9

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – detection threshold – the ear – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

UNITIV ARCHITECTURALACOUSTICS 9

Sound in endosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design. Environmental Acoustics: Weighted sound levels speech interference – highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

UNITV TRANSDUCTION 9

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker – loudspeaker cabinets – horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

TOTAL 45

TEXTBOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	LawerenceE.Kinsler, Austin R.Frey,	Fundamentals of Acoustics	4ht edition, John Wiley & Sons	2000

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	F. AltonEverest& Ken Pohlmann	Master Handbook of Acoustics	McGraw Hill Professional	2014

WEB REFERENCES

1. www.acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www.ocw.mit.edu

16BESHOE05 SOLID WASTE MANAGEMENT 3 0 0 3 100

COURSE OBJECTIVES:

1. To make the students conversant with basics of Solid wastes and its classification.
2. To make the student acquire sound knowledge of different treatments of solid wastes.
3. To acquaint the student with concepts of waste disposals.
4. To develop an understanding of the basic concepts of Hazardous waste managements.
5. To acquaint the students with the basics of energy generation from waste materials.
6. To get the information on energy conservation.

COURSE OUTCOMES:

1. Outline the basic principles of Solid waste and separation of wastes (K)
2. Identify the concepts of treatment of solid wastes (S)
3. Identify the methods of wastes disposals. (S)
4. Examine the level of Hazardousness and its management. (S)
5. Examine the possible of the energy production using waste materials. (S)
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNITI SOLIDWASTE 9

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

UNITII WASTETREATMENT 9

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNITIII WASTEDISPOSAL 9

Sanitary Land Fill Method of Solid Waste Disposal – Land Fill Classficaition, Types, Methods &Siting Consideration – Layout & Preliminary Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfillRemediation

UNITIV HAZARDOUS WASTEMANAGEMENT 9

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure, Remediaiton, riskassessment.

UNITV ENERGY GENERATION FROM WASTE 9

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, energy recovery systems. Biological & chemical conversion technologies – Aerobic composting, low solids. Anaerobic digestion, high solids anaerobic digestion, Energy production from biological conversion products, other biological transformation processes. Chemical transformation processes.

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dara.S.S, Mishra.D.D	A Text book of Environmental chemistry and pollution control	S.Chand and company Ltd	2011

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nagpal H.Theisen, S. Vigil	Integrated Solid Waste management- Engg. Principles and management issues	George Tchobanoglous, McGraw Hill	2013
2	Frank Kreith, GeorgeTchobanoglous	Hand Book of Solid Waste Management- 2ndedition	McGraw Hill Publishing Ltd., Newyork	2002
3	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall	1999

WEB REFERENCES

1. www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.
2. http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/
3. www.alternative-energy-news.info/technology/garbage-energy/
4. nzic.org.nz/ChemProcesses/environment/

16BESHOE06 GREEN CHEMISTRY 3 0 0 3 100

COURSE OBJECTIVES

1. To make the students conversant about the green chemistry
2. To make the student acquire sound knowledge of the atom efficient process
3. To make the student acquire sound knowledge of the synthesis elaborately.
4. To acquaint the student with concepts of green technology.
5. To develop an understanding of the basic concepts of renewable energy resources.
6. To acquaint the students with the basic's information on catalysis.

COURSE OUTCOMES

1. Outline the basic principles of green chemistry.
2. Examine the different atom efficient process and synthesis elaborately.
3. Apply the concepts combustion of green technology.
4. Identify and apply the concepts of renewable energy.
5. Apply the concepts of green catalysts in the synthesis.
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology

UNITI INTRODUCTION TO GREENCHEMICALPRINCIPLES 9

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

UNITII ATOM EFFICIENTPROCESSES 9

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis

UNITIII BIOTECHNOLOGY AND GREENCHEMISTRY 9

Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

UNITIV RENEWABLERESOURCES 9

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomassconversion

UNITV CATALYSIS INGREENCHEMISTRY 9

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	V. K. Ahluwalia and M.Kidwai	New Trends in Green Chemistry	Anamaya publishers.Newdelhi. Second Edition	2007
2	Sanjay K. Sharma, AckmezMudhoo	Green Chemistry for Environmental Sustainability	CRC Press	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication

1	K. R. Desai	Green Chemistry	Himalaya Publishing House, Mumbai.	2005
2	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons	2012
3	A. S.Matlack	Introduction to Green Chemistry	Marcel Dekker: New York	2001
4	Mukesh Doble	Green Chemistry and Engineering	Academic Press	2007

WEB REFERENCES

1. http://www.organic-chemistry.org/topics/green-chemistry.shtm
2. http://www.essentialchemicalindustry.org/processes/green-chemistry.html
3. http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm
4. http://www.epa.gov/research/greenchemistry/
5. http://www.amazon.in/Green-Chemistry-Catalysis

16BESHOE07 APPLIED ELECTROCHEMISTRY 3 0 0 3 100

COURSE OBJECTIVES

1. To get the information on electrochemical material.
2. To study about the conducting polymers.
3. To study about electrochemistry in storage devices
4. To acquaint the student with concepts of Energy storage devices.
5. To gain knowledge on the batteries and power sources.
6. To develop energy storage devices.

COURSE OUTCOMES

1. Outline the basic principles of chemistry in electrochemical material**.**
2. Examine the properties of conducting polymers.
3. Apply the concepts of electrochemistry in storage devices.
4. Identify the concepts of storage devices and its applications.
5. Apply the suitable materials for the manufacturing of storage devices.
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNITI METALFINISHING 9

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electroplating for electronic industry- Alloy plating, brass plating- Electro less plating of nickel- anodizing – Electroforming – Electro winning

UNITII CONDUCTING POLYMERSANDELECTROCHEMICALS 9

Electropolymerisation- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers-poly acetylene- Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNITIII BATTERIES ANDPOWERSOURCES-I 9

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types ofelectrolytes.

UNITIV BATTERIES ANDPOWERSOURCES-II 9

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

UNITV ELECTROCHEMICALMATERIALSCIENCE 9

Solar cells- Preparation of CdS/Cu2S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	D.Pletcher and F.C.Walsh	Industrial electrochemistry	Chapman and Hall, London	1990
2	Cynthia G. Zoski	Hand Book of Electrochemistry	Academic Press, Elesevier., UK	2007

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication

1	M.M.Baizer	Organic electrochemistry	Dekker Inc. New York	1983
2	M. Barak	Electrochemical power sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
3	K.L. Chopra and I. Kaur	Thin film devices and their application	Plenum Press, New York.	1983
4	Bruno Scrosati	Applications of Electroactive polymers	Chapman & Hall, London	1993

WEB REFERENCES

1. http://www.anoplate.com/finishes/
2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html
3. http://inventors.about.com/od/sstartinventions/a/solar_cell.htm

16BESHOE08 INDUSTRIAL CHEMISTRY 3 0 0 3 100

COURSE OBJECTIVES

1. To make the students conversant with cement and lime
2. To make the students to aware about uses of cement and lime.
3. To make the student acquire sound knowledge of abrasives and refractories.
4. To acquaint the student with concepts of inorganic chemicals.
5. To develop an understanding of the basic conceptsexplosives.
6. To acquaint the students with the basics of agriculture chemicals.

COURSE OUTCOMES

1. Outline the basic chemistry of **cement and lime.**
2. Examine the uses of abrasives and refractories.
3. Identify the usage of the inorganic chemicals.
4. Identify the concepts of explosives and smoke screens .
5. Identify the usage of the **agriculture** chemicals
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology.

UNITI CEMENTANDLIME 9

Manufacture of Portland cement – settling of hardening of Portland cement – regauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials- manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – magnesian lime – dolomitic lime – hydraulic lime.

UNITII ABRASIVES ANDREFRACTORIES 9

Abrasives–hardabrasives–siliceousabrasives–softabrasives –artificialabrasives–uses.Refractories–definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

UNITIII INORGANIC CHEMICALS 9

Common salt and soda ash – Manufacture – Different grades – products – alkalis – Na2CO3, Caustic soda and chlor-alkali industry – manufacture principles of electrolytic process – chlorine – storage. Hydrochloric acid – manufacture–absorption–uses,Sulphurandsulphuricacid–extractionofsulphur–manufactureofH2SO4 – chamber – contact processes – industrialuses.

UNITIV EXPLOSIVES 9

Explosives–uses–propertiesandtests–explosivesforwar–nitrocellulose–picricacidandT.N.T.– industrial explosives – nitroglycerin and dynamites – black powder – smoke screens – incendiaries – gasmask.

UNITV AGRICULTURECHEMICALS 9

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	B.K. Sharma	Industrial Chemistry	Goel Publishing House, Meerut	2000
2	D.Pletcher and F.C.Walsh	Industrial electrochemistry	Chapman and Hall, London	1990

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication

1	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH Publishing CO. New Delhi.	1998
2	R.N. Sherve	Chemical process industries	McGraw-Hill, Kugakuisha Ltd., Tokyo.	1984
3	James A. Kent	Hand Book of Industrial Chemistry, 9th edition	New York, Van Nostrand Reinhold.	1992
4	S.D. Shukla and G.N. Pandy	A text book of chemical technology	Vikas publishing house pvt. Ltd, New Delhi.	1979

WEB REFERENCES

1. http://en.wikipedia.org/wiki/Cement
2. http://www.hon.ch/HONselect/Selection/D01.html
3. http://fas.org/man/dod-101/navy/docs/fun/part12.htm
4. http://toxics.usgs.gov/topics/agchemicals.html

16BECSOE01 INTERNETPROGRAMMING 3 0 0 3 100

COURSE OBJECTIVES:

1. To study concepts of Internet, IP addresses and protocols
2. To explain the concept of web page development through HTML
3. To introduce the PERL and explore its current strengths and Weaknesses
4. To write working Java code to demonstrate the use of applets for client side programming
5. To study Internet telephony and various multimedia applications
6. To Elaborate on the principles of web page development

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

1. Learn the advanced concepts& techniques of Internet and Java.
2. Analyze the requirements for and create and implement the principles of web page development
3. Understand the concepts ofPERL
4. Implement client side programming using java applets
5. Generate internet telephony based upon advanced concepts
6. Develop applications on internet programming based on java applets and scripts

UNITI INTRODUCTION 9

Introduction - Network of Networks, Intranet, Extranet and Internet. World Wide Web- Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. TCP/IP- Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing- Classful and Classless Addressing, Subnetting

UNITII HTML 9

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue. Image Maps- map, area, attributes of image area- Extensible Markup Language (XML)- Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts- Introduction- Environment Variable, GET and POST Methods

UNITIII PERL 9

Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling- JavaScript- Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies- Definition of cookies, Create and Store a cookie with example. Java Applets-Container Class, Components, Applet Life Cycle, Update method,Applications

UNITIV CLIENT-SERVERPROGRAMMING 9

Client-Server programming In Java - Java Socket, Java RMI. Threats - Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks- Network security techniques- Password and Authentication- VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH). Firewall- Introduction, Packet filtering, Stateful, Application layer, Proxy.

UNITV INTERNETTELEPHONY 9

Introduction, VoIP- Multimedia Applications- Multimedia over IP: RSVP, RTP, RTCP and RTSP-Streaming media, Codec and Plugins, IPTV- Search Engine and Web Crawler- Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Paul Deitel, Harvey Deitel& Abby Deitel	Internet and World Wide Web-How to Program	PHI Learning, Delhi	2011
2	N.P. Gopalan and J. Akilandeswari	Web Technology: A Developer's Perspective	PHI Learning, Delhi	2013

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rahul Banerjee	Internetworking Technologies, An Engineering Perspective	PHI Learning, Delhi	2011
2	Robert W. Sebesta	Programming the World Wide Web	Pearson Education	2016

16BECSOE02 MULTIMEDIA AND ANIMATION 3 0 0 3 100

COURSE OBJECTIVES:

1. To impart the fundamental concepts of Computer Animation and Multimedia
2. To study the graphic techniques and algorithms using flash
3. Explain various concepts available in 3D animation
4. Explain various devices available for animation
5. To study the multimedia concepts and various I/O technologies for concept development
6. To understand the three-dimensional graphics and their transformations

COURSE OUTCOMES

Upon completion of this course, the student will be able to:

1. Develop their creativity using animation and multimedia
2. Understand the concepts of Flash and able to develop animation using it
3. Understand about various latest interactive 3D animation concepts
4. Know the various devices and software available in motion capture
5. Understand the concept development process
6. Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology

UNITI INTRODUCTION 9

What is mean by Animation – Why we need Animation – History of Animation– Uses of Animation – Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects -Creating Animation.

UNITII CREATING ANIMATIONINFLASH 9

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers - Action script.

UNITIII 3D ANIMATION &ITSCONCEPTS 9

Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation

UNITIV MOTIONCAPTION 9

Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage – Different Language of Script Animation Among the Software.

UNITV CONCEPTDEVELOPMENT 9

Story Developing –Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Malay K. Pakhira	Computer Graphics, Multimedia and Animation	PHI Learning	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ranjan Parekh	Principles of Multimedia	TMH	2007
2	Ashok Banerji, Ananda Mohan Ghosh	Multimedia Technologies	McGraw Hill Publication	2007
3	Pankaj Dhaka	Encyclopedia of Multimedia and Animations	Anmol Publications	2011

16BECSOE03 PC HARDWARE AND TROUBLE SHOOTING 3 0 0 3 100

COURSE OBJECTIVES:

1. To study the basic parts of computer in detail
2. Introduce various peripheral devices available for computer and its detailed working concepts
3. Overview of various interfaces and other hardware overview
4. Assemble/setup and upgrade personal computer systems and discuss about power supplies and the skills to trouble-shoot various power-related problems.
5. To study basic concepts and methods in troubleshooting
6. To study the installation/connectionand maintenance of computer and its associated peripherals.

COURSE OUTCOME:

Upon completion of this course, the student will be able to:

1. Identify the main components for the PC, familiarize themselves with PC memories such as RAM and ROM devices and so on.
2. Identify various peripheral devices available and its working
3. Understand various concepts of hardware and its interface and control
4. Perform basic installation of PC. Importance of maintenance is understood
5. Understand Various faults and failures are identified and troubleshooting in detail
6. Understand overall PC hardware, interfacing, maintenance and troubleshooting

UNITI INTRODUCTION 9

Introduction - Computer Organization – Number Systems and Codes – Memory – ALU – CU – Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques – Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC andUser.

UNITII PERIPHERALDEVICES 9

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices – FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNITIII PCHARDWAREOVERVIEW 9

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC.

UNITIV INSTALLATION ANDPREVENTIVEMAINTENANCE 9

Introduction – system configuration – pre installation planning – Installation practice – routine checks – PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – DataRecovery.

UNITV TROUBLESHOOTING 9

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LSI’s – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROMProblems.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	B. Govindarajalu	IBM PC Clones Hardware, Troubleshooting and Maintenance	TMH	2002

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Peter Abel, Niyaz Nizamuddin	IMB PC Assembly Language and Programming	Pearson Education	2007
2	Scott Mueller	Repairing PC's	PHI	1992

16BECSOE04 JAVA PROGRAMMING 3 0 0 3 100

COURSE OBJECTIVES:

1. To understand Object Oriented Programming concepts and basic characteristics of Java
2. To know the principles of packages, inheritance and interfaces
3. To define exceptions and use I/O streams
4. To develop a java application with threads, generics classes and swings
5. To explain the need for generic programming
6. To design and build simple Graphical User Interfaces

COURSE OUTCOMES:

Upon completion of the course, students will be able to:

1. Develop Java programs using OOP principles
2. Develop Java programs with the concepts inheritance and interfaces
3. Build Java applications using exceptions and I/O streams
4. Develop Java applications with threads and generics classes and swings
5. Understand various aspects for motivation of generic programming
6. Develop various interactive Java programs using OOP concepts of Java

UNITI INTRODUCTION TOJAVA 9

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation–inheritance–abstractclasses–polymorphism.-ObjectsandclassesinJava–definingclasses – methods - access specifiers – static members –constructors – finalizemethod

UNITII PACKAGES 9

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy –polymorphism – dynamic binding – final keyword – abstract classes

UNITIII I/OSTREAMS 9

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes

UNITIV EXCEPTIONHANDLING 9

Exceptions–Syntaxofexceptionhandlingcode–Multiplecatchstatements–Usingfinallystatements–Throwing our own exceptions – Using exceptions for debugging

UNITV THREADS 9

Introduction, Creating Threads, The Life Cycle of a Thread, Thread Methods, Using Threads, Synchronization of Threads, Summary

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Cay S. Horstmann and Gary Cornell	Core Java: Volume I – Fundamentals Sun Microsystems	Press	2008

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	K. Arnold and J. Gosling	The JAVA programming language	Pearson Education	2009
2	Timothy Budd	Understanding Object-oriented programming with Java Updated Edition	Pearson Education	2002
3	C. Thomas Wu	An introduction to Object-oriented programming with Java Fourth Edition	Tata McGraw-Hill Publishing company Ltd	2008

WEB REFERENCES

1. http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/
2. http://www.winprog.org/tutorial/msvc.html
3. http://www.tutorialized.com/tutorials/Visual-C/1
4. http://www.freeprogrammingresources.com/visualcpp.html

ELECTRICAL AND ELECTRONICS ENGINEERING

16BEEEOE01 ELECTRICHYBRIDVEHICLES 3 0 0 3 100

COURSE OBJECTIVES

1. To understand the basic concepts of electric hybrid vehicle.
2. To gain the knowledge about electric propulsion unit.
3. To gain the concept of Hybrid Electric Drive-Trains.
4. To gain the different Energy Management Strategies.
5. To study about the efficiency manipulation in drives
6. To understand and gain the knowledge about various energy storage devices

COURSE OUTCOMES:

1. Summarize the basic concepts in bioprocess Engineering.
2. Explain the concept of Hybrid Electric Vehicles.
3. Understand the concept of Hybrid Electric Drive-Trains.
4. Identify the different Energy Management Strategies.
5. Understand the concept of different Energy Storage devices
6. Analyze the different motor drives used in Hybrid Electric Vehicles

UNITI INTRODUCTION 9

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNITII HYBRID ELECTRIC DRIVE-TRAINS 9

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNITIII ELECTRIC PROPULSIONUNIT 9

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNITIV ENERGYSTORAGE 9

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNITV ENERGYMANAGEMENTSTRATEGIES 9

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mehrdad Ehsani, Yimi Gao, Gay, Ali Emadi	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	CRC Press	2009
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley	2012

16BEEEOE02 ENERGY MANAGEMENT & ENERGY AUDITING 3 0 0 3 100

COURSE OBJECTIVES:

1. To gain the knowledge about energy management.
2. To understand the basic concepts in economic analysis in energy management.
3. To understand the basic principles of energy audit.
4. To gain the knowledge about the basic concept of types of Energy Audit
5. To gain and Evaluate the different energy efficient motors
6. Understand the concept of Energy conservation.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

1. Understand the concept of Energy Management.
2. Analyze the different methods for economic analysis
3. Knowledge about the basic concept of Energy Audit and types.
4. Evaluate the different energy efficient motors
5. Understand the concept of Energy conservation.
6. Investigate the different methods to improve power factor

UNITI ENERGYMANAGEMENT 9

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNITII ECONOMIC ASPECTSANDANALYSIS 9

Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worth method.

UNITIII BASIC PRINCIPLES OFENERGYAUDIT 9

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNITIV ENERGYEFFICIENTMOTORS 9

Electric Motors: Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation –over motoring – motor energy audit-

Energy conservation: Importance-energy saving measures in DG set-fans and blowers pumps- air conditioning system- energy efficient transformers.

UNITV POWER FACTOR IMPROVEMENT, LIGHTING ANDENERGY INSTRUMENTS 9

Power factor - methods of improvement, location of capacitors, p.f with non linear loads, effect of harmonics on p.f,- p.f motor controllers –Energy efficient lighting system design and practice- lighting control–Measuring Instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application ofPLCs.

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Murphy W.R. and G.Mckay Butter worth	Energy Management	Heinemann Publications	2007

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	John.C.Andreas	Energy Efficient Electric Motors	Marcel Dekker Inc Ltd – 3rd edition	2005
2	W.C.Turner Steve Doty	Energy Management Handbook	John Wiley and Sons, 7th Edition	2013

16BEEEOE03 PROGRAMMABLE LOGIC CONTROLLER 3 0 0 3 100

COURSE OBJECTIVES

1. To understand the basic principles of PLC systems.
2. To gain the knowledge about data handling functions.
3. To gain the knowledge of storage techniques in PLC
4. To acquire the knowledge about how to handle the data and functions
5. To study about flow charts of ladder and spray process system
6. To understand the principles of PID.

COURSE OUTCOME

1. At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.
2. To acquire the knowledge of storage techniques in PLC
3. Students know how to handle the data and functions
4. Students known about advanced controller in PLC applications
5. Students gather real time industrial application of PLC
6. Students gathered and evaluate the flow charts of ladder and spray process system

UNITI INTRODUCTION 9

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNITII PLCPROGRAMMING 9

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNITIII REGISTERS ANDPLCFUNCTIONS 9

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNITIV DATAHANDLINGFUNCTIONS 9

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNITV PIDPRINCIPLES 9

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	JR Hackworth and F.D Hackworth – Jr	Programmable Logic Controllers – Programming Method and Applications	Pearson	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	2004
2	W.Bolton	Programmable Logic controller	Elsevier Newnes Publications, Fourth Edition	2009

WEB REFERENCE

1. http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logiccontroller

16BEEEOE04 RENEWABLE ENERGY RESOURCES 3 0 0 3 100

COURSE OBJECTIVES

1. To gain the knowledge about environmental aspects of energy utilization.
2. To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
3. To study about solar energy collectors and its storages
4. To study about the inter connected system in wind power
5. To understand the basic principles fuel cell, Geo thermal power plants.
6. To gain the knowledge about hydro energy.

COURSE OUTCOMES

At the end of this course, students will demonstrate the ability to

1. Analyze the Energy Scenario in india
2. Understand the concept of Solar Energy
3. Understand the concept of Wind Energy
4. Understand the concept of Hydro Energy
5. Analyze the different energy sources
6. Students gathered the real time inter connected system modelling in wind power

UNITI INTRODUCTION 9

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

UNITII SOLARENERGY 9

Introduction to solar energy: solar radiation, availability, measurement and estimation– Solar thermal conversion devices and storage – solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

UNITIII WINDENERGY 9

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNITIV HYDROENERGY 9

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNITV OTHERSOURCES 9

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rai.G.D	Non-conventional resources of energy	Khanna publishers ,Fourth edition	2011
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rao.S. &Parulekar	Energy Technology	Khanna publishers, Fourth edition	2013
2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis	2015

WEB REFERENCE

1. www.energycentral.com
2. 2. www.catelelectricpowerinfo.com

ELECTRONICS AND COMMUNICATION ENGINEERING

16BEECOE01 REAL TIMEEMBEDDEDSYSTEMS 3 0 0 3 100

COURSE OBJECTIVES

1. To introduce students to the embedded systems, its hardware and software.
2. To introduce devices and buses used for embedded networking.
3. To study about task management
4. To learn about semaphore management and message passing
5. To study about memory management
6. To imparts knowledge on

COURSE OUTCOMES

At the end of the course the students will be able to

1. Understand overview of embedded systems architecture
2. Acquire knowledge on embedded system, its hardware and software.
3. Gain knowledge on overview of Operating system
4. Discuss about task Management
5. Gain knowledge about semaphore management and message passing.
6. Gain knowledge about memory management

UNITI INTRODUCTION TO EMBEDDEDSYSTEM 9

Introduction - Embedded systems description, definition, design considerations & requirements - Overview of Embedded system Architecture (CISC and RISC) - Categories of Embedded Systems - embedded processor selection &tradeoffs - Embedded design life cycle - Product specifications - hardware/software partitioning - iterations and implementation - hardware software integration - product testing techniques – ARM 7

UNITII OPERATINGSYSTEMOVERVIEW 9

Introduction –Advantage and Disadvantage of Using RTOS – Multitasking – Tasks - Real Time Kernels – Scheduler - Non-preemptive Kernels - Preemptive Kernels – Reentrancy- Reentrant Functions – Round Robin Scheduling - Task Priorities - Static Priorities – Mutual Exclusion – Deadlock – Intertask Communication – Message Mailboxes – Message Queues - Interrupts - Task Management – Memory Management - Time Management – Clock Ticks.

UNITIII TASK MANAGEMENT 9

Introduction - µ C/OS-II Features - Goals of µ C/OS-II - Hardware and Software Architecture – Kernel Structures: Tasks –Task States – Task Scheduling – Idle Task – Statistics Task – Interrupts Under µ C/OS-II – Clock Tick - µ C/OS-II Initialization. Task Management: Creating Tasks – Task Stacks – Stack Checking – Task's Priority – Suspending Task – Resuming Task. Time Management: Delaying a Task – Resuming a Delayed Task – System Time. Event Control Blocks- Placing a Task in the ECB Wait List – Removing a Task from an ECB waits List.

UNITIV SEMAPHORE MANAGEMENT ANDMESSAGEPASSING 9

Semaphore Management: Semaphore Management Overview – Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox – Deleting Mailbox – Waiting for a Message box – Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue – Deleting a Message Queue – Waiting for a Message at a Queue – Sending Message to a Queue – Flushing a Queue

UNITV MEMORYMANAGEMENT 9

Memory Management: Memory Control Blocks – Creating Partition- Obtaining a Memor y Block – Returning a Memor y Block .Getting Started with µ C/OS-II – Installing µ C/OS-II – Porting µ C/OS-II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with µ C/OS-II - µ C/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Anal yze the Multichannel ADC with help of µ C/OS-II

TOTAL 45

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Jean J. Labrosse	MicroC/OS – II The Real Time Kernel	CMP BOOKS	2009
2	David Seal	ARM Architecture Reference Manual.	Addison-Wesley	2008
3	Steve Furbe,	ARM System-on-Chip Architecture,	Addison-Wesley Professional, California	2000

16BEECOE02 **CONSUMER ELECTRONICS** **3 0 0 3 100**

COURSE OBJECTIVES

1. To study about various speakers and microphone
2. To learn the fundamental of television systems and standards
3. To learn the process of audio recording and reproduction
4. To study various telephone networks
5. To discuss about the working of home appliances
6. To familiarize with TV services like ISDN.

COURSE OUTCOMES

At the end of the course the students will be able to

1. Understand working of various type of loud speakers
2. Acquire knowledge on various types of picture tubes
3. Demonstrate the working of various optical recording systems
4. Distinguish various standards for color TV system
5. Acquire knowledge on various telecommunication networks
6. Demonstrate the working of various home appliances

UNITI LOUDSPEAKERS ANDMICROPHONES 9

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones

UNITII TELEVISION STANDARDSANDSYSTEMS 9

Components of a TV system – interlacing – composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL, SECAM - Components of a RemoteControl

UNITIII OPTICAL RECORDINGANDREPRODUCTION 9

AudioDisc–ProcessingoftheAudiosignal–readoutfromtheDisc–Reconstructionoftheaudiosignal– Video Disc – Video disc formats- recording systems – Playback Systems

UNITIV TELECOMMUNICATIONSYSTEMS 9

Telephone services - telephone networks – switching system principles – PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellularmodems

UNITV HOME APPLIANCES 9

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

TOTAL 45

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.P.Bali	Consumer Electronics	Pearson Education	2005

16BEECOE03 NEURAL NETWORKS AND ITS APPLICATIONS 3 0 0 3 100

COURSE OBJECTIVES

1. To introduce the basic concepts of neural networks and its applications in various domain
2. To educate how to use Soft Computing to solve real-world problems
3. To have a solid understanding of Basic Neural Network.
4. To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
5. To gain exposure in the field of neural networks and relate the human neural system into the digital world
6. To provide knowledge of computation and dynamical systems using neural networks

COURSE OUTCOMES

At the end of the course the students will be able to

1. Understand the basic concepts of neural networks and its applications in various domains
2. Gain knowledge about learning process in Neural Networks
3. Apply perception concept in design
4. Design using ART phenomena
5. Gain knowledge on SOM concepts
6. Ability to develop the use of Soft Computing to solve real-world problems

UNITI INTRODUCTION TO NEURALNETWORKS 9

Introduction - biological neurons and their artificial models - learning, adaptation and neural network's learning rules - types of neural networks- single layer, multiple layer- feed forward, feedback networks

UNITII LEARNINGPROCESS 9

Error – correction learning – memory based learning - hebbian learning-competitive learning-Boltzmann learning- supervised and unsupervised learning-adaptation-statistical learning theory.

UNITIII PERCEPTION 9

Single layer perception-Adaptive filtering-unconstrained optimization-Least-mean square algorithm-Leaning curve-Annealing Technique-perception convergence theorem-Relationship between perception and Baye’s classifier-Back propagation algorithm

UNITIV ATTRACTOR NEURAL NETWORKANDART 9

Hopfield model-BAM model- BAM stability-Adaptive BAM -Lyapunov function-effect of gain-Hopfield design-Application to TSP problem-ART- layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP

UNITV SELFORGANIZATION 9

Self organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical vector Quantization. Applications of self-organizing maps: The Neural Phonetic Typewriter Learning Ballistic Arm Movements

TOTAL 45

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Simon Haykin	Neural Networks and Learning Machines	Pearson/ Prentice Hall	2009
2	Satish Kumar	Neural Networks - A Classroom Approach	TMH	2008

3	Freeman J.A., Skapura D.M	Neural networks, algorithms, applications, and programming techniques	Addition Wesley	2005
4	Laurene Fausett	Fundamentals of Neural Networks: Architectures, Algorithms, and Applications	Pearson/ Prentice Hall	1997

16BEECOE04 FUZZY LOGIC AND ITS APPLICATIONS 3 0 0 3 100

COURSE OBJECTIVES

1. To introduce the basic concepts of Fuzzy logic and its applications in various domain
2. To educate how to use Fuzzy computation to solve real-world problems
3. To have a solid understanding of Basic fuzzy models.
4. Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
5. To learn about applications on Fuzzy based systems
6. To familiarize with fuzzy fiction and de fuzzy fiction procedures

COURSE OUTCOMES

At the end of the course the students will be able to

1. Understand the basic concepts of Fuzzy logic and its applications in various domain
2. Gain knowledge on theory of Reasoning
3. Develop fuzzy controllers
4. Understand concepts of adaptive fuzzy control
5. Ability to develop how to use Fuzzy computation to solve real- world problems
6. Design fuzzy based model for any application

UNITI BASICS OFFUZZYLOGIC 9

Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNITII THEORY OFAPPROXIMATEREASONING 9

Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference-fuzzy models

UNITIII FUZZY KNOWLEDGE BASEDCONTROLLERS(FKBC) 9

Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures – Design of Fuzzy Logic Controller

UNITIV ADAPTIVEFUZZYCONTROL 9

Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

UNITV FUZZYBASEDSYSTEMS 9

Simple applications of FKBC -washing machines- traffic regulations -lift control-fuzzy in medical applications- Introduction to ANFIS.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	D. Diankar, H. Hellendoom	An Introduction to Fuzzy Control	Narosa Publishers India	1996
2	G. J. Klir and T. A. Folger	Fuzzy Sets Uncertainty and Information	PHI IEEE	1995

BIOTECHNOLOGY

16BTBTOE01 BIOREACTORDESIGN 3 0 0 3 100

COURSE OBJECTIVES

1. To impart basic knowledge in bioprocessEngineering
2. To design the bioreactors for variousoperations.
3. To understand the principle and working of heat transferequipments.
4. To extend the knowledge in principle of heat transfer inside abioreactor
5. To construct the equipments used in mass transferoperations.
6. To learn the equipments used in separationprocess.

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Summarize the basic concepts in bioprocessEngineering.
2. Design the bioreactors for variousoperations.
3. Understand the principle and working of heat transferequipments.
4. Develop the heat transfer equipments for BioprocessEngineering.
5. Construct the equipments used in mass transferoperations.
6. Categorize the equipments used in separationprocess.

UNITI ENGINEERING PROPERTIES ANDSTORAGETANK 9

Introduction to various mechanical properties of material to be used material of construction, design of cylindrical storage tank.

UNITII REACTORDESIGN 9

Design of Airlift fermentor, Bubble column reactor and Continuous stirred tank reactor.

UNITIII HEATTRANSFEREQUIPMENTS 9

Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulationevaporator.

UNITIV MASS TRANSFEREQUIPMENTS 9

Design of Bollmann extractor, fractionating column, packed tower and spray tray absorber

UNITV SEPERATIONEQUIPMENTS 9

Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rotart drum drier and Swenson –walker crystallizer.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	James Edwin Bailey, David F. Ollis	Biochemical Engineering Fundamentals	McGraw- Hill	2007
2	Don W. Green, Robert H. Perry	Chemical Engineer Hand book	The McGraw- Hill Companies, Inc.	2008

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Pauline. M. Doran	Bioprocess Engineering Principles	Academic Press	2013

16BTBTOE02 FOOD PROCESSING AND PRESERVATION 3 0 0 3 100

COURSE OBJECTIVES

1. To learn the scope and importance of foodprocessing.
2. To impart basic knowledge in different food processing methods carried out in the food techcompanies.
3. To extend the brief knowledge in food conservationoperations.
4. To study the methods of food preservation bycooling.
5. To familiarize the students on the concepts of preservation methods forfruits.
6. To create deeper understanding on preservation methods forvegetables.

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Describe the scope and importance of foodprocessing.
2. Outline the various processing methods forfoods.
3. Extend the knowledge in food conservationoperations.
4. Describe the methods of food preservation bycooling.
5. Summarize the preservation methods forfruits.
6. Demonstrate the preservation methods forvegetables.

UNITI SCOPE AND IMPORTANCE OFFOODPROCESSING 9

Properties of food - Physical, thermal, mechanical, sensory. Raw material Preparation - Cleaning, sorting, grading, peeling.

UNITII PROCESSINGMETHODS 9

Heating- Blanching and Pasteurization. Freezing- Dehydration- canning- additives fermentation- extrusion cooking- hydrostatic pressure cooking- dielectric heating- micro wave processing and aseptic processing – Infra red radiation processing- Concepts and equipmentused.

UNITIII FOODCONVERSIONOPERATIONS 9

Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membrane separation- filtration- equipment andapplication.

UNIT IV FOOD PRESERVATION BY COOLING 9

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Water activity, methods to control wateractivity.

UNITV PRESERVATION METHODS FOR FRUITSANDVEGETABLES 9

Pre processing operations - preservation by reduction of water content: drying / dehydration and concentration – chemical preservation – preservation of vegetables by acidification, preservation with sugar - Heat preservation– Food irradiation- Combined preservation techniques.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	R. Paul Singh, Dennis R. Heldman	Introduction to food engineering.	Academic Press	2001
2	P.Fellows.	Food Processing Technology, Principles and practice.	Wood head Publishing Ltd	2000
3	Mircea EnachescuDauthy	Fruit and Vegetable Processing	FAO agricultural services bulletin no.119	1995

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M.A. Rao, Syed S.H. Rizvi, Ashim K. Datta	Engineering properties of foods	CRC Press	2005
2	B. Sivasankar	Food processing and preservation	PHI Learning Pvt. Ltd	2002

16BTBTOE03 BASIC BIOINFORMATICS 3 0 0 3 100

COURSE OBJECTIVES

1. To understand the available tools and databases for performing research inbioinformatics.
2. To expose students to sequence alignment tool inbioinformatics.
3. To construct the phylogenetic trees forevolution.
4. To get familiar with the 3D structure of protein andclassification.
5. To acquire basic knowledge in protein secondary structureprediction.
6. To extend the brief knowledge in Micro array dataanalysis.

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Summarize the basic concepts and importance of Bioinformatics in varioussectors.
2. Demonstrate the sequence alignment tool inbioinformatics.
3. Construct the phylogenetic trees forevolution.
4. Analyze the three dimensional protein structure and classification using varioustools.
5. Illustrate the protein secondary structure prediction by comparativemodeling.
6. Extend the knowledge in micro array technology and applications of bioinformatics in varioussectors.

UNITI OVERVIEW OFBIOINFORMATICS 9

The scope of bioinformatics; bioinformatics & the internet; useful bioinformatics sites. Data acquisition: sequencing DNA, RNA & proteins; determination of protein structure; gene & protein expression data; protein interaction data. Databases – contents, structure & annotation: file formats; annotated sequence databases; miscellaneous databases.

UNITII RETRIEVAL OFBIOLOGICALDATA 9

Data retrieval with Entrez & DBGET/ LinkDB; data retrieval with SRS (sequence retrieval system).Searching sequence databases by sequence similarity criteria: sequence similarity searches; amino acid substitution matrices; database searches, FASTA & BLAST; sequence filters; iterative database searches & PSI-BLAST. Multiple-sequence alignment, gene & protein families: multiple-sequence alignment & family relationships; protein families & pattern databases; protein domain families.

UNITIII PHYLOGENETICS 9

Phylogenetics, cladistics & ontology; building phylogenetic trees; evolution of macromolecular sequences. Sequence annotation: principles of genome annotation; annotation tools & resources.

UNITIV STRUCTURALBIOINFORMATICS 9

Conceptual models of protein structure; the relationship of protein three-dimensional structure to protein function; the evolution of protein structure & function; obtaining, viewing & analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure: CATH & SCOP; introduction to protein structure prediction; structure prediction by comparative modeling; secondary structure prediction; advanced protein structure prediction & prediction strategies.

UNITV MICROARRAYDATAANALYSIS 9

Microarray data, analysis methods; microarray data, tools & resources; sequence sampling & SAGE. Bioinformatics in pharmaceutical industry: informatics & drug discovery; pharma informatics resources. Basic principles of computing in bioinformatics: running computer software; computer operating systems; software downloading & installation; database management.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication

16BTBTOE03 BASIC BIOINFORMATICS 3 0 0 3 100

1	Dan E. Krane, Michael L. Rayme	Fundamental Concepts of Bioinformatics	Pearson education	2004
2	Andreas D., F. Francis Ouellette	Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins	Wiley-Interscience	2004
3	David W. Mount	Sequence and Genome Analysis	Cold Spring Harbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Michael J. Korenberg	Microarray Data Analysis: Methods and Applications	Springer Science & Business Media	2007

16BTBTOE04 FUNDAMENTALS OF NANO BIOTECHNOLOGY 3 0 0 3 100

COURSE OBJECTIVES

1. To impart the skills in the field of nano biotechnology and itsapplications.
2. To acquire knowledge in the nano particles and its significance in variousfields.
3. To extend the knowledge in types and application of nano particles insensors.
4. To define the concepts of biomaterials through molecular selfassembly.
5. To equip students with clinical applications of nanodevices.
6. To describe deeper understanding of the socio-economic issues innanobiotechnology.

COURSE OUTCOMES

Upon completion of this course, the students will be able to

1. Develop skills in the field of nano biotechnology and itsapplications.
2. Summarize the nanoparticles and its significance in variousfields.
3. Extend the knowledge in types and application of nano particles insensors.
4. Define the concepts of biomaterials through molecular selfassembly.
5. Outline the clinical applications of nanodevices.
6. Describe the socio-economic issues innanobiotechnology.

UNITIINTRODUCTION 9

Introduction, Scope and Overview, Length scales , Importance of Nanoscale and Technology, History of Nanotechnology, Future of Nanotechnology: Nano Technology Revolution, Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concept, Controversies and confusions, Understanding advanced capabilities, Nanotechnology in Different, Fields: Nanobiotechnology, Materials, Medicine, Dental care.

UNIT IINANOPARTICLES 9

Introduction, Types of Nanoparticles, Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Applications, Toxic effects of Nanomaterials, Significance of Nanoparticles Nanofabrications-MEMS/NEMS, Atomic Force Microscopy, Self assembled monolayers/ Dip- pen Nanolithography, Soft Lithography, PDMS Molding, Nano Particles, Nano wires and Nanotubes.

UNITIII APPLICATIONS 9

Nanomedicine, Nanobiocensor and Nanofludics.Nanocrystals in biological detection, Electrochemical DNA sensors and Integrated Nanoliter systems.Nano-Biodevices and Systems.Fabrication of Novel Biomaterials through molecular self assembly- Small scale systems for in vivo drug delivery- Future nanomachine.

UNITIV NANOBIOTECHNOLOGY 9

Clinical applications of nanodevices.Artificialneurons.Real-time nanosensors- Applications in cancer biology.Nanomedicine.Synthetic retinyl chips based on bacteriorhodopsins.High throughput DNA sequencing with nanocarbon tubules.Nanosurgical devices.

UNITV ETHICAL ISSUESINNANOTECHNOLOGY 9

Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology: With Especial Reference to Nanomedicine, Nanomedicine Applied in Nonmedical Contexts, Social Issues Relating to Nanomedicine. Social and Ethical Issues, Economic Impacts, Other Issues, Nanotechnology and Future Socio-economic challenges.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication

1	Niemeyer. C.M. and Mirkin. C.A	Nanobiotechnology: Concepts, Applications and Perspectives	Wiley- VCH	2004
2	Goodsell. D.S.	Bionanotechnology	John Wiley and Sons, Inc	2004

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Shoseyov. O., Levy. I	Nanobiotechnology: Bioinspired Devices and Materials of the Future	Humana Press	2007
2	Bhushan. B.	Springer Handbook of Nanotechnology	Springer- Verlag Berlin Heidelberg	2004
3	FreitasJrR.A	Nanomedicine	Landes Biosciences	2004
4	Kohler. M. and Fritzsche. W.	Nanotechnology – An Introduction to Nanostructuring Techniques	Wiley- VCH	2004

AUTOMOBILE ENGINEERING

16BEAEOE01 AUTOMOBILEENGINEERING 3 0 0 3 100

COURSE OBJECTIVES:

1. To impart knowledge on the constructional details and principle of operation of various automobile components.
2. To learn the function and working of various components in transmission and drive lines.
3. To study the concept and working of steering and suspension systems in an automobile.
4. To give knowledge on the wheels, tyres and brakes of automobiles.
5. To provide information on the current and future trends in automobiles.
6. Identify and explain the types of steering system.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

1. Demonstrate the operating principles and constructional details of various automobile components.
2. Explain the function and working of components in transmission and drive lines.
3. Identify and explain the types of steering system.
4. Identify and explain the types of suspension system.
5. Classify and describe the types of wheels, tyres and brakes of automobiles.
6. Discuss the current and future trends in the automobiles

UNITI ENGINE AND FUELFEEDSYSTEMS 9

Classification of Engine , construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburettor working principle, requirements of an automotive carburettor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNITII TRANSMISSIONSYSTEMS 9

Requirements of transmission system.Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. Objective of the gearbox - Determination of gear ratios for vehicles. Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propellar Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

UNITIII SUSPENSIONSYSTEM 9

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension – Pneumatic suspension – Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

UNITIV BRAKES 9

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theoryBrake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System (ABS).

UNITV ELECTRICALSYSTEM 9

Principle and construction of lead acid battery.Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.Starting System and charging system.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., New Delhi	2003
3	Dr.Kirpal Singh	Automobile Engineering	Standard Publishes	2011

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
2	Crouse.W.H	Automobile Electrical Equipment	McGraw-Hill Book Co., Inc., New York.	1986
3	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAE Inc	2001

16BEAEOE02 BASICS OF TWO AND THREE WHEELERS 3 0 0 3 100

COURSE OBJECTIVES

1. The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.
2. Construct the frames of two and three wheelers of different layouts.
3. Demonstrate the constructional details and principle of operation of various engine components.
4. Identify and explain the types of transmission systems.
5. Identify and explain the types of steering and suspension systems.
6. Classify and describe the types of wheels, tyres and brakes for two and three wheelers

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

1. Construct the frames of two and three wheelers of different layouts.
2. Demonstrate the constructional details and principle of operation of various engine components.
3. Identify and explain the types of transmission systems.
4. Identify and explain the types of steering and suspension systems.
5. Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
6. Explain the servicing of two and three wheelers

UNITI INTRODUCTION 9

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNITII POWER UNITS, IGNITION SYSTEMS AND OTHERELECTRICALSYSTEMS 9

2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNITIII CLUTCHES ANDTRANSMISSION 9

Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNITIV FRAMES, SUSPENSION, WHEELS ANDTYRES 9

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNITV THREEWHEELERS 9

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992

2	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century book house.	1988

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M.M.Griffin.	Motor cycles from inside and outside.	Prentice Hall Inc, New Jersey.	1978
2	Bruce A. Johns and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAEOE03 AUTOMOBILE MAINTENANCE 3 0 0 3 100

COURSE OBJECTIVES

1. The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems inAutomobile.
2. Describe and differentiate the types of maintenance.
3. List the procedure for dismantling, servicing and assembling of engine components.
4. Demonstrate the servicing of transmission and driveline components.
5. Discuss the procedure for steering and suspension
6. Discuss the procedure for wheel and brake maintenance.

COURSE OUTCOMES

Upon successful completion of the course, the students should be able to:

1. Describe and differentiate the types of maintenance.
2. List the procedure for dismantling, servicing and assembling of engine components.
3. Demonstrate the servicing of transmission and driveline components.
4. Discuss the procedure for steering and suspension
5. Discuss the procedure for wheel and brake maintenance.
6. Explain the fault diagnosis in the electrical and air conditioner systems

UNITI MAINTENANCE OF RECORDSANDSCHEDULES 9

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNITII ENGINEMAINTENANCE 9

Dismantling of engine components and cleaning, cleaning methods, visual anddimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNITIII CHASSIS MAINTENANCE 9

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheelbalancing.

UNITIV ELECTRICALSYSTEM MAINTENANCE 9

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNITV MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLEBODY 9

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating systemmaintenance.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	John Doke	Fleet Management	McGraw Hill Co	1984
2	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011

REFERENCE

1. Service Manuals from Different VehicleManufacturers

16BEAEOE04 INTRODUCTION TO MODERN VEHICLETECHNOLOGY 3 0 0 3 100

COURSE OBJECTIVES:

1. To impart knowledge on trends in the vehicle power plants.
2. To learn the various advanced driver assistance systems.
3. To study the working of advanced suspension and braking systems in an automobile.
4. To give information about motor vehicle emission and noise pollution control.
5. To provide knowledge of the vehicle telematics.
6. To give information about the noise control techniques

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

1. Distinguish and describe the various modern vehicle power plant systems.
2. List and explain the various driver assistant mechanisms.
3. Identify and describe the working of advanced suspension and braking systems.
4. Apply the knowledge of motor vehicle emission and noise pollution control.
5. Describe the noise control techniques
6. Describe the vehicle telematics and its applications

UNITI TRENDS INPOWERPLANTS 9
Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNITII DRIVERASSISTANCESYSTEMS 9
Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNITIII SUSPENSION BRAKESANDSAFETY 9
Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passengercomfort.

UNITIV NOISE&POLLUTION 9
Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNITV TELEMATICS 9
Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	LjuboVlacic and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001
2	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems –Progress in Technology	Automotive Electronics Series, SAE, USA.	1998

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William B Riddens	“Understanding Automotive Electronics”	Butterworth Heinemann Woburn.	1998
2	Bechhold,	“Understanding Automotive Electronics”	SAE	1998
3	Robert Bosch,	“Automotive HandBook”	SAE	2000

CIVIL ENGINEERING

16BECEOE01 HOUSING, PLANANDMANAGEMENT 3 0 0 3 100

COURSE OBJECTIVES

1. To examine the role and tasks of basic housing policies and building bye laws
2. Understand the process of integrated service delivery in the context of economic, social, environmental and institutional factors
3. Analyze the Innovative construction methods and Materials
4. Analyze city management strategies and strengthen the urban governance through a problem solving approach
5. To know the Importance of basic housing policies and building bye laws
6. To use Housing Programmes and Schemes

COURSE OUTCOMES

The students will be able to

1. Know the Importance of basic housing policies and building bye laws.
2. Use Housing Programmes and Schemes.
3. Plan and Design of Housing projects.
4. Examine Innovative construction methods and Materials.
5. Know Housing finance and loan approval procedures.
6. Understand Construction as well as managing techniques.

UNITI INTRODUCTIONTOHOUSING 9

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNITII HOUSINGPROGRAMMES 9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNITIII PLANNING AND DESIGN OFHOUSINGPROJECTS 9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNITIV CONSTRUCTION TECHNIQUES ANDCOST-EFFECTIVEMATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNITV HOUSING FINANCE ANDPROJECTAPPRAISAL 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems).

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Meera Mehta and Dinesh Mehta	Metropolitan Housing Markets	Sage Publications Pvt. Ltd., New Delhi	2002
2	Francis Cherunilam and Odeyar D Heggade	Housing in India	Himalaya Publishing House, Bombay	2001

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	CMA	Development Control Rules for Chennai Metropolitan Area	CMA, Chennai	2002
2	UNCHS	National Experiences with Shelter Delivery for the Poorest Groups	UNCHS (Habitat), Nairobi	2000

16BECEOE02 BUILDING SERVICES 3 0 0 3 100

COURSE OBJECTIVES

1. Defining and identifying of engineering services systems in buildings.
2. The role of engineering services systems in providing comfort and facilitating life of users of the building.
3. The basic principles of asset management in a building & facilities maintenance environment
4. Importance of Fire safety and its installation techniques
5. To Know the principle of Refrigeration and application
6. To Understand Electrical system and its selection criteria

COURSE OUTCOMES

The students will be able to

1. Machineries involved in building construction
2. Understand Electrical system and its selection criteria
3. Use the Principles of illumination & design
4. Know the principle of Refrigeration and application
5. Importance of Fire safety and its installation techniques
6. Know the principle behind the installation of building services and to ensure safety in buildings

UNITI MACHINERIES 9

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNITII ELECTRICAL SYSTEMSIN BUILDINGS 9

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNITIII PRINCIPLES OF ILLUMINATION& DESIGN 9

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in buildingtypes.

UNITIV REFRIGERATION PRINCIPLES& APPLICATIONS 9

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

UNITV FIRESAFETYINSTALLATION 9

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	E.R.Ambrose	Heat Pumps and Electric Heating	John and Wiley and Sons, Inc., New York	2002

2	NBC	Handbook for Building Engineers in Metric systems	NBC, New Delhi	2005

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	-	Philips Lighting in Architectural Design	McGraw-Hill, New York	2000
2	A.F.C. Sherratt	Air-conditioning and Energy Conservation	The Architectural Press, London	2005
3	National Building Code			

16BECEOE03 MANAGEMENT OF IRRIGATION SYSTEMS 3 0 0 3 100

COURSE OBJECTIVES

1. To enable the students for a successful career as water management professionals.
2. To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.
3. To expose the students the need for an interdisciplinary approach in irrigation water management
4. To providing a platform to work in an interdisciplinary team.
5. To provide students an ability to understand the applications of mathematical and scientific concepts to analyse intricate technical, social and environmental problems in irrigation water management and finding solutions for them.
6. To promote student awareness for a life-long learning process and inculcate professional ethics and codes of professional practice in water management.

COURSE OUTCOMES

At the end of this the students will be in a capacity to

1. Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.
2. Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management
3. Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach.
4. Gain insight on local and global perceptions and approaches to participatory water resource management
5. Learn from successes and failures in the context of both rural and urban communities of water management.
6. Exposure on the use of economic concepts in irrigation development and to impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector.

UNITI IRRIGATIONSYSTEMREQUIREMENTS 9

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNITII IRRIGATIONSCHEDULING 9

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNITIII MANAGEMENT 9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNITIV OPERATION 9

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNITV INVOLVEMENT OF STAKEHOLDERS 9

Farmer’s participation in System operation – Water user’s associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dilip Kumar Majumdar	Irrigation Water Management – Principles and Practice	Prentice Hall of India Pvt. Ltd., New Delhi	2000
2	R.T. Gandhi	Hand book on Irrigation Water Requirement	Water Management Division, Department of Agriculture	1990

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Technical report No. 33,	Hand Book on Irrigation System Operation Practices	CWC, New Delhi	2000
2	Maloney, C. and Raju, K.V	Managing Irrigation Together - Practice and Policy in India	, Stage Publication, New Delhi, India	2000

16BECEOE04 ADVANCED CONSTRUCTION TECHNOLOGY 3 0 0 3 100

COURSE OBJECTIVES

1. To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
2. To study different methods of construction to successfully achieve the structural design with recommended specifications.
3. To involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. To study of construction equipment's, and temporary works required to facilitate the construction process
5. To provide a coherent development to the students for the courses in sector of Advanced construction technology.
6. To present the new technology of civil Engineering and concepts related Advanced construction technology.

COURSE OUTCOMES

1. Implementation of new technology concepts which are applied in field of Advanced construction.
2. Different methods of construction to successfully achieve the structural design with recommended specifications.
3. Application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. Will gain the Knowledge of construction equipment's, and temporary works required to facilitate the construction process
5. Development to the students for the courses in sector of Advanced construction technology.
6. The new technology of civil Engineering and concepts related Advanced construction technology.

UNITI MODERNCONSTRUCTIONMETHODS 9

Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNITII CONSTRUCTION METHODS FORSPECIALSTRUCTURES 9

Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines

UNITIII MODERN CONSTRUCTION EQUIPEMENTS-I 9

Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting,Tunneling and hoisting

UNITIV MODERN CONSTRUCTION EQUIPEMENTS-II 9

Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant

UNITV PRINCIPLES AND PRACTICES OFTEMPORARYSTRUCTURES 9

Principles and Practices of Temporary structures, Shoring, and Strutting,Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipments

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Peurifoyu , R. L, Ledbette, W.B	Construction Planning , Equipment and Methods	Mc Graw Hill Co	2000
2	Antill J.M., PWD	Civil Engineering Construction	Mc Graw Hill Book Co	2005

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Varma, M	Construction Equipment and its Planning & Applications	Metropoltian Book Co	2000
2	Nunnaly, S.W	Construction Methods and Management	Prentice – Hall	2000

3	Ataev, S.S	Construction Technology	MIR , Pub	2000

OPEN ELECTIVES
(COURSES OFFERED TO OTHER DEPARTMENTS)

16BEMEOE01 COMPUTERAIDED DESIGN 3 0 0 3 100

COURSE OBJECTIVES

1. To apply basic concepts to develop construction (drawing) techniques.
2. To ability to manipulate drawings through editing and plotting techniques.
3. To understand geometric construction and Produce template drawings.
4. To understand and demonstrate dimensioning concepts and techniques.
5. To understand Section and Auxiliary Views.
6. To become familiar with Solid Modelling concepts and techniques.

COURSE OUTCOMES

Upon completion of the course, the students will be able to

1. Apply basic concepts to develop construction (drawing) techniques.
2. Ability to manipulate drawings through editing and plotting techniques.
3. Understand geometric construction and Produce template drawings.
4. Understand and demonstrate dimensioning concepts and techniques
5. Understand Section and Auxiliary Views
6. Become familiar with Solid Modelling concepts and techniques.

UNITI OVERVIEW OFCADSYSTEMS 9

Conventional and computer aided design processes-advantages and disadvantages. Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations. Networking of CAD systems.

UNITII INTERACTIVE COMPUTER GRAPHICS ANDGRAPHICSTRANSFORMATIONS 9

Generative, cognitive and image processing graphics. Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Two- and Three – Dimensional graphics concepts, Graphical input technique, Geometric transpformations, Visual Realism, Computer animation, customizing graphics software.

UNITIII GEOMETRIC MODELING 9

Wireframe, surface, NURBS and solid modeling-applications and advantages. Creating primitive solids, sweeping solids, boolean operations. Extracting entities from a solid. Filleting of edges of solids. Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

UNITIV PARAMETRIC DESIGN ANDOBJECTREPRESENTATION 9

Types of co-ordinate systems. Parametric design - definition and advantages. Parametric representation of analytic and synthetic curves. Parametric representation of surfaces and solids - manipulations.

UNITV PRODUCT DESIGNANDDEVELOPMENT 9

Automated 2D drafting - basics, mechanical assembly - bill of materials generation. Mass property calculations.

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vera B Anand	Computer Graphics and Geometric Modeling for Engineers	John Wiley & Sons, New York	2000
2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	Dhanpat Rai & Sons, New Delhi	2002

OPEN ELECTIVES

2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	William M Newman and Robert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994
5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998
6	Rao S S	Optimisaiton Techniques	Wiley Eastern, New Delhi	2003

16BEMEOE02 INDUSTRIAL SAFETYANDENVIRONMENT 3 0 0 3 100

COURSE OBJECTIVES

1. To recognize and evaluate occupational safety and health hazards in the workplace.
2. To determine appropriate hazard controls following the hierarchy of controls.
3. To analyse the effects of workplace exposures, injuries and illnesses, fatalities.
4. To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
5. To teach student the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
6. To prevent or mitigate harm or damage to people, property, or the environment.

COURSE OUTCOMES

At the end of the course, student will be able to

1. Recognize and evaluate occupational safety and health hazards in the workplace.
2. Determine appropriate hazard controls following the hierarchy of controls.
3. Analyse the effects of workplace exposures, injuries and illnesses, fatalities.
4. Prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
5. Understand the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
6. Prevent or mitigate harm or damage to people, property, or the environment.

UNITI INTRODUCTIONTOLOGISTICS 9

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNITII PHASES OFSUPPLYCHAIN 9

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNITIII EVOLUTION OF SUPPLY CHAINMODELS 9

Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain with customer.

UNITIV SUPPLYCHAIN ACTIVITIES 9

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNITV SCM ORGANISATION ANDINFORMATIONSYSTEM 9

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERPSoftware's

TOTAL 45

TEXTBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Shari.P.B and Lassen.T.S	Managing the global supply chain	Viva books, New Delhi	2000
2	Ayers.J.B	Hand book of supply chain management	The St. Lencie press	2000

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nicolas.J.N	Competitive manufacturing management - continuous improvement, Lean production, customer focused quality	McGrawHill, New York	1998

2	Steudel.H.J and Desruelle.P	Manufacturing in the nineteen - How to become a mean, lean and world class competitor	Van No strand Reinhold, New York	1992

16BEMEOE03 TRANSPORT PHENOMENA 3 0 0 3 100

COURSE OBJECTIVES

1. To generalized equations for mass, momentum and heat.
2. To understand the concepts of Reynolds and Gauss theorems.
3. To learn combined diffusive and convective transport.
4. To apply Film- and penetration models for mass and heat transfer.
5. To apply Stefan-Maxwells equations for multi-component diffusion.
6. To Solve the given set of equations either analytically or numerically.

COURSE OUTCOMES

1. Generalized equations for mass, momentum and heat.
2. Understand the concepts of Reynolds and Gauss theorems.
3. Learn combined diffusive and convective transport.
4. Apply Film- and penetration models for mass and heat transfer.
5. Apply Stefan-Maxwells equations for multi-component diffusion.
6. Solve the given set of equations either analytically or numerically.

UNITI INTRODUCTION ANDBASICCONCEPTS 9

General overview of transport phenomena including various applications, Transport of momentum, heat and mass , Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNITII PROPERTIES, UNITS AND OTHERPHYSICALPARAMETERS 9

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNITIII MOMENTUM TRANSPORT 9

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNITIV ENERGYTRANSPORT 9

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heattransfer

UNITV MASS TRANSPORT 9

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion-Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

TOTAL 45

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

WEB REFERENCE

1. https://laulima.hawaii.edu/portal

16BEMEOE04 INTRODUCTION TO BIOMECHANICS 3 0 0 3 100

COURSE OBJECTIVES

1. To describe the principles of the study of human movement.
2. To describe the range of factors that influence the initiation, production and control of human movement.
3. To identify the body's lever systems and their relationship to basic joint movement and classification.
4. To distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
5. To explain joint and muscle function and the forces acting upon the human body during various sporting activities.
6. To relate the different body systems necessary for human movement to occur.

COURSE OUTCOMES

1. Describe the principles of the study of human movement.
2. Describe the range of factors that influence the initiation, production and control of human movement.
3. Identify the body's lever systems and their relationship to basic joint movement and classification.
4. Distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
5. Explain joint and muscle function and the forces acting upon the human body during various sporting activities.
6. Relate the different body systems necessary for human movement to occur.

UNITI INTRODUCTION 9

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNITII KEYMECHANICALCONCEPTS 9

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application ofBiomechanics

UNITIII HUMAN ANATOMY AND SOMEBASICTERMINOLOGY 9

Gross (Whole-Body) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups - Anthropometric Data

UNITIV ANATOMICALDESCRIPTION 9

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNITV MECHANICS OF THEMUSCULOSKELETALSYSTEM 9

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit - Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle - Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control

TOTAL 45

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Duane Knudson	Fundamentals of Biomechanics	Springer Science+ Business Media, LLC	2007
2	C. Ross Ethier Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

FACULTY OF ENGINEERING

DEGREE OF BACHELOR OF TECHNOLOGY
IN
BIOTECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY

(REGULAR PROGRAMME)

CURRICULUM & SYLLABI
(2016 -2017)

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ACADEMY OF HIGHER EDUCATION
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Eachanari Post, Coimbatore – 641 021.INDIA

FACULTY OF ENGINEERING

DEGREE OF BACHELOR OF ENGINEERING / TECHNOLOGY (B. E. /B. Tech.)

REGULAR PROGRAMME

REGULATIONS
(2016)

CHIOCE BASED CREDIT SYSTEM

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Email :info@karpagam.com
Web: www.kahedu.edu.in

Semester I & II

16BTCC101 COMMUNICATIVE ENGLISH 3 0 0 3

OBJECTIVES:

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence
- To acquiregood vocabulary for sentence structure and sentence formation.

OUTCOMES:

- Use English language for communication: verbal & non –verbal.
- Enrich comprehension and acquisition of speaking & writing ability.
- Gain confidence in using English language in real life situations.
- Improve word power: lexical, grammatical and communication competence.
- Acquire good vocabulary for easy communication.
- Be familiar with sentence structure and sentence formation.

Unit I (9)

Listening– Types of listening - Listening to class reading - Video tapes/ Audio tapes. **Speaking** – Introduction on self - Introduction on one's friend. **Reading** - Reading for comprehension – Reading different kind of passages like descriptive, narrative, objective, conversational and argumentative.**Writing** – Formal and Informal letters- Free writing on any topic –My favorite place, hobbies, dreams, goals, etc- - To fill in different application forms. **Grammar** – Articles- WH questions –Yes/No Question - Subject Verb agreement. **Vocabulary** - Word Formation – Word expansion (Root word) - Prefix and Suffix.

Unit II (10)

Listening – Understanding the passage in English –Pronunciation practice. **Speaking** – Asking and answering questions - Telephone etiquette. **Reading** – Critical reading – Finding key information in a given text (Skimming - Scanning). **Writing**– Coherence and cohesion in writing – Short paragraph writing – Writing short messages. **Grammar**– Parts of speech – Noun – Verb – Adjectives - Adverbs. **Vocabulary**– Compound Nouns/Adjectives – Irregular verbs.

Unit III (10)

Listening – Listening for specific task – Fill in the gaps. **Speaking** – Phonemes – Syllables – Role play – Conversation Practice. **Reading** – Reading and Comprehension. **Writing** - Autobiographical writing – Biographical writing - Instruction writing. **Grammar** – Preposition – Infinitive – Gerund – Tenses. **Vocabulary** – Foreign words used in English – British and American usage.

Unit IV **(8)**

Listening – Responding to questions – Reading in class for complete understanding and for better pronunciation. **Speaking** – Debate- Presentations in seminars. **Reading** – Making inference from the reading passage – Predicting the content of reading passages. **Writing** - Interpreting visual materials (tables, graphs, charts, etc) Letters to the Editor. **Grammar** – Sentence pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

Unit V **(8)**

Listening - Listening to different accents, speeches/presentations. **Speaking-** Extempore talk – Just-a-minute talk. **Reading**-Reading strategies–Intensive reading – Text analysis. **Writing** - Creative writing – Writing circulars and notices – Writing proposal. **Grammar** – Direct and Indirect speech – Conditional sentences - Auxiliary verbs. **Vocabulary** – Abbreviations & Acronyms.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

Total-45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Sangeeta Sharma , Meenakshi Raman	Technical Communication: Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2009
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES:

www.learnerstv.com – Listening/ Speaking/ Presentation
www.usingenglish.com – Writing/ Grammar
www.englishclub.com – Vocabulary Enrichment/ Speaking
www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking
www.teachertube.com – Writing Technically
www.Dictionary.com – Semantic / Grammar

16BTBT102 MATHEMATICS I 3 2 0 4

COURSE OBJECTIVES

1. To develop analytical skills for solving different engineering problems.
2. To understand the concept of Matrices and Theory of equations.
3. To know the basics of differential calculus and its applications.
4. To impart the knowledge of integral calculus and its applications.
5. To learn the basics of ordinary differential equations.
6. To Apply the concept of ordinary differential Equations and solving the problems.

COURSE OUTCOMES

The students will be able to

- Acquire the basic knowledge and understanding of mathematics
- Apply advanced matrix knowledge to engineering problems.
- Improve their ability in evaluating problems by applying theory of equations.
- Evaluating engineering problems involving differential calculus and its applications.
- Understand the concepts involving integral calculus and its applications.
- Applying the concept of ordinary differential Equations and solving the problems.

UNIT-I MATRICES (12)

Fundamentals of Matrix- Inverse of a matrix- Rank of a Matrix – Consistency and Inconsistency of a system of 'm' linear equations in 'n' unknowns – Eigenvalues and Eigenvectors of a real matrix .

UNIT- II THEORY OF EQUATIONS (12)

Relations between coefficients and roots: Irrational and imaginary roots – symmetric functions of the roots – transformation of equations – reciprocal equations and formation of equations whose roots are given.

UNIT - III DIFFERENTIAL CALCULUS AND ITS APPLICATIONS (12)

Differentiation and Derivatives of simple functions – Successive Differentiation – Tangent and Normal-Radius of curvature – Velocity and acceleration.

UNIT - IV INTEGRAL CALCULUS AND ITS APPLICATIONS (12)

Various types of integration - Reduction formula for $e^{ax}x^n$, $\sin^n x$, $\cos^n x$, $\sin^n x\cos^m x$ (Statement only). – Length, Area and Volume of solid revolution.

UNIT - V ORDINARY DIFFERENTIAL EQUATIONS (12)

Differential equations of first order and higher degree – higher order differential equations with constant coefficients- Euler's form of Differential equations.

Total : 60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Grewal. B.S	Higher Engineering Mathematics	Khanna Publications, Delhi.	2013
2	B.V.Ramana	Higher Engineering Mathematics	Tata McGraw Hill Education Pvt.Ltd, New Delhi.	2010

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Dass H.K.	Engineering Mathematics	S.Chand & Co., New Delhi.	2008
2	Bali N.P., Manish Goyal	A text book of Engineering Mathematics	Laxmi publications Pvt. Ltd, New Delhi.	2014
3	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2006

WEBSITES:

1. www.intmath.com
2. www.efunda.com
3. www.mathcentre.ac.uk

16BTPH103
16BTPH203 **ENGINEERING PHYSICS** **3 0 0 3**

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology
- To enhance the idea of the thermodynamics properties of the materials
- To Understand the basics of laser and optical fibre with appropriate applications.
- To Introduce the concepts of quantum mechanics for diverse applications.
- To Impart the basic knowledge of crystal and its various crystal structures.
- To Disseminate the fundamentals of nuclear physics and their applications.

OUTCOMES:

- Identify the elastic nature of materials and its thermodynamic properties.
- Infer the characteristics of laser and optical fibers for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Identify the different atomic arrangements of crystals and its defects
- Make use of the concepts of sound waves for medical applications
- Illustrate the basic ideas of nuclear reactors for energy resources

UNIT I PROPERTIES OF MATTER AND THERMODYNAMICS (9)

Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniform bending
Concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBER OPTICS (9)

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER -CO_2, Semiconductor LASER- Applications of LASER in industry and medicine.
Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNIT III QUANTUM PHYSICS (9)

Introduction to quantum theory – Black body radiation-Photo electric effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- scanning electron microscope.

UNIT IV CRYSTAL PHYSICS (9)

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures- crystal defects – point, line and surface defects

UNIT V ULTRASONICS AND NUCLEAR PHYSICS(9)

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications – Sonogram Introduction – basics about nuclear fission and fusion, nuclear composition – Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

Total- 45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Serway and Jewett	Physics for Scientists and Engineers with Modern Physics	Thomson Brooks/Cole, Indian reprint, New Delhi	2010
2	Gaur, R.K. and Gupta, S.C	Engineering Physics	Dhanpat Rai Publications,New Delhi.	2011
3	M.N. Avadhanulu and PG Kshirsagar	A Text book of Engineering Physics	S.Chand and company, Ltd., New Delhi	2011
4	D.C. Ghosh, N.C. Ghosh, P.K. Haldar	Engineering Physics	University Science, New Delhi	2011
5	P. Khare, A. Swarup	Engineering Physics: Fundamentals and Modern Applications	Jones & Bartlett Learning	2009

WEBSITES:

- www.nptel.ac.in
- www.physicsclassroom.com
- www. oyc.yale.edu
- www.physics.org

16BTCH103
16BTCH203 ENGINEERING CHEMISTRY 3 0 0 3

OBJECTIVES:

- To gain knowledge on adsorption phenomena.
- To make the students conversant with basics of water technology.
- To make the student acquire sound knowledge of electrochemistry and storage devices.
- To acquaint the student with concepts of fuels and rocket propellants.
- To develop an understanding of the basic concepts of corrosion science.
- To acquaint the students with the basics of surface chemistry.

OUTCOMES:

- Outline the basic principles of chemistry for water treatment (K)
- Examine the electrochemical properties to design non – conventional energy storage devices (S)
- Apply the concepts combustion of different fuels (S)
- Identify the concepts of corrosion and its protection in the engineering field (S)
- Apply the concepts of surface chemistry in the field of engineering (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I WATER TECHNOLOGY (9)

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverse osmosis.

UNITII LECTROCHEMISTRY AND STORAGE DEVICES (9)

Electrochemical cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - Fe^{2+}vs dichromate) –Electrolytic conductance-application (conductometric titration)-Batteries- Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H_2-O_2 Fuel Cell.

UNIT III FUELS AND COMBUSTION (9)

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method - Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas,Combustion of fuel-Introduction-GCV-NCV-Flue gas analysis.

UNIT IV CORROSION SCIENCE (9)

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings – Organic coatings-Paints - Constituents and functions –Inorganic coatings- Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating - Hot dipping.

UNIT V SURFACE CHEMISTRY AND PHASE RULE (9)

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm-Role of adsorbents in industries (catalysis and water softening).

Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company (P) Ltd., Chennai.	2012

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3rd Reprint NewDelhi.	2013
2.	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5th edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010
3.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009
4.	Dara.S.S	Text book of Engineering Chemistry.	S.Chand & Co.Ltd., New Delhi	2008
5.	Sharma.B. K	Engineering Chemistry	Krishna Prakasam Media (P) Ltd., Meerut	2001

WEBSITES:

1.http://www.studynotes.ie/leaving-cert/chemistry/
2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html
3.http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
4. http://ocw.mit.edu/courses/#chemistry
5. http://www.chem.qmul.ac.uk/surfaces/sec

16BTBT104 INTRODUCTION TO BIOTECHNOLOGY 3 0 0 3 100

Course Objectives

- To explain the basics of biology
- To summarize the overview of biotechnology and its applications
- To describe the scope of industrial biotechnology
- To elaborate the production of SCP and other metabolites
- To discuss the application of biotechnology in agriculture
- To outline the production of bioproducts and ethical considerations in Biotechnology.

Course Outcomes

- Outline the basics of biology and its importance
- Elaborate the scope of biotechnology and its application in rDNA technology
- Describe the production of primary and secondary metabolites
- Discuss how biotechnology involves in crop improvement
- Explain the various techniques and applications involved in Biotechnology.
- Discuss the development of bioproducts with social and ethical considerations.

UNIT I BASICS OF BIOLOGY (9)

Cell theory and Cell structure: Prokaryotic and eukaryotic cells, Biomolecules: Nucleic acid-DNA & RNA, Proteins and carbohydrates, Types of bonds involved in biomolecules,

UNIT II GENERAL BIOTECHNOLOGY (9)

Biotechnology: An overview – biotechnology – an interdiscipilinary pursuit, old and new biotechnology, scope and importance, Isolation and screening of microorganisms, microbial growth curve, basics of rDNA technology - cloning

UNIT III INDUSTRIAL BIOTECHNOLOGY (9)

Production of single cell protein (SCP): advantages and nutritional value, Overview of enzymes and its applications in various fields, Production of primary and secondary metabolites from microbial source - citric acid, ethanol fermentation and penicillin.

UNIT IV BIOTECHNOLOGY IN AGRICULTURE AND HEALTH CARE (9)

Biotechnology methods of crop improvement – plant tissue culture, Genetically modified crops – golden rice and Bt cotton, Conventional vaccines, concept of recombinant vaccines, recombinant insulin.

UNIT V ENVIRONMENTAL BIOTECHNOLOGY AND ETHICAL CONSIDERATIONS (9)

Biofuels, bioinsecticides, biofertilizers andBiosafety.

Total hours: 45

TEXT BOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	R.C. Dubey	A Textbook of Biotechnology	S. Chand & Company LYD.	2014
2	P.K. Gupta	Elements of Biotechnology	Rastogi Publication	2nd Edition (3rd Reprint) 2015-16
3	H.K. Das	Textbook of Biotechnology	Wiley DreamTech Publications	2nd Edition, 2005

REFERENCE BOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	John E. Smith	Biotechnology	Cambridge University Press	5th Edition, 2009
2	H.D. Kumar	Modern Concepts of Biotechnology	Vikas Publication House Pvt LTD	2007

16BTBT105 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING 3 0 0 3 100

OBJECTIVES

- To impart the basic knowledge about the DC Electriccircuits.
- To study the working of various ElectricalMachines.
- To study the basic concepts of Electrical safety andwiring
- To get the knowledge of Magnetic circuits and its properties
- To impart the basic knowledge about the DC Electriccircuits.
- To study the basic of power system

INTENDED OUTCOMES

At the end of this course, students will be able to

1. To understand and analyse basic electric and magnetic circuits.
2. Attributing the electric circuits with DC and AC excitation by applying various circuit laws.
3. Attributing the electrical machines and transformer.
4. Evaluate the various digital circuits in real time applications.
5. Analysis various semiconductor devices in real time applications.
6. Reproduce the Measuring Instruments and Electrical Installation.

UNIT I ELECTRIC CIRCUITS & MEASUREMENTS

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase balanced Circuits.

UNIT II ELECTRICAL MACHINES 9

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III MEASURING INSTRUMENTS 9

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT IV SEMICONDUCTOR DEVICES AND APPLICATIONS 9

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics

UNIT V- DIGITAL ELECTRONICS 9

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems- simplification of Boolean expression - implementation of Boolean expressionsusing logic gates - standard forms of Boolean expression.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mittle, V.M	Basic Electrical Engineering	Tata McGraw Hill Edition, New Delhi	2004
2	Sedha R.S	Applied Electronics	S. Chand & Co	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Muthusubramanian R, and Muraleedharan K A	Basic Electrical, Electronics and Computer Engineering	Tata McGraw Hill, Second Edition	2006
2	Nagsarkar T K and Sukhija M S	Basics of Electrical Engineering	Oxford press	2005
3	Mahmood Nahvi and Joseph A. Edminister	Electric Circuits	Schaum’ Outline Series, McGraw Hill	2002
4	Premkumar N	Basic Electrical Engineering	Anuradha Publishers	2003

16BTPH111

16BTPH211 ENGINEERING PHYSICS LABORATORY 0 0 4 2

OBJECTIVES:

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To prepare for the lab experiment and perform individually a wide spectrum of experiments.
- To present experimental data in various appropriate forms like tabulation, and plots.
- To analyze, Interpret and Summarize experimental results.
- To communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- The ability to use modern engineering physics techniques and tools, including laboratory instrumentation.

OUTCOMES:

- The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- Prepare for the lab experiment and perform individually a wide spectrum of experiments.
- Present experimental data in various appropriate forms like tabulation, and plots.
- Analyze, Interpret and Summarize experimental results.
- Communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- Prepare to develop the skills for understanding basic electric circuits.

LIST OF EXPERIMENTS – PHYSICS

1. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
2. Determination of wavelength of mercury spectrum – spectrometer grating.
3. Determination of Young's modulus of the material – Non uniform bending (or) Uniform bending.
4. Determination of Viscosity of liquid – Poiseuille's method.
5. Spectrometer Dispersive power of a prism.
6. Torsional pendulum – Determination of Rigidity modulus.
7. Particle size determination using Diode Laser
8. Determination of Laser parameters – Wavelength, and angle of divergence.
9. Determination of acceptance angle in an optical fiber.
10. Determination of thickness of a thin wire – Air wedge method
11. Determination of Band Gap of a semiconductor material.
12. Determination of Specific resistance of a given coil of wire – Wheatstone Bridge

16BTCH111
16BTCH211ENGINEERING CHEMISTRY LABORATORY 0 0 4 2
OBJECTIVES:

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To estimate the amount of alkalinity ions, hardness, chloride in water sample
- To make the student acquire practical skills in the determination of conductance of solutions, EMF etc
- To acquaint the students with the determination of molecular weight of a polymer by viscometry
- To carried out different types of titrations for estimation of concerned in materials
- To gain practical knowledge by applying the experimental methods to correlate with the theory.

OUTCOMES:

- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
- Estimate the amount of alkalinity ions, hardness, chloride in water sample
- Measure molecular/system properties of conductance of solutions, EMF etc
- Acquaint the students with the determination of molecular weight of a polymer by visocometry
- Determine the corrosion rate of steel by weight loss method.
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more qualities and quantities of materials involved for accurate results.

LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of alkalinity of Water sample.
2. Estimation of hardness of Water by EDTA
3. Estimation of chloride in Water sample (Argentometric method)
4. Determination of corrosion rate by weight loss method.
5. Conductometric Titration (Simple acid base).
6. Conductometric Titration (Mixture of weak and strong acids).
7. Conduct metric Titration using $BaCl_2$ vs Na_2 SO_4.
8. pH Titration (acid & base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$).
10. Estimation of Ferric ion by Spectrophotometry.
11. Determination of water of crystallization of a crystalline salt (Copper sulphate).
12. Determination of molecular weight and degree of polymerization using Viscometry.
13. Determination of chemical oxygen demand.

16BTBT112 COMPUTER PRACTICE AND PROGRAMMING LABORATORY 1 0 4 3

COURSE OBJECTIVES

- To familiarize with open source office packages
- To write programs for Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings and Functions.
- To discuss the fundamental principles of C Programming, as well as in-depth data and information processing techniques
- To solve problems, explore real-world software development challenges, and create practical and contemporary applications
- To learn about data structures
- To apply the string handling functions to solve the given problem

COURSE OUTCOMES

- Study logical structure of a computer program
- analyze logical structure of a computer program
- understand computer program, and different constructor to develop a program in 'C' language
- Utilize the basic data structures.
- Distinguish and use the fundamental data types.
- Utilize a simple programming environment, compile programs and interpret compiler errors.

THEORY:

What is computer- Computer Components- What is C- C Character set- Constants, Variables and Keywords-General form of C Program - Relational and Logical Operators - Selection Structures- If and nested if - Switch Case - Loops-Definition and types- Functions- Arrays- Introduction to Strings-Pointers.

PRACTICALS:

1. Working with word Processing, Spreadsheet and presentation software in Linux

2. Programming in Scratch:

   Practicing fundamental concepts of programming like sequence, selection decision statements, working of loops and event driven programming

3. C Programming:

   Practicing programs to get exposure to basic data types, algebraic expressions, Conditional statements, Input and Output Formatting, Decision Statements, Switch Case, Control structures, arrays, Strings and function, implementation of pointers.

Total Hours: 45

REFERENCES:

1. E. Balagurusamy, " Computing Fundamentals and C Programming", TMH Education, 5^{th} Edition, 2014
2. Yashavant Kanetkar, " Let us C", BPB Publications, 13^{th} Edition, 2013

16BTBT113 ENGINEERING GRAPHICS 0 0 4 2 100

COURSE OBJECTIVES:

- To understand the importance graphics in engineering
- To learn basic engineering drawing formats
- To develop the graphical skills for communication of concepts, ideas and design of engineering products through technical drawings.
- To learn to take data and transform it into graphic drawings.
- To prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

COURSE OUTCOMES:

Upon completion of this course the students will be able to:

- Know and understand the conventions and the method of engineering drawing.
- Interpret engineering drawings using fundamental technical mathematics.
- Construct basic and intermediate geometry.
- Improve their visualization skills so that they can apply these skill in developing new products.
- Improve their technical communication skill in the form of communicative drawings.
- Comprehend the theory of projection.

UNIT I INTRODUCTION 9

Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

UNIT II SCALES AND PLANE CURVES 8

SCALES:Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

UNIT III FREE HAND SKETCHING 9

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT IV PROJECTION OF POINTS, LINES AND PLANE SURFACES 8

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT V PROJECTION OF SOLIDS 8

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

Introduction to Drafting Software/Package (Not for Exam) 3

Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venugopal K and Prabhu Raja V	Engineering Graphics	New Age International Publishers	2007
2	VTU	A Primer on Computer Aided Engineering Drawing	Belgaum	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kumar M S	Engineering Graphics	D D Publications, Chennai	2007
2	Bureau of Indian Standards	Engineering Drawing Practices for Schools and Colleges SP 46-2003	BIS, New Delhi	2003
3	Luzadder W J	Fundamentals of Engineering Drawing	Prentice Hall Book Co., New York	1998

WEB REFERENCES

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

16BTCC151 **HUMAN VALUES** **1 0 0 - 100**

OBJECTIVE

1. To know the value of being a human being and the value of being a useful citizen

UNIT I **3**

Human life on Earth - Concept of Human Values - Value Education - Aim of education and value education - Types of values - Components of values – Attitudes – types of attitudes

UNIT II **3**

Self Development : Self analysis – Goal Setting - Thought Analysis – Guarding against Anger - Respect to age, experience, maturity, family members, neighbors, co-workers

UNIT III **3**

Individual Qualities – Truthfulness – Constructivity – Sacrifice – Sincerity - Self Control – Altruism – Tolerance - Scientific Vision – Regulating Desire

UNIT IV **3**

Mind Culture - Modern Challenges of Adolescent - Emotions and behavior - Sex and spirituality - Adolescent Emotions - Meditation

UNIT V **3**

Body and Mind Fitness : (a) Physical Exercises (b) Activities: (i) Moralization of Desires (ii) Neutralization of Anger (iii) Eradication of Worries (iv) Benefits of Blessings

TOTAL **15**

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Subramanian. R	Professional Ethics	Oxford, New Delhi	2013
2	Govindarajan. M, Natarajan. S,	Engineering Ethics	Prentice Hall of India, New Delhi	2004
3	Tripathi. A.N	Human Values	New Age International	2009
4	Pope. G. U.	Thirukkural with English Translation	Uma Publication, Thanjavur.	2002

16BTCC201A BUSINESS COMMUNICATION 3 0 0 3

OBJECTIVES:

- To help students comprehend the role of listening skills in effective communication.
- To familiarize students with verbal and non-verbal communication.
- To expose students to neutral accent.
- To develop emotional intelligence skills in them for enhancing their self-esteem.
- To assist them in setting goals and developing positive attitude.
- To develop soft skills and inter personal skills which will make excel in their job.

OUTCOMES:

- Design and deliver a persuasive presentation that convinces the audience of the topic's relevance and overcomes resistance, using appropriate visual support and adhering to a specified time limit.
- Use a strategic communication model and critical thinking to identify objectives, analyse audiences, and choose the most effective structure and style for delivering strategically sound written and spoken messages.
- Practice principles of effective business writing and document design in all written documents.
- Build an understanding of different organizational cultures, business practices, and social norms to communicate more effectively in domestic and cross-cultural business contexts.
- Develop their soft skills and inter personal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- Acquire decision making skills, problem solving skills and assertive skills.

UNIT I

What is Business Communication? - Types of Communication – Formal and informal communication – Process of Communication- modes of Communication – Barriers to communication.

UNIT II

Written Business Communication – Style- word-usage- organisation of Ideas – mechanics of writing and fill up of forms - Cover Letter- Letter for Job Application- Letter of Complaint - Memos - Resumes - Email- Reports Revising and proofreading- Advertising slogans- jargons- Description of Graphics and visual aids - interpretation of graphs using expressions of comparison and contrast .

UNIT III

Reading and Understanding the news articles - Oral Business Communication - First Impressions - Attire – Effective Presentation strategies- Nuances of delivery – Controlling nervousness and stage fright- Visual aids Presentations- Capturing Audience - Tone - Behavior - Telephone Etiquette- Non - verbal communication - Eye contact - Facial expressions - Posture - Gestures - Body langage – Etiquette- Organization of presentation – brain storming- Negotiations.

UNIT - IV

Difference between goals and dreams - SMART goal setting - 3 Ds of goal setting- Determination, Discipline and Direction - Developing the right attitude - Motivation - Intrinsic and Extrinsic motivation - Dealing with change - Dedication - Taking responsibilities - Decision making.

UNIT - V

Intrapersonal skills - Self-analysis - Thought process – Interpersonal skills - Confidence building - Resolving conflicts- Analytical skills - Team Building - Leadership skills - Planning/organizing - Ability to work independently - Professional ethics - Communicating via e-mail. Ethical perspectives and their implications for responsible communication - Proposal Presentation

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Meenakshi Raman ; Prakash Singh	Business Communication	Oxford University Press	2012

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Murthy, G .R. K.	Soft Skills for Success.	The ICFAI University Press, Hyderabad.	2008
2	Jagadeesan, G & Santanakrishnan,R.	Soft Skills Development:Training and Evaluation.	The ICFAI University Press, Hyderabad.	2008
3	Sherfield, Robert M., Rhonda J. Montgomery, & Patricia G. Moody	Developing Soft Skills.	Pearson Education, New Delhi.	2005

WEBSITES

http://tribehr.com/social-hr-software/talent-management/skills-tracking
www.ispeakyouspeak.blogspot.com
https://alison.com/subjects/6/Personal-Development-Soft-Skills
www.learning-development.hr.toolbox.com
http://www.niit.com/solution/soft-skill-training
http://mybcommlab.com to test your understanding of the concepts presented in each chapter and explore additional materials that will bring the ideas to life in videos, activities, and an online multimedia e-book.

16BTCC201B

TECHNICAL ENGLISH 3 0 0 3

OBJECTIVES:

- To motivate learners to acquire listening & speaking skills in both formal and informal context
- To focus on question forms & to make them understand the important of using question tags and also the functional use of transformation of sentences.
- To improve their reading habit and to train them in critical and analytical reading
- To equip them to write for academic as well as work place context
- To enable students to face interviews
- To develop admire and appreciate elegancy in communication.

OUTCOMES:

- Acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- Enhance them reading texts critically and analytically
- Develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Enrich the ability to face interviews with confidence.
- Enable to write documents and formal written communication
- Admire and appreciate elegancy in communication.

UNIT-1 (10)

Listening - Difference between Hearing & Listening –Listening to informal conversation. **Speaking** - Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., **Reading** – Extensive and Intensive reading. **Writing** – Report writing - Writing a covering letter. **Grammar** – Regular & Irregular verbs - Kinds of sentences - Question tags. **Vocabulary** – Homonyms and Homophones.

UNIT-II (8)

Listening – Note Taking- Improving grasping ability. **Speaking** – Welcome address - Vote of thanks - Master of ceremony. **Reading** – Active and Passive reading - Reading for vocabulary- Reading for a purpose. **Writing** - Writing a review (Film review) - Summary of a story. **Grammar** - Modal verbs – Conjunction - Expression of cause and effect. **Vocabulary** - Phrasal verbs - Idioms.

UNIT – III (9)

Listening - Barriers to listening (Physical, Psychological, Linguistic & Cultural). **Speaking** – Stress, Pause and Intonation. **Reading** – Rapid reading – Skimming, Scanning and Surveying. (SQ3R)**Writing** - Essay writing -Minutes of meeting - Agenda – **Grammar** - Active and Passive voice - Purpose expression. **Vocabulary** - Same words used as noun and verb - Often misspelt and confused words.

UNIT-IV (8)

Listening – Listening to telephone conversation - Viewing model interviews. **Speaking** – Group Discussion - Correlation between verbal & non - verbal communication. **Reading** – Reading comprehension (short & long text) - Reading job advertisements and profile of a company. **Writing** – Job application - Resume writing - Checklist preparation. **Grammar** - Numerical expressions – Collocations - **Vocabulary** - Singular and Plural (Nouns)

UNIT- V **(10)**

Listening – Types of listening- Improving listening comprehension**. Speaking** - Oral presentation - Vocal communication techniques - Voice, quality, volume, pitch etc., **Reading** -Note making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation writing – Short essays writing- **Grammar**- Transformation of sentences (Simple, Compound & Complex). **Vocabulary** - Collection of Technical Vocabularies with their meanings.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

Total-45

TEXT BOOK:

S. NO.	**AUTHOR(S) NAME**	**TITLE OF THE BOOK**	**PUBLISHER**	**YEAR OF PUBLICATION**
1	Sangeeta Sharma , Meenakshi Raman	Technical Communication: Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	**AUTHOR(S) NAME**	**TITLE OF THE BOOK**	**PUBLISHER**	**YEAR OF PUBLICATION**
1	Lakshminarayanan, K.R. & Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2008
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES :

www.learnerstv.com – Listening/ Speaking/ Presentation
www.usingenglish.com – Writing/ Grammar
www.englishclub.com – Vocabulary Enrichment/ Speaking
www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking
www.teachertube.com – Writing Technically
www.Dictionary.com – Semantic / Grammar

16BTBT202 MATHEMATICS II 3 2 0 4

OBJECTIVES:

- To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.
- To understand the concepts ofMultiple integrals, Functions of several variables and Fourier series
- Fourier series to apply physical science and signal systems.
- To understand the concepts ofBoundary value problems and Statistics.
- To acquire knowledge on the Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To enhance the knowledge on the various measures of central tendencies, dispersion, moments, skewness, kurtosis and to interpret them.

OUTCOMES:

- The students will be able to understand mathematical tools needed in evaluating multiple integrals and their usage
- To Calculate and establish identities connecting these quantities, to Evaluate line, surface and volume integrals in simple coordinate systems.
- The students will be able to familiarize functions of several variables which is used in many physical engineering problems. Apply differentiation to solve maxima and minima problems.
- To solve differential equations using Fourier series analysis which plays a vital role in engineering applications
- To introduce the Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To compute various measures of central tendencies, dispersion, moments, skewness, kurtosis and to interpret them.

UNIT -I MULTIPLE INTEGRALS (12)

Double integration in Cartesian – Change of order of integration – Area as a double integral – Triple integration in Cartesian coordinates.

UNIT -II FUNCTIONS OF SEVERAL VARIABLES (12)

Function of two variables – Taylor's expansion – maxima and minima – constrained maxima and minima by Lagrangian multiplier method – Jacobians.

UNIT- III FOURIER SERIES (12)

Dirchlet's conditions – statement of Fourier theorem – Fourier coefficients – change of scale – Half range series – Harmonic Analysis.

UNIT- IV BOUNDARY VALUE PROBLEMS (12)

Method of separation of variables – one dimensional wave equation – one dimensional heat equation – steady state conditions – zero and non – zero boundary conditions.

UNIT – V STATISTICS (12)

Measures of central tendency – Mean, Median, Mode, Standard deviation – moments – skewness and kurtosis-correlation – rank correlation.

Total : 60

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hemamalini. P.T	Engineering Mathematics I & II	McGraw-Hill Education Pvt.Ltd, New Delhi.	2014
2	Dr.P.Kandasamy , Dr.K.Thilagavathy, Dr.K.Gunavathy	Engineering Mathematics Volume III	S.Chand &Co., New Delhi.	2013
3	Veerarajan, T	Engineering Mathematics	Tata McGraw Hill Publishing Co., New Delh.	2010
4	Sundaram V., Balasubramanian R., Lakshminarayanan K.A.	Engineering Mathematics	Vikas publishing house Pvt. Ltd, New Delhi.	2005
5	Gupta S.C.,Kapoor V.K	Fundamentals of Mathematical Statistics	Sultan chand & Sons, New Delhi.	2006

WEBSITES:

1. www.intmath.com
2. www.efunda.com
3. www.mathcentre.ac.uk

16BTCC204 ENVIRONMENTAL SCIENCES 3 0 0 3

OBJECTIVES:

- To give a comprehensive insight into natural resources, ecosystem and biodiversity.
- To educate the ways and means of the environment
- To protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures
- To impart knowledge on ecosystem and biodiversity.
- To inculcate the environmental principles in the field of engineering and technology

OUTCOMES:

- Recognize the importance of natural resources (S)
- Associate themselves with the various ecosystems (S)
- Describe the importance of biodiversity (S)
- Identify and minimize the difference pollutions (S)
- Prioritize and analyses the social issues (S)
- Integrate the environmental principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES (9)

Definition, Scope and Importance – Need for public awareness -Forestresources: Useandover-exploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources- role of an individual in conservation of natural resources.

UNIT II ECOSYSTEM (9)

Chemistry and Environment- Environmental segments, Composition and Structure of atmosphere- Concept of an ecosystem- Structure, components and function of an ecosystem Energy flow in the ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marine ecosystem)

UNIT III BIODIVERSITY (9)

Introduction to biodiversity, Definition- Genetic diversity, Species diversity and Ecosystem diversity, Biogeographical classification of India, Importance of biodiversity-Value of biodiversity - Hot Spots of biodiversity-Threats to biodiversity - Endangered and Endemic Species of India – Conservation of biodiversity- In-Situ and Ex-Situ conservation of biodiversity.

UNIT IV ENVIRONMENTAL POLLUTION (9)

Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control measures of urban and industrial wastes– Role of an individual in prevention of pollution–Disaster management-earthquake, tsunami, cyclone and landslides.

UNIT V SOCIAL ISSUES AND ENVIRONMENT (9)

From Unsustainable to Sustainable development, Urban problems related to energy sources, Water conservation, Rain water harvesting and Watershed management, Resettlement and rehabilitation of people, its problems and concerns, Environmental ethics- Issues and possible solutions- Climate change- Green house effect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation- Environment Protection Act- Human Rights- Value education, Role of Information Technology in Environment and Human health-Population growth, Variation of population among nations-Population explosion.

Total: 45

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Ravikrishnan, A	Environmental Science	Sri Krishna Hi tech Publishing Company Private Ltd., Chennai	2012
2.	Anubha kaushik C.P. Kaushik	Environmental Science and Engineering	New Age International (P) Ltd., New Delhi.	2010

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William P.Cunningham	Principles of Environmental Science	Tata Mc Graw -Hill Publishing Company, New Delhi.	2008
2.	Linda D. Williams	Environmental Science Demystified	Tata Mc Graw -Hill Publishing Company Ltd., New Delhi.	2005
3.	Bharucha Erach	Environmental Science Demystified	Mapin Publishing (P) Ltd., Ahmedabad.	2005
4.	Tyler Miller G. Jr	Environmental Science	Thomson & Thomson Publishers, New Delhi.	2004
5.	Trivedi, R.K. and	Introduction to Air	Techno-Science Publications,	2003

	Goel, P.K	Pollution	Jaipur.	

WEBSITES:

1. http://people.eku.edu/ritchisong/envscinotes1.html
2.http://nptel.ac.in/courses.php?disciplineId=120
3.www.newagepublishers.com/samplechapter/001281.
4.www.unesco.org/ext/field/beijing/scienceb.htm,www.infinitepower.org/education.htm
5. http://www.sciencedaily.com/news/top/environment/

16BTBT205 **BIOCHEMISTRY-I** **3003100**

Course Objectives

- To understand the foundations of biochemistry
- To discuss the properties of water and its interactions
- To explain the structure and properties of carbohydrates
- To explain the structure and properties of amino acids, Peptides, Proteins and lipids
- To understand the chemistry and function of nucleotides and nucleic acids.
- To discuss the various functions and properties of important biomolecule.

Course Outcomes

1. Outline the cellular foundations of Biochemistry
2. Interpret different types of biomolecules and its interaction with water.
3. Analyze the function and properties of carbohydrates.
4. Explain the importance of amino acids, Peptides, Proteins and lipids.
5. Examine the structure, function and properties of nucleotides, nucleic acid, DNA.
6. Assess various functions and properties of important biomolecule.

UNIT-I THEFOUNDATIONSOFBIOCHEMISTRY (8)

Cellularfoundations: theuniversalfeaturesoflivingcells,phylogeny ofthreedomainoflife, classificationoforganisms basedonenergy.Chemicalfoundation: essentialelements,common functionalgroupsofbiomolecules, molecularcomponent ofan*E.coli*cell,macromoleculesofcells Physicalfoundation:Energy interconversion inlivingorganisms,entropy,enthalpy,Gibbstheory, Geneticfoundations:DNAtoRNAtoprotein,Evolutionary foundations:geneticmutation,roleof geneticmutation,stimulationofchemicalevaluation,moleculararanatomy revealingevolutionary relationship.

UNIT-II WATER (9)

Weak interactions in aqueous systems, Hydrogen bonding, structure of water molecules, bond dissociationenergy,commonhydrogenbondsinbiologicalsystems,directionality ofhydrogenbond, electrostatic interaction of water with charged solutes, Polar, Nonpolar, and Amphipathic Biomolecules,Entropy changesupondissolving crystallinesubstances,clathrates,micelles,Vander Waalsinteraction,hydrophobic interaction,fourtypesofnoncovalentinteractionsinbiomoleulesin aqueoussolvent,colligativeproperties,osmosisandthemeasurementofosmoticpressure,ionization ofweak acid and weakbases,buffers.

UNIT-III (a)AMINOACIDS, PEPTIDES, PROTEINS (10)

Generalstructureofaminoacid,properties, conventions of aminoacids, classification of aminoacids By R group,uncommon aminoacids, Zwitterion. Peptides: Peptide bond, polypeptides, oligomers, protomers.Proteins: hierarchy, four levels of structure in protein, steps in sequencing of a polypepide, locating disulfide bond.Chemical synthesis of peptides.

(b)LIPIDS

Fattyacids,structural lipids in membrane, galactolipids, sphingolipids,and sterols, lipid extraction.

UNIT-IV CARBOHYDRATESANDGLYCOBIOLOGY (9)

Monosaccharides: aldose, ketose, epimers, pyronoses, furanoses, anomers, Haworth formula, conformation of pyranoses, sugars as reducing agents, Disaccharides: Glycosidic bonds,hydrolysis, Polysaccharides:starch,glycogen,dextrans,homopolysaccharides, chitin. Glyconjugates: Glycoproteins, proteoglycan, and glycolipids.Sugarcode, methods of carbohydrate analysis

UNIT-V NUCLEOTIDESANDNUCLEICACIDS (9)

Nucleotides and nucleic acid nomenclature, Phosphodiesterase Linkage, structure of purine and pyrimidine, Absorption spectra of the common nucleotide,Nucleic acid structure: DNA stores genetic information, DNA is a Double helix, Watson-Crick structure, RNA-three dimensional structure, nucleicacid chemistry:denaturation and annealing, DNA sequences determination,chemical synthesis of DNA, purine, pyrimidine synthesis.

Total: 45

TEXTBOOK:

S.NO	**AUTHOR(S) NAME**	**TITLEOFTHEBOOK**	**PUBLISHER**	**YEAROF PUBLICATION**
1	D. L. Nelson, M.Cox&M. M.Cox	LehningerPrinciplesof Biochemistry4th Edition	Freeman, W.H. &Company, New York	2004

REFERENCES:

S.NO	**AUTHOR(S)NAME**	**TITLEOFTHEBOOK**	**PUBLISHER**	**YEAROF PUBLICATION**
1	Zubay,G.L	PrinciplesofBiochemistry	WCB Publishers, London	1996
2	Herg,J.M.,J.L. Tymoczko&L. Stryer	Biochemistry.VEdition	WH-Freeman andCo,New York	2002
3	Voet,G.&A.Voet	Fundamentalsof Biochemistry.IIEdition	JohnWileyand Sons,Inc.New York	2015

16BTBT206 **MATERIALS SCIENCE** **3 0 0 3**

OBJECTIVE:

- To enrich the understanding of various types of materials and their applications in engineering and technology

INTENDED OUTCOME:

- The students will have the knowledge on different types of materials and that knowledge will be used by them in different engineering and technology

UNIT I CONDUCTING MATERIALS (9)

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS (9)

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS (9)

Origin of magnetic moment – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications.

Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Temperature superconductors – Applications of superconductors – Magnetic levitation.

UNIT IV DIELECTRIC MATERIALS (9)

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – Applications of dielectric materials – ferroelectricity and applications.

UNIT V ADVANCED MATERIALS (9)

Metallic glasses: preparation, properties and applications.

Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, applications.

Composite materials, Aircraft materials and non-metallic materials.

Nano materials: synthesis – Physical and chemical vapour deposition – ball milling - properties of nanoparticles and applications. Carbon nanotubes: structure – properties and applications.

Total- 45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering Physics II	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	William D Callister Jr	Material Science and Engineering-An Introduction	John Wiley & Sons Inc., New York.	2013
2	James F Shackelford	Introduction to Materials Science for Engineers	Macmillan Publication Company, New York	2014
3	Charles Kittel	Introduction to Solid State Physics	John Wiley & sons, Singapore.	2005

WEBSITES:

1. www.nptel.ac.in
2. www.physicsclassroom.com
3. www. oyc.yale.edu
4. www.physics.org

16BTBT212 BIOCHEMISTRYLABORATORY 0032100

COURSE OBJECTIVE:

To experiment with sugar quantification method
To perform analysis to distinguish reducing and non-reducing sugars
To understand the protein quantification using Lowry's method
To explain the quantification of lipid and amino acid
To experiment the separation of solutes through chromatography
To demonstrate the DNA and RNA estimation though DPA and Orcinol method.

COURSE OUTCOMES:

1. Outline the sugar quantification through anthrone method
2. Illustrate the procedure for distinguishing reducing and non-reducing sugars
3. Perform the protein quantification
4. Recall the procedure for distinguishing immino and amino acids using ninhydrin test.
5. Interpret the solutes separated through chromatography
6. Discuss the DNA and RNA estimation.

LIST OF EXPERIMENTS:

1. Quantificationofsugars(Anthronemethod)
2. Distinguishreducingandnonreducingsugars.
3. Quantificationof proteins(Lowry*et al*Method)
4. UsingninhydrinfordistinguishingIminoand aminoacids
5. Quantificationoflipids
6. Analysisofoils-Acidnumber
7. PaperChromatography
8. EstimationofDNA(DPAmethod)
9. EstimationofRNA(Orcinolmethod)

TEXTBOOKS:

S. NO.	**AUTHOR(S) NAME**	**TITLEOFTHEBOOK**	**PUBLISHER**	**YEAROF PUBLICATION**
1	Boyer,R.	ExperimentalBiochemistry	BenjaminCummings, RedwoodCity,California, USA	2000
2	Palanivelu,P.	AnalyticalBiochemistryand SeparationTechniques	KalaimaniPrinters,Madurai	2001

REFERENCEBOOK:

S. NO.	**AUTHOR(S) NAME**	**TITLEOFTHEBOOK**	**PUBLISHER**	**YEAROF PUBLICATION**
1	Sadasivam,S.& A.Manickam	BiochemicalMethods	NewAgeInternational PvtLtdPublishers, NewDelhi	2002

16BTBT251 **APTITUDE TRAINING** **1 0 0 - 100**

OBJECTIVE

1. To achieve the competencies in Analytical ability, Decision making

UNIT I **5**

Introduction, Speed Math's, Problems on Numbers, Averages, Ratios and Proportions, Problems on Ages

UNIT I I **5**

Percentage, Data Interpretation, Profit and loss, Simple and Compound Interest

UNIT I III **5**

Time Speed and Distance, Time and Work, Pipes and Cistern, Geometry, Probability, Permutation and Combination

TOTAL **15**

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Agarwal.R.S	Quantitative Aptitude for Competitive Examinations	S.Chand Limited	2011
2	Abhijit Guha	Quantitative Aptitude for Competitive Examinations	Tata McGraw Hill	2011
3	Edgar Thrope	Test Of Reasoning for Competitive Examinations	Tata McGraw Hill, 4th Edition	2012

16BTBT301 PROBABILITY AND STATISTICS 3 2 0 4

OBJECTIVES:

- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two-dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.
- To acquaint the student with concepts ofsampling distributions and statistical techniques used in engineering and management problems.

OUTCOMES:

- To understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- To understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- To apply the concept of testing of hypothesis for small and large samples in real life problems.
- To apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- To have the notion of sampling distributions and statistical techniques used in engineering and management problems.
- To make the student acquire sound knowledge of techniques in quality control that model engineering problems.

UNIT- I PROBABILITY (11)

Probability – Definition – Law - conditional probability-Bayes theorem- Probability mass function - Probability density functions.

UNIT- II RANDOM VARIABLES (13)

Introduction to one dimensional random variables – Discrete – Continuous - Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Regression.

UNIT- III TESTING OF HYPOTHESIS (12)

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions – Tests for independence of attributes and Goodness of fit.

UNIT – IV DESIGN OF EXPERIMENTS (12)

Analysis of variance – one way classification – CRD – Two-way classification – RBD – Latin square.

UNIT – V RELIABILITY AND QUALITY CONTROL (12)

Concepts of reliability – hazard functions – Reliability of series and parallel systems – control charts for measurement ($\bar{X}$ and R $charts$) - Control charts for attributes (p, c and np charts).

Total : 60

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	P.S.S.Sundar Rao and J.Richard	Introduction to Biostatistics and Research Methods	Prentice Hall of India, New Delhi.	2012
2	R.A.Johnson and C.B.Gupta	Miller and Freund's Probability and Statistics for Engineers	Pearson Education Asia, New Delhi.	2007
3	S.C.Gupta and V.K.Kapoor	Fundamentals of Applied Statistics	Sultan Chand & Sons, New Delhi	2007

WEBSITES:

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld. Wolfram.com

16BTBT302 CELL BIOLOGY 3003100

Course Objectives

- To explain the cell structure of Prokaryotes and Eukaryotes
- To understand how cells undergo mitosis
- To outline the views on transport across the cell membranes.
- To explain the signaling process involved in the cell.
- To illustrate the function of mitochondria and chloroplast.
- To recall the importance of cell signaling process to understand diseases.

Course Outcomes

1. Summarize the structure and function of cell components
2. Understand the role of the cytoskeletal proteins and link it with cell cycle.
3. Illustrate the transport process across the cell membrane.
4. Outline the basic ideas on signaling process through the receptors.
5. Explain the electron transfer in mitochondria.
6. Relate the importance of cell signaling process to understand diseases.

UNIT-I CELLSTRUCTUREANDCELLORGANELLES (9)

Historyofcell biology,comparisonofeukaryoticandprokaryoticcells,principlesofmembrane organisation,membrane proteins; Structure ofprokaryoticcells - cilia, flagella,cell wall;Structureofeukaryoticcellorganelles:cytoplasm,endoplasmic reticulum, mitochondria, chloroplast, peroxisomes, nucleus, Microscopic techniques for viewing cell organelles.

UNIT-II CYTOSKELETALPROTEINS &CELL DIVISION (9)

Cytoskeletal proteins, contractileproteins–actin&myosin, cell adhesion proteins;extracellular matrix; Typesofcelldivision:mitosis&meiosis, Cell cycle and molecules that control cell cycle

UNIT-III TRANSPORTACROSSCELLMEMBRANES (9)

Passive&activetransport,permeases,sodiumpotassiumpump,Ca2+ATPasepumps, lysosomal and vacuolarmembraneATPdependentprotonpumps,cotransportsymport, antiport, active group translocation; endocytosisandexocytosis;Entryofviruses andtoxinsintocells.

UNIT-IV RECEPTORSANDMODESOFCELLSIGNALLING (9)

Cytosolic,nuclearandmembraneboundreceptors,examplesofreceptors, identify cation and purification of cell surface receptors, autocrine, paracrineand endocrinemodesofaction

UNIT-V FUNCTIONOFMITOCHONDRIAANDCHLOROPLAST (9)

ElectronTransportinMitochondria:Electrontransportchain, ReductionPotentialsof ElectronCarriers, Electrontransferfromreducedcytochrome*c*toO_2,Chloroplast:photosyntheticstages andlight-absorbingpigments.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	H. Lodish,A. Berk,S. L. Zipurursky,P. Matsudaria,D. BaltimoreandJ. Darnell	MolecularCellBiology	Freemanpress	2000
2	B.Alberts,A. Johnson,J.Lewis, M.Raff,K. Roberts,andP. Walte	MolecularBiologyofthe Cell	GarlandPUB	2002

REFERENECE

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	S.C.Rastogi	CellBiology	NewAge International Pub.Ltd	2004
2	Karp,G and Puritt,N. L	CellandMolecularbiology, ConceptsandExperiments	John Wileyand SonsInc.,	2005
3	DeRobertis,E. D.P.andDe Robertis,E.M.F	CellandMolecularbiology	B. I publications pvt.Ltd.	2005

16BTBT303 MICROBIOLOGY 3003100

Course Objectives

- To illustrate the basic concepts of microbiology and different microbial identification techniques.
- To explain the structure and multiplication of microorganism.
- To interpret the microbial growth and its metabolism.
- To outline the mechanism for the control of microorganisms.
- To infer the application of microorganism in industries.
- To explain the role of microorganisms in bioremediation.

Course Outcomes

1. Outline the history of microbiology and microbial staining techniques.
2. Discuss the microbial structural organization and multiplication.
3. Infer the basic requirements for microbial growth towards the biosynthesis of important molecules.
4. Discuss the controlling mechanism of microorganisms.
5. Illustrate the production of various metabolites and its applications.
6. Explain the role of microorganisms in bioremediation.

UNIT-I INTRODUCTION (8)

History of microbiology,classificationandnomenclatureof microorganism, Microbes in soil, air and water microscopicexaminationofmicroorganisms, lightandelectronmicroscopy,principlesofdifferent stainingtechniqueslikegramstaining,acidfast, capsular staining,flagellar staining.

UNIT-II MICROBES-STRUCTUREANDMULTIPLICATION (10)

Structuralorganizationandmultiplicationofbacteria,viruses,algaeandfungiwithaspecialmention oflifehistoryofactinomycetes,yeast,mycoplasmaandbacteriophage.

UNIT-III MICROBIALNUTRITION,GROWTHANDMETABOLISM (10)

Thecultivationofbacteria,Nutritionalrequirementsofbacteriaanddifferentmediausedforbacterial culture; growth curve and different methods to quantify thebacterial growth, aerobic and anaerobic bioenergeticsandutilizationofenergyforbiosynthesisofimportantmolecules.

UNIT–IV CONTROLOFMICROORGANISMS (8)

Physicaland chemical controlofmicroorganisms,host-microbeinteractions,antibacterial, anti-fungalandanti-viralagents,modeofactionandresistancetoantibiotics,clinicallyimportant microorganisms.

UNIT–V INDUSTRIALANDENVIRONMENTAL MICROBIOLOGY (9)

Primarymetabolites;secondarymetabolitesandtheirapplications- preservationoffood;Microorganismusedfortheproduction ofpenicillin,alcohol,vit.B-12;biogas;bioremediation; mycorrhiza;BiologicalNitrogen fixation,microorganismsandpollutioncontrol.

. **Total Hours: 45**

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	TalaronK,Casita,Pelczar AndReid.	FoundationsInMicrobiology	W.C.Brown Publishers	1993
2	PelczarMJ,ChanECS andKreinNR	Microbiology,	Tata McGraw- Hil Edition	2007
3	PrescottLM,HarleyJP, KleinDA,	Microbiology,5th Edition	McGraw Hill	2002
4	Kolwzan,B,Adamiak, W,Grabes,K, Pawelczyk,.	IntroductiontoEnvironmental Microbiology	ebook	2006

16BTBT304 PRINCIPLES OF CHEMICAL ENGINEERING 3003100

COURSE OBJECTIVES

- To understand the basic laws and concepts of chemical calculations.
- To explain the first and second laws of thermodymics.
- To explain the overall material balances of chemical reactions and its basic calculations.
- To discuss the fluid flow mechanics and its concepts.
- To understand the fluid transportation.
- To understand the basic principles of chemical calculations and measurements.

COURSE OUTCOMES

1. Outline the basic chemical calculations and the basic laws governing it.
2. Illustrate basic laws of thermodynamics.
3. Infer the overall material balances of chemical reactions and its basic calculations.
4. Outline the application of fluid flow mechanics in chemical engineering.
5. Discuss the fluid flow and its measurements.
6. Understand the basic principles of chemical calculations and measurements.

UNIT-I BASICCHEMICALCALCULATIONS (9)

SIunits,stoichiometry,basicchemicalcalculations:mole,atomicmassandmolarmass,equivalentmass,conversionof massfunctionto molefraction,molarity,normality,density,specific gravity.Ideal gaslaw-Idealmixturesandsolutions–Dalton's lawofadditivevolumes, Henry'slaw,Raoult'slaw, ConceptsofSimpson'sruleandtheirapplicationstodifferentsystems.

UNIT-II FIRSTANDSECONDLAWSOFTHERMODYNAMICS (8)

Energybalances,sensibleheat,latentheat,vapourpressure,steadyandunsteadystatecalculations.

UNIT-III MATERIALBALANCES (10)

Overalland componentbalances,material balanceswithoutandwithchemicalreactions,degreesoffreedom,steadyandunsteadystate,unit operations,recycle andbypasshumiditycalculations.

UNIT-IV FLUIDMECHANICS (10)

Fluids;fluidstaticsandapplicationsin chemicalengineering;fluidflow;laminar; Turbulentpressuredrops;compressiblefluidflowconcepts;multiphaseflowconcepts.

UNIT-V FLOWTHROUGHPACKEDCOLUMNS (8)

Fluidisation,centrifugalandpistonpumps,characteristics,compressors,work.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	BhattB.I.,and VoraS.M.	Stoichiometry	TataMcGraw-Hill,	2010
2	McCabeW.L., SmithJ.C, andHarriotP.	UnitOperationsIn ChemicalEngineering	McGraw-HillInc	1993

16BTBT305 BIO-ORGANICCHEMISTRY 3003100

COURSE OBJECTIVES

- To explain the basic reactions in organic chemistry
- To discuss the kinetics of enzymes using different methods
- To illustrate the enzyme inhibition process
- To outline the various enzymatic reactions in relation with stereochemistry
- To determine the specific enzyme structure and mechanism
- To classify the protein folding kinetics

COURSE OUTCOMES

1. Interpret the basic reactions in stereochemistry
2. Derive and calculate the kinetics of enzymes in different orders
3. Summarize the enzymatic reactions in stereochemistry
4. Illustrate the mechanism behind specific enzymes
5. Explain the protein folding kinetics
6. Discuss the protein folding pathways

UNIT-I CONCEPTSINORGANICCHEMISTRY (9)

Stereochemistry:opticalactivity,chiralcenter – enantiomers - *R*, *S* notation, stereo selectiveand stereospecificreactions-Zand E isomers, *Re*, *Si* faces, conformationalanalysis,ethane,n-butane mechanismsof SN1 SN2 reactions, E_1E_2 reactions, ester formation and hydrolysis,reaction rates, hammond'spostulate,h/deffects,catalysis:generalacid –base andcovalentcatalysis.

UNIT-II ENZYMEKINETICSANDINHIBITION (9)

Steadystatekinetics,derivationandsignificanceofMichaelis Mentenequation,Lineweaver-Burke Plot,singleanddoubledisplacementreactions, co-operativitywithrespectto oxygenbindingby haemoglobin.Inhibition–reversibleandirreversible–competitive,non-competitive, uncompetitive inhibition(characteristicsandexamples).

UNIT-III STEREOCHEMISTRY OF ENZYMATIC REACTIONS (9)

Stereospecificenzymaticreactions -fumarase catalysed reactions -NADdependentoxidation and reductionreactions -stereochemistryofnucleophilicreactions -chiralmethylgroup, chiralphosphate.

UNIT-IV ENZYMESTRUCTUREANDMECHANISM (9)

The dehydrogenases (alcohol dehydrogenase) - proteases (serine protease),lysozyme, Ribonucleases, Ribozymes.

UNT-V PROTEINFOLDING KINETICS AND FOLDING PATHWAYS (9)

Kineticsofproteinfolding: basicmethods,twostatekinetics,multistate kinetics,transitionstatesinproteinfolding,
$^{1}H/^{2}H$exchangemethods,foldingofpeptides,CI2folding,molecularchaperones.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	FershtA.R	StructureandMechanismin ProteinScience:AGuideto EnzymeCatalysisandProtein Folding	W H Freeman	1999
2	Morrison,R.T andBoyd,R.N	OrganicChemistry	Prentice Hallof IndiaPvt Ltd	1999

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	DugasH	BioorganicChemistry	SpringerVerlag	1999
2	ZubayG L,	Biochemistry	WCB/McGraw-Hillpublishers	1998
3	Nelson,D. L. andCox,M.M	LehningerPrinciplesof Biochemistry4thEdition	Freeman,W.H. &Company	2004
4	Palmer,T	Enzymes	AffiliatedEast WestPress Pvt.Ltd	2004

16BTBT311 CELL BIOLOGY LAB 0032100

Course objective:

- To understand the nature of the cells present in the biological sample through microscope.
- To explain the different staining techniques.
- To understand the stages of mitosis.
- To understand the chloroplast isolation from leaves.
- To demonstrate the different types of blood cells.
- To understand about the osmosis and tonicity.

Course outcomes:

1. Illustrate the handling of microscope and categorize the cells present in the biological sample.
2. Interpret the various staining techniques to identify the cell.
3. Outline the stages of mitosis.
4. Understand the blood cell identification.
5. Understand the knowledge about the cell concentration with osmosis and tonicity.
6. Recall assay to identify the cell condition.

1. Principles of microscopy – Phase contrast and Fluorescent Microscopy.
2. Identification of given plant, animal and bacterial cells and their components by microscopy.
3. Staining Techniques: (i) Leishmann staining (ii) Giemsa staining.
4. Staining for different stages of mitosis in *Allium cepa* (Onion).
5. Separation of plant pigments by Chromatography.
6. Identification of different types of blood cells
7. Isolation of chloroplasts from spinach leaves.
8. Osmosis and Tonicity.
9. Tryphan Blue Assay.

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Bregman,A.A	LaboratoryInvestigationsin CellandMolecularBiology	Wiley	2001
2	Dr.S.Rajanand Mrs.R.Selvi Christy	ExperimentalproceduresinLife Sciences	Anjanna Book House, Chennai	2011

16BTBT312 MICROBIOLOGY LAB 0032100

Course objective:

- To understand the nature of the cells present in the biological sample through microscope.
- To explain the different staining techniques.
- To discuss the different culture media prepation.
- To demonstrate the culturing, growth and control of micro organisms.
- To understand about the chemicals that controls the bacterial growth.
- To optimize the parameters on bacterial growth.

Course outcomes:

1. Illustrate the handling of microscope and categorize the cells present in the biological sample.
2. Interpret the various staining techniques to identify the cell.
3. Outline the different types of media preparation techniques.
4. Understand the growth of the organism and the parameters that influences their stability to grow.
5. Understand the knowledge about the chemicals that controls the bacterial growth.
6. Recall the growth curve and the control of microorganisms.

1. LaboratorySafetyandAsepticTechniques
2. Microscopy-LightMicroscopy
3. Culturemedia–Types,preparationofnutrientbrothandnutrientagar
4. Culturingofmicroorganisms –inbrothandinplates(spread plate, pourplate,streakplate)
5. StainingTechniques & MotilityTest
6. QuantitationofMicroorganisms
7. ChemicalControlofMicroorganisms &AntibioticSensitivityAssay
8. BacterialGrowthCurve
9. Effectofdifferentparametersonbacterial growth(temperature,UVirradiation)

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Leboffee,M.J.	MicroBiology:Laboratory Theoryand applications	BEPierce Morten Publishing House	2006
2	Aneja,K.R.,	ExperimentsinMicrobiology, PlantPathology,Tissue CultureandMushroom ProductionTechnology	NewAge International (P)Limited Publishers, NewDelhi	2001
3	Cappucino,J.G. andN.Sherman	MicrobiologyA Laboratory Manual	Benjamin Cummings, NewYork	2001
4	Dubey,R.C.and D.K.Maheshwari	PracticalMicrobiology	S.Chand and Company Ltd,New Delhi	2002
5	Gunasekaran,P	LabManualinMicrobiology	NewAge International (P)Ltd, Publishers, NewDelhi	1996
6	Arora,B.,D.R. Arora	PracticalMicrobiology	CBS Publishers and Distributors, Bangalore	2007
7	Chakraborthy,P. andN.K.Pal	ManualofPractical Microbiologyand Parasitology	NewCentral Book Agency(I Ltd,India.	2008

16BTBT313 BIO-ORGANICCHEMISTRY LAB 0032100

COURSE OBJECTIVES

- To understand the synthesis of Aspirin and p-nitroacetanilide
- To explain the preparation method for Acetanilide from Aniline
- To experiment on sucrose hydrolysis
- To perform reactions for the preparation of alpha D-glucopyranose penta acetate and 1,2:5,6-dicyclohexylidine- alpha-D glucofuranose.
- To determine the extraction procedure for lycopene
- To discuss the methods for the preparation of oleic acid and casein

COURSE OUTCOMES

1. Analyze the protocol for aspirin synthesis and p-nitroacetanilide
2. Infer the preparation of Acetanilide from Aniline
3. Outline the inference on sucrose hydrolysis
4. Determine the protocol for preparation of alpha D-glucopyranose penta acetate and 1,2:5,6-dicyclohexylidine- alpha-D glucofuranose.
5. Perform the extraction of lycopene from different sources
6. Experiment the suitable method for the preparation of casein from milk

1. SynthesisofAspirin.
2. Synthesisofp-nitroacetanilide.
3. Preparationof AcetanilidefromAniline.
4. HydrolysisofSucrose.
5. Extractionof Lycopene
6. Preparationof alphaD-glucopyranose penta acetate.
7. Preparationof 1,2:5,6-dicyclohexylidine-alpha-Dglucofuranose.
8. Preparationof Oleicacid.
9. Preparationof casein frommilk

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Leonard,JLygo, BandProcter,G	AdvancedPracticalOrganic Chemistry	CRCPress	1994

16BTBT351 SOFT SKILLS 1 0 0 - 100

OBJECTIVE

1. To elevate the students into productivity powerhouses who can employ life skills to better their performances

UNIT I **4**

Overview to communication, self Introduction, Presentation on their own topic, Extempore, Group Activity

UNIT II **3**

Group Discussion, Do's and Don'ts of Group Discussion, Body language, Grooming and Resume, Resume correction

UNIT III **4**

Introduction to HRM – Questions - Do's and Don't's - Interview - Mock GD - Stress Management

UNIT IV **4**

Personality Development - Presentation skills, Interpersonal skills, Critical thinking, Confidence building and Stress management.

TOTAL 15

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Barun K Mitra	Personality Development and Soft Skills	Oxford University Press-New Delhi	2012
2	Rajiv K. Mishra	Personality Development	Rupa & Co.	2012

16BTBT401 UNIT OPERATIONS 3003100

Course Objectives

- To infer the basic knowledge on agitation and its flow pattern in differentsystems.
- To explain the concept of filtration and its industrialapplication.
- To understand the different modes of heat transfer and its transfer through different dimesnsionalsurfaces.
- To discuss the types of convectional heat transfer and itsapplication.
- To explain the different types and designing parameters of heat exchangers and evaporators.
- To explain the basics of design, equipmentation and calculations of evaporators and heat exchangers.

Course Outcomes

1. Interpret the properties of mixing and agitation in different flowsystems.
2. Outline the basic principle of filtration and its application in different filtrationmethods.
3. Discuss the modes of heattransfer.
4. Illustrate the mechanism of heat transfer through different dimensionalsurfaces.
5. Infer the basics of convectional heat transfer in differentsurfaces.
6. Appraise the basics of design, equipmentation and calculations of evaporators and heat exchangers.

UNIT-I MIXINGANDAGITATION (8)

Purposeofagitation,equipmentsforagitation,flowpatterninagitatorvessels,dimensionalanalysis; powerforagitation;agitationofliquids;gas-liquidsystems;gas-solid suspensions;agitatorscaleup.

UNIT-II FILTRATION (8)

Filtration-typesoffiltration,filtermedia,selectionofmedium,filteraids-filtertheory, constant pressurefiltration,constantvolumebatchfiltration;continuousfiltration;industrialfilters;settlingand sedimentation;centrifugation.

UNIT-III MECHANISMOFHEATTRANSFER (10)

Modesofheattransfer,principlesofconduction,Fourier'sLawofheat conduction,thermal conductivity,steadystate conduction,combinedresistances,heatflowthroughacylinderand sphere,unsteady stateconduction,heattransferfromextendedsurfaces.

UNIT-IV CONVECTIONHEATTRANSFER (10)

Dimensionalanalysis,forcedandnatural convection,convectioninflowoversurfaces throughpipes boilingandcondensation.

UNIT-V HEATEXCHANGERS (9)

Heatexchangertypes,Equipments;overallheattransfercoefficients;designofheatexchangers;NTU concept; Evaporators;single andmultipleeffects;massandenthalpybalances.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s)Name	Titleofthe book	Publisher	Yearof Publication
1	GeankoplisC.J.	Transport ProcessAnd UnitOperations	PrenticeHall India	2002
2	McCabeW.L.,SmithJ.C, andHarriotP.	UnitOperations InChemical Engineering	McGraw-HillInc	1993

REFERENCEBOOKS

S.No.	Author(s)Name	Titleofthe book	Publisher	Yearof Publication
1	IncroperaF.P.	Fundamentals OfHeatAnd MassTransfer	JohnWileyandSons	2000

16BTBT402 CHEMICAL THERMODYNAMICS 3003100

Course Objectives

- To explain the thermodynamic properties of fluids and itscalculations.
- To discuss the basic concepts of solutionproperties.
- To illustrate the phase equilibria concepts for varioussystems.
- To outline the equilibrium criteria for various chemicalreactions.
- To infer the knowledge on general thermodynamicprocesses.
- To explain the working principles and the process involved in the refrigeration and Liquefactionsystem.

Course Outcomes

1. Discuss the various properties of the fluids and itscalculations.
2. Explain the concept of solution thermodynamics and compositionmodels.
3. Analyze the criteria of phase equilibria for different componentsystem.
4. Apply the concept of chemical reaction equilibria and equilibriumconversion.
5. Analyze the thermodynamic flowprocess.
6. Illustrate the working principles and the process involved in the refrigeration and Liquefactionsystem.

UNIT-I THERMODYNAMICPROPERTIESOFFLUIDS (9)

Volumetricpropertiesof fluidsexhibitingnonidealbehavior;residualproperties;estimationof thermodynamicpropertiesusingequationsofstate; calculationsinvolvingactualpropertyexchanges; Maxwell’srelationsandapplications.

UNIT-II SOLUTIONTHERMODYNAMICS (9)

Partialmolarproperties;conceptsof chemicalpotentialandfugacity;idealandnon-ideal solutions; conceptsand applicationsofexcesspropertiesof mixtures;activitycoefficient; compositionmodels;GibbsDuhemequation.

UNIT-III PHASEEQUILIBRIA (9)

Criteriaforphaseequilibria;v-l-ecalculationsforbinaryandmulticomponentsystems; liquid-liquidequilibriaandsolid-solidequilibria.

UNIT-IVCHEMICALREACTIONEQUILIBRIA (9)

Equilibriumcriteriaforhomogeneouschemicalreactions;evaluationofequilibrium constant;effectoftemperatureandpressureonequilibriumconstant;calculationof equilibriumconversionand yieldsforsingle and multiplereactions.

UNIT-VTHERMODYNAMICANALYSISOFPROCESSES (9)

Thermodynamics of flow processes, Conceptoflostwork;entropygeneration; powercycle (rankine, regenerative, reheat);liquefaction and refrigeration

Total Hours: 45

TEXTBOOKS

S.No.	Author(s)Name	Titleofthebook	Publisher	Yearof Publication
1	Smith,J.M.,VanNessH.C., andAbbotM.M.	Chemical Engineering Thermodynamics	McGraw-Hill	2001
2	NarayananK.V.	AText BookOf Chemical Engineering Thermodynamics	PrenticeHall India	2001

REFERENCEBOOKS

S.No.	Author(s)Name	Titleofthebook	Publisher	Yearof Publication
1	SandlerS.I.	ChemicalAnd Engineering Thermodynamics	JohnWiley	1989
2	Urs von Stockar, Luuk A. M. van der Wielen	Biothermodynamics: The Role of Thermodynamics in Biochemical Engineering	EPFL Press	2013

16BTBT403 INSTRUMENTAL METHODS OF ANALYSIS 3003100

Course Objectives

- To explain the basic concepts of wave properties and radiation sources.
- To discuss the instrumentation and application of various molecular spectroscopy.
- To understand the concept and instrumentation of magnetic resonance spectroscopy and mass spectroscopy.
- To categorize the different separation methods for product purification.
- To outline the thermal analysis techniques and its applications.
- To understand the instrumentation and applications of different thermal analysis techniques.

Course Outcomes

1. Infer the various sources and properties of electromagnetic radiation.
2. Discuss the theory of molecular absorption spectroscopy.
3. Relate the theory, instrumentation and applications of various molecular spectroscopies.
4. Interpret the theory and instrumentation of magnetic resonance and mass spectroscopy.
5. Identify the various chromatographic and electrophoresis techniques for purification.
6. Explain the instrumentation and applications of different thermal analysis techniques.

UNIT I INTRODUCTION TO SPECTROMETRY (9)

Properties of electromagnetic radiation- wave properties – components of optical instruments – Sources of radiation – wavelength selectors – sample containers – radiation transducers – Signal process and read outs – signal to noise ratio - sources of noise – Enhancement of signal to noise - types of optical instruments – Principle of Fourier Transform optical Measurements.

UNIT II MOLECULAR SPECTROSCOPY (9)

Molecular absorption spectrometry – Measurement of Transmittance and Absorbance – Beer's law – Instrumentation - Applications -Theory of fluorescence and Phosphorescence Instrumentation – Applications – Theory of Infrared absorption spectrometry – IR instrumentation – Applications – Theory of Raman spectroscopy – Instrumentation – applications, Circular dichroism spectroscopy.

UNIT III MAGNETIC RESONANCE SPECTROSCOPY AND MASSSPECTROMETRY (9)

Theory of NMR – environmental effects on NMR spectra – chemical shift- NMRspectrometers – applicatons of 1H and 13C NMR- Molecular mass spectra – ion sources – Mass spectrometer. Applications of molecular mass - Electron paramagnetic resonance- g values – instrumentation.

UNIT IV SEPARATION METHODS (9)

General description of chromatography – Band broadening and optimization of column performance- Liquid chromatography – Partition chromatography - Adsorption chromatography – Ion exchange chromatography -size exclusion chromatographyAffinity chromatography- principles of GC and applications – HPLC- Capillary electrophoresis – Applications

UNIT V THERMAL METHODS (9)

Different thermal analysis techniques. Differential scanning calorimetry - instrumentation & application. Differential thermalanalysis - instrumentation & application, DTA curve. Thermogravimetry – instrumentation & application, TG curve.

Total Hours: 45

TEXTBOOK

S.No.	Author(s)Name	Titleofthe book	Publisher	Yearof Publication
1	Willard,H.HandMerrit,L. L	Instrumental Methodsof Analysis	PrenticeHallof India	2005
2	Skoog,D,A.Holler,J.Fand Nieman,T.A.	Principlesof Instrumental Analysis	Thomsan	2006

REFERENCEBOOKS

S.No.	Author(s)Name	Titleofthe book	Publisher	Yearof Publication
1	G.W.Ewing	Instrumental Methodsof Chemical Analysis	McGraw-Hill	1985
2	Skoog,D,A.Holler,J.Fand Nieman,T.A.	Instrumental Methodsof Chemical Analysis	Krishnaprakasan	2004

16BTBT404 MOLECULAR BIOLOGY 3003100

Course Objectives

- To outline the classical genetics concepts of eukaryotes and prokaryotes.
- To explain the structure of nucleic acids and DNAreplication.
- To understand the molecular process oftranscription.
- To understand the basic machinery of translation and its mechanisms.
- To understand the regulation of gene expression and various types of mutation
- To discuss the different types of mutation and DNA repair mechanisms .

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Course outcomes

1. Discuss the concepts related to eukaryotic and prokaryoticgenetics.
2. Identify the structure of nucleic acids, DNA replication and chromosome organization.
3. Illustrate the prokaryotic and eukaryotic transcription, and its post transcriptional modifications.
4. Outline the concept of genetic code, translation process and post translational modifications.
5. Interpret the process of regulation of gene expression and itsimportance.
6. Identify the different types of mutation and DNA repair mechanisms.

UNIT-I CLASSICALGENETICS (7)

Mendeliangenetics,linkage,crossingover,classicalexperiments–HersheyandChase, AveryMcLeod &McCarty. Bacterialconjugation,transductionandtransformation. Conformation of DNA and RNA.

UNIT-II STRUCTUREOFNUCLEICACIDSANDDNAREPLICATION (10)

Types of RNA, Replication in prokaryotes, D-loop and rollingcircle mode of replication, replication of linear viral DNA. Organisationofeukaryoticchromosome – cot value, replicationoftelomeresin eukaryotes

UNIT-III TRANSCRIPTION (10)

Inprokaryotesandeukaryotes,featuresofpromotersandenhancers, transcription factors,nuclearRNA splicing,regulationoftranscription: prokaryote and eukaryote

UNIT-IV TRANSLATION (9)

Elucidationofgeneticcode, basic machinery of translation and its mechanism, Post translational modifications, codonusage,suppressormutation,regulationoftranslation: prokaryote and eukaryote.

UNIT-V REGULATIONOFGENEEXPRESSION (9)

Lacandtrpoperon,phagelifecycle,mutationand repairof DNA, regulation of gene expression in eukaryotes

Total Hours: 45

TEXTBOOKS

S.No.	Author(s)Name	Titleofthe book	Publisher	Yearof Publication
1	David,F	Molecular biology	NarosaPubl	2001
2	Benjamin,L	GeneVIII	PearsonEducation	2004
3	Watson,J.D	Molecular Biologyofthe Gene	PearsonEducation	2004

REFERENCEBOOKS

S.No.	Author(s)Name	Titleofthe book	Publisher	Yearof Publication
1	Weaver,R.F	Molecular biology	McGrrawHill	2005

16BTBT405 BIOPROCESS PRINCIPLES 3003100

Course Objectives

- To understand the process of fermentation and basic fermentorconfiguration.
- To explain the medium requirements and media optimization methods for fermentation process.
- To explain the different sterilization methods and its kinetics anddesign.
- To discuss and solve the problems related to metabolic stoichiometry andenergetics.
- To understand the modes of operations and various kinetic models for productformation.
- To analyze the different kinetic models for microbial growth and productformation.

Course outcomes

1. Discuss the general process of fermentation and fermentorconfiguration.
2. Analyze the medium requirements and medium formulations for fermentationprocess.
3. Outline the thermal death kinetics and different sterilizationmethods.
4. Solve problems related to stoichiometry of cell growth andenergetic.
5. Illustarte the various modes of operation in fermentationprocess.
6. Analyze the different kinetic models for microbial growth and productformation.

UNIT-I OVERVIEWOFFERMENTATIONPROCESSES (7)

Overviewoffermentationindustry,generalrequirementsoffermentationprocesses,basic configurationof Fermentorandancillaries,mainparameterstobemonitoredandcontrolledin fermentationprocesses.

UNIT-II RAWMATERIALSANDMEDIADESIGNFORFERMENTATION PROCESS (9)

Criteriaforgoodmedium,mediumrequirementsforfermentationprocesses,carbon,nitrogen, minerals,vitaminsandothercomplexnutrients,oxygenrequirements,mediumformulationofoptimal growthandproductformation,examplesofsimpleandcomplexmedia,designofvariouscommercial mediaforindustrialfermentations–mediumoptimizationmethods.

UNIT-III STERILIZATIONKINETICS (9)

Thermaldeathkineticsofmicroorganisms,batch andcontinuousheatsterilizationofliquidmedia, filtersterilizationofliquidmedia,airsterilizationanddesignofsterilizationequipment-batchand continuous.

UNIT-IVMETABOLICSTOICHIOMETRYANDENERGETICS (10)

Stoichiometryofcell growthandproductformation,elementalbalances,degreesof reductionof substrateandbiomass,availableelectronbalances, yieldcoefficientsofbiomassandproduct formation,maintenancecoefficientsenergeticanalysisofmicrobialgrowthandproductformation, oxygenconsumptionandheatevolutionin aerobiccultures,thermodynamicefficiencyof growth.

UNIT-VKINETICSOFMICROBIALGROWTHANDPRODUCTFORMATION (10)

Modesofoperation-batch,fedbatchandcontinuouscultivation.Simpleunstructuredkineticmodels formicrobialgrowth,Monodmodel,growthoffilamentousorganisms,productformationkinetics- leudeking-piretmodels,substrateandproductinhibitiononcell growthand productformation.

Total Hours: 45

TEXT BOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	BaileyandOllis	Biochemical Engineering Fundamentals	McGraw-Hill (2nd Ed.),	1986
2	Shule andKargi	BioprocessEngineering	Prentice Hall	1992

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	PaulineDoran	BioprocessEngineering Calculation	Academic Press	2012
2	PeterF.Stanbury, StephenJ.Hall& A. Whitaker	PrinciplesofFermentation Technology	Butterworth-Heinemann	1999
3	HarveyW. Blanch,Douglas S.Clark	Biochemical Engineering	CRCPress	2014

16BTBT406BIOCHEMISTRY-II 3003100

Course Objectives:

- To understand the basics of bioenergetics
- To explain the metabolism of carbohydrate
- To explain the nucleic acid synthesis and regulations
- To discuss the synthesis and catabolism of amino acids pathways
- To understand the lipid metabolism and its associated genetic disorders
- To relate the importance of metabolism and how it leads to disorders.

Course Outcomes:

1. Outline the relationship of bioenergetics in biological reactions.
2. Examine the knowledge of carbohydrate metabolic pathways.
3. Describe the concept of nucleic acid synthesis and regulations.
4. Illustrate the synthesis and catabolism of amino acids pathways.
5. Explain the lipid metabolism and its associated genetic disorders.
6. Discuss the importance of metabolism and how it leads to disorders.

UNIT-I BIOENERGETICS (8)

Energy relationship between the catabolic and anabolic pathways, Five major reactions in living cells, Bioenergetics and thermodynamics. Phosphoryl group transfers;ATP hydrolysis in two steps, Ping-Pong mechanism of nucleoside diphosphate kinase.

UNIT-II METABOLISM OF CARBOHYDRATES (9)

Majorpathwaysofglucoseutilization:glycolysis,fermentation,gluconeogenesis: carbohydratesynthesis fromsimpleprecursors. Pentose phosphatepathway;TCAcycle:Reactions and regulations,genetic disordersaffecting carbohydrate metabolism

UNIT III METABOLISM OF NUCLEIC ACIDS (9)

Biosynthesis of nucleotides, denovo and salvage pathways for purines and pyrimidines, regulatory mechanisms: Metabolic disorders associated with nucleic acid metabolism.

UNIT-IV METABOLISM OF AMINOACIDS (10)

Biosynthesisofamino acidsfromacetyl coA, Biosynthesisofessentialaminoacids(Met,Thr,Lys,Ile,Val, Leu, Phe, Trp, Tyr).Glucose-alaninecycle, Ureacycle.Pathways ofdegradation of aromatic, glucogenic and ketogenic aminoacids. Human genetic disordersaffecting aminoacid metabolism.

UNIT-V METABOLISMOFLIPIDS (9)

Biosynthesisoffattyacid,Triacylglycerol.Biosynthesisofcholesterol. Digestion,mobilization,andtransportoffats,fattyacid entryintomitochondriaviatheacyl-carnitine/carnitinetransporter.The β-oxidationpathway.Oxidationofamonounsaturated and polyunsaturatedfattyacid.Genetic defectsinfattyAcyl–CoA dehydrogenases causingseriousdiseases.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s)Name	Titleofthebook	Publisher	Yearof Publication
1	Nelson,D. L.andCox,M.M	LehningerPrinciples ofBiochemistry4th Edition	Freeman,W.H.& Company	2004

REFERENCES

S.No.	Author(s)Name	Titleofthe book	Publisher	Yearof Publication
1	VoetandVoet	Biochemistry	JohnWiley&SonsInc	1995
2	Murray,R.K.,Granner,B.K., Mayes,P.A.,andRodwell. V.W.	Harper’s Biochemistry	PrenticeHall International	2000
3	Creighton.T.E.	Proteins, Structureand Molecular Properties	FreemanandCo	1993
4	Salway,J.G.	Metabolismat a Glance	BlackwellScience Ltd	2000

16BTBT411 INSTRUMENTALMETHODSOFANALYSISLAB 0032100

Course Objectives

- To understand the basic principle of analytical techniques
- To discuss the instrumental techniques used in chemical and biochemical research labs.
- To explain the fundamentals of spectroscopy operations.
- To carry out qualitative analysis experiments using Lambert's – Beer law using absorption spectroscopy.
- To carry out different spectroscopic techniques.
- To carry out different chromatographic techniques.

Course Outcomes

1. Explain the basic principle of analytical techniques
2. Discuss the instrumental techniques used in chemical and biochemical research labs.
3. Explain the fundamentals of spectroscopy operations.
4. Perform the qualitative analysis experiments using Lambert's – Beer law using absorption spectroscopy.
5. Demonstrate the different spectroscopic techniques.
6. Demonstrate the different chromatographic techniques.

1.Precisionandvalidityin an experimentusingabsorptionspectroscopyandvalidating Lambert-Beer'slawusingkMnO_4
2.DeterminationofanalyticalwavelengthforKMnO_4
3.Determinationofiron concentrationusing1,10phenanthroline.
4.FindingthepKaof4-nitrophenolusingabsorptionspectroscopy.
5.UVspectraofnucleic acids.
6.UV–spectraofproteins.
7.EstimationofSulphatebynephelometry.
8.EstimationofAL+++byflourimetry.
9.DeterminationofRfvalueusingTLC.

16BTBT412CHEMICALENGINEERINGLAB 003 2100

Course Objectives

- To understand chemical engineering principles and itsoperations.
- To understand the concept of pressure drops inpipes
- To understand the concept of pressure drops in differentreactors.
- To understand the concept of filtration and heattransfer.
- To explain the different separationtechniques.
- To understand the process involved in leaching

Course outcomes

Students undergoing this course will be able to

1. Outline the chemical engineering principles andoperations.
2. Calculate the flow measurements and pressure drop in pipes and differentreactors.
3. Analyze the process of filtration and heat transfer.
4. Perform the distillation andextraction.
5. Demonstrate the process involved in adsorption equilibrium.
6. Demonstrate the process involved in leaching

1. Flowmeasurement and Pressuredropinpipes.
2. Pressuredropacross Fluidizedbed.
3. Pressuredropacrosspackedcolumn
4. Continuousrotaryfiltration
5. Heatexchanger
6. Simpleandsteamdistillation
7. Liquid-liquidequilibriain extraction
8. Adsorptionequilibrium
9. Leaching

16BTBT451PRODUCTION OF COMMERCIALLY VALUABLE BIOPRODUCTS0 0 1 – 100

Course Objective

- To understand the manufacturing of industrially important bioproducts from different natural source.
- To carry out the production of ethanol from molasses andgrapes
- To carry out the production ofBiofertilizers
- To carry out the production of Single cell protein(Spirullina)
- To carry out the mushroom cultivation
- To carry out the production of jam from mixedfruits

Course Outcome

- Demonstrate the production of commercially valuable bioproducts from different natural source.
- Demonstrate the production of ethanol from molasses andgrapes
- Demonstrate the production of Biofertilizers
- Demonstrate the production of Single cell protein (Spirullina)
- Demonstrate the mushroom cultivation
- Demonstrate the production of jam from mixed fruits

1. Production of ethanol from molasses and grapes
2. Production of Biofertilizers
3. Production of Single cell protein (Spirullina)
4. Mushroom cultivation
5. Production of jam from mixed fruits

16BTBT501BIOPROCESSENGINEERING 3003100

Course Objectives

- To understand the basic concepts of fermentation processes.
- To apply the knowledge about the design of bioreactors
- To explain the scale up of bioreactors.
- To illustrate the bioprocess simulation and modeling
- To explain the immobilized enzyme kinetics and its significance.
- To discuss the commercial production of bioproducts.

Course outcomes

1. Understand the fermentation processes.
2. Interpret the design of bioreactors
3. Describe the scale up of bioreactors.
4. Infer the different types of bioprocess simulation and modeling
5. Examine the immobilized enzyme kinetics and its significance.
6. Outline the commercial production of bioproducts.

UNIT-I ANALYSISOFSTR (8)

AnalysisofSTR:Stirredtankreactor-non-ideality,RTDandstabilityanalysis,tanksin seriesanddispersionmodels– applicationtodesignof continuoussterilizer.

UNIT-II ANALYSISOFOTHERCONFIGURATIONS (9)

Analysisofotherconfigurations:Packedbedreactor,airliftreactor,fluidizedbedreactorbubble columnreactors–non-ideality,RTDandstabilityanalysis.

UNIT-III BIOREACTORSCALE–UP (8)

Bioreactorscale-up: Regimeanalysisofbioreactorprocesses,oxygenmasstransferinbioreactors-microbialoxygendemands;methodsforthedetermination ofmasstransfercoefficients;masstransfer correlations.Scale up criteria for bioreactorsbased on oxygentransfer,power consumptionand impellertipspeed.

UNIT-IV MODELLINGANDSIMULATIONOFBIOPROCESSES (10)

Modelling and simulation of bioprocesses: Study of structured models for analysis of various bioprocess–compartmental models,modelsofcellularenergeticsandmetabolism,singlecellmodels, plasmid replicationandplasmidstability model.Dynamicsimulationofbatch,fedbatch,steadyand transientculturemetabolism.

UNIT-V BIOREACTORCONSIDERATIONINENZYMESYSTEMS (10)

Bioreactorconsiderationinenzymesystems:Analysisoffilmandporediffusioneffectsonkineticsof immobilizedenzymereactions;formulationofdimensionlessgroupsandcalculationofeffectiveness factors.Designofimmobilizedenzymereactors–packedbed,fluidizedbedandmembranereactors.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	AntonMoser	BioprocessTechnology, KineticsandReactors	Springer Verlag	1988
2	JamesE.Bailey &DavidF.Ollis	BiochemicalEngineering Fundamentals	McGraw-Hill	1986
3	ShulerandKargl	BioprocessEngineering	Prentice Hall	1992

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	JamesM.Lee	BiochemicalEngineering	PHI	1991
2	EMT.EL-Mansi.CFA.Bryce, A.L.Demain, AR.Allman	FermentationMicrobiology AndBiotechnology	CRCPress	2011
3	HarveyW. Blanch,Douglas S.Clark	BiochemicalEngineering	CRCPress	2014

16BTBT502GENETICENGINEERING 3003100

Course Objectives

- To understand the basic concepts in rDNAtechnology.
- To explain the importance of recombinant molecules in rDNAtechnology.
- To understand the gene libraries construction and to perform blottings.
- To outline the concepts involved in gene library construction and differentiate between different gene libraries.
- To explain about the different types of PCR, the main concept in geneticengineering.
- To understand the vast applications of rDNA technology in diversefields.

Course Outcomes

1. Discuss the knowledge on the basics of rDNAtechnology.
2. Outline the usage of recombinant molecules in research anddevelopment.
3. Understand gene libraries construction and to perform blottings.
4. Interpret the indepth knowledge acquired to perform PCR reactions and theirtypes.
5. Infer the importance of DNA sequencingmethods.
6. Summarize the concept of rDNA technology and its importance in cloning, gene therapy and relate itsapplications.

UNIT-I BASICSOFRECOMBINANTDNATECHNOLOGY (6)

Roleofgeneswithincells, geneticelementsthatcontrolgeneexpression,restrictionand modifyingenzymes,safetyguidelinesofrecombinantDNAresearch.

UNIT-II CREATIONOFRECOMBINANTMOLECULES (9)

Restrictionmapping,designoflinkersandadaptors, gene editing.Characteristicsof plasmid and phage vectors, prokaryotic and eukaryotic expression vectors. Insect,Yeast andMammalianvectors.

UNIT-III CONSTRUCTIONOFLIBRARIES (10)

ConstructionofcDNAandgenomiclibraries.ScreeningoflibrarieswithDNAprobesandwith antisera.Cloning:Characterization of recombinant clones by southern, Northern, western and PCR analysis.

UNIT-IV POLYMERASECHAINREACTION (10)

Polymerasechainreaction:InversePCR,NestedPCR,Taqmanassay, RT - PCR, RACE PCR, RAPD,sitedirectedmutagenesis(Kunkel’s Method),methodsofnucleicacidsequencing-Sangersmethod,Maxam Gilbert sequencing

UNIT-V APPLICATIONSOFRECOMBINANTDNATECHNOLOGY (10)

ApplicationsofrecombinantDNATechnology:Cloninginplants,Tiplasmid,Methods of producingtransgenicanimals and their applications, gene silencing, gene therapy.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	OldRW, PrimroseSB	Principles of Gene Manipulation, An Introduction ToGeneticEngineering	Blackwell Science Publications	1993
2	AnsubelFM, BrentR, KingstonRE, MooreDD.	CurrentProtocolsInMolecular Biology	Greene Publishing Associates	1988

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	BergerSl, KimmerAR	MethodsInEnzymology	Academic Press	1987

16BTBT503BASICSOFINDUSTRIALBIOTECHNOLOGY 3003100

Course Objectives

- To explain the basic idea on scope of biotechnology and its commercial production in modern biotechnology.
- To analyse the modern biotechnological processing techniques for the production of commercial bioproducts.
- To discuss the process of primary metabolite production in different industries.
- To discuss the process of secondary metabolite production.
- To explain the basic procedures for production of bioproducts.
- To illustrate the various methods for the production of recombinant products.

Course Outcomes

1. Outline the scope of biotechnology and its commercialpotential.
2. Interpret the modern biotechnological processing techniques for the production of commercialbioproducts.
3. Illustrate the production methods of primarymetabolites.
4. Illustrate the production methods of secondarymetabolites.
5. Infer the knowledge on commercial enzyme and bioproductproduction.
6. Explain the production of various commercially available products using recombinant technology.

UNIT-I INTRODUCTIONTOINDUSTRIALBIOPROCESS (8)

Biotechnology: Scope and importance, Commercial potential of Biotechnology in India. Traditionalandmodernbiotechnology.productsrelatingtomodernbiotechnology A briefsurveyof industrially important organisms, fermentation processes – modes of operation-pictorialrepresentation of fermentation process

UNIT-II PRODUCTIONOFPRIMARYMETABOLITES (10)

Abriefoutlineofprocessesfortheproductionofsomecommerciallyimportantorganicacids (e.g. citricacid,lactic acid,acetic acid)aminoacids(glutamicacid,phenyalanine,asparticacid) andalcohols(ethanol,butanol)

UNIT-III PRODUCTIONOFSECONDARYMETABOLITES (10)

Studyofproductionprocessesforvariousclasses ofsecondarymetabolites:antibiotics:beta-lactams (penicillin,cephalosporin),aminoglycosides(streptomycin) macrolides(erythromycin), vitamins (B12) andsteroids (progesterone).

UNIT-IV PRODUCTIONOFENZYMESANDOTHERBIOPRODUCTS (9)

Productionofindustrialenzymessuchasproteases,amylases,lipases,cellulasesetc.,Productionof biopesticides,biofertilizers,biopreservatives(Nisin),cheese,biopolymers(xanthangum,PHB), singlecell protein.

UNIT-V PRODUCTIONRECOMBINANTDNAPRODUCTS (8)

Productionofrecombinantproteinshavingtherapeuticanddiagnosticapplications,productionof vaccines(hepatitisBvaccine),hormones(insulin).Productionofmonoclonalantibodies-commercial scale, productsof plant(humangrowthhormone)andanimalcell culture(interferons).

Total Hours: 45

TEXT BOOKS

S.No.	Author(s)Name	Titleofthebook	Publisher	Yearof Publication
1	CasidaJr, L.E.	Industrial Microbiology	NewAge International(P)Ltd	2000
2	Presscott,S.C.andDunn, C.G	Industrial Microbiology	Agrobios(India).	2006
3	R. C. Dubey	A textbook of Biotechnology	S. Chand & Company ltd.,	2003

REFERENCE BOOKS

S.No.	Author(s)Name	Titleofthebook	Publisher/journal	Yearof Publication
1	Cruger,W and Crueger,A	Biotechnology:ATextbook of Industrial Microbiology	Panima Publishing Corporation	2003
2	Moo,Mand Young	Comprehensive Biotechnology	Pergamon	2007
3	Barta,A.*et al.*	Theexpressionofanopaline synthase humangrowthhormone chimaericgeneintransformed tobaccoandsunflowercallus tissu	PlantMol.Biol	1986

16BTBT504A BIOINFORMATICS 3 0 0 3 100

Course Objectives

- To understand the basics of operating systems and biological databases.
- To explain the various methods for analysis of DNA, RNA and protein sequences.
- To explain the dynamic programming approach and methods of pair wisealignment.
- To explain the multiple sequence alinment techniques for analysis.
- To understand the machine learning techniques and protein structureanalysis.
- To understand the basics on available tools and databases for performing research in bioinformatics.

Course Outcomes

1. Illustrate the basics of operating systems and biologicaldatabases.
2. Analyze the DNA, RNA AND protein sequences using common databases.
3. Discuss the different algorithms for the pairwise sequenceanalysis
4. Outline the various biological databases used for multiple sequence alignment.
5. Summarize the machine learning techniques and various techniques for protein structure analysis.
6. Understand the use of bioinformatics tools for research.

UNIT-I INTRODUCTION TO BIOLOGICAL DATABASES (9)

Introduction- types, Biological databases, Information Retrieval from Biological Databases: for example Nucleic acid databases: Genbank, Protein Databases- Swissprot, Sequence Formats, Sequence storage, Sequence submission to sequence Database.

UNIT-II ANALYZING DNA, RNA AND PROTEIN SEQUENCES IN DATABASES (9)

Database technology, Genbank:organisms in Genbank, genomic DNA databases, cDNA databases corresponding to expressed genes, Introduction to phylogenetics- distance based trees, UPGMA, neighbour joining trees, Expressed sequence tags, Sequence tagged sites, Genome survey sequences, High throughput genomic sequence

UNIT-III PAIRWISE SEQUENCE ALIGNMENT (9)

Alignment Types: Local alignment, Global alignment, Scoring matrices- PAM, BLOSUM, Gaps, Dot Plots. Dynamic programming Approach: Needleman and Wunsch Algorithm, Smith and waterman Algorithm, Heuristic Approach: BLAST, FASTA

UNIT-IV MULTIPLE SEQUENCE ALIGNMENT (9)

Exhaustive Algorithm**-** Divide and Conquer alignment**,** Heuristic Algorithm: Progressive Alignment- ClustalW, Tcoffee, Iterative Alignment- PRRN, Block based method- Match-Box, DIALIGN2

UNIT-V INTRODUCTION TO PROTEIN STRUCTURE PREDICTION (9)

Secondary structure prediction for Globular and Trans-membrane proteins, 3DProtein structure file format: PDB, mmCIF, MMDB, Methods of Tertiary structure prediction: Threading and fold recognition methods, Homology modeling, Fold recognition databases.

Total Hours: 45

TEXT BOOKS

S. No.	**Author (s) Name**	**Title of the book**	**Publisher**	**Year of Publication**
1	Dan E. Krane, Michael L. Rayme	Fundamental Concepts of Bioinformatics	Pearson education	2004
2	Andreas D. Baxevanis, B. F. Francis Ouellette	Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins	Wiley-Interscience	2004
3	David W. Mount	Sequence and Genome Analysis	Cold Spring Harbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

16BTBT504BENZYMOLOGYANDENZYMETECHNOLOGY 3003100

Course Objectives

- To understand the knowledge on enzyme mechanism of action.
- To explain the production & purification ofenzymes.
- To explain about the kinetics of single substrate enzyme action
- To understand the kinetics of multi substrate enzyme action
- To illustrate on immobilization and applications.
- To understand the features of enzyme biosensors and its application.

Course Outcomes

1. Discuss the overview of enzyme mechanism of action.
2. Outline the knowledge on extraction, purification and characterization ofenzymes.
3. Understand the kinetics of multisubstrate enzyme action.
4. Interpret the various enzyme immobilization techniques and its application in bioreactor.
5. Summarize the basics of enzyme engineering.
6. Explain the features of enzyme biosensors and its application.

UNIT-I INTRODUCTIONTOENZYMES (9)

Chemicalnature,apoenzyme,coenzyme,cofactor,prostheticgroup.Nomenclature–IUBsystemof classification-Sixmainclasseswithexamples.Mechanisms ofenzyme-action; Specificity,typeof enzyme specificity,Active site,Models ofenzyme action–Lockandkey,inducedfit,transitionstate theory.metalioncatalysis,proximity&orientation.metal-activatedenzymeandmetalloenzyme.

UNIT-II EXTRACTION,PURIFICATIONANDCHARACTERIZATIONOFENZYMES (9)

Productionand purificationof crudeenzyme extracts from plant, animal and microbialsources; methodsofcharacterizationofenzymes;developmentofenzymaticassays,

UNIT-III KINETICSOFMULTISUBSTRATE-ENZYMEACTION (9)

Kinetics of Single substrate reaction – estimation of Michaelis- Menten parameters and Multisubstratereactionsmechanisms;Turnovernumber;typesofinhibitionAllostericregulationofenzymes,Monod-Changeux-Wyman model,pHand temperatureeffectonenzymes&deactivationkinetics.

UNIT-IV ENZYMEIMMOBILIZATION (9)

Physicaland chemicaltechniquesforenzymeimmobilization– adsorption,matrixentrapment, encapsulation,cross-linking,covalentbindingetc.,- examples, applications, advantagesanddisadvantages. applications. Immobilised enzymebioreactors.

UNIT-V ENZYMEENGINEERINGANDBIOSENSORS (9)

Chemicaland geneticmethods,Propertyalteration,Predictionofenzymestructure,designand constructionofnovelenzymes;Classification andDesignofenzymebiosensors.Applicationof enzymebiosensorinindustry,healthcare,foodand environment.

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Palmer,T	Enzymes	Affiliated EastWest Presspvt. Ltd	2004
2	Wiseman	EnzymeBiotechnology	Ellis Horwood Publishers	1995
3	Chaplinand Bucke	EnzymeTechnology	Cambridge University Press	1990
4	Priceand Stevens	FundamentalsofEnzymology	Oxford University Press	2002

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	H.W.Blanch andD.S.Clark	BiochemicalEngineering	Marcel Dekker, Inc.	1996
2	J.E.Baileyand D.F.Ollis,	BiochemicalEngineering Fundamentals	McGraw Hill	1986
3	E.K.Pye and L. B.Wingard	EnzymeEngineeringII,	Plenum Press	1974

16BTBT505APLANTBIOTECHNOLOGY 3003100

Course Objectives

- To illustrate the genetic material and its biological significance in organization.
- To explain the basic ideas on structure and function on genetic material.
- To list the various functions of Nitrogen fixation.
- To label the basic theory of genes involved in the pathogenesis.
- To develop a picture about applications of plant biotechnology.
- To discuss the different stages of developments in gene analysis and its recombination.

Course Outcomes

1. Summarize about the importance of genetic material and its uses.
2. Determine the structure and function of the genetic material.
3. Express the functions of fixing nitrogen to soil through microbes.
4. Be aware of the conceptuation behind various genes involved in pathogenesis.
5. Describe the various functions and application of plant biotechnology through tissue culture.
6. Summarize and predict the different stages of developments in gene analysis and its recombination.

UNIT-I ORGANIZATIONOFGENETICMATERIAL (9)

Geneticmaterialofplant cells –nucleosomestructureanditsbiologicalsignificance;junkand repeat sequences;outlineoftranscriptionandtranslation.

UNITII CHLOROPLAST&MITOCHONDRIA (9)

Structure,functionand geneticmaterial;rubiscosynthesisand assembly,coordination,regulation andtransportofproteins.Mitochondria:Genome,cytoplasmicmalesterility andimportof proteins.

UNIT-III NITROGENFIXATION (9)

Nitrogenaseactivity,nod genes,nifgenes,bacteroids.

UNIT-IV AGROBACTERIUM&VIRALVECTORS (9)

Pathogenesis,crowngalldisease, genesinvolvedinthepathogenesis,Ti plasmid–t-DNA, importanceingenetic engineering.ViralVectors:Geminivirus,cauliflowermosaicvirus,viral vectorsanditsbenefits.

UNIT-V APPLICATIONOFPLANTBIOTECHNOLOGY (9)

Outlineofplanttissueculture,transgenicplants,herbicideandpestresistantplants,molecular pharming,theraputicproducts.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	GamburgOL,Philips GC,	PlantTissue&Organ Culturefundamental Methods	Narosa Publications	1995
2	SinghBD.	Text Bookof Biotechnology	KalyaniPublishers	1998

REFERENCEBOOKS

S.No.	Author(s)Name	Titleofthebook	Publisher	Yearof Publications
1	HeldtHW	PlantBiochemistry& MolecularBiology	Oxford University Press	1997
2	Ignacimuthu.S	AppliedPlantBiotechnology	TataMcGraw-Hill	1996

16BTBT505BFOODBIOTECHNOLOGY 3003100

Course Objectives

- To understand the constituents of food and energy.
- To classify the different sources of microbes in food that assist food spoilage.
- To record the basic notion on fermented food products.
- To differentiate and organize the distinct food additives used.
- To explain the basic theory of food processing and preservation.
- To discuss the problems related to food deterioration and its preventive measures.

Course Outcomes

1. Compare and contrast different food constituents and their effectiveness.
2. Summarize the controlling measures for food spoilage.
3. Prioritize diverse properties of fermented foods.
4. Construct and design the food additives for food preservation.
5. Apply the knowledge on basics of food processing and preservation methods.
6. Examine and solve the problems related to food deterioration and its preventive measures.

UNITI FOODANDENERGY (9)

ConstituentsofFood-Water : importance, water in food, activity and shelf life of food; Carbohydrates: functional properties of sugars and polysaccharides in food; Llipids: uses, physical and chemical properties; Proteins and amino acids: physical and chemical properties, distribution, functions and functional properties;VitaminsandMinerals:Dietarysources; Nutritive value of foods, food as a source of energy, food health and disease.

UNITII FOODMICROBIOLOGY (9)

Typesofmicro-organismnormallyassociatedwithfood -mold,yeast,and bacteria.Micro-organisms in naturalfoodproducts.Biochemicalchangescausedbymicro-organisms.Foodpoisoningand microbialtoxin.Spoilageofvegetables, fruit,meat,poultry,beveragesand otherfoodproducts.Food safety.

UNITIII FERMENTATIONPRODUCTS (9)

Enzymesinfoodsandfoodindustry,Natureandtypeofstarters,RoleofstartersinFermentedfoods, FermentationofMilkproducts-Fermentedsoyand peanutmilk,Idli,Fermentedfishproducts,Pickles, FermentedOlives; Productionofdistilledbeveragealcohol,wine,brandy,andbeer.Mycoprotein production.

UNITIV FOODADDITIVES (9)

Chemicalandphysicalmethodsoffoodanalysisfordeterminationoffoodcomposition;Pigmentsin food,foodflavours,foodadditivesandtoxicants.Naturalsweetenersandartificialsweeteners-rolein controllingdiseases.

UNITV FOODPROCESSING&PRESERVATION (9)

Basicprinciples,unitoperations Involvedinthefoodprocessingmethods;Objectives,importanceand functionsofqualitycontrol.Principlesinvolvedintheuseofsterilization,pasteurizationand blanching, thermaldeathcurvesofmicroorganisms,canning,frozenstoragecharacteristicsoffoods, microbialactivityat lowtemperatures,factorsaffectingqualityoffoodsinfrozenstorage;irradiation preservationoffoods.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	JamesM.Jay, MartinJ. Loessner,David A.Golden	ModernFoodMicrobiology	Springer Science&Busines Media	2005
2	William C.Frazier	FoodMicrobiology	TataMCGraw hill	1987

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	H.-D.Belitz, WernerGrosch, PeterSchieberle	FoodChemistry	Springer Science&Busines Media	2009

2	B.Sivashankar	Foodprocessingand preservation	Prentice–Hall of India Pvt.Ltd.New Delhi	2002.

16BTBT511BIOPROCESSLAB 0032100

Course Objectives

- To understand the concept of thermal death kinetics.
- To understand the concept of batch sterilization.
- To predict the design for media components using Plackett Burman and RSM.
- To perform the batch cultivation and practice k_La estimation methods.
- To understand the procedure to calculate the residence time distribution.
- To demonstrate enzyme kinetis and enzyme immobilization techniques.

Course Outcomes

1. Evaluate the thermal death kinetics.
2. Perform the batch sterilization batch cultivation.
3. Identify and perform media optimization using Plackett Burman and RSM.
4. Demonstrate the different k_La estimation methods.
5. Perform the experiment on residence time distribution.
6. Interpret enzyme kinetis and enzyme immobilization techniques.

1. Thermaldeathkinetics
2. Batchsterilizationdesign
3. Media designing using Plackett Burman and RSM
4. Batch cultivation
5. Estimationofk_La–dynamicgassingmethod
6. Estimationofk_La–sulphiteoxidationmethod
7. Estimationofk_La–powercorrelationmethod
8. Residencetimedistribution
9. Enzymekinetics–MichaelisMentenparameters.
10. Enzymeimmobilization.

16BTBT512MOLECULARBIOLOGYAND GENETIC ENGINEERING LAB0032100

Course Objectives

- To outline and evaluate the methods for isolation and purification of DNA from plant and animalsamples.
- To explain the protocol to run the agarose gel electrophoresis sampleanalysis.
- To demonstrate the DNA ligation techniques for transformation and screening ofrDNA.
- To understand the methods involved in optimization protocol for recombinant protein expression.
- To explain the importance of high throughput screening, SDS PAGE andPCR.
- To compile the overall structure of rDNA technology and implement its techniques in research anddevelopment.

Course Outcomes

1. Carry out agarose gel electrophoresis and isolation of DNA samplesindividually.
2. Develop the knowledge of techniques involved in DNA isolation andpurification.
3. Perform the restriction enzyme digestion and ligation of DNAsamples.
4. Produce recombinant DNA and implement blue white screening techniques to screenthem.
5. Develop methods to produce recombinant proteins and understand their applications and perform SDS PAGE and PCRreactions.
6. Summarize the overall structure of rDNA technology and implement its techniques in research anddevelopment.

1. Agarosegelelectrophoresis
2. IsolationofbacterialplasmidDNA
3. Isolationofplant cellgenomicDNA
4. Elution of DNA
5. Restrictionenzymedigestion and ligation
6. Competentcellspreparation
7. Transformationandscreeningforrecombinants
8. Blueand whiteselectionforrecombinants
9. Optimization of inducer concentration and time of induction for recombinant protein expression.
10. SDS PAGE
11. PCR

TEXTBOOKS

S.No.	Author(s)Name	Titleofthe book	Publisher	Yearof Publication
1	David,L. GandMichael,K.W	Basic Methodsin Molecular Biology	PrenticeHall Inc	1994
2	Sambrook,J.andRussel,D.W	Molecular Cloning Laboratory Manual	ColdSpringHarbor LaboratoryPress	2001

16BTBT513ABIOINFORMATICSLAB 0032100

Course Objectives

- To perform the NCBI database search.
- To understand the usage of BLAST for similar DNA sequence search.
- To predict the nucleotide and protein sequence using various database.
- To perform the gene prediction.
- To understand the protein sequence analysis tools.
- To build the phylogenetic tree

Course Outcomes

1. Discuss the database search through NCBI.
2. Perform the similar DNA sequence search using BLAST.
3. Identify the nucleotide and protein sequence.
4. Demonstrate the experiment to predict the genes.
5. Tell the method to build the phylogenetic tree.
6. Interpret the protein sequence using analysis tools.

1. NCBI database.
2. BLAST – Similar DNA sequences search
3. EMBL – Nucleotide sequence database
4. SWISSPROT/TREMBL – Protein sequence database
5. Analysis of Protein sequence using PIR database
6. Analysis of structural features of proteins using protein data bank and SWISS PDB viewer
7. Eukaryotic gene prediction
8. Phylogenetic tree.
9. Protein sequence analysis tools
10. Multiple sequence alignment
11. Design of primers for cloning.

16BTBT513B PROTEIN AND ENZYME TECHNOLOGY LAB 0 0 3 2 100

Course Objectives

- To explain the types of chromatography
- To illustrate the partial purification of enzymes
- To understand the ultrafiltration process
- To carry out ion exchange & gel filtration chromatography
- To carry out affinity chromatography
- To understand the application of chromatography

Course outcomes

- Outline the types of chromatography
- Explain the partial purification of enzymes.
- Elaborate the process of ultrafiltration
- Perform the ion exchange & gel filtration chromatography
- Perform the affinity chromatography
- Compile the application of chromatography

1. Ammonium Sulphate /TCA/ Organic solvent precipitation
2. Ultrafiltration using tangential-flow membrane separation
3. Ion Exchange Column Chromatography
4. Gel Filtration chromatography
5. Affinity chromatography

Mini project

16BTBT551 SEPARATION OF BIOACTIVE COMPOUNDS FROM PLANT MATERIAL

1 0 0 - 100

Course Objective

- To explain the basic concepts of natural product isolations.
- To explain the principles of chromatography.
- To discuss the applications of modern NMR.
- To understand the extraction process.
- To demonstrate the extraction and isolation of caffeine from tea leaves.
- To understand the concept of separation of bioactive compounds.

Course Outcome

- Outline the general concepts of bioproduct isolation from various natural sources.
- Elaborate the principles of chromatography.
- Summarize the applications of modern NMR.
- Outline the extraction process.
- Carry out the experiments related to extraction and isolation of caffeine from Tea Leaves.
- Discuss the concept of separation of bioactive compounds.

UNIT- I GENERAL CONCEPT OF NATURAL PRODUCT ISOLATION

Natural Product Isolation, Extraction of Plant Secondary Metabolites, Selecting General Separation Conditions, Principles of Chromatography, An Introduction to Planar Chromatography, Applications of Liquid Chromatography, Isolation of Natural Products by Low-Pressure Column Chromatography, Crystallization in Final Stages of PurificationDetermination of the Nature of the Compound, Applications of Modern NMR Techniques in the Structural Elucidation, Identification and Characterization

UNIT-I I LABORATORY- EXTRACTION AND ISOLATION OF CAFFEINE FROM TEA LEAVES

General background and overview of the experiment, Caffeine extraction: Solid-liquid Extraction, Overview of the extraction process, Purification, Isolation of caffeine from tea leaves

REFERENCES

S.No.	Author(s)	Title of the book	Publisher	Year of Publications

	Name			
1	Satyajit D. Sarker, Zahid Latif, Alexander I. Gray	Methods in biotechnology: Natural products isolation	Springer	2005
2	Corrado Tringali	Bioactive Compounds from Natural Sources	CRC press	2011
3	Mayo, D. W.; Pike, R. M.; Butcher, S. S.	Microscale Organic Laboratory;	John Wiley & Sons	1986
4	Hill, R.; Barbaro, J.	Experiments in Organic Chemistry; 3rd ed	Contemporary Publishing Company:	2005

16BTBT601 MASSTRANSFTEROPERATIONS 3204 100

Course Objectives

- To understand the basics of molecular diffusion and mass transfer concepts.
- To explain the gas absorption and its related concepts.
- To explain the various vapour liquid operations and its concepts.
- To understand the HETP, HTU and NTU concepts.
- To outline the extraction and leaching principles.
- To outline the Solid Fluid operations.

Course Outcomes

1. Discuss the molecular diffusions and mass transfer operation in different system.
2. Outline the absorption principles and its concepts for gas liquid operations.
3. Infer the basic concept of equilibria and distillation concepts in vapour liquid operations.
4. Understand the HETP, HTU and NTUconcepts.
5. Interpret the equilibria of different systems in extraction and leaching operations.
6. Outline the concepts of adsorption and drying in solid – fluid operations.

UNIT-I DIFFUSIONANDMASSTRANSFER (9)

Moleculardiffusioninfluidsandsolids;InterphaseMassTransfer;MassTransfercoefficients; AnalogiesinTransportPhenomenon.

UNIT-II GASLIQUIDOPERATIONS (9)

Principlesofgasabsorption;SingleandMulticomponentabsorption;Absorptionwithchemical reaction;Designprinciplesofabsorbers;Industrialabsorbers;HTU,NTUconcepts.

UNIT-III VAPOURLIQUIDOPERATIONS (9)

V-LEquilibria;Simple,SteamandFlashDistillation;Continuousdistillation;McCABE-THIELE& PONCHON-SAVARITPrinciples;Industrialdistillationequipments,HETP,HTUandNTUconcepts.

UNIT-IV EXTRACTIONOPERATIONS (9)

L-Lequilibria,Stagedandcontinuousextraction,Solid-liquidequilibria,Leachingprinciples.

UNIT-V SOLIDFLUIDOPERATIONS (9)

Adsorptionequilibria– Batch andfixedbedadsorption;Drying-Mechanism-Dryingcurves - TimeofDrying;Batch andcontinuousdryers.

Total Hours: 45+15 = 60

TEXTBOOK

. S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Treybal R.E.	MassTransferOperations	McGraw-Hill,	1981
2	GeankoplisC.J.	TransportProcessesandUnit Operations	Prentice Hall	2002
3	Coulsonand Richardson	Chemical EngineeringVol.I& II	Asian Books Pvt Ltd	1998

16BTBT602IMMUNOLOGY 3003100

Course objectives:

- To understand the basic knowledge of cells and organs of Immune system.
- To explain the different cellular responses and its functions.
- To understand the basic views on monoclonal antibodies and antigen- antibody interactions.
- To outline the Immune responses to various disease and different immunologic reactions in Human body.
- To explain the organ transplantation and tumor immunology.
- To outline the basics of autoimmunity.

Course outcomes:

1. Discuss the cells and components of immune system.
2. Explain the basics of B, T cells, genes and generation of antibody and its functions.
3. Infer the basic views on monoclonal antibodies and antigen- antibody interactions.
4. Discuss the concept of immunity and various immunological responses toinfections.
5. Discuss the basics of Transplantation and tumortherapies.
6. To illustrate the current trends in treatment of auto immunedisease.

UNIT-I INTRODUCTION (7)

Cellsofimmunesystem,innateandacquiredimmunity,primaryandsecondary lymphoidorgans, antigens,haptens,adjuvants,typesofimmuneresponses,theoryofclonalselection.

UNIT-II CELLULARRESPONSES (10)

Development, maturation,activationanddifferentiationofT-cellsandB-cells:TCR, antibodies, structureandfunctions;antibodies:genesandgenerationofdiversity;antigen-antibody reactions; monoclonalantibodies:principles andapplications;antigenpresentingcells;majorhistocompatibility complex;antigenprocessingandpresentation;regulationofT-celland B-cellresponses.

UNIT-III INFECTIONANDIMMUNITY (11)

Injuryandinflammation;immuneresponsestoinfections:immunity toviruses,bacteria,fungiand parasites,cytokines,complement,immunosuppression,tolerance,allergyandhypersensitivity,resistanceandimmunization:Vaccines.

UNIT-IV TRANSPLANTATIONAND TUMOR IMMUNOLOGY (10)

Transplantation:geneticsoftransplantation,lawsoftransplantation,problemsintransplantation:Basis of Graft rejection, specificity and memory of graft rejection;Role of cell mediated response in graft rejection, Transplantationantigens,MechanismsinvolvedinGraftrejections, tumor immunology-immune therapy

UNIT-V AUTOIMMUNITY (7)

Autoimmunity, Auto immune diseases and diagnosis, proposed mechanisms for induction ofAutoimmunity,Treatment ofAutoimmunediseases;currenttherapies,monoclonalantibody anddiagnosis, treatment.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	RoittI,Male, Brostoff	Immunology	Mosby Publ	2002
2	KubyJ,	Immunology	WH Freeman&o	2000
3	DavidW Mount	Bioinformatics:SequenceAnd GenomeAnalysis	coldSpring Harbor Press	1996

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	AshimK. Chakravarthy	Immunology	Tata McGraw-Hill	1998

16BTBT603A BIOPHARMACEUTICALTECHNOLOGY 3003 100

Course Objectives

- To understand the foundation and advanced information on biopharmaceutical aspects in relation to drug development.
- To understand the basics of pharmacokinetics.
- To discuss the drug manufacturing, process and its application.
- To explain the manufacture of solid dosage forms of drugs.
- To understand the manufacture process of liquid orals and topical.
- To discuss the legal steps involved in progressing a new drug to market.

Course Outcomes

1. Illustrate the different pharmaceutical parameters for the current and future biotechnology related products on themarket.
2. Outline the concepts of Pharmacokinetics.
3. Infer the basic knowledge on drug process, manufacturing methods and its application.
4. Discuss about the solid dosage forms of drug manufacturing.
5. Explain the manufacturing process of liquid orals andtopical.
6. Interpret the legal steps involved in progressing a new drug to market.

UNIT- I INTRODUCTION (7)

History of pharmacy, pharmacopeia, monograph, types of various dosage forms, economics and regulatory aspects.

UNIT- II BASICS OF PHARMACOKINETICS (10)

Mechanism of drug action; physico-chemical properties and principles of drug metabolism; pharmaco kinetics.

UNIT- III MANUFACTURE OF DRUGS, PROCESS AND APPLICATIONS (9)

Types of reaction process and special requirements for bulk drug manufacture.

UNIT- IV MANUFACTURE OF SOILD DOSAGE FORMSS (9)

Compressed tablets; dry and wet granulation; slugging or direct compression; tablet presses; coating of tablets; capsule preparation.

UNIT- V MANUFACTURE OF LIQUID ORALS AND TOPICALS (10)

Oral liquids – vegetable drugs – topical applications; preservation of drugs; analytical methods and other tests used in drug manufacture; packing techniques; quality management; GMP.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	David B. Troy, Paul Beringer	Remington: The science and practice of pharmacy	Lippincott Williams & Wilkins	2006
2	Gareth Thomas	Medicinal Chemistry. An introduction	John Wiley	2000
3	Katzung B.G.	Basic and Clinical Pharmacology	Prentice Hall of Intl	1995

16BTBT603B MOLECULARMODELLING 3003100

Course Objectives

- To define the basic view of concept of molecular modelling.
- To demonstrate the computational quantum mechanics through different methods.
- To explain the general features of molecular mechanics.
- To discuss the molecular dynamics simulation methods.
- To outline the basic concept on cheminformatics molecular modeling.
- To explain the diverse techniques on molecular modeling.

Course Outcomes

1. Identify different views on global and local energy minima through molecular modeling.
2. Differentiate various calculations on molecular properties.
3. Illustrate the concept behind molecular mechanics through derivative methods.
4. Evaluate and characterize molecules simulation through dynamics methods.
5. Analyze and categorize the structure based drug design for targets.
6. Explain the diverse techniques on molecular modeling.

UNIT-I MOLECULARMODELLING (9)

Introductiontoconceptofmolecularmodeling,molecularstructureandinternalenergy,applicationsof molecugraphics,coordinatesystems,potentialenergysurfaces,discussionoflocalandglobalenergy minima

UNIT-II QUANTUMMECHANICS (9)

Introduction tothecomputationalquantum mechanics;oneelectronatom,ply electronicatomsand molecules, HartreeFockequations;calculatingmolecular properties usingabinitioandsemiempirical methods.

UNIT-III MOLECULARMECHANICS (9)

Molecular mechanics;generalfeaturesofmolecular mechanicsforcefield,bondstretching,angle bending,torsionalterms,non–bondedinteractions;forcefieldparameterizationandtransferability;energy minimization;derivativeandnon–derivativemethods,applicationsofenergyminimization.

UNIT-IV MOLECULARDYNAMCS (9)

Molecular dynamicssimulation methods;moleculardynamics usingsimple models, molecular dynamicswithcontinuouspotential, setting upandrunningamolecular dynamicsimulation,constraint dynamics;MonteCarlosimulation;MonteCarlosimulationofmolecules.

UNIT-V MODELLINGANDDRUGDESIGN (9)

Macromolecular modeling,designofligandsforknownmacromoleculartargetsites,Drug-receptor interaction,classicalSAR/QSARstudiesandtheirimplicationstothe3Dmodeler,2-Dand3-Ddatabase searching,pharmacophore identificationandnoveldrugdesign,moleculardocking,Structure-based drug design forallclassesoftargets.

Total hours : 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Year of Publications
1	AndrewLeach	Molecular Modelling: PrinciplesandApplications	Prentice Hall	2001
2	N. Claude Cohen	Guidebook on Molecular ModelinginDrugDesign	Academic Press	1996

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Year of Publications
1	Yvonne C. Martin, editor, PeterWillett	Designing bioactive molecules :three- dimension techniquesand applications	Washington, DC : American Chemical Society	1998
2	Matthew F. Schlecht	MolecularModelingonthe PC	Wiley-Blackwell; Ha	1998

16BTBT604ACHEMICALREACTIONENGINEERING 3003100

Course Objectives

- To illustrate the rate equation with different parameters.
- To explain the basic ideas on first order reaction in reactor design.
- To list the various functions of Non Ideal flow of fluidized bed.
- To label the basic theory of rate equation systems in heterogenous reactions.
- To develop a picture about rate controlling mechanism in solid catalyzed reaction.
- To understand the various biochemical reactions.

Course Outcomes

1. Summarize about the rate equation.
2. Determine the first order reaction in reactor design.
3. Express the functions of non ideal flow of fluidized bed.
4. Be aware of the conceptuation behind various rate equations in heterogenous systems.
5. Describe the various rate controlling mechanism in solid catalyzed reaction.
6. Summarize and predict the various reactions.

UNIT-I KINETICS OFHOMOGENOUS REACTIONS (9)

Concentration andtemperature dependenttermofrateequation–searchingfor mechanism–predictability ofreaction ratefromtheory;Interpretation ofbatchreactordata–constantvolume andvariablevolume batchreactors–temperatureandreactionrate-development ofrateequationsfordifferent homogeneous reactions(up tosecondorderreactionsbothreversibleandirreversiblereactions).

UNIT-II REACTORDESIGN (9)

Idealbatchreactors–steadystate MFR&PFR–holdingtimeforflowsystems;Designforsinglereactions-performanceequations forsinglereactors ;multiplereactorsystems–PFRinseries/parallel–equal sizeanddifferent sizeMixedreactorsinseries;reactorsof differenttypes inseries. Design forMultiple reactions (firstorderreactionsonly)

UNIT-III NONIDEALFLOW (9)

RTDoffluidinvessel–relationshipbetweenF,C&Ecurve–conversion fromtracerinformation; non-idealflowmodels–Dispersion modelandTanksinseriesModel;Multiparametermodels–modelsfor fluidizedbeds.

UNIT-IV DESIGNFORHETEROGENOUSSYSTEMS (9)

Rateequations–contactingpatternsfortwophasesystems;fluidparticlereactions–unreactedcore modelforsphericalparticlesofunchanging size–rateofreactionforshrinking sphericalparticles–determinationofratecontrolling step–applicationtodesign;reactionssteps;resistancesandrate equations;Fluid–Fluidreactions–rateequations.

UNIT-V SOLIDCATALYSEDREACTIONS (9)

Rateequation–ratecontrolling mechanisms–experimentalmethodsforfinding rates–product distributioninmultiplereactions–applicationof design;Deactivatingcatalysts–mechanism–rateequation.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publication s
1	LevenspielO	ChemicalReactionEngineering.	JohnWiley	1999
2	FoglerH.S..	ElementsofChemicalReaction Engineering	PrenticeHall India	2002

REFERENCE BOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Missen R.W.,Mims C.A.,SavilleB.A	Introductionto ChemicalReaction Engineering andKinetics	JohnWiley	1999

16BTBT604BNANOBIOTECHNOLOGY 3003100

Course Objectives

- To explain basic knowledge on nanotechnology.
- To demonstrate the structural and functional principles of bionanotechnology.
- To discuss various methods for microfluidic components.
- To explain the effects of various protein and DNA based nanostructures.
- To outline the basic concepts of nanoparticles in cancer therapy.
- To identify the different nanoparticles using different controlling measures.

Course Outcomes

1. Summarize the characteristics different nanoparticles.
2. Evaluate the different structural and functional principles of biotechnology.
3. Explain the microfluidic devices.
4. Discuss the protein and DNA based nanostructures.
5. Recognize cancer curingnanoparticles.
6. Identify and list different nanoparticles for different controlling measures.

UNIT-I INTRODUCTIONTONANOTECHNOLOGY (9)

Backgroundanddefinitionofnanotechnology, chemicalbondsinnanotechnology–Scalesatthebio-nanointerface–Basiccapabilitiesofnanobiotechnology andnanomedicine–Biologicaltraditionand mechanicaltraditionbiotechnology–Applicationsinbiotechnology.

UNIT-II STRUCTURAL AND FUNCTIONAL PRINCIPLES OF BIONANOTECHNOLOGY (9)

Biomolecular structure and stability – Protein folding – Self-assembly – Self-organization – Molecularrecognition– Information driven nanoassembly – Energetics –Chemical transformation– Biomaterials – Biomolecular motors – Traffic across membranes – Biomolecular sensing – Self-replication – Machine-phase bionanotechnology.

UNIT-III MICROFLUIDICS (9)

Conceptsandadvantagesofmicrofluidic devices–Materialsandmethodsforthemanufactureof microfluidiccomponent–Fluidicstructures–Surfacemodifications–Lab-on-a-chip forbiochemical analysis.

UNIT-IV PROTEIN AND DNA BASEDNANOSTRUCTURES (9)

S-Layers–Engineerednanopores–Microbialnanoparticleproduction–DNA-Proteinnanostructures–Biomimeticfabricationof DNAbasedmetallic nanowiresand networks–DNA-Goldnanoparticleconjugates–Nanoparticlesasnon-viraltransfectionagents.

UNIT-V NANOPARTICLES IN CANCER THERAPY (9)

Magnetic nano and microparticles for embolotherapy - hyperthermic therapy-delivery of chemotherapeutic drugs-brachytherapy, Thermoresponsive liposomes for hyperthermic chemotherapy assemblies and ultrasound activation.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Year of Publications
1	Niemeyer, C.M. andMirkin,C.A	Nanobiotechnology: Concepts, Applicationsand Perspectives	Wiley-VCH	2004
2	Goodsell,D.S.	Bionanotechnology	JohnWiley and Sons, Ir	2004

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Year of Publications
1	Shoseyov, O. and Levy,I	Nanobiotechnology: Bioinspired Devices and Materialsof theFuture	Humana Press	2007
2	Bhushan,B.	Springer Handbook of Nanotechnology	Springer-Verlag Berlir Heidelberg	2004
3	FreitasJrR.A	Nanomedicine	Landes Biosciences	2004

4	Kohler, M. and Fritzsche,W.	Nanotechnology – An IntroductiontoNanostructuring Techniques	Wiley-VCH	2004

16BTBT611 IMMUNOLOGYLAB 0032100

Course Objectives

- To discuss the handling techniques of animals and immunization.
- To understand the isolation and identification of cells and blood group.
- To explain the methods for the detection ofanitigen-antibody.
- To outline the techniques for antigen identification.
- To understand the techniques of T-cell rossetting.
- To understand the techniques of Western blotting.

Course Outcomes:

1. Infer the basic handling techniques for animal studies.
2. Outline the basics of isolation and identification of cells and blood group.
3. Illustrate the Immuno electrophoresis and Immuno diffusion for determination of antibody.
4. Understand the knowledge about ELISA and western blotting for identification of various diseases.
5. Explain the identification of typhoid antigens by Widal test.
6. Discuss principles of T-cell rossetting.

1.Handlingofanimals,immunizationandraisingantisera

2.Identificationofcellsinabloodsmear

3.Identificationofbloodgroup

4.Immunodiffusion

5. Immunoelectrophoresis

6.TestingfortyphoidantigensbyWidaltest

7.EnzymeLinkedImmunoSorbentAssay(ELISA)

8.Isolationofperipheralbloodmononuclearcells

9.Identificationof t cellsbyT-cellrossettingusingsheepRBC.

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Hay,F.C.and M.R.Westwood	PracticalImmunology	Blackwell Science, Publishers	2004
2	Janeway,C.A., andP.Travers.	Immunobiology	Garland PublishingInc.	1994
3	Kuby,J.	.Immunology	W.H.Freeman andCompany	1994
4	Talwar,G.P. andS.K.Gupta,	AHandbookofPracticaland Clinical Immunology.Vol1 and2	CBS Publications	1992
5	.Weir,D.M	ImmunologicalTechniques	Blackwell Scientific Publications	1992

16BTBT612A BIOPHARMACEUTICAL TECHNOLOGY LAB 0 0 3 2 100

Course Objectives

- To understand the wet granulation method for granules preparation.
- To explain the dry and wet granulation protocol for tablet preparation.
- To predict the steps for the analysis of tablets for its quality control.
- To perform the preparation of liquid orals-syrup.
- To understand the procedure for the preparation of topical formulations.
- To illustrate the assay techniques for tablets and injection..

Course Outcomes

1. Perform the granules preparation using wet granulation method.
2. Experiment the tablet preparation using wet and dry granulation techniques.
3. Identify the quality of tablets using different analysis.
4. Demonstrate the protocol for liquid-orals syrup preparation.
5. Perform the assay for riboflavin tablets.
6. Interpret dextrose injection using basic assays.

1. Preparation of granules by wet granulation
2. Preparation of Tablets by wet and dry granulation
3. Quality control test for tablets
4. Preparation of liquid orals-syrup
5. Preparation of topical preparation-lotion, ointment, cream
6. Assay of Riboflavin tablets
7. Assay of Dextrose Injection

16BTBT612B MOLECULAR MODELING LAB 0 0 3 2 100

Course Objectives

- To understand how to visualize and understand macromolecule-ligand interactions
- To explain various computational tools used for drug design
- To predict the properties of small molecules
- To perform homology modeling of proteins
- To understand the active site prediction
- To illustrate the protein ligand docking and protein-protein docking

Course Outcomes

1. Perform the QSAR study.
2. Experiment the visualization tools to understand the macromolecule – ligand interactions.
3. Identify the the properties of small molecules
4. Demonstrate the homology modeling of proteins.
5. Perform the active site prediction.
6. Interpret the protein ligand docking and protein-protein docking.

1. Explore Visualization tools
2. Learn to calculate properties of small molecules
3. Perform a QSAR study
3. Homology modeling of proteins
4. Virtual screening using Zinc database
5. Protein ligand docking
6. Protein-Protein docking
7. Molecular Dynamics using simple models

16BTBT651 MINI PROJECT 0 0 1 - 100

OBJECTIVES

- To provide exposure in practical aspects
- To equip the students to meet the industry standards .

The students will be directed to do a project work during VI semester and their projects will be evaluated for, forty percentages for Continuous Internal Assessment and sixty percentage for End Semester Examination.

End Semester Examination evaluation will be based on the report submitted by the student after the completion of the project work.

16BTBT652TECHNICALPRESENTATIONANDSEMINAR 0 0 1 - 100

OBJECTIVES

- Toequipthestudentsfor effectivetechnicalpresentation
- Toimprovebodylanguageandpostureforeffectivepublicspeaking.

INTENDED OUTCOMES:

- To get familiarize in the teaching presentation skills.
- To gain confidence in the teaching process.

During theseminarsessioneachstudentisexpectedtoprepareandpresentatopicon biotechnology,fordurationofabout8to10minutes.Inasessionofthreeperiodsperweek,15 studentsareexpectedtopresentseminars.Afaculty guideistobeallottedandhe/shewillguide and monitortheprogressofthestudentandmaintainattendancealso.

Studentsareencouraged tousevariousteachingaidssuchasoverheadprojectors,powerpoint presentation and demonstrativemodels. This will enable themtogainconfidence in facingthe placementinterviews.

16BTCC701 PROFESSIONAL ETHICS, PRINCIPLES OF MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT 3 0 0 3 100

Course Objectives:

- To create an awareness on Engineering Ethics
- To incorporate Moral and Social Values and Loyalty
- To appreciate the rights of other
- To motivate the leadership skills
- To train to become an entrepreneur
- To learn the management skills

Course Outcomes:

1. Explain the engineering ethics
2. Outline the Moral and Social Values and Loyalty
3. Justify the rights of other
4. Illustrate the values of leadership skills
5. Assess the skills ofentrepreneur
6. Discuss the management skills

UNIT I ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – variety of moral issued – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – Models of Professional Roles – theories about right action – Self–interest – customs and religion – uses of ethical theories.

UNIT II FACTORS OF CHANGES 9

Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws. Social changes – Meaning and nature – Theories.

UNIT III HISTORICAL DEVELOPMENT, PLANNING, ORGANISING 9

Definition of Management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies and Planning Premises– Forecasting – Decision–making – Formal and informal organization – Organization Chart –.

UNIT IV DIRECTING AND CONTROLLING 9

Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment –Process of Communication – System and process of Controlling – Requirements for effective control – Control of Overall Performance – Direct and Preventive Control – Reporting

UNIT V ENTREPRENEURSHIP AND MOTIVATION 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harold Kooritz and Heinz Weihrich	Essentials of Management	Tata McGraw Hill, New Delhi	2010
2	Khanka S.S	Entrepreneurial Development	S.Chand and Co. Ltd., NewDelhi	2006
3	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw–Hill, NewYork	2005

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Tripathy P.C and Reddy P.N	Principles of Management	Tata McGraw Hill, New Delhi	2008
2	Rabindra N Kanungo	Entrepreneurship and innovation	Sage Publications, New Delhi	1998
3	Charles E Harris, and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, New Delhi	2013

WEB REFERENCES

1. http://www.managementstudyguide.com/taylor_fayol.htm
2. http://tutor2u.net/business/gcse/people_motivation_theories.htm
3. http://lfkkb.tripod.com/eng24/gilligangstheory.html
4. http://www.developingeyes.com/five–types–of–entrepreneurs/

16BTBT702DOWNSTREAMPROCESSING 3003100

Course Objectives:

- To understand the importance of downstream processing and various cell disruption techniques.
- To discuss the various cell disruption techniques for product release.
- To explain the physical methods of separation.
- To understand the methods for the isolation of products.
- To understand the methods for the purification of the bioproducts.
- To explain the various methods for final product formulation and finishing operations.

Course Outcomes:

1. Outline the principles involved in downstream processing and characteristics of biomolecules.
2. Discuss the various cell disruption techniques for product release.
3. Illustrate the different physical methods of separation of bioproducts.
4. Relate and apply the methods available for the isolation of products.
5. Discuss the techniques used for the product purification.
6. Outline the principles for the final product formulation and finishing operations.

UNIT-I DOWNSTREAMPROCESSING (9)

Introductiontodownstreamprocessingprinciplescharacteristicsofbiomoleculesandbioprocesses. Celldisruptionforproductrelease–mechanical,enzymaticand chemicalmethods.Pretreatmentand stabilizationofbio-products.

UNIT-II PHYSICALMETHODSOFSEPARATION (9)

Unitoperationsforsolid-liquidseparation-filtrationandcentrifugation, flocculation and sedimentation

UNIT-III ISOLATIONOFPRODUCTS (9)

Adsorption,liquid-liquidextraction,aqueoustwo-phaseextraction,membraneseparation,ultrafiltration andreverseosmosis,dialysis,precipitationofproteinsbydifferentmethods.

UNIT-IV PRODUCTPURIFICATION (9)

Chromatography– principles, instrumentsand practice, adsorption,reverse phase,ion-exchange, size exclusion, hydrophobic interaction, bio-affinityand pseudo affinitychromatographic techniques.

UNIT-VFINALPRODUCTFORMULATIONANDFINISHINGOPERATIONS (9)

Crystallization: principles, batch crystallizers, process crystallization of proteins; Drying: Principles, heat and mass transfers, dryers description, batch and continuous dryers, freeze and spray dryers infinalproductformulation.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	P.A.Belter,E.L. CusslerAnd Wei-Houhu	Bioseparations–Downstream ProcessingFor Biotechnology	Wiley Interscience Pub	1988
2	R.O.Jenkins, (Ed.)	ProductRecoveryIn BioprocessTechnology–Biotechnology ByOpenLearningSeries	Butterworth-Heinemann	1992

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	J.C.JansonAnd L.Ryden,(Ed.)	ProteinPurification–Principles,HighResolution MethodsAndApplications	VCHPub Press	1989
2	R.K.Scopes	ProteinPurification–PrinciplesAndPractice	NarosaPub	1994
3	Roger.G.Harrison,Pa Todd,Scott R.Rudgeand Demetri P.Petrides	Bioseparation ScienceandEngineering	Oxford University Press	2003

16BTBT711 DOWNSTREAMPROCESSINGLAB 0032100

Course Objectives

- To illustrate the rate equation with different parameters.
- To explain the basic ideas on first order reaction in reactor design.
- To list the various functions of Non Ideal flow of fluidized bed.
- To label the basic theory of rate equation systems in heterogenous reactions.
- To develop a picture about rate controlling mechanism in solid catalyzed reaction.
- To understand the various biochemical reactions.

Course Outcomes

1. Summarize about the rate equation.
2. Determine the first order reaction in reactor design.
3. Express the functions of non ideal flow of fluidized bed.
4. Be aware of the conceptuation behind various rate equations in heterogenous systems.
5. Describe the various rate controlling mechanism in solid catalyzed reaction.
6. Summarize and predict the various reactions.

1.ProteinPurificationbyisoelectricpointprecipitation.

2.AmmoniumSulphateprecipitation.

3.Liquid–Liquidextraction.

4.Solid–Liquidextraction.

5.Crystallization.

6.Cellfractionationusingcentrifuge.

7. Drying of solid by heatsource.

8. Dialysis

9.Purificationofα–Amylasefrom*Bacillus*.

16BTBT791 PROJECT WORK PHASE I 0 0 8 4 100

The students will be directed to do a project work which will be the Phase I if their main project work that will be performed in the eigth semester during.Their projectswill be evaluated for, forty percentages for Continuous Internal Assessment and sixty percentagefor End Semester Examination.

End Semester Examination evaluation will be based on the report submitted by the student
after the completion of the project work.

16BTBT891 PROJECT WORK PHASE II AND VIVA-VOCE 0 0 32 16 300

The students will be performing their main project work as a continuation of the Phase I project completed in the seventh semester.Their projectswill be evaluated for a total of three hundred marks, out of which one twenty marks will be for Continuous Internal Assessment and one hundred and eighty marks for End Semester Examination.

End Semester Examination evaluation will be based on the report submitted and presentation of his/her work by the studentto a panel of evaluators after the completion of the project work.

PROFESSIONAL ELECTIVES

16BTBT5E01ANIMALBIOTECHNOLOGY 3003100

Course Objectives

- To define the basic view of tissue culture techniques.
- To illustrate the breeding of farm animals.
- To propose an opinion on transgenic animal technology.
- To explain the characterization techniques for bacterial and viral diseases in animals.
- To justify the basic concept on recombinant cytokines.
- To discuss the diverse techniques on animal cell culturing and its mechanism.

Course Outcomes

1. Identify the different views on tissue culturing.
2. Differentiate various breeding farm animals.
3. Illustrate the concept behind transgenic animal technology.
4. Evaluate the bacterial and viral diseases that attack animals.
5. Analyze and categorize the best approach on recombinant cytokines.
6. Discuss the diverse techniques on animal cell culturing and its mechanism.

UNITI ANIMALCELLCULTURE (10)

Introductiontobasictissueculturetechniques,equipmentsandinstrumentsinATC - chemically definedandserumfreemedia-animalcellcultures-maintenance andpreservation– varioustypesof cultures;suspension cultures-continuousflowcultures-immobilizedcultures– somaticcellfusion- organcultures.

UNITII ANIMALDISEASESANDTHEIRDIAGNOSIS (9)

Bacterialandviraldiseasesinanimals-monoclonal antibodies–diagnosis-molecular diagnostic techniques;PCR-in-situhybridization-northern-southernblotting-RFLP.

UNITIII THERAPYOFANIMALDISEASES (9)

Recombinantcytokines–therapeuticapplicationsofmonoclonal antibody, vaccines- DNA, subunit, cocktailvaccines-genetherapyforanimaldiseases

UNITIV MICROMANIPULATION OFEMBRYOS (9)

Micromanipulation technology-equipments-enrichmentofxandybearingsperms fromsemen samples-artificialinsemination -germcellmanipulations –Invitro fertilization-embryo transfer- micromanipulationtechnologyandbreedingof farmanimals.

UNITV TRANSGENICANIMALS (8)

Conceptsoftransgenicanimaltechnology;strategiesfortheproduction oftransgenicand knockout animals–significanceinbiotechnology-stemcellcultures and induced pluoripotent stem cells in the productionof transgenicanimals.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	MastersJ.R.W	AnimalCellCulture: PracticalApproach	Oxford University Press	2000

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	RangaM.M.	AnimalBiotechnology	Agrobios India Limited	2002
2	RamadassP,Meera RaniS	Text BookOfAnimal Biotechnology	Akshara Printers	1997

16BTBT5E02 ENTREPRENEURSHIPINBIOTECHNOLOGY 3003100

Course Objectives

- To explain basic knowledge on biotech industries in various field.
- To demonstrate the various lab construction through new ventures.
- To construct various parameters of research and development in production of bio based products.
- To explain the case studies of different industries and their strategic planning.
- To outline the basic concepts of IPR and ethics in biotechnology.
- To discuss the different techniques for entrepreneurship in biotechnology.

Course Outcomes

1. Summarize the characteristics of different biotechindustries.
2. Evaluate the different lab construction through newventures.
3. List the various parameters of research and developmental techniques.
4. Explain the opportunities to know different industrial strategic plans.
5. Recognize basic concepts of IPR and ethics in biobased product production.
6. Identify and list different techniques for entrepreneurship in biotechnology.

UNITI OVERVIEWOFBIOTECHNOLOGYINDUSTRIES (9)

Scope - Biotechnology Industries in India and Abroad - Fundamentals of Biotechnology for biobusiness-TrendsandkegissuesinBiotechnology anddevicesindustries-Technology basisin industrysegment,emergingtechnologiesandtechnicalconvergencesissues.

UNITII NEWVENTURECREATION–ENTREPRENEURSHIP (9)

Plant tissueculturelabconstruction–Equipment,glasswareandchemicalrequirements -techniquesin culturing of plants. Export of tissue cultured plants to aboard – Vermi technology– Mushroom cultivation-singlecellprotein-Biofertilizertechnology -production-Commercialization ofR&D-Fermentationtechnology:Bakery,Dairyproducts.

UNITIII PRODUCTDEVELOPMENT (9)

Beer,wineandethanolproductionusingdifferentsources–Enzyme:production, purificationand characterization-Organicacids(Citric,lactic)production-Antibioticproduction-Biogastechnology-Azollacultivation-Productdevelopmentandprojectmanagement, transitionfromR&Dtobusiness units.Institute–industryinteractionandpartnership/alliances.

UNITIV INTELLECTUALPROPERTY,BIOETHICSANDLEGALISSUES (9)

Intellectualpropertyrightsin Biotech,Patentlaws-Bioethics andcurrentlegalissues-Marketing and public perceptions in product development – Genetically modified products and organisms

(Transgenicproducts)-Technologylicensingand brandingconcerns.

UNITV BIOBUSINESSPLANS (9)

Healthcare,theBiomedicalSciences,agricultureandAgrobiotechnology. Transferandbusiness planning-Bankloanandfinancestrategy–Budgetplan–licensingandBranding Concernsand Opportunities, Policy and regulatory Concerns and Opportunities Financial assistance for R&D projectsandentrepreneurship.Corporatepartnersmarketing–Modelproject:Casestudiesofdifferent industriesandtheirstrategicplanning.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	RichardOliver	ThecomingBiotechage:The businessofBiomaterials	McGraw Hill Publications, NewYork	1999
2	Karthikeyan,S. andArthurRuf	Biobusiness	MJP Publications. Chennai, India	2009

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	GurinderShahi	BioBusinessinAsia:How countriesCanCapitalizeonthe LifeScienceRevolution	Pearson Prentice Hall	2004
2	RuthEllen Bulger	Theethicaldimensionsofthe Biologicalsciences	Cambridge University Press	1993

16BTBT5E03INDUSTRIALSAFETYANDHAZARDSMANAGEMENT 3003100

Course Objectives

- To explain descriptive views of fire and explosion.
- To illustrate Differentiating relief systems in various explosions.
- To descriminate various hazards and toxicity.
- To evaluate various spills and leakage of liquids.
- To interpret different situations of explosions and toxicity through case studies.
- To discuss the different global and local explosive issues.

Course Outcomes

1. Elaborate the concept of fire and explosion.
2. Learn and evaluate relief systems in various explosions.
3. Explain the hazards and toxicity in various situations.
4. Discuss the various spills and leakage preventive measures.
5. Identify basic views in different situations of explosions and toxicity.
6. Make up perspective techniques and create data on different global and local explosive issues.

UNITIFIREANDEXPLOSION (9)

Introduction-Industrial processes and hazards potential, mechanicalelectrical, thermal andprocess hazards. Safetyandhazardsregulations,Industrialhygiene.FactoriesAct,1948and Environment (Protection) Act,1986andrulesthereof.Shock wavepropagation, vapourcloudandboilingliquid expanding vapours explosion (VCE and BLEVE), mechanical and chemical explosion, multiphasereactions,transporteffectsandglobalrates.

UNITIIRELIEFSYSTEMS (9)

Preventiveandprotectivemanagementfromfiresandexplosion-inerting, staticelectricitypassivation, ventilation,andsprinkling,proofing,reliefsystems– relief valves,flares,scrubbers.

UNITIIITOXICOLOGY (9)

Hazards identification-toxicity,fire, static electricity, noise and dust concentration;Material safety data sheet, hazards indices- Dowand Mond indices, hazard operability (HAZOP)and hazard analysis (HAZAN).

UNITIVLEAKSANDLEAKAGES (9)

Spilland leakageofliquids,vapors,gasesand theirmixturefromstoragetanksand equipment; Estimationofleakage/spillratethrough hole, pipes and vessel burst; Isothermal and adiabatic flows ofgases, spillage and leakage of flashing liquids, pool evaporation andboiling;Release oftoxicsanddispersion.Naturallybuoyantanddensegasdispersionmodels;Effects of momentum andbuoyancy;Mitigationmeasuresforleaksandreleases.

UNITVCASESTUDIES **(9)**

Flixborough,Bhopal,Texas,ONGCoffshore,HPCL Vizagand Jaipur IOC oil-storage depot incident;Oil,naturalgas,chlorineandammoniastorageandtransportationhazards.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Crowl D.A. and Louvar J.F	Chemical Process Safety Fundamentals with Applications	Prentice Hall.	2001
2	MannanS.	Lee’sLossPreventioninthe ProcessIndustries	Butterworth-Heinemann	2005

16BTBT5E04 DEVELOPMENTALBIOLOGY 3003100

Course Objectives

- To illustrate the origin of developmental biology.
- To explain the basic ideas on specifications of germ layers.
- To list the various functions of vertebrates development by its differentiation.
- To discuss the basic theory of morphogenesis and organogenesis.
- To understand embryogenesis and its functions.
- To discuss the different stages of developmental biology.

Course Outcomes

1. Summarize about the cell commitment and differentiation in developmental biology.
2. Determine the postulation of germ cells and patterning of vertebrate body plan.
3. Express the functions of cell differentiation in vertebrate development.
4. Explain the conceptuation behind morphogenesis and organogenesis.
5. Describe the various functions and stages in embryogenesis.
6. Summarize and predict the different stages of developmental biology.

UNITI INTRODUCTION (8)

Originsofdevelopmentalbiology;Conceptsindevelopment–Developmentalsignalsincelldivision& differentiation;Role of gene expression in development; Identifying developmental genes, Cell commitment&differentiation;Determination&inductionofcell fate, Conceptofmorphogen& positional information; Model vertebrate organisms: Mouse, Zebrafish, Model invertebrate organisms:*D.melanogaster,C.elegans*,Modelplant:*A.thaliana*

UNITII GERMCELLSANDPATTERNINGTHEVERTEBRATEBODYPLAN (9)

Genotypic&phenotypicsex-determination inmammals,*D.melanogaster*and*C.elegans*,Structure&Formationofgermcells,Fertilization;axes&germl ayers;Settingupthebody axes;theorigin& specificationofthegermlayers.

UNIT III DEVELOPMENTOFVERTEBRATES (10)

DevelopmentoftheDrosophila,Nematodes&CellularSlimeMolds: BodyPlan;Specificationof bodyaxes&roleofmaternalgenes;Polarizationofbodyaxesduringoogenesis; Patterning, Segmentation-&roleof pair-rulegenes;celldifferentiationandaggregation.

UNIT IV MORPHOGENESIS ANDORGANOGENESIS (10)

Morphogenesis;Kindsofcleavage&blastulation; Typesoftissuemovementingastrulation; Gastrulationinamphibians&mammals;Neuraltubeformation&neuralcrestmigration; Cell Differentiation&Organogenesis;Modelsofcelldifferentiation;Insectimaginaldisc&wingdevelopment; metamorphosis.

UNITV EMBRYOGENESIS (8)

Plantdevelopment**;**Patterndevelopmentinearlyembryogenesisofangiosperms; floraldevelopment.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	ScottF.Gilbert	DevelopmentalBiology	Sinauer Associates,	2013
2	Arumugam.A	DevelopmentalBiology	Saras Publications	1995

16BTBT6E01PHYTOCHEMICALSANDHERBALMEDICINE 3003100

Course Objectives

- To illustrate the scope and importance of crude drugs.
- To understand the basic ideas on cultivation and utilization of medicinal and aromatic plants.
- To list the various functions of plant tissue culture as asource.
- To label the basic theory of methods of drug evaluation.
- To develop a picture about applications of phytochemicals in industry and healthcare.
- To discuss the different stages of developments in using phytochemicals and medicinal plants.

Course Outcomes

1. Summarize about the importance of crude drugs in different medicinal system.
2. Determine the modern cultivation techniques through plants.
3. Express the functions of plant tissue culturing.
4. Be aware of the conceptuation behind various methods for drug evaluation.
5. Describe the various functions and application of phytochemicals in different industries.
6. Summarize and predict the different stages of developments in using phytochemicals and medicinal plants.

UNITI CRUDEDRUGS (9)

CrudeDrugs–Scope&Importance,Classification(Taxonomical,Morphological Chemical, Pharmacological); Cultivation,Collection&processing ofCrudeDrugs.IndianSystemofmedicine: Ayurveda,SiddhaandUnanianditssignificance

UNITII MEDICINAL&AROMATICPLANTS (9)

Cultivation andUtilizationofMedicinal&Aromatic PlantsinIndia.GeneticsasappliedtoMedicinal herbs.ModernBiotechnologicaltoolsanditsinfluenceinMedicalandAromaticplantcultivation.

UNITIII TISSUECULTUREOFMEDICINALPLANTS (9)

PlantTissueCultureassourceofmedicines,Secondary metaboliteproductioninplants;PlantTissue Culture for enhancing secondarymetabolite production (Withaniasomnifera,Rauwolfiaserpentina, Catheranthusroseus,Andrographispaniculata, Dioscoreasp.);Anticancer,Antiinflammatory, Antidiabetic,Analgesicdrugs,BiogenesisofPhytopharmaceuticals.

UNITIV ANALYSISOFPHYTOCHEMICALS (9)

MethodsofDrugevaluation(Morphological, Microscopic,Physical&Chemical).Preliminary screening,Assay ofDrugs–Biologicalevaluation/assays,Microbiological methods. Types of Phytochemicals: Glycosides - extraction methods(Aloe);VolatileOilsextractionmethods(Clove);Alkaloids-extractionmethods(Cinchona); Flavonoids extractionmethods,Resins-extractionmethods;Lectins.

UNITV APPLICATIONSOFPHYTOCHEMICALS (9)

Applicationofphytochemicalsinindustry andhealthcare;Biocides,Biofungicides, Biopesticides. Nutraceuticalsandtheirsignificance.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	C.K.Kokate,A. P.Purohit&S. B.Gokhale	Pharmacognosy	NiraliPrakashan	1996
2	PaulM.Dewick	NaturalProductsinmedicine: ABiosyntheticapproach	Wiley	2009

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Hornok,L.	Cultivation&Processingof MedicinalPlants	Wiley& Sons	1992
2	Trease&Evans	Pharmacognosy	Harcourt Brace &Company	1989

16BTBT6E02METABOLICENGINEERING 3003100

Course Objectives

- To explain the gene expression and its regulation.
- To determine the methods for the synthesis of primary metabolites.
- To discuss the procedure for biosynthesis of secondary metabolites.
- To distinguish the features of bioconversion.
- To tell about the regulation of enzyme production.
- To summarize the repressions in enzyme production.

Course Outcomes

1. Illustrate the gene expression and its regulation.
2. Demonstrate the primary metabolite synthesis.
3. Discuss the methods for secondary metabolites production.
4. Outline the features of bioconversion.
5. Explain the regulation of enzyme production.
6. Describe the repressions in enzyme production.

UNITI INTRODUCTION (9)

JacobMonodmodelforgeneexpression regulation–Lacoperon,cataboliteregulation - glucose effect-cAMPdeficiency.Regulation of RNAsynthesisby aminoacid.Feedbackregulation, regulationinbranchedpathways-differential regulation inisozymes,concertedfeedback regulation, cumulative feedback regulation, permeability control: passive diffusion, active transport,grouptransportation.

UNITII SYNTHESISOFPRIMARYMETABOLITES (9)

Alterationoffeedback regulation,limitingaccumulationofend products,feedbackresistant mutants,alterationofpermeabilityformetabolites.

UNITIII BIOSYNTHESISOFSECONDARYMETABOLITES (9)

Producersofsecondarymetabolites,Precursor effects,trophophase-idiophaserelationship,enzyme induction,feedbackregulation,cataboliteregulationbypassingcontrolof secondarymetabolism.

UNITIV BIOCONVERSIONS (9)

AdvantagesofBioconversions,specificity,yields,factorsimportantforbioconversion,regulation of enzyme synthesis,mutation, permeability, co-metabolism,avoidanceof product inhibition, mixedorsequentialbioconversions,conversionofinsolublesubstances.

UNITV REGULATIONOFENZYMEPRODUCTION (9)

Strainselection,improving fermentation, recognizinggrowth cyclepeak,induction, feedback repression,catabolite repression,mutantsresistanttorepression,genedosage.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	PeterF.Stanbury, StephenJ.Hall& A.Whitaker	PrinciplesofFermentation Technology	Butterworth-Heinemann	2005
2	G.Stephanopoulos ,AristosA. Aristidou,Jens HoirisNielson	MetabolicEngineering: Principlesand Methodologies	Academicpress	1998

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	WangD.I.C., CooneyC.L., DemainA.L., DunnilP., Humphrey A.E.,LillyM.D	FermentationandEnzyme Technology	JohnWileyand Sons	1980
2	Cruger,W and Crueger,A	Biotechnology:ATextbook of Industrial Microbiology	Panima Publishing Corporation	2003
3	Zubay,G.L	PrinciplesofBiochemistry	WCB Publishers, London	1995

16BTBT6E03 GENOMICSANDPROTEOMICS 3003100

Course Objectives

- To explain basic knowledge on genome organization of prokaryotes and eukaryotes.
- To discuss the effects of cytogenetic mapping.
- To construct various methods for gene finding and annotations in functional genomics.
- To explain the effects of various protein level estimation in proteomics
- To understand the different protein analysis techniques.
- To outline the post translational modification and other protein interactions.

Course Outcomes

1. Summarize the characteristics of genomic organization of prokaryotes and eukaryotes.
2. Evaluate the different physical mapping techniques.
3. Discuss the gene findings in functional genomics.
4. Explain the protein estimation through different techniques.
5. Recognize different protein analysis techniques.
6. Identify and list different protein interactions.

UNITI OVERVIEWOFGENOMESOFBACTERIA,ARCHAEANDEUKARYOTA (9)

Genome organization ofprokaryotesandeukaryotes,genestructureofbacteria,archaebacterial and eukaryotes,Humangenomeproject,Introductionof functionalandcomparativegenomics.

UNITII PHYSICALMAPPINGTECHNIQUES (9)

Cytogeneticmapping, radiation hybrid mapping, Fish, STSmapping, SNPmappingopticalmapping, Topdownandbottomupapproach,linkingandjumping ofclones,gapclosure,pooling strategies, genomesequencing.

UNITIII FUNCTIONALGENOMICS (9)

Genefinding;annotation;ORFandfunctionalprediction;SubstractiveDNAlibraryscreening; differentialdisplayand representationaldifferenceanalysis;SAGE.

UNITIV TECHNIQUES IN PROTEOMICS (9)

Proteinlevelestimation; Edmanproteinmicrosequencing;protein cleavage; 2Dgelelectrophoresis; metabolic labeling; detectionofproteinsonSDSgels.Mass spectrometry-principlesofMALDI-TOF;TandemMS-MS;Peptide massfingerprinting.

UNITV PROTEINPROFILING (9)

Posttranslationalmodification;protein-protein interactions;glycoprotein analysis;phosphor protein analysis.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Cantorand Smith	Genomics	John Wiley& Sons	1999
2	Penningtonand Dunn	Proteomics	BIOS Scientific Publishers	2001
3	T.ABrown	Genomes	BiosScientific PublishersLtd	2002

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Liebler	IntroductiontoProteomics	Humana Press	2002
2	Huntand Livesey	FunctionalGenomics	Oxford University press	2000
3	Primroseand Twyman	Principlesofgenomeanalysis andgenomics	Blackwell Publishing Co	2003

16BTBT6E04 BIOPROCESSPLANTDESIGN 3003100

Course Objectives

- To discuss the mass and energy balance.
- To explain the scale up of equipments.
- To describe the scale down of equipments.
- To explain design of equipments.
- To understand the facility design with safety.
- To outline the process economics in biological products production.

Course Outcomes

1. Calculate the mass and energy balance.
2. Evaluate the scaling up process for equipments.
3. Discuss the scale down process for equipments.
4. Describe the design of equipments.
5. Tell about the facility design in euipmentation.
6. Summarize the process economic calculations in plant design.

UNITI MASSANDENERGYBALANCE (9)

Introduction: Generaldesigninformation-Materialandenergy balancecalculations-ProcessFlow sheeting.

UNITII SCALEUPANDSCALEDOWNOFEQUIPMENTS (9)

HeatandMassTransferstudies: Effectofscaleonoxygenation,mixing,sterilization, pH,temperature, inoculumdevelopment, nutrientavailabilityandsupply.Bioreactorscale-up-constantpower consumptionpervolume,mixingtime,impellertipspeed(shear)-masstransfercoefficients.Scaleup ofdownstreamprocesses-Adsorption(LUBmethod),Chromatography (constantresolutionetc.), Filtration(constantresistanceetc.)-Centrifugation(equivalenttimesetc.)-Extractors(geometry basedrules)-Scale-downrelatedaspects.

UNITIII DESIGNOFEQUIPMENTS (9)

Selection of bioprocess equipment (upstream and downstream) - Specifications of bioprocess equipment-Mechanicaldesignofreactors,heattransferandmasstransferequipment. Design considerationsformaintaining sterilityofprocessstreamsandprocessequipment-Pipingand instrumentation-Materialsofconstructionforbioprocessplants.

UNITIV FACILITYDESIGN (9)

Facilitydesignaspects-Utility supplyaspects-Equipmentcleaningaspects-Culturecellbanks-cGMPguidelines–Validation-Safety.

UNITV ECONOMICSANDCASESTUDY (9)

Processeconomics-Casestudies.Commoditychemicalsandproductionofpharmaceuticalproducts.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	RobertH.Perry andDonW. Green(eds.)	Perry’sChemicalEngineers’ Handbook	McGrawHill BookCo	1997
2	ShulerM and KargiF	BioprocessEngineering:Basic Concepts	PrenticeHall, Englewood Cliffs,NJ	2002
3	MaxS.Peters andKlaus,D. Timmerhaus	PlantDesignandEconomics forChemicalEngineers	McGrawHill BookCo	1991

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	CoulsonJ.M. andJ.F. Richardson (Eds.) R.K.Sinnott	ChemicalEngineering,Volume 6:AnIntroductiontoChemical EngineeringDesign	Asian Books Private Limited, NewDelhi	1983
2	JoshiM.V.and V.V.Mahajani	ProcessEquipmentDesign	Macmillan India Ltd	2000
3	MichaelR. Ladisch	BioseparationsEngineering: Principles,Practiceand Economics	Wiley	2001

16BTBT6E05MOLECULARPATHOGENESIS 3003100

Course Objectives

- To define the basic view of infectious diseases in host microbe interactions.
- To illustrate the diverse host defense mechanism and pathogenic strategies.
- To propose an opinion on molecular pathogenesis.
- To explain the characterization techniques for host pathogen interactions.
- To understand the basic concept on modern approaches to control pathogens.
- To explain the diverse pathogens and its controlling measures.

Course Outcomes

1. Identify different views on host microbe interactions.
2. Differentiate various host defense mechanisms.
3. Illustrate the concept behind molecular pathogenesis.
4. Evaluating and characterizing host pathogen interactions.
5. Analyze and categorize the best approach to control pathogens.
6. Explain the diverse pathogens and its controlling measures.

UNIT-I HOST-MICROBE INTERACTIONS (7)

Normal Flora-Protective role-dyanamic nature, Principles of Infectious diseases-pathogenicity-pathogen types and modes of entry, causes of infectious disease-Koch's postulates molecular postulates-mechanisms of pathogenesis. Epidemiology-principles.

UNIT-II HOST-DEFENSEAGAINSTPATHOGENSANDPATHOGENICSTRATEGIES (10)

Hostdefense:skin,mucosa,cilia,secretions,physical movements,limitationoffree iron, antimicrobial compounds,mechanismofkillingbyhumoral andcellular defensemechanisms,complements,inflammationprocess,generaldisease symptoms.

UNIT-III MOLECULARPATHOGENESIS (10)

Virulencefactors-generegulationinvirulenceofpathogens-labile&stabletoxins;*VibrioCholerae*-Choleratoxin-*E.coli*pathogens: -ETEC–EPEC- EHEC-EIECHemolyticUremicSyndrome-Shigella toxin-PlasmodiumLifecycle-Antimalarialsbasedontransport processes-Influenzavirus-action of amantidine.

UNIT-IV EXPERIMENTALSTUDIESONHOST-PATHOGENINTERACTIONS (9)

Virulenceassays:adherence,invasion,cytopathic,cytotoxic effects.Criteria&testsinidentifying virulence factors,attenuatedmutants,molecularcharacterizationofvirulence factors,signaltransduction& hostresponses.

UNIT-V MODERNAPPROACHESTOCONTROLPATHOGENS (9)

Classicalapproachesbasedonserotyping.Moderndiagnosisbasedonhighlyconservedvirulencefactors, immuno&DNA-basedtechniques.Newtherapeuticstrategiesbasedonrecentfindingsonmolecular pathogenesisofavarietyofpathogens,Vaccines -DNA,subunit andcocktail vaccines

Total Hours: 45

TEXT BOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	EduardoA. Groisman	PrinciplesofBacterial Pathogenesis	Academic Press,	2001
2	Tizard.	Immunology:Anintroduction	Cengage Learning	1994
3	PeterWilliams, JulianKetley& GeorgeSalmond,	MethodsinMicrobiology: BacterialPathogenesis,	Academic Press	1998
4	AbigaliA. SalyersandDixie D.Whitt,	BacterialPathogenesis–A molecularApproach	ASMPress, Washington	2002

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Nester, E. W. Anderson, D. G Roberts, C.E. Jr. and Nester, M. T.	Microbiology:AHuman Perspective, Fifth Edition	McGraw-Hill,	2007

16BTBT6E06BASICSOFDRUGACTION 3003100

Course Objectives

- To explain the general concepts of pharmacology.
- To discuss the systemic pharmacology with drug action.
- To describe the experimental pharmacology in drug discovery.
- To tell about the general aspects on the pharmacognosy.
- To infer the knowledge on methods and quality control for following pharmacognosy.
- To discuss the protocol for isolation of phytochemicals.

Course Outcomes

1. Tell about the basics of paharmacology in drug action.
2. Explain the systemic pharmacology.
3. Discuss the methods for experimental pharmacology.
4. Describe the action of drugs in pharmacognosy.
5. Outline the methods for isolation of phytochemicals.
6. Understand the characterization of phytochemicals.

UNIT I BASICSOFPHARMACOLOGY (9)

General concepts of Pharmacology, ADME process, drug action- mechanism, factors affecting drugaction.Dose-effectrelationship

UNITII SYSTEMICPHARMACOLOGY (9)

DrugsAffectingtheCentralNervousSystem,CardiovascularandRenalSystems,Immune system, RespiratorySystem, Gastrointestinal System and Nutrition, Endocrine System, Integumentary systemandEyes/Ears.Drugsaffectinguterinemotility,Chemotherapy ofparasiteinfections, Chemotherapyofmicrobialdiseases.Antineoplasticagents,Immunomodulators.Drugsactingon bloodandbloodformingorgans

UNITIII EXPERIMENTALPHARMACOLOGY (9)

Experimentalmethodologiesinvolvedinthediscovery ofdrugs(*invivo,invitro,exvivo*).Animal handlingandanimalcare.Methodsofanaesthetisinganimalsandmethodsofeuthanasia. Restraining andbloodcollectingmethods.

UNITIV PHARMACOGNOSY (9)

General aspects of sources of natural medicinal products**.** Marine Pharmacognosy and its applications. Generalcultivationofmedicinalplants,theirmeritsandDemerit-a.Generalaspects,b. Factors involved,c. Methodsused to improve the Qualityand d. Pest control.Roleofnatural pesticides–Preparationanduses.

UNITV ISOLATION AND CHARACTERIZATION OF PHYTOCHEMICALS (9)

GeneralmethodsandPrinciplesofextractionmethods,typesofextractionandtheirmerits and demerits. Selectionandpurificationofsolvents forextraction,methods ofisolation,purification and identificationofphytoconstituents.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	BertramG. Katzung	Basic&clinicalpharmacology	McGrawHill	2004
2	RichardA. HarveyPhD, PamelaC. Champe	Lippincott'sIllustrated Reviews:Pharmacology	Wolters Kluwer	2008

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	G.E.Trease, W.C.Evans	Pharmacognosy	ELBS	2002
2	VarroE.Tyler, Lynn.R.Brady, JamesE.Robbers	Pharmacognosy	Lee&Febiger	1988
3	T.E.Wallis	Text BookofPharmacognosy	CBSPub	1985

16BTBT6E07MARINEBIOTECHNOLOGY 3003100

Course Objectives

- To explain descriptive properties of seawater.
- To illustrate differentiating marine organisms and their industrial applications.
- To descriminate various pollution controlling marine organisms.
- To evaluate various marine toxins used in pharmaceutical industries.
- To interpret recombinations in marine aquaculture.
- To understand the usage of marine organism for different situations.

Course Outcomes

1. Discuss the basic knowledge on biogeochemical cycles.
2. Organize and manage marine organism in different industries.
3. Organize and manage pollution controlling measures through marine organisms.
4. Perceive the basics on combining marine toxins in pharma industries.
5. Compile different proteins of marine organism to develop a new variety.
6. Explain how to use marine organism for different situations.

UNITI INTRODUCTIONTOMARINEENVIRONMENT (9)

Worldoceansandseas–oceancurrents–physicalandchemicalproperties ofseawater–abioticand bioticfactorsofthesea–ecologicaldivisionsofthesea–historyofmarinebiology–biogeochemical cycles–foodchainandfoodweb**.**

UNITII MARINEORGANISMS AND THEIR INDUSTRIAL APPLICATIONS (9)

Phytoplanktons–zooplanktons–nektons–benthos–marinemammals–marinealgae–mangroves–coralreefs– algal products, fuels from algae, algal cell culture

UNITIII MARINEENVIRONMENTALBIOTECHNOLOGY (9)

Marinepollution–biologicalindicators(marinemicro,algae)–biodegradation&bioremediation–marinefoulingandcorrosion.

UNITIV MARINEPHARMACOLOGY (9)

Medicinalcompoundsfrom marineflora andfauna–marinetoxins, anti cancer agents, antiviralandantimicrobialagents. Marine Toxins

UNITV AQUACULTURETECHNOLOGY (9)

Importanceofcoastalaquaculture–marinefisheryresources–commonfishingcraftsandgears–Aqua farmdesignandconstruction, transgenic fish.

Total Hours: 45

TEXTBOOKS

S. No.	Author(s)Name	Titleofthebook	Publisher	YearofPublication
1	M.Fingerman,R. Nagabhushanam	Recentadvancesinmarine biotechnologyvolume3	MaryFrancesThomson	1999
2	M.Fingerman,R. Nagabhushanam	Recentadvancesinmarine biotechnologyvolume2	Sciencepublishers	1999
3	E. W. Becker	Microalgae: Biotechnology an Microbiology	Cambridge University Press	1994
	Jasper S. Lee, Michae E. Newman	Aquaculture: An Introduction	Interstate Publishers, Incorporated	1992

16BTBT6E08PROTEINENGINEERING 3003100

Course Objectives

- To identify the basic structural principles of protein.
- To classify the different techniques of mutagenesis in bioimprinting.
- To record the basic notion on enzyme engineering and protein purification.
- To differentiate and organize the distint metagenomics and ecosystem biology.
- To explain the basic theory of protein engineering in industries.
- To examine the problems related to engineering enzymes.

Course Outcomes

1. Compare and contrast structural and functional properties of proteins.
2. Summarize the diverse techniques of mutagenesis.
3. Prioritize diverse methods for protein purification.
4. Construct and design the techniques of metagenomics and ecosystem biology.
5. Apply the knowledge on applications of protein engineering in industries.
6. Examine and solve the problems related to engineering enzymes.

UNIT-I BASICSTRUCTURALPRINCIPLESOFPROTEINS (9)

AminoAcids properties (size,solubility,charge,pKa), Kyle-Doolittle(Hydropathy)Index; Peptides as buildingblocksofproteins;Torsional(dihedral)angles,RamachandranPlot;Secondary Structuresof proteins; Loops – Types and Functions;Biosynthesis and chemical synthesisof Peptides. Lesk, RichardsonandTopologySchematics

UNIT-II TECHNIQUESOFMUTAGENESIS (9)

Rational Design, Non rational design , Mutagenesis library construction- Chemical, Staggered Extension, RandomElongation, Randompriming,ErrorpronePCR,Impactofstructureanalysisand prediction- structure and modeling, role of biocomputing, denova design, Effect of protein conformationandbioimprinting.

UNIT-III ENGINEERINGENZYMES (9)

Engineeringstability(*Bacillussubtilis*neturalprotease,Pseudomonasisoamylase,carbamylasefrom Agrobacterium radiobacter),specificityandfeaturestoeaseproteinpurification,Engineering antibodies-Engineering signal molecules (hormones/receptors), Engineeringprotein to facilitate recovery.Affinitypurification(Strep-Tag)

UNIT-IV METAGENOMICS (9)

Metegenomics and ecosystems Biology- conceptual framework, tools and methods- Analyses of metagenomics, Singlegeneapproach,Targetedpartialmetagenomesequencing,Analysesof metatranscriptome-Limitationinanlaysingthemetatranscriptome- 16srRNasequencing and metatranscriptomepyrosequencing, metaproteome-molecularmethodstostudycomplexmicrobial communities,metabolomics-metabolomeofanecosystemandmetagenomics. Metabolomicsfornaturalproductperception

UNIT-V PROTEINENGINEERINGININDUSTRIES (9)

Proteinengineeringforindustrialenzymology,Biosensor-chemicallyengineeredelectronicprotein, geneticallyfusedprotein,Geneengineeringformolecularnetworkingandprotein assembly;molecular bioscreening inoncology- mechanismbaseddrugdiscovery.Proteinengineeringinvaccine development.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	LiliaAlberghina	ProtienEngineeringin IndustrialBiotechnology	Harwood Academic publications	2005
2	P.C.E.Moody andA.J. Wilkinson	ProteinEngineering	IRLPress, Oxford	1990
3	KarenE. Nelson	MetagenomicsofHumanBody	Springer	2010

REFERENCESBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	T.E.Creighton	Proteins,Structureand Molecularproperties	FreemanW. H&Comp any	1993
2	C.Brandenand J.Tooze	IntroductiontoProtein Structure	Garland Publications	1999

16BTBT7E01IMMUNOTECHNOLOGY 3003100

Course Objectives

- To explain basic knowledge on antigen structure and preparation.
- To discuss the structural and functional principles of antibodies and immunodiagnosis.
- To construct various parameters of B cells and T cells.
- To explain the effects of preparation and storage of tissues in immunopathology.
- To outline the basic concepts of preparations of vaccine in molecular immunology.
- To discuss the different techniques for antigen and antibody synthesis.

Course Outcomes

1. Summarize the characteristics of different methods of antigensproduction.
2. Evaluate the different structural and functional principles of antibodies and immunodi
3. List the various parameters of B cells and Tcells.
4. Explain the preparation and storage of antibodies and immunodiagnosis.
5. Recognize basic concepts of vaccine preparation in molecular immunology.
6. Identify and list different techniques for antigen and antibody synthesis.

UNIT I ANTIGENS (7)

Types of antigens, their structure, preparation of antigens for raising antibodies, handling of animals,adjuvantsandtheirmodeofaction.

UNITII ANTIBODIES&IMMUNODIAGNOSIS (10)

Monoclonal andpolyclonalantibodies–theirproductionandcharacterization,Westernblotanalysis, Immunoelectrophoresis,SDS-PAGE-purificationandsynthesisofantigens,ELISA–principleand applications,adioimmunoassay(RIA)-principlesandapplications,nonisotopicmethodsofdetection of antigens-enhancedchemiluminescenceassay.

UNIT III ASSESMENTOFCELLMEDIATEDIMMUNITY (10)

Identificationoflymphocytesandtheirsubsetsinblood.Tcellactivationparameters,estimation of cytokines,macrophageactivation,macrophage microbicidalassays,in-vitroexperimentation– applicationoftheabovetechnologytounderstandthepathogenesisofinfectiousdiseases.

UNITIV IMMUNOPATHOLOGY (9)

Preparationof storageof tissues,identificationofvariouscelltypesand antigensintissues,isolation andcharacterizationofcelltypesfrominflammatorysitesandinfectedtissues,functionalstudies onisolatedcells,immunecytochemistry–immunofluoresecence,immune enzymaticandimmuno ferritintechniques,immunoelectronmicroscopy.

UNITV MOLECULARIMMUNOLOGY (9)

Preparationofvaccines,applicationofrecombinantDNAtechnology forthestudy oftheimmune system,productionofantiidiotypicantibodies,catalyticantibodies,applicationofPCRtechnology to produceantibodiesandotherimmunologicalreagents, immunotherapywithgeneticallyengineered antibodies–Tetramer,recombinantvaccines.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	TalwarG.P.,and GuptaS.K	Ahandbookofpractical and clinicalimmunology(Vol1&2)	CBS Publications	1992
2	WeirD.M	PracticalImmunology	Blackwell Scientific Publications, Oxford	1990

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	AustinJ.M. and WoodK.J.	Principleof cellular and molecularimmunology	Oxford university press	1993

16BTBT7E02 ENVIRONMENTALBIOTECHNOLOGY 3003100

Course Objectives

- To explain basic knowledge on soil microbes and its characteristics.
- To demonstrate the effects of xenobiotic compounds.
- To discuss various methods for industrial waste water management.
- To explain the effects of various industrial wastes and to infer basic concepts for its management.
- To outline the natural and engineered bio-treatment methods to remediate the pollutants.
- To discuss the different environmental issues using biotechnology.

Course Outcomes

1. Summarize the characteristics of soil microbes and its interactions.
2. Evaluate the different xenobiotics present and methods to degrade them.
3. Describe the industrial waste management systems.
4. List the opportunities in waste treatment industries and its management.
5. Recognize natural and engineered biotreament methods to remediate pollutants.
6. Identify and list different environmental issues and its remedy.

UNITI INTRODUCTION (8)

Microbialfloraofsoil,growthandecologicaladaptationsofsoilmicroorganisms, interactions amongsoilmicroorganisms,biogeochemicalroleofsoilmicroorganisms.

UNITII DEGRADATIONOFXENOBIOTICCOMPOUNDS (9)

Aromatics -benzene, pentachlorophenol, Polyaromatic hydrocarbons (PAHs)–naphthalene,, Polychlorinatedbiphenyls(PCBs)hexachloro biphenyl,Pesticides-DDTandSurfactants–LAS

UNIT III INDUSTRIALWASTEWATERMANAGEMENT (10)

Wastewater characteristics–physical,chemicalandbiological,Biologicalprocesses-unit operations,aerobictreatmentprocesses,activatedsludgeprocess–characteristicsof activatedsludge andprocessconfiguration,anaerobictreatmentbymethanogenesis

UNITIV TREATMENTOFINDUSTRIALWASTES (9)

Dairy, Paper & Pulp, Textile, leather, hospital and pharmaceutical industrial waste management, e-waste-radioactive and nuclear power waste management.

UNITV DEVELOPMENTSPERTAININGTOENVIRONMENTALBIOTECHNOLOGY (9)

Solidwaste management,RoleofbiosensorsinEnvironmentalmonitoring,Heavymetalpollution and theircontrolstrategies,Preventionofenvironmental damagewithrespecttonitrogenfixation, Bioremediation,Productionofbioelectricity frommicrobialfuelcell(MFC),Improvementofwater qualitybydenitrification,Roleofbiotechnologyonagriculturalchemical use.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	BruceE. Rittmannand perryL.Mccarty	EnvironmentalBiotechnology: PrincipleandApplications	McGraw Hill	2001
2	Mecalfand Eddy	WastewaterEngineering: TreatmentDisposalReuse	Mc Graw Hill	1991
3	DesW.Connell,	Basicconceptsof Environmentalchemistry	Lewis publishers	2005

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	AlanScragg	EnvironmentalBiotechnology	Oxford University press	2005
2	Prescott,Harley, Klein	Microbiology	WCB publishers	1996

16BTBT7E03 RECOMBINANTDNATECHNOLOGY 3003100

Course Objectives

- To present basic knowledge about the various cloning vectors and its features.
- To demonstrate the various techniques and enzymes involved in cloning.
- To explain and practice diverse concepts on expression vectors for cloning.
- To practice the basic views on preparation of genomic and cDNA library.
- To identify and organize differeing views on applications of gene cloning in rDNA research.
- To compile the basic concepts of rDNA technology.

Course outcomes

1. Compose about basic concepts about the features of cloning vectors.
2. Assemble different techniques and enzymes involved in cloning.
3. Classify about expression vectors for cloning.
4. List the techniques in preparation of genomic and cDNA library.
5. Propose knowledge on applications for rDNA research.
6. Summarize concepts of rDNA technology.

UNITI CLONINGVECTORS (9)

Idealfeaturesofcloning vectors–plasmidsandbacteriophages–cloningvectorsforE.coli;pBR322, pUCvectors,M13andotherplasmidvectors–Cosmids, Phagemids–vectorsforBacillus, StreptomycesRestrictionmappingand analysis

UNITII ENZYMESANDTECHNIQUESFORCLONING (9)

DNAmodifying enzymes–ligases–Nucleicacidprobepreparation;Radioactiveandnonradioactive labels–Hybridizationtechniques–PCR;differenttypesandapplications–DNAsequencing –DNA fingerprinting–RFLP,RAPD– chromosomewalking.

UNITIII EXPRESSIONVECTORS (9)

Expression vectors in prokaryotes – Expression vectors in Eukaryotes-Yeast cloning vectors – selectablemarkersforeukaryotes–SV40,Papilloma,Retrovirus,Baculoviralvectors–mammalian cellexpression system–Genetransfertechniques–Agrobacterialplasmids–Tiplasmidandviral vectors– cloninginplants.

UNITIV GENOMICANDcDNALIBRARY (9)

Differentstrategiesforinvitroandinvivocloning–Preparation ofrDNA, Preparation ofcDNAand genomicDNAlibraries–screeningprocedures–linkers,adapters,homopolymertailingandTA cloning–genetransfertechnologies–Mutagenesis–sitedirectedmutagenesis– application.

UNITV APPLICATIONOFGENECLONING (9)

Fusionprotein-down-streamprocessingofrecombinantproteinsApplications inmedicine–Gene therapy- Diagnostics, pathogenesis, recombinant vaccines –humanized antibodies and their applicationsgeneticallymodifiedfood–bioremediation withrecombinant microorganisms– forensic science–geneticdiversity –Agriculture,cropimprovement–productionofbiosensors,enzymes–safetyguidelinesinrDNAresearch–containmentanddisposal.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	JeremyW.Dale, Malcolmvon Schantz, NicholasPlant	FromGenestoGenomes: ConceptsandApplicationsof DNATechnology	Wiley-Blackwell	2011
2	SandyB. Primroseand Richard Twyman	PrinciplesofGene ManipulationandGenomics	Wiley	2009
3	MichaelR. Greenand Joseph Sambrook	MolecularCloning:A LaboratoryManual	ColdSpring HarborPress	2012

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	T.A.Brown	GeneCloningandDNA Analysis:AnIntroduction	Blackwell	2010
2	JocelynE. Krebs,ElliottS. Goldsteinand StephenT. Kilpatrick	Lewin'sGENESXI	Jones& Bartlett Learning	2012

16BTBT7E04 CANCERBIOLOGY 3 0 0 3 100

Course Objectives

- To explain the fundamentals of cancer biology
- To understand the principles ofcarcinogenesis
- To explain the principles of molecular cell biology
- To explain the principles of cancer metastasis
- To outline the different types of cancer therapy.
- To understand the molecular tools for cancer diagnosis.

Course Outcomes

At the end of the course students will be able to

1. Understand the fundamentals of cancer biology
2. Interpret the mechanism ofcarcinogenesis
3. Outline the principles of molecular cellbiology
4. Understand the significance of cancer metastasis
5. Summarize the different types of cancertherapy
6. Recall the molecular tools of cancer diagnosis

UNIT I FUNDAMENTALSOFCANCERBIOLOGY (8)

Epidemiologyofcancer:environmentalfactors:tobacco,alcohol,diet,occupationalexposure,hormones.Regulationofcell cycle, modulation of cell cycle in cancer. Different forms of cancers. Specific type of cancer hepato cellular, melanoma, breast,lungcancer.Geneticbasisofcancer-DNArepair.mutationsthatcausechangesinsignalmolecules,signalswitches.

UNIT II PRINCIPLESOFCARCINOGENESIS (9)

Theoryofcarcinogenesis,Chemicalcarcinogenesis,metabolismofcarcinogenesis,principlesofphysicalcarcinogenesis,x- rayradiation-mechanismsofradiationcarcinogenesis.

UNIT III PRINCIPLESOFMOLECULARCELLBIOLOGYOFCANCER (10)

Signal amplification:Current models of signal amplification– Phosphorlyation of protein kinases;regulation of protein kinases: serine threonine kinase, TNF receptor families,tumorsuppressorgenes,Oncogenes,identificationofoncogenes,detectionofoncogenes.Oncogenes/protooncogeneactivity.Growthfactorsrelatedto transformation. Telomerases.

UNIT IV PRINCIPLESOFCANCERMETASTASIS (10)

Clinicalsignificancesofinvasion,heterogeneityofmetastaticphenotype,metastaticcascade,basementmembranedisruption, threesteptheoryofinvasion,proteinasesandtumourcellinvasion.

UNIT V CANCERTHERAPY **(8)**

Cancerscreeningandearlydetection,Detectionfusingbiochemicalassays,tumormarkers,moleculartoolsforearl ydiagnosis ofcancer. Advancesincancerdetection.Differentformsoftherapy,chemotherapy,radiationtherapy,immunotherapy, moleculartherapy,useofsignaltargetstowardstherapyofcancer;Genetherapy.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	IanF.Tannock	TheBasicScienceofOncology	McGraw Hill Professional,	2005
2	Dunmock.N.J and PrimroseS.B	Introductiontomodern Virology,	Blackwell Scientific Publications, Oxford	1988
3	L.M. Franks, N.M. Teich	Introduction to the Cellular ar Molecular Biology of Cancer	Oxford Medic Publications	1991
4	MalyB.W.J	Virologyapractical approach	IRLpress, Oxford	1987
5	Ruddon,R.W.	CancerBiology	Oxford University Press	1995

16BTBT8E01 TISSUEENGINEERING 3003100

Course Objectives

- To explain the various cell types and their advances in tissue engineering.
- To demonstrate the various biomaterials for tissue engineering.
- To explain and practice diverse concepts on tissue engineering and tissue creation.
- To discuss the techniques in tissue typing.
- To practice the basic views on gene therepy.
- To identify and organize differeing views on advances on tissue engineering.

Course outcomes

1. Compose about basic concepts in tissue engineering
2. Assemble different biomaterials for tissue engineering
3. Classify about methods for Tissue Engineering.
4. List the techniques in tissue typing
5. Explain the principles of gene therapy
6. Summarize the concepts of tissue engineering in different fields.

UNITI INTRODUCTIONTOTISSUEENGINEERING (9)

Celltherapies.TissueConstructs, OrganModules,CosmeticMeasures.ConceptsofTissueCreation: Sources,StemCells,CellsfromTissues,CultureMethodsforTissueEngineering.Maturationof TissueConstructs.Musculo–skeletal tissueengineering;Modificationsoftissuering; Receptorsligand interaction;Receptor.

UNITII BIOMATERIALSFORTISSUEENGINEERING (9)

Biomaterials:Degradablepolymericscaffolds,Acellular Bio-Matrices, Biologicalderived polymersin tissueengineering:NaturalBDPolymers&SyntheticBDpolymers, Cellseedingofscaffolds, Cell source:Allogeniccells,Autologous cells&stemcells.Bioreactorsusedintissueengineering:Nail Naughtom’sBioreactor,PulsatileBioreactor.

UNITIII BIOLOGICALSTUDYOFDIFFERENTCELLTYPES (9)

Cellline,Establishment ofcelllines,Differentcelltypes:Endothelialcell,Fibroblastcells,Epithelial cell,Myoblastcells,chromaffincell,Smoothmusclecells&plasmacell.

UNITIV PRINCIPLESANDPRACTICE OFGENETHERAPY (9)

Introductiontogenetherapy,Requirements ofgenetherapy,Geneticdefects,Targetcellsforgene therapy,processof genetherapy,Factorsresponsibleforgenetherapyformakingeffectivetreatment ofgeneticdisease,Recentdevelopments ingenetherapyresearch,ethicalconsiderationsofgene therapy.

UNITV ADVANCESINTISSUEENGINEERING (9)

Developmentofartificialtissues;Transplantation biology:Tissue typing,Techniquesoftissuetyping, Minorhistocompatibilityantigens,Immuno-suppression,Sideeffectsofimmuno-suppression.

Total Hours: 45

TEXTBOOKS

S. No.	Author (s) Name	Titleofthebook	Publisher	Year of Publication
1	Bhojwani, S. S. Razdan, M.K.	Plant Tissue Culture (Theory and Practice)	Elseveir	1996
2	Ranga,M.M	AnimalBiotechnology	Agrobios	2010
3	Watson,J.D. and Gilman, M	RecombinantDNA	Scientific American Books	1992

16BTBT8E02 CLINICAL TRIAL AND MANAGEMENT 3003100

Course Objectives

- To explain descriptive views of clinical practices and its scope.
- To illustrate Differentiating ethical theories and foundations of clinical trials.
- To discuss various evolution and regulation of clinical research.
- To evaluate various designing protocols and amendments of clinical research.
- To interpret different biostatistics and data management.
- To create data on different clinal research.

Course Outcomes

1. Elaborate the concept of scope and types of clinal research.
2. Evaluate the ethical theories of clinical research.
3. Discuss the history and regulation of clinical research.
4. Explain the various protocol developments in clinical research.
5. Identify basic views in different situations of biostatictics in clinical trials.
6. Make up perspective techniques and create data on different clinal research.

UNITI INTRODUCTIONTOCLINICALRESEARCH (9)

Definition,TypesandScopeofClinicalResearch,GoodClinicalPractices-Introduction tostudy designsand clinicaltrials-CareersinClinicalResearch.

UNITII ETHICSINCLINICALRESEARCH (9)

Ethical Theories and Foundations, Ethics Review Committee, Ethics and Historically derived principles-Nuremberg Code,DeclarationofHelsinki,BelmontReport,Equipoise,Informedconsent, Integrity&Misconduct.

UNITIII REGULATIONSINCLINICALRESEARCH (9)

EvolutionandHistoryofRegulationsinClinicalResearch,PatentsUSRegulatory Structure,IND, NDA,ANDA, PostDrugApproval Activities,PMS,FDAAuditsandInspectionsEURegulatory Affairs,EMEAOrganizationandFunction,INDIANRegulatorysystem,ScheduleY-Rules and Regulations,Descriptionoftrialphases(Phase0,PhaseI,II,III,andIV),Trialcontexts(typesof trials:pharma,devices,etc.),Trialexamples

UNITIV CLINICALRESEARCHMETHODOLOGYANDMANAGEMENT (9)

DesigningofProtocol,CRF,e-CRF,IB,ICF,SOP; Study Protocol-Introduction, background,Objectives-Eligibility,Design,Randomization- Intervention details,assessmentsanddatacollection,casereportforms–Violations-.Amendments. Study/TrialDesign-PhaseIdesigns-Dose-findingdesigns.PhaseIIdesigns-Pilotstudies,Single arm,Historicalcontroldesigns.PhaseIIIdesigns-Factorialdesigns,Crossover designs,Multicenter studies,Pilotstudies.PhaseIVdesigns-Preparationofasuccessfulclinicalstudy,Studymanagement, ProjectmanagementDocumentation,Monitoring,AuditsandInspections,Pharmacovigilancetraining in clinicalresearchbudgetingin clinicalresearch,Suppliesandvendormanagement.

UNITV BIOSTATISTICSANDDATAMANAGEMENT (9)

Introduction toPowerandSampleSize-Hypothesis testing,P-values,confidenceintervals,General power/sample size,estimatingeffectsize,Matching samplesizecalculationstoendpoints.Importance ofstatisticsinclinicalresearchStatisticalconsiderationsatthedesign,analysisandreportingstage Datamanagement-Datacollection,Paperorelectronic,Parsimony, Datavalidation,SAE reconciliation,querymanagement Softwareconsiderations. DataMonitoring,TrialConduct-Data qualityassurance,Datadelinquency, DataMonitoring,d.TrialConduct,Occurrenceandcontrolof variationandbias.

Total Hours: 45

TEXTBOOKS

S. No.	Author (s) Name	Titleofthebook	Publisher	Year of Publication
1	Friedman,L. M., Furberg, C. I and DeMets, D. L	Fundamentals of Clinical Trials (4th Edition)”	Springer	2010
2	Machin, D. andFayers,P	Randomized Clinical Trials: Design, PracticeandReporting	Wiley-Blackwell	2010
3	Piantadosi,S.	Clinical Trials: A Methodologi Perspective	John Wiley & Sons	2005

16BTBT8E03 STEM CELL TECHNOLOGY 3003100

Course Objectives

- To explain basic knowledge on definition and scope of stem cells.
- To demonstrate the structural and functional principles of in vitro fertilization.
- To discuss the various identification and cell differentiation of somatic stem cells.
- To explain the effects of stem cell in drug discovery and tissue engineering.
- To outline the basic concepts of cellular therapy and gene therapy of stem cells.
- To compile the application of stem cells.

Course Outcomes

1. Summarize the characteristics stem cells.
2. Evaluate the different structural and functional parameters of invitro fertilization.
3. List the properties of adult stem cells in differentiation.
4. Explain the uses of stem cells in drug discovery and tissue engineering.
5. Recognize various stem cell therapies.
6. Summarize the application of stem cells.

UNITI STEMCELLSANDCELLULARPEDIGREES (9)

Scopeofstemcells–definitionofstemcells–conceptsofstemcells–differentiation, maturation , proliferation,pluripolericy,self – maintenanceand self – renewal–problemsinmeasuring stem cells–preservationprotocols.

UNITII EMBRYONIC STEMCELLS (9)

In vitro fertilization –culturing of embryos-isolation of human embryonic stem cells – blastocyst – inner cell mass – growing ES cells in lab – laboratory tests to identify ES cells – stimulation ES cells for differentiation – properties of ES cells.

UNIT III ADULT STEM CELLS (9)

Somatic stem cells – test for identification of adult stem cells – adult stem cell differentiation – trans differentiation – plasticity – different types of adult stem cells – IPS and cancer stem cells.

UNIT IV STEM CELL IN DRUG DISCOVERY AND TISSUE ENGINEERING (9)

Target identification – Manipulating differentiation pathways – stem cell therapy Vs cell protection - stem cell in cellular assays for screening – stem cell based drug discovery, drug screening and toxicology, stem cell markers

UNITV POTENTIALUSESOFSTEMCELLS (9)

Cellulartherapies–vaccines–genetherapy–immunotherapy –tissueengineering–bloodandbone marrow–Fccells.

Total Hours: 45

TEXTBOOKS

S. No.	Author(s)Name	Titleofthebook	Publisher	YearofPublication
1	CSPotten	Stemcells	Elsevier	1997
2	Kursad and Turksen	Embryonic Stem cells	Humana Press.	2002
3	RobertPaul Lanza	Essentials of stem cell biology,	O’Reilly	2006
4	Clive Svendensen , AllisonD.Ebert.	Encyclopediaofstemcell researchvol1&2	Sagepub	2008

16BTBT8E04 BIOMASS ENERGY 3003100

Course Objectives

- To explain the variations of renewable and nonrenewable energy and its usage.
- To classify the different sources for the production of biomass and bioenergy.
- To record the basic notion on assorted properties of fuels.
- To design the bioenergy production through agricultural wastes.
- To differentiate and organize the distint agricultural wastes used for bioenergy production.
- To understand the basic theory of bioprocess principles.

Course Outcomes

1. Compare and contrast energy use as renewable and non-renewable energy.
2. Synthesize the biomass for renewable energy production.
3. Prioritize diverse properties of fuels.
4. Construct and design the bioenergy production through agricultural wastes.
5. Apply the knowledge on downstream processing for bioenergy production.
6. Examine and solve the problems related to bioenergy production.

UNITI OVERVIEWOFENERGYUSE (9)

Fossil fuels - past, present &future, Remedies &alternativesforfossilfuels,Today's energy use,Fossilfuelsandenvironmentalimpact,Renewableenergysourceanddevices, SolarEnergy, windenergyandhydroenergy.

UNITII BIOMASSANDBIO-ENERGY (9)

Biomasspotential-terrestial,aquaticandmarine-collection-storageandutilization, Dedicated bioenergycrops,Woodybiomass,Liquidbiofuels, Syntheticfuelsfrom thebiomass,biomassto biofuelconversion,Alcoholproduction- cellulosedegradation.

UNITIII PROPERTIESOFFUELS (9)

Fuelproperties-alcohol,biogas,producergas,vegetableoil.Combustion-airrequirement – Octane andCetane numbers.Analysisof productsofcombustion.Fuelblending-fuelefficiency indualfuel operation,Biogasandproducergasengines.

UNITIV AGRICULTURAL BIOMASS (9)

Bioenergy fromwastes,agriculturalwastesandbyproducts-sourcesandavailability, utilisation pattern - as fuel, Biochemical conversion of organic wastes, anaerobic digesters, methane production-sludgetreatment-suitabilityofwastesasfuel.

UNITV DOWNSTREAMPROCESSING (9)

Introduction todownstreamprocessingprinciples,characteristicsofbiomolculesand bioprocesses. Celldisruptionforproductrelease–mechanical, enzymaticand chemicalmethods,fileration, centrifugation,chromatography,esterification,pyrolysis.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Stout. B.A.	Biomass energy	Texas University Press,College Station	1985
2	Chahal.D.S	Food,FeedandFuelfromBiomass	Oxford&IBHPub shingCo.	1991

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Chakraverty, A	Biotechnologyand other alternate technologies for utilisation ofbiomass	Oxfordand IBHpublising Co.,NewDelhi	1993.
2	Donald.L.Klass andEmertH. Georg	FuelsfromBiomassand wastes	AnnArbo Science Publishers,Inc. Michigan	1981.
3	Chavla,O.P	AdvancesinBiogas Technology	ICARPub	1986

16BTBT8E05 BIOSEPARATIONS 3003100

Course Objectives

- To explain cell disruption techniques.
- To illustrate different chromatographic methods for separation of active components.
- To descriminate separation techniques for analyzing the biological samples.
- To discuss the importance of separation of biomolecules from a mixture..
- To describe the isolation, purification and behavior of biomolecules.
- To understand the basic downstream process for treating the samples.

Course Outcomes

1. Discuss the basic knowledge on forensic activities.
2. Analyze the forensic criminalities.
3. Describe the analysis for the evidences of forensic samples.
4. Perceive the procedure for forensic sample analyzing using different assays.
5. Compile different properities and functions of digital imaging in forensic.
6. Explain the forensic ethics.

UNIT I CELLDISRUPTION (9)

Mechanicalandenzymatic methodsofcelldisruption, importanceofcelldisruption inproduct release,homogenization,ultrasonication,extraction,absorption,adsorption.

UNITII CHROMATOGRAPHICMETHODS (9)

Chromatographicmethods,paperchromatography, thinlayerchromatography, gaschromatography, GLC, HPLC,affinitychromatography, ion exchangechromatography, reverse phase chromatography

UNITIII SEPARATIONTECHNIQUES (9)

Basicseparationtechniques:sedimentation, centrifugation,ultracentrifugation,gradient centrifugation, filtration,micro/ultrafiltration,useofmembranes (semipermeable)inpurification, reverse osmosis. Separation of bioconversion products/ secondarymetabolites e.g. Steroids and antibiotics.

UNIT IV PHYSICO-CHEMICALSEPARATION (9)

Importance ofseparationtechniquesinbiotechnology,itsscopefromresearchtoindustry,chemical, physicalandbiochemical aspectsofseparationandisolation,purificationofbiomolecules. Behavior ofbiomoleculesinbodyfluids

UNITV DOWNSTREAMPROCESSES (9)

Leaching,crystallization,lyophilzation,drying.Chemistryofextraction,selectionofsolvent,useof solvent extraction in antibiotic separation, affinity extraction/ chromatography. Industrial applicationswithexamples.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	P.A.Belter,E.L. CusslerAnd Wei-Houhu	Bioseparations–Downstream ProcessingFor Biotechnology	Wiley Interscience Pub	1988
2	R.O.Jenkins, (Ed.)	ProductRecoveryIn BioprocessTechnology–Biotechnology ByOpenLearningSeries	Butterworth-Heinemann	1992

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	R.K.Scopes	ProteinPurification–PrinciplesAndPractice	NarosaPub	1994
2	Roger.G. Harrison,Paul Todd,Scott R.Rudgeand DemetriP.Petrides	Bioseparation ScienceandEngineering	Oxford University Press	2003

16BTBT8E06 BIOCONJUGATE TECHNOLOGY 3003100

Course Objectives

- To illustrate the modification of biomolecules.
- To describe the chemical reactions of active biomolecules.
- To list the importance and uses of bioconjugate reagents.
- To infer the chemical modifications of enzymes and nucleic acids.
- To tell about the enzyme and nucleic acid conjugation
- To discuss the various applications of bioconjugation of molecules.

Course Outcomes

1. Tell about the modifications of common biomolecules.
2. Determine the basic chemical reactions for active groups.
3. Express the functions ofbioconjugate reagents.
4. Summarize the steps for enzyme and nucleic acid modification.
5. Describe the protocol for enzyme and nucleic acid conjugation.
6. Summarize applications of bioconjugation.

UNIT I FUNCTIONALTARGETS (9)

ModificationofAminoAcids, PeptidesandProteinsModificationofsugars,polysaccharidesand glycoconjugates–modificationof nucleicacidsandoligonucleotides.

UNITII CHEMISTRYOFACTIVEGROUPS (9)

Aminereactivechemicalreactions–Thiolreactivechemical reactions–carboxylatereactivechemical reactions–hydroxyl reactivechemical reactions–aldehydeandketone reactivec hemical reactions–Photoreactivechemicalreactions.

UNITIII BIOCONJUGATEREAGENTS (9)

Zero length crosslinkers – Homo bifunctional crosslinkers–Hetero bifunctional crosslinkers–Trifunctionalcrosslinkers–Cleavablereagentsystems–tagsandprobes.

UNIT IV ENZYMEANDNUCLEICACIDMODIFICATIONANDCONJUGATION (9)

Propertiesofcommonenzymes–Activatedenzymesforconjugation –biotinylatedenzymes–chemicalmodificationofnucleicacids–biotinlabelingofDNA–enzymeconjugation toDNA–Fluorescenceof DNA.

UNITV BIOCONJUGATEAPLICATIONS (9)

PreparationofHapten-carrierImmunogenconjugates–antibody modificationandconjugation–Immunotoxinconjugationtechniques–liposome conjugationandderivatives-Colloidal–gold-labeled proteins–modificationwithsyntheticpolymers.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	G.T.Hermanson	BioconjugateTechniques	AcademicPress	2013

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	RavinNarain	ChemistryofBioconjugates: Synthesis,Characterization, andBiomedicalApplications	Wiley	2013

16BTBT8E07 IPR AND ETHICAL ISSSUES IN BIOTECHNOLOGY 3003 100

Course Objectives

- To illustrate about the biosafety in biotechnology.
- To explain basic knowledge on Intellectual property rights.
- To rephrase different views on policies of IPR.
- To solve the IPR issues and Bioethics.
- To list and examine about the case studies of copyright and patents.
- To understand the basics of IPR and ethical issues in biotechnology.

Course Outcomes

1. Classify the different techniques involved in biosafety in biotechnology based industries.
2. Manage and organize the knowledge about the intellectual property rights.
3. Label an idea about the policies of IPR.
4. Relate about the IPR issues and bioethics.
5. Diagnose about the case studies on patents.
6. Summarize the basics of IPR and ethical issues in biotechnology.

UNITI BIOSAFETY (8)

Biosafety–BiotechnologydevelopmentinIndia,Safetyissuesconcerningbiotechnologicalproducts, governingbiosafety,Cartagenaprotocolonbiosafety,ConservationofBiodiversity.

UNITII INTELLECTUALPROPERTYRIGHTS (10)

Introduction-InventionandCreativity-IntellectualProperty(IP)-Importance-Protectionof IPR-Basictypesofproperty(i.MovablePropertyii.ImmovablePropertyandiii.IntellectualProperty).IP- Patents-Copyrightsand relatedrights-TradeMarksandrightsarisingfromTrademarkregistration- Definitions-IndustrialDesignsandIntegratedcircuits-ProtectionofGeographicalIndicationsat nationaland Internationallevels-ApplicationProcedures.

UNITIII IPR–POLICIES (9)

Internationalconventionrelatingtoİntellectual Property-Establishmentof WIPO-Missionand Activities-History-GeneralAgreementonTradeandTariff(GATT).IndianPositionVsWTOand Strategies-Indian IPRlegislations- commitmentstoWTO-PatentOrdinanceandthe Bill-Draftof a nationalIntellectualPropertyPolicy-Presentagainstunfaircompetition.

UNITIV CASESTUDIES (9)

CaseStudieson -Patents(Basumatirice,curcumin,Neem,etc.)-Copyrightandrelated rights-Trade Marks-Industrialdesignand Integratedcircuits-Geographicindications- Protectionagainstunfair competition.

UNITV IPR ISSUES &BIOETHICS (9)

Trade Secrets, Copy Rights, Farmer's Rights, Plant Breeder's rights; Traditional knowledge and their commercial exploitation and protection. Bioethics–DiseasepreventionVsrighttoprivacy,patentabilityofDNA,pre implantationembryo diagnosis,Engineeredorganismsintoenvironment,Genetictestsindiagnosticsandtherapy.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	V.H Heywood.R.T Watson	GlobalBiodiversityAssessment	Cambridge University Press	1996
2	BrodyBAand Engelhardt	Bioethics: Readingsand Cases	Prentice John-Wiley andSons	2007
3	Joshi.R	BiosafetyandBioethics	IshaBooks, NewDelhi	2006.

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	SubbaramN.R	Handbookof IndianPatent Law andPractice	S.Viswanathan Printersand PublishersPvt. Ltd.,	1998.
2	SassonA	Biotechnologiesand Development	UNESCO Publications,	1988.
3	SinghK	Intellectualpropertyrightson Biotechnology	BCIL	2015

16BTBT8E08 BIOLOGICAL WASTEWATER TREATMENT 3003100

Course Objectives

- To understand the variations of stoichiometry and kinetics of biochemical operations.
- To classify the different activities of microbes in waste water treatment.
- To record the basic notion on design and evaluation of growth process.
- To differentiate and organize the distint methods for modeling reactors..
- To explain the basic applications of bioreactors.
- To discuss the problems related to biochemical operations in different industries.

Course Outcomes

1. Compare and contrast fundamentals and properties of biochemical operations.
2. Demonstrate various waste water treatment activities through biological methods.
3. Prioritize design and evaluation of growth process in bioreactors.
4. Construct and design the methods for modeling bioreactors.
5. Apply the knowledge on applications of modeling bioreactors.
6. Examine and solve the problems related to biochemical operations in different industries.

UNITI BIOCHEMICALOPERATIONS (8)

ClassificationofBiochemicaloperations,fundamentalsofbiochemicaloperations,Stoichiometryand KineticsofBiochemicalOperations.

UNITII REACTORSINWASTEWATERTREATMENT (10)

Theory, modeling of ideal suspended Growth Reactors, Modeling Suspended Growth Systems. AerobicGrowthofHeterotrophsinasingleContinuous StirredTank,ReactorReceivingSoluble Substrate, Multiple MicrobialActivities in a Single Continuous Stirred Tank Reactor, Multiple Microbial Activities inComplexSystems,TechniquesforEvaluating KineticsandStoichiometric parameters.

UNITIII PROCESSESINWASTEWATERTREATMENT (9)

Applications:SuspendedGrowthReactors,DesignandEvaluationofSuspendedGrowthProcesses, ActivatedSludge,BiologicalNutrientRemoval,Aerobic–digestion,AnaerobicProcesses,Lagoons.

UNITIV MODELINGOFREACTORS (9)

Theory: Modeling of Ideal Attached Growth Reactors, Bio-filmModeling. AerobicGrowthof BiomassinPackedTowers,AerobicGrowthofHeterotrophsinRotatingDiscReactors,Fluidized Bed BiologicalReactors.

UNITV APPLICATIONSOFBIOREACTORS (9)

AttachedGrowthReactors,TricklingFilter, RotatingBiological Contactor,SubmergedAttached GrowthBioreactors,FutureChallenges,Fateand Effectsof XenobioticOrganicChemicals.

Total Hours: 45

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	M.Henze	BiologicalWastewater Treatment:Principles, ModellingandDesign	IWA Publishing	2008
2	Graty. C.P.L.Daigger, Gand Lim,H.C	BiologicalWastewater Treatment	MarcelDekker	1998

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	MizahiA	BiologicalWasteTreatment	JohnWiley SonsInc	1989

OPENELECTIVES

COURSES OFFERED BY OTHER DEPARTMENTS

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OPEN ELECTIVES OFFERED BY S&H

16BTSHOE01 PROBABILITY AND RANDOM PROCESS 3 0 0 3

OBJECTIVES:

- To gain knowledge in measures of central tendency.
- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of random processes which are widely used in IT fields.
- To understand the concept of correlation and spectral densities.
- To acquire the knowledge on random process in engineering disciplines.

OUTCOMES:

- Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
- The students will have an exposure of various distribution functions, correlation and spectral densities.
- To understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- To understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- To apply the concept random processes in engineering disciplines.
- To understand and apply the concept of correlation and spectral densities.

UNIT- I MEASURES OF CENTRAL TENDENCY AND PROBABILITY(9)

Measures of central tendency – Mean, Median, Mode - Standard Deviation
Probability - Random variable - Axioms of probability - Conditional probability - Total probability – Baye’s theorem.

UNIT- II STANDARD DISTRIBUTIONS (9)

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma(one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – Chebyshev's inequality.

UNIT -III TWO DIMENSIONAL RANDOM VARIABLES (9)

Joint distributions - Marginal and conditional distributions - Probability mass function - Probability density functions – Covariance - Correlation and regression

UNIT- IV CLASSIFICATION OF RANDOM PROCESS (9)

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT -VCORRELATION AND SPECTRAL DENSITIES (9)

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

Total : 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peebles Jr, P.Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Pubishers, New Delhi.	2002

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO N
1	Ross, S	A first Course in Probability	Pearson Education, New Delhi (Chap 2 to 8)	2012
2	Gupta, S.C. and Kapoor, V.K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2014
3	Veerarajan,T.	Probabilitiy, Statistics and Random process	Tata McGraw-Hill Education pvt. Ltd., New Delhi	2008
4	Henry Stark and John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002

WEBSITES:

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld. Wolfram.com

16BTSHOE02 **FUZZY MATHEMATICS** **3 0 0 3**

COURSE OBJECTIVES:

- Be able to understand basic knowledge of fuzzy sets and fuzzy logic
- Be able to apply basic knowledge of fuzzy operations.
- To know the basic definitions of fuzzy relations
- Be able to apply basic fuzzy inference and approximate reasoning
- To know the applications of fuzzy Technology.
- Be able to acquire the knowledge on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology

COURSE OUTCOME:

- To gain the main subject of fuzzy sets.
- To understand the concept of fuzziness involved in various systems and fuzzy set theory.
- To gain the methods of fuzzy logic.
- To comprehend the concepts of fuzzy relations.
- To analyse the application of fuzzy logic control to real time systems.
- The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

UNIT I FUZZY SETS (9)

Fuzzy Sets : Basics Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations – Level Sets – Fuzzy functions - Zadeh's Extension Principle

UNIT II OPERATIONS ON FUZZY SETS (9)

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III FUZZY RELATIONS (9)

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNIT IV FUZZY MEASURES (9)

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures vs Possibility Measures

UNIT V FUZZY INFERENCE (9)

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

Total : 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	George J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic : Theory and Applications	Prentice Hall of India, New Delhi.	2003

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Zimmermann H.J.	Fuzzy Set Theory and its Applications	Kluwer Academic publishers, USA.	2001
2	Michal Baczynski and Balasubramaniam Jayaram	Fuzzy Implications	Springer-Verlag publishers, Heidelberg	2008
3	Kevin M Passino and Stephen Yurkovich	Fuzzy Control	Addison Wesley Longman publishers, USA	1998

WEBSITES:

1. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

16BTSHOE03 LINEAR ALGEBRA 3 0 0 3

OBJECTIVES:

- To introduce the basic concepts of vector space
- To know the fundamentals of linear Algebra
- To solve system of linear equations
- To study about the linear transformations
- To introduce the concepts of inner product spaces
- To give the knowledge on the importance of Linear Algebra.

COURSE OUTCOMES:

The student will be able to

- To explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- To apply the fundamental concepts in their respective engineering fields
- To visualize linear transformations as matrix form
- To recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
- To articulate the importance of Linear Algebra and its applications in branches of Mathematics

UNIT I VECTOR SPACES (9)

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II EIGEN VALUES AND EIGEN VECTORS (9)

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

UNIT III SYSTEM OF LINEAR EQUATIONS (9)

Direct methods, Gauss elimination method, Gauss Jordan method, Crout’s method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNIT IV LINEAR TRANSFORMATIONS (9)

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNIT V INNER PRODUCT SPACES (9)

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

Total : 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES:

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com

16BTSHOE04 ENGINEERING ACOUSTICS 3 0 0 3

COURSE OBJECTIVES:

- To disseminate the fundamentals of acoustic waves.
- To inculcate the characteristics of radiation and reception of acoustic waves.
- To divulge knowledge on the basics of pipe resonators and filters.
- To introduce the features of architectural acoustics.
- To identify the factors affecting the acoustics of building.
- To impart the basic knowledge of transducers and receivers.

COURSE OUTCOME:

- Develop the idea of the fundamentals of acoustic waves.
- Apply the concepts of radiation and reception of acoustic waves.
- Explain the basic ideas of pipe resonators and filters.
- Illustrate the basics of architectural acoustics.
- Illustrate the transducers and receivers and its applications in various electronic devices.
- Apply the knowledge inputs of the course for engineering applications.

UNIT I INTRODUCTION (9)

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves - Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales.Reflection and Transmission:Transmission from one fluid to another normal and oblique incidence –method of images.

UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES (9)

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers.Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III PIPES RESONATORS AND FILTERS (9)

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

UNIT IV ARCHITECTURAL ACOUSTICS (9)

Sound in endosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design.

Environmental Acoustics: Highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

UNIT V TRANSDUCTION (9)

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

Total: 45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lawerence E.Kinsler, Austin R.Frey,	Fundamentals of Acoustics	John Wiley & Sons	2000

REFERENCE:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	F. AltonEverest & Ken Pohlmann	Master Handbook of Acoustics	McGraw Hill Professional	2014

WEBSITES:

1. www.acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www. ocw.mit.edu

16BTSHOE05 SOLID WASTE MANAGEMENT 3 0 0 3

OBJECTIVES:

- To make the students conversant with basics of Solid wastes and its classification.
- To make the student acquire sound knowledge of different treatments of solid wastes.
- To acquaint the student with concepts of waste disposals.
- To develop an understanding of the basic concepts of Hazardous waste managements.
- To acquaint the students with the basics of energy generation from waste materials.
- To get the information on energy conservation.

OUTCOMES:

- Outline the basic principles of Solid waste and separation of wastes (K)
- Identify the concepts of treatment of solid wastes (S)
- Identify the methods of wastes disposals. (S)
- Examine the level of Hazardousness and its management. (S)
- Examine the possible of the energy production using waste materials. (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I SOLID WASTE (9)

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

UNIT II WASTE TREATMENT (9)

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNIT III WASTE DISPOSAL (9)

Sanitary Land Fill Method of Solid Waste Disposal – Land Fill Classficaition, Types, Methods &Siting Consideration – Layout & Preliminary Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfill Remediation

UNIT IV HAZARDOUS WASTE MANAGEMENT (9)

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure, Remediaiton, risk assessment.

UNIT V ENERGY GENERATION FROM WASTE (9)

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, Energy recovery systems. Biological & Chemical conversion technologies – Aerobic composting, low solids. Anaerobic digestion, high solids anaerobic digestion, Energy production from biological conversion products, other biological transformation processes. Chemical transformation processes.

Total: 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dara.S.S,Mishra.D.D	A Text book of Environmental Chemistry and Pollution Control	S.Chand and Company Ltd., New Delhi.	2011

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Naomi B. Klinghoffer and Marco J. Castaldi	Waste to Energy Conversion Technology (Woodhead Publishing Series in Energy)	Woodhead Publishing Ltd., Cambridge, UK	2013
2.	Frank Kreith, George Tchobanoglous	Hand Book of Solid Waste Management- 2nd edition	McGraw Hill Publishing Ltd., Newyork	2002
3.	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall (P) Ltd., New Delhi.	1999

WEBSITES:

1.www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.

2.http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/

3.www.alternative-energy-news.info/technology/garbage-energy/

16BTSHOE06 GREEN CHEMISTRY 3 0 0 3

OBJECTIVES:

- To make the students conversant about the green chemistry
- To make the student acquire sound knowledge of the atom efficient process and synthesis elaborately.
- To acquaint the student with concepts of green technology.
- To develop an understanding of the basic concepts of renewable energy resources.
- To acquaint the students with the basic information on catalysis.
- To inculcate the chemical principles in the field of engineering and technology

OUTCOMES:

- Outline the basic principles of green chemistry (K)
- Examine the different atom efficient process and synthesis elaborately (S)
- Apply the concepts combustion of green technology (S)
- Identify and apply the concepts of renewable energy (S)
- Apply the concepts of green catalysts in the synthesis (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO GREEN CHEMICAL PRINCIPLES (9)

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

UNIT II ATOM EFFICIENT PROCESSES (9)

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

UNIT III BIOTECHNOLOGY AND GREEN CHEMISTRY (9)

Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

UNIT IV RENEWABLE RESOURCES (9)

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

UNIT V CATALYSIS IN GREEN CHEMISTRY (9)

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Sanjay K. Sharma, Ackmez Mudhoo	Green Chemistry for Environmental Sustainability	CRC Press , London	2010
2.	Ahluwalia V. K. and M.Kidwai	New Trends in Green Chemistry 2nd edition	Anamaya publishers., New Delhi.	2007

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons., New Delhi.	2012
2.	Mukesh Doble. Ken Rollins, Anil Kumar	Green Chemistry and Engineering, 1st edition	Academic Press, Elesevier., New Delhi.	2007
3.	Desai K. R.	Green Chemistry	Himalaya Publishing House, Mumbai.	2005
4.	Matlack A. S.	Introduction to Green Chemistry	Marcel Dekker: New York	2001

WEBSITES:

1.http://www.organic-chemistry.org/topics/green-chemistry.shtm

2.http://www.essentialchemicalindustry.org/processes/green-chemistry.html

3. http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm

4. http://www.epa.gov/research/greenchemistry/

16BTSHOE07 APPLIED ELECTROCHEMISTRY 3 0 0 3

OBJECTIVES:

- To make the students conversant with **the information on electrochemical material**.
- To make the student acquire sound knowledge of **conducting polymers**.
- To acquaint the student with concepts of Energy storage devices.
- To develop energy storage devices.
- To impart knowledge on basic principals of solar cells and its applications
- To inculcate the chemical principles in the field of engineering and technology

OUTCOMES:

- Outline the basic principles of chemistry in **electrochemical material (K)**
- Examine the properties of conducting polymers (S)
- Apply the concepts of electrochemistry in storage devices. (S)
- Identify the concepts of storage devices and its applications. (S)
- Apply the suitable materials for the manufacturing of storage devices. (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I METAL FINISHING (9)

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electroplating for electronic industry- Alloy plating, brass plating- Electro less plating of nickel- anodizing – Electroforming – Electro winning.

UNIT II CONDUCTING POLYMERS AND ELECTROCHEMICALS (9)

Electropolymerisation- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene- Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNIT III BATTERIES AND POWER SOURCES-I (9)

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNIT IV BATTERIES AND POWER SOURCES-II (9)

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

UNIT V ELECTROCHEMICAL MATERIAL SCIENCE (9)

Solar cells- Preparation of CdS/Cu_2S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Cynthia G. Zoski	Hand Book of Electrochemistry	Academic Press, Elesevier., UK	2007
2.	D.Pletcher and F.C.Walsh	Industrial Electrochemistry	Chapman and Hall, London	1990

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M. Barak	Electrochemical Power Sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
2.	Bruno Scrosati	Applications of Electroactive Polymers	Chapman & Hall, London	1993
3.	K.L. Chopra and I. Kaur	Thin Film Devices and their Application	Plenum Press, New York.	1983
4.	M.M.Baizer	Organic Electrochemistry	Dekker Inc. New York	1983

WEBSITES:

1.http://www.anoplate.com/finishes/

2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html

16BTSHOE08 INDUSTRIAL CHEMISTRY 3 0 0 3

OBJECTIVES:

- To make the students conversant with **cement and lime** and its uses.
- To make the student acquire sound knowledge of abrasives and refractories.
- To acquaint the student with concepts of inorganic chemicals.
- To develop an understanding of the basic concepts**explosives**.
- To acquaint the students with the basics of **agriculture chemicals**.
- To inculcate the chemical principles in the field of engineering and technology

OUTCOMES:

- Outline the basic chemistry of **cement and lime (K)**
- Examine the uses of abrasives and refractories (S)
- Identify the usage of the inorganic chemicals. (S)
- Identify the concepts of explosives and smoke screens (S)
- Identify the usage of the **agriculture** chemicals (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I CEMENT AND LIME (9)

Manufacture of Portland cement – settling of hardening of portland cement – regauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials- manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – magnesian lime – dolomitic lime – hydraulic lime.

UNIT II ABRASIVES AND REFRACTORIES (9)

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories – definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

UNIT IIIINORGANIC CHEMICALS (9)

Common salt and soda ash – manufacture – different grades – products – alkalis – Na_2CO_3, caustic soda and chlor-alkali industry – manufacture principles of electrolytic process – chlorine – storage. Hydrochloric acid – manufacture – absorption – uses, sulphur and sulphuric acid – extraction of sulphur – manufacture of H_2SO_4 – chamber – contact processes – industrial uses.

UNIT IV EXPLOSIVES (9)

Explosives – uses – properties and tests – explosives for war – nitrocellulose – picric acid and T.N.T. – industrial explosives – nitroglycerin and dynamites – black powder – smoke screens – incendiaries – gas mask.

UNIT V AGRICULTURE CHEMICALS (9)

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Harikrishan	Industrial Chemistry	Goel Publishing House, Meerut.	2014
2.	B.K. Sharma	Industrial Chemistry	Goel Publishing House, Meerut.	2000

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH Publishing CO. New Delhi.	1998
2.	James A. Kent	Hand Book of Industrial Chemistry, 9th edition	Van Nostrand Reinhold, New York.	1992
3.	R.N. Sherve	Chemical Process Industries	McGraw-Hill, Kugakuisha Ltd., Tokyo.	1984
4.	S.D. Shukla and G.N. Pandy	A Text book of Chemical Technology	Vikas Publishing House (P) Ltd, New Delhi.	1979

WEBSITES:

1.http://en.wikipedia.org/wiki/Cement

2. http://www.hon.ch/HONselect/Selection/D01.html

3. http://fas.org/man/dod-101/navy/docs/fun/part12.htm

OPEN ELECTIVES OFFERED BY DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

16BECSOE01	INTERNET PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study concepts of Internet, IP addresses and protocols
- To explain the concept of web page development through HTML
- To introduce the PERL and explore its current strengths and Weaknesses
- To write working Java code to demonstrate the use of applets for client-side programming
- To study Internet telephony and various multimedia applications
- To Elaborate on the principles of web page development

COURSE OUTCOMES:

Upon completion of this course, the student will be able to:

- Learn the advanced concepts& techniques of Internet and Java.
- Analyze the requirements for and create and implement the principles of web page development
- Understand the concepts ofPERL
- Implement client-side programming using java applets
- Generate internet telephony based upon advanced concepts
- Develop applications on internet programming based on java applets and scripts

UNITI Introduction (9)

Introduction- Network of Networks,Intranet,ExtranetandInternet. WorldWide Web- Domainand Subdomain,AddressResolution,DNS,Telnet,FTP,HTTP.TCP/IP- Features, Segment,Three-Way Handshaking, Flow Control,ErrorControl,Congestion control,IPDatagram,IPv4andIPv6.IP Subnettingand addressing-Classfuland Classless Addressing, Subnetting

UNITII HTML (9)

Introduction, Editors, Elements, Attributes, Heading, Paragraph.Formatting,Link,Head, Table,List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue. Image Maps- map, area, attributesof image area-ExtensibleMarkupLanguage (XML)-Introduction,Tree,Syntax,Elements, Attributes,Validation,Viewing.XHTMLinbrief.CGI Scripts-Introduction-EnvironmentVariable, GET and POST Methods.

UNITIII PERL (9)

Introduction,Variable,Condition,Loop,Array,Implementing datastructure,Hash,String,Regular Expression,File handling,I/Ohandling- JavaScript- Basics, Statements,comments,variable, comparison,condition,switch, loop,break. Object–string, array, Boolean, reg-ex. Function, Errors, Validation.Cookies-Definitionofcookies,Createand Store a cookiewithexample.Java Applets-Container Class, Components, AppletLifeCycle,Update method, Applications.

UNITIV Client-Serverprogramming (9)

Client-ServerprogrammingInJava-JavaSocket,JavaRMI.Threats-Maliciouscode-viruses, Trojan horses,worms;eavesdropping,spoofing,modification,denialof service attacks- Network security techniques-PasswordandAuthentication-VPN,IPSecurity,security inelectronic transaction,Secure SocketLayer(SSL), SecureShell(SSH).Firewall-Introduction,Packetfiltering, Stateful, Application layer, Proxy.

UNITV Internet Telephony (9)

Introduction,VoIP-MultimediaApplications-MultimediaoverIP:RSVP,RTP, RTCPandRTSP-Streamingmedia, Codecand Plugins,IPTV-Search Engine andWeb Crawler-Definition, Metadata, Web Crawler,Indexing, Pagerank, overview of SEO.

Total Hours: 45

TEXT BOOKS:

1. Paul Deitel, HarveyDeitel and AbbyDeitel,“Internet andWorld Wide Web-Howto Program”, 5th Edition, 2011.
2. WebTechnology:ADeveloper'sPerspective,N.P.GopalanandJ.Akilandeswari,PHI Learning, Delhi, 2013.

REFERENCES:

1. Rahul Banerjee, Internetworking Technologies, An Engineering Perspective, PHI Learning, Delhi, 2011.
2. Robert W. Sebesta, “Programmingthe World Wide Web”, Pearson Education, 2016

16BECSOE02	MULTIMEDIA AND ANIMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart the fundamental concepts of Computer Animation and Multimedia
- To study the graphic techniques and algorithms using flash
- Explain various concepts available in 3D animation
- Explain various devices available for animation
- To study the multimedia concepts and various I/O technologies for concept development
- To understand the three-dimensional graphics and their transformations

COURSE OUTCOMES

Upon completion of this course, the student will be able to:

- Develop their creativity using animation and multimedia
- Understand the concepts of Flash and able to develop animation using it
- Understand about various latest interactive 3D animation concepts
- Know the various devices and software available in motion capture
- Understand the concept development process
- Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.

UNITI Introduction (9)

What is mean byAnimation– Whyweneed Animation– Historyof Animation– Uses of Animation –TypesofAnimation–PrinciplesofAnimation–SomeTechniquesofAnimation–Animationon the WEB– 3D Animation– Special Effects-CreatingAnimation.

UNITII Creating AnimationinFlash (9)

IntroductiontoFlashAnimation–IntroductiontoFlash–WorkingwiththeTimelineandFrame-basedAnimation-WorkingwiththeTimelineandTween-basedAnimation–UnderstandingLayers -Action script.

UNITIII 3D Animation& its Concepts (9)

Types of 3DAnimation – Skeleton &Kinetic3DAnimation – Texturing&Lightingof 3D Animation – 3D Camera Tracking– Applications &Softwareof 3DAnimation.

UNITIV MotionCaption (9)

Formats – Methods –Usages – Expression – Motion CaptureSoftware's–Script Animation Usage – DifferentLanguageof Script Animation Among the Software.

UNITV Concept Development (9)

StoryDeveloping–Audio &Video – Color Model– DeviceIndependent Color Model– Gamma and GammaCorrection-Production Budgets-3DAnimated Movies.

Total Hours: 45

TEXT BOOK:

1. Computer Graphics, Multimedia and Animation-Malay K. Pakhira,PHI Learning PVTLtd,2010

REFERENCES:

1. Principles of Multimedia– Ranjan Parekh, 2007,TMH. (UnitI, Unit V)
2. MultimediaTechnologies–AshokBanerji,AnandaMohanGhosh–McGraw Hill Publication.
3. Encyclopediaof Multimedia and Animations-Pankaj Dhaka, Anmol Publications-2011

16BECSOE03 **PC HARDWARE ANDTROUBLE SHOOTING**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To study the basic parts of computer in detail
- Introduce various peripheral devices available for computer and its detailed working concepts
- Overview of various interfaces and other hardware overview
- Assemble/setup and upgrade personal computer systems and discuss about power supplies and the skills to trouble-shoot various power-related problems.
- To study basic concepts and methods in troubleshooting
- To study the installation/connectionand maintenance of computer and its associated peripherals.

COURSE OUTCOME:

Upon completion of this course, the student will be able to:

- Identify the main components for the PC, familiarize themselves with PC memories such as RAM and ROM devices and so on.
- Identify various peripheral devices available and its working
- Understand various concepts of hardware and its interface and control
- Perform basic installation of PC. Importance of maintenance is understood
- Understand Various faults and failures are identified and troubleshooting in detail
- Understand overall PC hardware, interfacing, maintenance and troubleshooting

UNITI Introduction (9)

Introduction-ComputerOrganization–Number SystemsandCodes–Memory –ALU–CU– Instruction prefetch–Interrupts–I/OTechniques–DeviceControllers–ErrorDetection Techniques–Microprocessor–PersonalComputer Concepts–AdvancedSystemConcepts– MicrocomputerConcepts–OS–MultitaskingandMultiprogramming–VirtualMemory –Cache Memory– Modern PC and User.

UNITII Peripheral Devices (9)

Introduction–Keyboard–CRTDisplay Monitor–Printer–MagneticStorageDevices–FDD– HDD – Special Types ofDisk Drives– Mouseand Trackball– Modem–Fax-Modem –CD ROM Drive – Scanner – Digital Camera– DVD – Special Peripherals.

UNITIII PC HardwareOverview (9)

Introduction – HardwareBIOS DOSInteraction–ThePC family– PC hardware–Insidethe System Box–MotherboardLogic–Memory Space–PeripheralInterfacesandControllers–Keyboard Interface – CRT Displayinterface– FDC – HDC.

UNITIV InstallationandPreventive Maintenance (9)

Introduction–systemconfiguration–preinstallationplanning–Installationpractice–routine checks–PCAssemblingandintegration–BIOSsetup–Engineering versionsandcompatibility –preventivemaintenance–DOS– Virus – Data Recovery.

UNITV Troubleshooting (9)

Introduction – computerfaults– Natureoffaults– Types offaults– Diagnosticprograms andtools–Microprocessor andFirmware– ProgrammableLSI's–BusFaults–FaultsEliminationprocess–Systematic Troubleshooting–Symptomsobservationandanalysis–faultdiagnosis–fault rectification–Troubleshootinglevels– FDD, HDD, CD ROM Problems.

Total Hours: 45

TEXT BOOK:

1. B. Govindarajalu, “IBMPC Clones Hardware, Troubleshootingand Maintenance”, 2/E, TMH, 2002.

REFERENCES:

1. Peter Abel, NiyazNizamuddin, “IMB PC AssemblyLanguage and Programming”, Pearson Education, 2007
2. ScottMueller, “RepairingPC's”, PHI, 1992

16BECSOE04 **JAVA PROGRAMMING** **L T P C**

COURSE OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads, generics classes and swings
- To explain the need for generic programming
- To design and build simple Graphical User Interfaces

COURSE OUTCOMES:

Upon completion of the course, students will be able to:

- Develop Java programs using OOP principles
- Develop Java programs with the concepts of inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generics classes and swings
- Understand various aspects for motivation of generic programming
- Develop various interactive Java programs using OOP concepts of Java

UNITI INTRODUCTION TO JAVA (9)

Objectorientedprogramming concepts–objects–classes–methodsandmessages–abstraction andencapsulation–inheritance–abstractclasses–polymorphism.- ObjectsandclassesinJava– defining classes – methods- access specifiers – staticmembers –constructors– finalizemethod

UNITII PACKAGES (9)

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy – polymorphism– dynamicbinding– final keyword– abstract classes

UNITIII I/O STREAMS (9)

TheObjectclass–Reflection–interfaces–objectcloning–innerclasses–proxies-I/O Streams-Graphics programming – Frame – Components– working with 2D shapes.

UNITIV EXCEPTION HANDLING (9)

Basicsofeventhandling–eventhandlers–adapter classes– actions–mouse events–AWT eventhierarchy –introductiontoSwing–Model-View-Controllerdesignpattern–buttons– layout management – Swing Components – exception handling – exception hierarchy – throwing and catching exceptions.

UNITV MOTIVATION FOR GENERIC PROGRAMMING (9)

Motivationforgenericprogramming–genericclasses–generic methods–genericcodeand virtual machine – inheritance and generics – reflection and generics - Multi-threaded programming– interrupting threads–threadstates–threadproperties–threadsynchronization– Executors – synchronizers.

TEXTBOOK:

1. CayS. Horstmann andGaryCornellCoreJava:VolumeI–Fundamentals Sun Microsystems Press2008

REFERENCES:

1.K.ArnoldandJ.GoslingTheJAVAprogramminglanguageThirdedition, Pearson Education,2009
2.Timothy Budd Understanding Object-oriented programming with Java Updated Edition, Pearson Education 2002
3.C.ThomasWuAnintroductiontoObject-orientedprogrammingwithJavaFourthEdition, Tata McGraw-Hill Publishingcompany Ltd., 2008

WEBSITES:

1. http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/
2. http://www.winprog.org/tutorial/msvc.html
3. http://www.tutorialized.com/tutorials/Visual-C/1
4. http://www.freeprogrammingresources.com/visualcpp.html

OPEN ELECTIVES OFFERED BY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

16BEEEOE01 ELECTRIC HYBRID VEHICLE L T P C 3 0 0 3

Course Objectives

- To understand the basic concepts of electric hybrid vehicle.
- To gain the knowledge about electric propulsion unit.
- To gain the concept of Hybrid Electric Drive-Trains.
- To gain the different Energy Management Strategies.
- To study about the effciency manipulation in drives
- To understand and gain the knowledge about various energy storage devices

Course Outcomes:

- Summarize the basic concepts in bioprocess Engineering.
- Explain the concept of Hybrid Electric Vehicles.
- Understand the concept of Hybrid Electric Drive-Trains.
- Identify the different Energy Management Strategies.
- Understand the concept of different Energy Storage devices.
- Analyze the different motor drives used in Hybrid Electric Vehicles.

UNIT I INTRODUCTION 9

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II HYBRID ELECTRIC DRIVE-TRAINS 9

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT 9

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE 9

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENT STRATEGIES 9

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press – 2nd edition	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	Standardsmedia – 2nd edition	2009
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley – 2nd edition	2012

16BEEEOE02 ENERGY MANAGEMENT AND ENERGY AUDITING 3 0 0 3

Course Objectives:

- To gain the knowledge about energy management.
- To understand the basic concepts in economic analysis in energy management.
- To understand the basic principles of energy audit.
- To gain the knowledge about the basic concept of types of Energy Audit
- To gain and Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- To study about the behaviour changes of PF requirement in motor currents

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the concept of Energy Management.
- Analyze the different methods for economic analysis
- Knowledge about the basic concept of Energy Audit and types.
- Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- Investigate the different methods to improve power factor.

UNIT I ENERGY MANAGEMENT 9

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS 9

Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worth method.

UNIT III BASIC PRINCIPLES OF ENERGY AUDIT 9

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT IV ENERGY EFFICIENT MOTORS 9

Electric Motors: Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation –over motoring – motor energy audit-
Energy conservation: Importance-energy saving measures in DG set-fans and blowers pumps- air conditioning system- energy efficient transformers.

UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS 9

Power factor - methods of improvement, location of capacitors, p.f with non linear loads, effect of harmonics on p.f,- p.f motor controllers –Energy efficient lighting system design and practice- lighting control– Measuring Instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLCs.

TOTAL: 45 HOURS

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Murphy W.R. and G.Mckay Butter worth	Energy Management	Heinemann Publications	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John.C.Andreas	Energy Efficient Electric Motors	Marcel Dekker Inc Ltd – 3rd edition	2005
2	W.C.Turner Steve Doty	Energy Management Handbook	Lulu Enterprises, Inc. - 8th Edition Volume II	2013

16BEEEOE03 PROGRAMMABLE LOGIC CONTROLLER L T P C 3 0 0 3

Course Objectives

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To gain the knowlege of storage techniques in PLC
- To acquire the knowledge about how to handle the data and functions
- To study about flow charts of ladder and spray process system
- To understand the principles of PID.

Course Outcome

- At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.
- To acquire the knowlege of storage techniques in PLC
- Students know how to handle the data and functions
- Students known about advanced controller in PLC applications
- Students gather real time industrail application of PLC
- Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION 9

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING 9

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS 9

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS 9

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES 9

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	JR Hackworth and F.D Hackworth – Jr	Programmable Logic Controllers – Programming Method and Applications	Pearson	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	2004
2	W.Bolton	Programmable Logic controller	Elsevier Newnes Publications, 5th Edition	2009

WEBSITE

http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logic controller

16BEEEOE04 RENEWABLE ENERGY RESOURCES L T P C 3 0 0 3

Course Objectives

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
- To understand the basic principles fuel cell, Geo thermal power plants.
- To gain the knowledge about hydro energy.
- To study about solar energy collectors and its storages
- To study about the inter connected system in wind power

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Analyze the Energy Scenario in india
- Understand the concept of Solar Energy
- Understand the concept of Wind Energy
- Understand the concept of Hydro Energy
- Analyze the different energy sources
- Students gathered the real time inter connected system modelling in wind power

UNIT I INTRODUCTION 9

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

UNIT II SOLAR ENERGY

9

Introduction to solar energy: solar radiation, availability, measurement and estimation– Solar thermal conversion devices and storage – solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

UNIT III WIND ENERGY

9

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNIT IV HYDRO ENERGY 9

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V OTHER SOURCES 9

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TOTAL: 45 HOURS

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rai.G.D	Non-conventional sources of energy	Khanna publishers	2011
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rao.S. & Parulekar	Energy Technology	Khanna publishers, Eleventh Reprint	2013
2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis – 3rd edition	2015

WEBSITES

1. www.energycentral.com
2. www.catelelectricpowerinfo.com

OPEN ELECTIVES OFFERED BY DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

16BEECOE01 REAL TIME EMBEDDED SYSTEMS 3 0 0 3 100

Course Objectives

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing
- To study about memory management
- To imparts knowledge on

Course Outcomes

At the end of the course the students will be able to

- Understand overview of embedded systems architecture
- Acquire knowledge on embedded system, its hardware and software.
- Gain knowledge on overview of Operating system
- Discuss about task Management
- Gain knowledge about semaphore management and message passing.
- Gain knowledge about memory management.

UNIT - I INTRODUCTION TO EMBEDDED SYSTEM

Introduction - Embedded systems description, definition, design considerations & requirements - Overview of Embedded system Architecture (CISC and RISC) - Categories of Embedded Systems - embedded processor selection &tradeoffs - Embedded design life cycle - Product specifications - hardware/software partitioning - iterations and implementation - hardware software integration - product testing techniques – ARM 7

UNIT - II OPERATING SYSTEM OVERVIEW

Introduction –Advantage and Disadvantage of Using RTOS – Multitasking – Tasks - Real Time Kernels – Scheduler - Non-preemptive Kernels - Preemptive Kernels – Reentrancy- Reentrant Functions – Round Robin Scheduling - Task Priorities - Static Priorities – Mutual Exclusion – Deadlock – Intertask Communication – Message Mailboxes – Message Queues - Interrupts - Task Management – Memory Management - Time Management – Clock Ticks.

UNIT - III TASK MANAGEMENT

Introduction - μ C/OS-II Features - Goals of μ C/OS-II - Hardware and Software Architecture – Kernel Structures: Tasks –Task States – Task Scheduling – Idle Task – Statistics Task – Interrupts Under μ C/OS-II – Clock Tick - μ C/OS-II Initialization. Task Management: Creating Tasks – Task Stacks – Stack Checking – Task's Priority – Suspending Task – Resuming Task. Time Management: Delaying a Task – Resuming a Delayed Task – System Time. Event Control Blocks- Placing a Task in the ECB Wait List – Removing a Task from an ECB waits List.

UNIT - IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING

Semaphore Management: Semaphore Management Overview – Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox – Deleting Mailbox – Waiting for a Message box – Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue – Deleting a Message Queue – Waiting for a Message at a Queue – Sending Message to a Queue – Flushing a Queue.

UNIT - V MEMORY MANAGEMENT

Memory Management: Memory Control Blocks – Creating Partition- Obtaining a Memor y Block – Returning a Memor y Block .Getting Started with μ C/OS-II – Installing μ C/OS-II – Porting μ C/OS-II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with μ C/OS-II - μ C/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Anal yze the Multichannel ADC with help of μ C/OS-II.

REFERENCES

1.Jean J. Labrosse "MicroC/OS – II The Real Time Kernel"-CMP BOOKS- 2009
2.David Seal "ARM Architecture Reference Manual"-Addison-Wesley-2008
3.Steve Furbe,"ARM System-on-Chip, Architecture"-Addison-Wesley Professional California-2000

16BEECOE02 CONSUMER ELECTRONICS 3 0 0 3 100

Course Objectives

- To study about various speakers and microphone
- To learn the fundamental of television systems and standards
- To learn the process of audio recording and reproduction
- To study various telephone networks
- To discuss about the working of home appliances
- To familiarize with TV services like ISDN.

Course Outcomes

At the end of the course the students will be able to

- Understand working of various type of loud speakers
- Acquire knowledge on various types of picture tubes
- Demonstrate the working of various optical recording systems
- Distinguish various standards for color TV system
- Acquire knowledge on various telecommunication networks
- Demonstrate the working of various home appliances

UNIT I LOUDSPEAKERS AND MICROPHONES

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNIT – II TELEVISION STANDARDS AND SYSTEMS

Components of a TV system – interlacing – composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL, SECAM - Components of a Remote Control.

UNIT – III OPTICAL RECORDING AND REPRODUCTION

Audio Disc – Processing of the Audio signal –read out from the Disc – Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems.

UNIT – IV TELECOMMUNICATION SYSTEMS

Telephone services - telephone networks – switching system principles – PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio systems, Limited range Cordless Phones; cellular modems

UNIT – V HOME APPLIANCES

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

Text Book:

1. S.P.Bali, “Consumer Electronics”, Pearson Education, 2005.

16BEECOE03 NEURAL NETWORKS AND ITS APPLICATIONS 3 0 0 3 100

Course Objectives

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.
- To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
- To gain exposure in the field of neural networks and relate the human neural system into the digital world
- To provide knowledge of computation and dynamical systems using neural networks

Course Outcomes

At the end of the course the students will be able to

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks
- Apply perception concept in design
- Design using ART phenomena
- Gain knowledge on SOM concepts
- Ability to develop the use of Soft Computing to solve real-world problems

UNIT I: INTRODUCTION TO NEURAL NETWORKS

Introduction - biological neurons and their artificial models - learning, adaptation and neural network's learning rules - types of neural networks- single layer, multiple layer- feed forward, feedback networks

UNIT II LEARNING PROCESS

Error – correction learning – memory based learning - hebbian learning-competitive learning-Boltzmann learning- supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT III PERCE PTION

Single layer perception-Adaptive filtering-unconstrained optimization-Least-mean square algorithm-Leaning curve-Annealing Technique-perception convergence theorem-Relationship between perception and Baye's classifier-Back propagation algorithm

UNIT IV ATTRACTOR NEURAL NETWORK AND ART

Hopfield model-BAM model- BAM stability-Adaptive BAM -Lyapunov function-effect of gain-Hopfield design-Application to TSP problem-ART- layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP

UNIT V SELF ORGANIZATION

Self organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical vector Quantization. Applications of self-organizing maps: The Neural Phonetic Typewriter Learning Ballistic Arm Movements

REFERENCES:

1. Simon Haykin, “Neural Networks and Learning Machines” -3/E - Pearson/ Prentice Hall 2009
2. Satish Kumar- “Neural Networks : A Classroom Approach”-TMH-2008
3. Freeman J.A., Skapura D.M.”Neural networks, algorithms, applications, and programming techniques” -Addition Wesley, 2005.
4. Laurene Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms, and Applications” - Pearson/ Prentice Hall 5. Robert J Schalkoff-“Artificial Neural Networks,McGraw Hill”-1997

16BEECOE04 FUZZY LOGIC AND ITS APPLICATIONS 3 0 0 3 100

Course Objectives

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.
- Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
- To learn about applications on Fuzzy based systems
- To familiarize with fuzzy fiction and de fuzzy fiction procedures

Course Outcomes

At the end of the course the students will be able to

- Understand the basic concepts of Fuzzy logic and its applications in various domain
- Gain knowledge on theory of Reasoning
- Develop fuzzy controllers
- Understand concepts of adaptive fuzzy control
- Ability to develop how to use Fuzzy computation to solve real- world problems
- Design fuzzy based model for any application

UNIT - I

Basics Of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT – II

Theory Of Approximate Reasoning**:** Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference-fuzzy models

UNIT - III

Fuzz y Knowledge Based Controllers (Fkbc)**:** Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures – Design of Fuzz y Logic Controller

UNIT - IV

Adaptive Fuzz y Control: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

UNIT V FUZZY BASED SYSTEMS

Simple applications of FKBC -washing machines- traffic regulations -lift control-fuzz y in medical applications-Introduction to ANFIS.

TEXT BOOKS:

1. An Introduction to Fuzz y Control- D. Diankar, H. Hellendoom and M. Reinfrank- Narosa Publishers India, 1996.

2. Fuzzy Sets Uncertainty and Information- G. J. Klir and T. A. Folger- PHI IEEE, 1995.

OPEN ELECTIVES OFFERED BY DEPARTMENT OF AUTOMOBILE ENGINEERING

16BEAEOE01 AUTOMOBILE ENGINEERING 3 0 0 3 100

Course Objectives:

- To impart knowledge on the constructional details and principle of operation of various automobile components.
- To learn the function and working of various components in transmission and drive lines.
- To study the concept and working of steering and suspension systems in an automobile.
- To give knowledge on the wheels, tyres and brakes of automobiles.
- To provide information on the current and future trends in automobiles.
- Identify and explain the types of steering system.

Course Outcomes:

Upon successful completion of the course, the students should be able to:

- Demonstrate the operating principles and constructional details of various automobile components.
- Explain the function and working of components in transmission and drive lines.
- Identify and explain the types of steering system.
- Identify and explain the types of suspension system.
- Classify and describe the types of wheels, tyres and brakes of automobiles.
- Discuss the current and future trends in the automobiles.

UNIT-I ENGINE AND FUEL FEED SYSTEMS

Classification of Engine, construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburettor working principle, requirements of an automotive carburettor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNIT –II TRANSMISSION SYSTEMS

Requirements of transmission system. Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. Objective of the gearbox - Determination of gear ratios for vehicles. Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propeller Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

UNIT -III SUSPENSION SYSTEM

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension – Pneumatic suspension – Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

UNIT-IV BRAKES

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theory, Brake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System (ABS).

UNIT -V ELECTRICAL SYSTEM

Principle and construction of lead acid battery.Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.Starting System and charging system.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2.	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., New Delhi	2003
3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publishes	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
2.	Crouse.W.H	Automobile Electrical Equipment", 3rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAE Inc	2001

16BEAEOE02 BASICS OF TWO AND THREE WHEELERS 3 0 0 3 100

Course Objectives

- The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.
- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.

Course Outcomes

Upon successful completion of the course, the students should be able to:

- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
- Explain the servicing of two and three wheelers.

UNIT I INTRODUCTION

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS

2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHES AND TRANSMISSION

Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992.
2.	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century book house.	1988.

REFERENCES:

SL. NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M.M.Griffin.	Motor cycles from inside and outside.	Prentice Hall Inc, New Jersey.	1978.
2.	Bruce A. Johns, David D.Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAEOE03 AUTOMOBILE MAINTENANCE 3 0 0 3 100

Course Objectives

- The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems inAutomobile.
- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.

Course Outcomes

Upon successful completion of the course, the students should be able to:

- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.
- Explain the fault diagnosis in the electrical and air conditioner systems.

UNIT I MAINTENANCE OF RECORDS AND SCHEDULES

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	John Doke	Fleet Management	McGraw Hill Co	1984
2.	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011
3.	Service Manuals from Different Vehicle Manufacturers			

16BEAEOE04 INTRODUCTION TO MODERN VEHICLE TECHNOLOGY 3 0 0 3 100

Course Objectives:

- To impart knowledge on trends in the vehicle power plants.
- To learn the various advanced driver assistance systems.
- To study the working of advanced suspension and braking systems in an automobile.
- To give information about motor vehicle emission and noise pollution control.
- To provide knowledge of the vehicle telematics.
- To give information about the noise control techniques

Course Outcomes:

Upon successful completion of the course, the students should be able to:

- Distinguish and describe the various modern vehicle power plant systems.
- List and explain the various driver assistant mechanisms.
- Identify and describe the working of advanced suspension and braking systems.
- Apply the knowledge of motor vehicle emission and noise pollution control.
- Describe the noise control techniques
- Describe the vehicle telematics and its applications.

UNIT I TRENDS IN POWER PLANTS

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNIT II DRIVER ASSISTANCE SYSTEMS

Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNIT III SUSPENSION BRAKES AND SAFETY

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT IV NOISE & POLLUTION

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT VTELEMATICS

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

TEXT BOOKS

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Ljubo Vlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001
2.	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems –Progress in Technology	Automotive Electronics Series,SAE, USA.	1998

REFERENCES

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William B Riddens	"Understanding Automotive Electronics", 5th Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold,	"Understanding Automotive Electronics"	SAE	1998
3.	Robert Bosch,	"Automotive HandBook", 5th Edition	SAE	2000

OPEN ELECTIVES OFFERED BY DEPARTMENT OF CIVIL ENGINEERING

16BECEOE01 HOUSING, PLAN AND MANAGEMENT 3 0 0 3 100

COURSE OBJECTIVES

1. To examine the role and tasks of basic housing policies and building bye laws
2. Understand the process of integrated service delivery in the context of economic, social, environmental and institutional factors
3. Analyze the Innovative construction methods and Materials
4. Analyze city management strategies and strengthen the urban governance through a problem solving approach
5. To know the Importance of basic housing policies and building bye laws
6. To use Housing Programmes and Schemes

COURSE OUTCOME

The students will be able to

1. Know the Importance of basic housing policies and building bye laws
2. Use Housing Programmes and Schemes
3. Plan and Design of Housing projects
4. Examine Innovative construction methods and Materials
5. Know Housing finance and loan approval procedures
6. Understand Construction as well as managing techniques

UNIT I INTRODUCTION TO HOUSING 9

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II HOUSING PROGRAMMES 9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V Housing Finance and Project Appraisal 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems).

TOTAL HRS : 45

TEXT BOOKS

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 2002.

2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 2001.

REFERENCES

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.

2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 2000.

16BECEOE02 BUILDING SERVICES 3 0 0 3 100

COURSE OBJECTIVES

1. Defining and identifying of eng. services systems in buildings.
2. The role of eng. services systems in providing comfort and facilitating life of users of the building.
3. The basic principles of asset management in a building & facilities maintenance environment
4. Importance of Fire safety and its installation techniques
5. To Know the principle of Refrigeration and application
6. To Understand Electrical system and its selection criteria

COURSE OUTCOME

The students will be able to

1. Machineries involved in building construction
2. Understand Electrical system and its selection criteria
3. Use the Principles of illumination & design
4. Know the principle of Refrigeration and application
5. Importance of Fire safety and its installation techniques
6. Know the principle behind the installation of building services and to ensure safety in buildings

UNIT I MACHINERIES 9

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS 9

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN 9

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS 9

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION 9

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

TOTAL HRS : 45

TEXT BOOKS

1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 2002.

2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2005.

REFERENCES

1. Philips Lighting in Architectural Design, McGraw-Hill, New York, 2000.

2 A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 2005.

3 National Building Code.

16BECEOE03 MANAGEMENT OF IRRIGATION SYSTEMS 3 0 0 3 100

OBJECTIVES

1. To enable the students for a successful career as water management professionals.
2. To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.
3. To expose the students the need for an interdisciplinary approach in irrigation water management
4. To providing a platform to work in an interdisciplinary team.
5. To provide students an ability to understand the applications of mathematical and scientific concepts to analyse intricate technical, social and environmental problems in irrigation water management and finding solutions for them.
6. To promote student awareness for a life-long learning process and inculcate professional ethics and codes of professional practice in water management.

OUTCOME

At the end of this the students will be in a capacity to

1. Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.
2. Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management
3. Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach.
4. Gain insight on local and global perceptions and approaches to participatory water resource management
5. Learn from successes and failures in the context of both rural and urban communities of water management.
6. Exposure on the use of economic concepts in irrigation development and to impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector.

UNIT I. IRRIGATION SYSTEM REQUIREMENTS 9

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNIT II. IRRIGATION SCHEDULING 9

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III. MANAGEMENT 9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV. OPERATION 9

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V. INVOLVEMENT OF STAKE HOLDERS 9

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL HRS : 45

TEXT BOOKS

1. Dilip Kumar Majumdar, "Irrigation Water Management – Principles and Practice", Prentice Hall of India Pvt. Ltd., New Delhi, 2000

2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi

REFERENCES

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 2000

2. Maloney, C. and Raju, K.V., "Managing Irrigation Together", Practice and Policy in India, Stage Publication, New Delhi, India, 2000

16BECEOE04 ADVANCED CONSTRUCTION TECHNOLOGY 3 0 0 3 100

OBJECTIVE:

1. To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
2. To study different methods of construction to successfully achieve the structural design with recommended specifications.
3. To involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. To study of construction equipment's, and temporary works required to facilitate the construction process
5. To provide a coherent development to the students for the courses in sector of Advanced construction technology.
6. To present the new technology of civil Engineering and concepts related Advanced construction technology.

OUTCOMES:

1. Implementation of new technology concepts which are applied in field of Advanced construction.
2. Different methods of construction to successfully achieve the structural design with recommended specifications.
3. Application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. Will gain the Knowledge of construction equipment's, and temporary works required to facilitate the construction process
5. Development to the students for the courses in sector of Advanced construction technology.
6. The new technology of civil Engineering and concepts related Advanced construction technology.

UNIT - I MODERN CONSTRUCTION METHODS 9

Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT - II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES 9

Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines

UNIT - III MODERN CONSTRUCTION EQUIPEMENTS -I 9

Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting,Tunneling and hoisting

UNIT - IV MODERN CONSTRUCTION EQUIPEMENTS -II 9

Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant

UNIT - V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES 9

Principles and Practices of Temporary structures, Shoring, and Strutting,Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipments

TOTAL HRS : 45

TEXT BOOKS

1. Peurifoyu , R. L., , Ledbette, W.B., Construction Planning , Equipment and Methods,

Mc Graw Hill Co., 2000.

2. Antill J.M., PWD, Civil Engineering Construction, Mc Graw Hill Book Co., 2005

REFERENCE

1.Varma, M Construction Equipment and its Planning & Applications, Metropoltian

Book Co., 2000

2.Nunnaly, S.W., Construction Methods and Management , Prentice – Hall, 2000

3.Ataev, S.S., Construction Technology, MIR , Pub. 2000

OPEN ELECTIVES OFFERED BY DEPARTMENT OF MECHANICAL ENGINEERING

16BEMEOE01 COMPUTER AIDED DESIGN 3 0 0 3 100

Course Objective

1. To apply basic concepts to develop construction (drawing) techniques.
2. To ability to manipulate drawings through editing and plotting techniques.
3. To understand geometric construction and Produce template drawings.
4. To understand and demonstrate dimensioning concepts and techniques.
5. To understand Section and Auxiliary Views.
6. To become familiar with Solid Modelling concepts and techniques.

Course Outcome

1. Apply basic concepts to develop construction (drawing) techniques.
2. Ability to manipulate drawings through editing and plotting techniques.
3. Understand geometric construction and Produce template drawings.
4. Understand and demonstrate dimensioning concepts and techniques
5. Understand Section and Auxiliary Views
6. Become familiar with Solid Modelling concepts and techniques.

UNIT I OVERVIEW OF CAD SYSTEMS 9

Conventional and computer aided design processes-advantages and disadvantages. Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations. Networking of CAD systems.

UNIT II INTERACTIVE COMPUTER GRAPHICS AND GRAPHICS TRANSFORMATIONS 9

Generative, cognitive and image processing graphics. Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Two- and Three – Dimensional graphics concepts, Graphical input technique, Geometric transpformations, Visual Realism, Computer animation, customizing graphics software.

UNIT III GEOMETRIC MODELING 9

Wireframe, surface, NURBS and solid modeling-applications and advantages. Creating primitive solids, sweeping solids, boolean operations. Extracting entities from a solid. Filleting of edges of solids. Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

UNIT IV PARAMETRIC DESIGN AND OBJECT REPRESENTATION 9

Types of co-ordinate systems. Parametric design - definition and advantages. Parametric representation of analytic and synthetic curves. Parametric representation of surfaces and solids - manipulations.

UNIT V PRODUCT DESIGN AND DEVELOPMENT 9

Automated 2D drafting - basics, mechanical assembly - bill of materials generation. Mass property calculations.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vera B Anand	Computer Graphics and Geometric Modeling for Engineers	John Wiley & Sons, New York	2000
2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	Dhanpat Rai & Sons, New Delhi	2002
2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	William M Newman and Robert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994
5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998
6	Rao S S	Optimisaiton Techniques	Wiley Eastern, New Delhi	2003

16BEMEOE02 **INDUSTRIAL SAFETY AND ENVIRONMENT** **3 0 0 3 100**

Course Objective

1. To recognize and evaluate occupational safety and health hazards in the workplace.
2. To determine appropriate hazard controls following the hierarchy of controls.
3. To analyse the effects of workplace exposures, injuries and illnesses, fatalities.
4. To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
5. To teach studentthe conceptof Industrial Safety & provide useful practical knowledge for workplace safety.
6. Toprevent or mitigate harm or damage to people, property, orthe environment.

Course Outcome

1. Recognize and evaluate occupational safety and health hazards in the workplace.
2. Determine appropriate hazard controls following the hierarchy of controls.
3. Analyse the effects of workplace exposures, injuries and illnesses, fatalities.
4. Prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
5. Understand the conceptof Industrial Safety & provide useful practical knowledge forworkplace safety.
6. Prevent or mitigate harm or damage to people, property, orthe environment.

UNIT I INTRODUCTION TO LOGISTICS 9
Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNIT II PHASES OF SUPPLY CHAIN 9
The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAIN MODELS 9
Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain with customer.

UNIT IV SUPPLY CHAIN ACTIVITIES 9
Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNIT V SCM ORGANISATION AND INFORMATION SYSTEM 9
The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERP Software's

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Shari.P.B and Lassen.T.S	Managing the global supply chain	Viva books, New Delhi	2000
2	Ayers.J.B	Hand book of supply chain management	The St. Lencie press	2000

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nicolas.J.N	Competitive manufacturing management - continuous improvement, Lean production, customer focused quality	McGrawHill, New York	1998
2	Steudel.H.J and Desruelle.P	Manufacturing in the nineteen - How to become a mean, lean and world class competitor	Van No strand Reinhold, New York	1992

16BEMEOE03 **TRANSPORT PHENOMENA** **3 0 0 3 100**

Course Objective

1. To generalized equations for mass, momentum and heat.
2. To understand the concepts of Reynolds and Gauss theorems.
3. To learn combined diffusive and convective transport.
4. To apply Film- and penetration models for mass and heat transfer.
5. To apply Stefan-Maxwells equations for multi-component diffusion.
6. To Solve the given set of equations either analytically or numerically.

Course Outcome

1. Generalized equations for mass, momentum and heat.
2. Understand the concepts of Reynolds and Gauss theorems.
3. Learn combined diffusive and convective transport.
4. Apply Film- and penetration models for mass and heat transfer.
5. Apply Stefan-Maxwells equations for multi-component diffusion.
6. Solve the given set of equations either analytically or numerically.

UNIT I INTRODUCTION AND BASIC CONCEPTS 9

General overview of transport phenomena including various applications, Transport of momentum, heat and mass , Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II PROPERTIES, UNITS AND OTHER PHYSICAL PARAMETERS 9

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III MOMENTUM TRANSPORT 9

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNIT IV ENERGY TRANSPORT 9

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer **-** through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heat transfer

UNIT V MASS TRANSPORT 9

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion-Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

TOTAL 45

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

WEB REFERENCE

1. https://laulima.hawaii.edu/portal

16BEMEOE04	**INTRODUCTION TO BIOMECHANICS**	**3 0 0 3 100**

Course Objective

2. To describe the principles of the study of human movement.
3. To describe the range of factors that influence the initiation,production and control of human movement.
4. To identify the body's lever systems and their relationship to basicjoint movement and classification.
5. To distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
6. To explain joint and muscle function and the forces acting upon the human body during various sporting activities.
7. To relate the different body systems necessary for human movement to occur.

Course Outcome

1. Describe the principles of the study of human movement.
2. Describe the range of factors that influence the initiation, production and control of human movement.
3. Identify the body's lever systems and their relationship to basic joint movement and classification.
4. Distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
5. Explain joint and muscle function and the forces acting upon the human body during various sporting activities.
6. Relate the different body systems necessary for human movement to occur.

UNIT I INTRODUCTION **9**

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNIT II KEY MECHANICAL CONCEPTS **9**

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application ofBiomechanics

UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY **9**

Gross (Whole-Body) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups - Anthropometric Data

UNIT IV ANATOMICAL DESCRIPTION **9**

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNIT V MECHANICS OF THE MUSCULOSKELETAL SYSTEM 9

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit - Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle - Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control

TOTAL 45

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Duane Knudson	Fundamentals of Biomechanics	Springer Science+ Business Media, LLC	2007
2	C. Ross Ethier Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

COURSES OFFERED TO OTHER DEPARTMENTS
OPEN ELECTIVES OFFERED BY BIOTECHNOLOGY

16BTBTOE01 **BIOREACTOR DESIGN** **3003100**

Course Objectives:

- To impart basic knowledge in bioprocess Engineering
- To design the bioreactors for various operations.
- To understand the principle and working of heat transfer equipments.
- To extend the knowledge in principle of heat transfer inside a bioreactor
- To construct the equipments used in mass transfer operations.
- To learn the equipments used in separation process.

Course Outcomes:

- Summarize the basic concepts in bioprocess Engineering.
- Design the bioreactors for various operations.
- Develop the heat transfer equipments for Bioprocess Engineering.
- Elaborate the principle of heat transfer in bioreactor.
- Construct the equipments used in mass transfer operations.
- Categorize the equipments used in separation process.

UNITI ENGINEERINGPROPERTIESANDSTORAGETANK (9)

Introductiontovariousmechanicalpropertiesofmaterialtobeusedmaterialofconstruction, designofcylindricalstoragetank.

UNITII REACTORDESIGN (9)

DesignofAirliftfermentor,BubblecolumnreactorandContinuousstirredtankreactor.

UNITIII HEATTRANSFEREQUIPMENTS (9)

DesignofShellandtubeHeatexchanger,Doublepipeheatexchanger,longtube verticalevaporatorandforcedcirculation evaporator.

UNITIV MASSTRANSFEREQUIPMENTS (9)

DesignofBollmannextractor,fractionatingcolumn,packedtowerandspraytrayabsorber

UNITV SEPARATIONEQUIPMENTS (9)

Designof plate andframefilter press,leaffilter,rotarydrumfilter,discbowlcentrifuge, rotart drumdrierandSwenson–walkercrystallizer.

TEXTBOOKS:

S.No	Author(s)Name	Titleofthebook	Publisher	Year of Publications
1	James Edwin Bailey, DavidF.Ollis	Biochemical Engineering Fundamentals	McGraw-Hill	2007
2	DonW.Green,RobertH. Perry	Chemical Engineer Handbook	The McGraw- Hill Companies, Inc.	2008

REFERENCEBOOKS

S.No	Author(s)Name	Titleofthebook	Publisher	Year of Publications
1	Pauline.M.Doran	BioprocessEngineering Principles	Academic Press	2013

16BTBTOE02 FOODPROCESSINGANDPRESERVATION 3003100

Course Objectives

- To learn the scope and importance of food processing.
- To impart basic knowledge in different food processing methods carried out in the food tech companies.
- To extend the brief knowledge in food conservation operations.
- To study the methods of food preservation by cooling.
- To familiarize the students on the concepts of preservation methods for fruits.
- To create deeper understanding on preservation methods for vegetables.

Course Outcomes

- Describe the scope and importance of food processing.
- Outline the various processing methods for foods.
- Extend the knowledge in food conservation operations.
- Describe the methods of food preservation by cooling.
- Summarize the preservation methods for fruits.
- Demonstrate the preservation methods for vegetables.

UNITI SCOPEANDIMPORTANCEOFFOODPROCESSING (9)

Properties of food- Physical, thermal, mechanical, sensory. Raw material Preparation - Cleaning,sorting,grading,peeling.

UNITII PROCESSINGMETHODS (9)

Heating- Blanching and Pasteurization. Freezing- Dehydration- canning- additives- fermentation- extrusion cooking- hydrostatic pressure cooking- dielectric heating- microwave processingandasepticprocessing–Infraredradiationprocessing- Conceptsandequipmentused.

UNITIII FOODCONVERSIONOPERATIONS (9)

Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membrane separation-filtration-equipmentandapplication.

UNITIV FOODPRESERVATIONBYCOOLING (9)

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect oflowtemperature onfood. Water activity, methods tocontrolwateractivity.

UNITV PRESERVATIONMETHODSFORFRUITSANDVEGETABLES (9)

Preprocessing operations-preservation byreductionofwatercontent:drying/dehydration and concentration –chemicalpreservation –preservation ofvegetablesbyacidification, preservation withsugar-Heatpreservation–Foodirradiation-Combinedpreservationtechniques.

TEXTBOOKS

S.No	Author(s)Name	Titleofthebook	Publisher	Year of Publications
1	R.PaulSingh,DennisR. Heldman	Introduction to food engineering.	Academic Press	2001
2	P.Fellows.	Food Processing Technology, Principles and practice.	Woodhead Publishing Ltd	2000
3	MirceaEnachescuDauthy	Fruit and Vegetable Processing	FAO agricultural services bulletin	1995

REFERENCEBOOKS

S.No	Author(s)Name	Titleofthebook	Publisher	Year of Publications
1	M.A. Rao, Syed S.H. Rizvi,AshimK.Datta	Engineering properties offoods	CRC Press	2005
2	B.Sivasankar	Food processing and preservation	PHI Learning Pvt.Ltd	2002

16BTBTOE03 BASICBIOINFORMATICS 3003100

Course Objectives

- To understand the available tools and databases for performing research in bioinformatics.
- To expose students to sequence alignment tool in bioinformatics.
- To construct the phylogenetic trees for evolution.
- To get familiar with the 3D structure of protein and classification.
- To acquire basic knowledge in protein secondary structure prediction.
- To extend the brief knowledge in Micro array data analysis.

Course Outcomes

- Summarize the basic concepts and importance of Bioinformatics in various sectors.
- Demonstrate the sequence alignment tool in bioinformatics.
- Construct the phylogenetic trees for evolution.
- Analyze the three dimensional protein structure and classification using various tools.
- Illustrate the protein secondary structure prediction by comparative modeling.
- Extend the knowledge in micro array technology and applications of bioinformatics in various sectors.

UNITI OVERVIEWOFBIOINFORMATICS (9)

Thescopeofbioinformatics; bioinformatics&theinternet;usefulbioinformatics sites.Data acquisition:sequencingDNA,RNA&proteins;determination ofproteinstructure;gene&protein expression data;proteininteractiondata. Databases–contents,structure&annotation:fileformats; annotatedsequencedatabases;miscellaneousdatabases.

UNITII RETRIEVALOFBIOLOGICALDATA (9)

DataretrievalwithEntrez&DBGET/LinkDB;dataretrievalwithSRS(sequence retrieval system).Searching sequencedatabasesbysequencesimilaritycriteria:sequencesimilarity searches;aminoacidsubstitution matrices;databasesearches,FASTA&BLAST;sequence filters;iterativedatabasesearches&PSI-BLAST.Multiple-sequence alignment,gene&protein families:multiple-sequence alignment&family relationships;proteinfamilies&pattern databases;proteindomainfamilies.

UNITIII PHYLOGENETICS (9)

Phylogenetics, cladistics &ontology; building phylogenetic trees; evolution of macromolecularsequences.Sequenceannotation:principlesofgenomeannotation;annotationtools &resources.

UNITIV STRUCTURALBIOINFORMATICS (9)

Conceptualmodelsofproteinstructure;therelationshipofproteinthree-dimensional structureto proteinfunction;theevolutionofproteinstructure&function;obtaining, viewing&analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure:CATH&SCOP;introduction toproteinstructureprediction;structurepredictionby comparativemodeling;secondary structureprediction;advancedproteinstructureprediction& predictionstrategies.

UNITV MICROARRAYDATAANALYSIS (9)

Microarray data,analysismethods;microarraydata,tools&resources;sequencesampling&SAGE.Bioinformatics inpharmaceuticalindustry:informatics&drugdiscovery; pharmainformatics resources.Basicprinciplesofcomputinginbioinformatics:runningcomputer software;computeroperatingsystems;softwaredownloading &installation;database management.

TEXTBOOK

S.No.	**Author (s) Name**	**Titleof thebook**	**Publisher**	**Year of Publication**
1	Dan E. Krane, Micha L. Rayme	Fundamental Concepts of Bioinformatics	Pearsoneducation	2004
2	Andreas D. Baxevanis, B. F. Francis Ouellette	Bioinformatics: A Practical GuidetotheAnalysisofGenes andProteins	Wiley-Interscience	2004
3	David W. Mount	SequenceandGenomeAnalysis	ColdSpringHarbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

REFERENCEBOOKS

S.No.	**Author (s) Name**	**Titleof thebook**	**Publisher**	**Year of Publication**
1	Michael J. Korenberg	Microarray Data Analysis: MethodsandApplications	Springer Science & BusinessMedia	2007

16BTBTOE04 FUNDAMENTALSOFNANOBIOTECHNOLOGY 3003100

Course Objectives

- To impart the skills in the field of nano biotechnology and its applications.
- To acquire knowledge in the nano particles and its significance in various fields.
- To extend the knowledge in types and application of nano particles in sensors.
- To define the concepts of biomaterials through molecular self assembly.
- To equip students with clinical applications of nano devices.
- To describe deeper understanding of the socio-economic issues in nanobiotechnology.

Course Outcomes

- Develop skills in the field of nano biotechnology and its applications.
- Summarize the nanoparticles and its significance in various fields.
- Extend the knowledge in types and application of nano particles in sensors.
- Define the concepts of biomaterials through molecular self assembly.
- Outline the clinical applications of nano devices.
- Describe the socio-economic issues in nanobiotechnology.

UNITI INTRODUCTION (9)

Introduction, ScopeandOverview,Lengthscales,Importance ofNanoscaleandTechnology, HistoryofNanotechnology, FutureofNanotechnology:NanoTechnologyRevolution,Silicon basedTechnology,BenefitsandchallengesinMolecularmanufacturing: TheMolecular assemblerconcept,Controversiesandconfusions,Understanding advancedcapabilities, NanotechnologyinDifferent,Fields:Nanobiotechnology,Materials,Medicine,Dentalcare.

UNITII NANOPARTICLES (9)

Introduction, Types of Nanoparticles, Techniques to Synthesize Nanoparticles, CharacterizationofNanoparticles, Applications,ToxiceffectsofNanomaterials, Significance ofNanoparticlesNanofabrications-MEMS/NEMS,Atomic ForceMicroscopy,Selfassembled monolayers/Dip-penNanolithography, SoftLithography, PDMSMolding,NanoParticles, Nanowires andNanotubes.

UNITIII APPLICATIONS (9)

Nanomedicine,NanobiocensorandNanofludics.Nanocrystals inbiologicaldetection, ElectrochemicalDNAsensorsandIntegratedNanolitersystems.Nano-Biodevices and Systems.Fabricationof NovelBiomaterialsthroughmolecularself assembly-Small scale systemsforinvivodrugdelivery-Futurenanomachine.

UNITIV NANOBIOTECHNOLOGY (9)

Clinicalapplicationsofnanodevices.Artificialneurons.Real-timenanosensors-Applicationsin cancerbiology.Nanomedicine.Synthetic retinylchipsbasedonbacteriorhodopsins.High throughputDNAsequencingwithnanocarbontubules.Nanosurgicaldevices.

UNITV ETHICALISSUESINNANOTECHNOLOGY (9)

Introduction,Socioeconomic Challenges,EthicalIssuesinNanotechnology: WithEspecial ReferencetoNanomedicine, NanomedicineAppliedinNonmedicalContexts,SocialIssues RelatingtoNanomedicine. SocialandEthicalIssues,EconomicImpacts,OtherIssues, Nanotechnologyand FutureSocio-economicchallenges.

TEXTBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Niemeyer,C.M. andMirkin,C.A	Nanobiotechnology:Concepts, Applicationsand Perspectives	Wiley-VCH	2004
2	Goodsell,D.S.	Bionanotechnology	JohnWiley andSons, Inc	2004

REFERENCEBOOKS

S.No.	Author(s) Name	Titleofthebook	Publisher	Yearof Publications
1	Shoseyov,O. and Levy,I	Nanobiotechnology: BioinspiredDevicesand Materialsof theFuture	Humana Press	2007
2	Bhushan,B.	SpringerHandbookof Nanotechnology	Springer-Verlag Berlin Heidelberg	2004
3	FreitasJrR.A	Nanomedicine	Landes Biosciences	2004
4	Kohler,M.and Fritzsche,W.	Nanotechnology–An IntroductiontoNanostructuring Techniques	Wiley-VCH	2004

Chemical Engineering (B. Tech)

CHOICE BASED CREDIT SYSTEM (CBCS)

Syllabus 2016-2017

DEPARTMENT CHEMICAL ENGINEERING

ENGINEERING

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)

(Establishedundersection3 of UGC Act,1956)

Pollachi Main Road, Eachanari (Post), Coimbatore- 641021, TamilNadu, India

Phone: 0422 –2980011 –15 FaxNo: 0422–2980022-23

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B.Tech Chemical Engineering **2016-2017**

Semester-I

16BTCE101 **English ForEngineers** **3H-3C**

Instruction Hours/week: L:3 T:1 P:0 **Marks:** Internal**:40** External**:60**Total**:100**

End Semester Exam:3 Hours

COURSE OBJECTIVES:

1. To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
2. To help students acquire their ability to speak effectively in real life situations.
3. To inculcate the habit of reading and to develop their effective reading skills.
4. To ensure that students use dictionary to improve their active and passivevocabulary.
5. To enable students to improve their lexical, grammatical and communicative competence.
6. To inspire the learner by his work and studies in different fields of engineering andscience.

COURSE OUTCOMES:

Students undergoing this course will be able to

1. Use English language for communication: verbal & non–verbal.
2. Enrich comprehension and acquisition of speaking &writingability.
3. Gain confidence in using English language in real lifesituations.
4. Improve word power: lexical, grammatical and communicationcompetence.
5. Understand the importance of writing skills and its techniques
6. Communicate the necessity to exercise humour in the daily life

Unit-I LSRW SKILLS & GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speakingand Representing) **(9)**

Listening–Types of listening- Listening to class reading - Video tapes/ Audio tapes. **Speaking** – Introduction on self. **Reading** - Reading for comprehension – Reading different kind of passages like descriptive, narrative, COURSE OBJECTIVES:, conversational and argumentative.**Writing**– Formal and Informal letters- Letters to the Editor.

Grammar&Vocabulary (Function Grammar & Technical Vocabulary)

Tenses -Articles.**Vocabulary**- Word Formation – Word expansion (Root word) - Prefix and Suffix.

Unit– II LSRW SKILLS & GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) **(8)**

Listening – Understanding the passage in English –Pronunciation practice. **Speaking** – Asking and answering questions. **Reading** – Critical reading – Finding key information in a given text

(Skimming - Scanning). **Writing**– Coherence and cohesion in writing – Short paragraph writing – Writing shortmessages.

Grammar&Vocabulary (Function Grammar & Technical Vocabulary)

WH questions –Yes/No Question - Subject Verb agreement. **Vocabulary**– Compound Nouns/Adjectives – Irregular verbs.

Unit-III LSRW SKILLS & GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (8)

Listening – Listening for specific task – fill in the gaps.**Speaking**– Phonemes – Syllables – Role play – Conversation Practice.**Reading**–comprehension passages based on general topics or matters of current affairs. **Writing** - Autobiographical writing &Biographicalwriting.

Grammar&Vocabulary (Function Grammar & Technical Vocabulary)

Preposition – Infinitive &Gerund.Vocabulary– Foreign words used in English – British and American usage.

Unit- IV LSRW SKILLS & GRAMMAR, CAREER ORIENTED

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (10)

Listening – Responding to questions – Reading in class for complete understanding and for better pronunciation. **Speaking** – Debate- Presentations in seminars.**Reading**– Making inference from the reading passage – Predicting the content of reading passages. **Writing** - Interpreting visual materials (tables, graphs, charts, etc) & Instruction writing.

Grammar&Vocabulary (Function Grammar & Technical Vocabulary)

Parts of Speech, Sentence pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

Unit-VLSRW SKILLS & GRAMMAR, FIELD WORK

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (10)

Listening –Distinction between native and Indian English (Speeches by TED and Kalam). **Speaking**-Extempore talk –Just-a-minute talk.**Reading**-Reading strategies–Intensive reading – Text analysis.**Writing-** Creative writing – Writing circulars and notices – Writing proposal.

Grammar&Vocabulary (Function Grammar & Technical Vocabulary)

Direct and Indirect speech – Conditional sentences - Auxiliary verbs.**Vocabulary**– Abbreviations & Acronyms.

Note: Students shall have hands on training in improving listening skill in the language laboratory@ 2 periods per each unit.

Total-45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Sangeeta Sharma, Meenakshi Raman	Technical Communication:Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lakshminarayanan, K.R. &Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2009
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication	Pearson Education,	2006

WEBSITES:

www.learnerstv.com– Listening/ Speaking/ Presentation
www.usingenglish.com– Writing/ Grammar
www.englishclub.com– Vocabulary Enrichment/ Speaking
www.ispeakyouspeak.blogspot.com– Vocabulary Enrichment/ Speaking
www.teachertube.com– Writing Technically
www.Dictionary.com – Semantic /Grammar

16BTCE102 ENGINEERINGMATHEMATICSI 3 2 0 4

COURSE OBJECTIVES:

1. To develop analytical skills for solving different engineering problems.
2. To understand the concepts of Matrices and vector differentiation.
3. To solve problems by applying Differential Calculus and Differential equations.
4. To recall and remember basics of matrices, complex numbers, and differential calculus
5. To understand the concepts of basic mathematical methods for matrices, complex numbers and differential calculus
6. To apply methods to solve engineering problems.

COURSE OUTCOMES:

The student will be able to

1. apply advanced matrix knowledge to Engineering problems.
2. improve their ability in solving geometrical applications of differential calculus problems
3. improve their ability in vector differentiation.
4. Students will be able to remember terminologies and formulae in matrices, complex numbers, and differential calculus
5. Students will be able to understand and interpret the concepts of matrices, complex numbers, and differential calculus.
6. Students will be able to compare and analyze the methods in matrices, complex numbers, and differential calculus

UNITI MATRICES (12)

Review of Matrix Algebra - Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction to canonical form through orthogonal reduction.

UNITII DIFFERENTIALCALCULUS (12)

Limits, Continuity (Concepts only)- Differentiation- Differentiation Techniques: standard formulae, product rule, quotient rule, chain rule, method of substitution, implicit functions and successive differentiation.

UNITIII GEOMETRICAL APPLICATIONS OFDIFFERENTIALCALCULUS (12)

Curvature – centre, radius and circle of curvature in Cartesian co- ordinates – Evolutes - Envelope – Evolute as envelope of normals.

UNITIV DIFFERENTIALEQUATIONS (12)

Introduction to Ordinary differential equations: Linear ordinary differential equations of second and higher order with constant coefficients.

Introduction to Partial differential equations: Linear Partial differential equations of second and higher order with constant coefficients.

UNITV VECTORDIFFERENTIATION (12)

Vectors-Differentiation of vectors – scalar and vector point functions –vector operator – vector operator applied to scalar point functions: Gradient; vector operator applied to vector point functions: Divergence and curl; Physical interpretation of divergence and curl, Directional derivative, solenoidal and irrotational vectors.

Total: 60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics	McGraw Hill Education (India) Private Limited, New	2014
			Delhi.	
2	Sundaram, V. Lakhminarayan,K.A. &Balasubramanian,R.	Engineering Mathematics for firstyear.	Vikas Publishing Home, New Delhi.	2006
3	Bali, N.P. & Manish Goyal	A Text Book of Engineering Mathematics	Laxmi Publications Pvt. Ltd., New Delhi.	2014

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Grewal . B. S.	Higher Engineering Mathematics	Khanna Publications, New Delhi.	2014
2	BhaskarRao. P. B, Sri Ramachary SKVS, BhujangaRao. M	Engineering Mathematics I	BS Publications, India.	2010
3	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
5	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES:

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.intmath.com/matrices-determinants
4. www. Intmath.com/calculus/calculus-intro.php

16BTPH103/16BTPH203 ENGINEERINGPHYSICS 3 0 0 3

COURSE OBJECTIVES:

1. To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology
2. To become acquainted with the terminologies of Electrodynamics, Optics and Relativity
3. For interpreting the notions of Electrodynamics, Optics and Relativity
4. For classifying and comparing these notions with respect to their domains of validity
5. In executing procedures toward solving problems in Electrodynamics, Optics and Relativity
6. In differentiating and organising basic ideas and mathematical relations of Electrodynamics, Optics and Relativity

COURSE OUTCOMES:

1. The students will have the knowledge on the basics of physics related to properties of matter, fiber optics, quantum, crystal physics and that knowledge will be used by them in different engineering and technologicalapplications
2. Recall and recognise the terminologies of Electrodynamics, Optics and Relativity
3. Interpret the notions of Electrodynamics, Optics and Relativity
4. Classify and compare these notions with respect to their domains of validity
5. Execute procedures toward solving problems in Electrodynamics, Optics and Relativity
6. Differentiate and organise basic ideas and mathematical relations of Electrodynamics, Optics and Relativity

UNITI PROPERTIES OF MATTERANDTHERMODYNAMICS (9) Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), Poisson‟s ratio- Torsional pendulum- bending of beams - bending moment – uniform and non uniform bending

Thermodynamics – laws of thermodynamics- concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNITII LASER ANDFIBEROPTICS (9)

Introduction – emission and absorption process- Einstein‟s coefficients derivation. Types of LASER - CO_2, Semiconductor LASER- Applications of LASER in industry and medicine.

Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNITIII QUANTUMPHYSICS (9)

Introductiontoquantumtheory–Blackbodyradiation-dualnatureofmatterand radiation – de Broglie wavelength, uncertainty principle –Schrödinger‟s wave equation – time dependent and time independent equations – particle in one dimensional box- physical significance of wave function, scanning electronmicroscope

UNITIV CRYSTALPHYSICS (9)

Lattice – unit cell – Bravais lattice – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCPstructures,crystal defects – point, line and surfacedefects

UNITV ULTRASONICS ANDNUCLEARPHYSICS (9)

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C – scandisplays,Medical applications – Sonogram. Introduction – basics about nuclear fission and fusion, Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- powerreactor.

Total- 45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Serway and Jewett	Physics for Scientists and Engineers with Modern Physics	Thomson Brooks/Cole, Indian reprint, New Delhi	2010
2	Gaur, R.K. and Gupta, S.C	Engineering Physics	Dhanpat Rai Publications,New Delhi.	2011
3	M.N. Avadhanulu and PG Kshirsagar	A Text book of Engineering Physics	S.Chand and company, Ltd., New Delhi	2011
4	**D.C. Ghosh, N.C. Ghosh, P.K. Haldar**	Engineering Physics	University Science, New Delhi	2011
5	**P. Khare, A. Swarup**	Engineering Physics: Fundamentals and Modern Applications	Jones & Bartlett Learning	2009

WEBSITES:

1. www.nptel.ac.in
2. www.physicsclassroom.com
3. www.oyc.yale.edu
4. www.physics.org

16BTCH103/16BTCH203ENGINEERING CHEMISTRY3 0 0 3 COURSE

OBJECTIVES:

1. To understand about the watertechnology.
2. To get the information on electrochemical cells, batteries, fuels and combustion.
3. To study about the corrosion and protective coatings.
4. To gain knowledge on adsorption phenomena.
5. To learn about properties, characteristics and applications of different molecules based upon chemical bonding and structure.
6. To understand different synthesis routes for preparation of variety of compounds.

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COURSE OUTCOMES:

1. This course will create an impact on the students and make them to realize the modern utility on electrochemical cells, batteries, fuels and combustion process, corrosion and adsorption methods.
2. To understand nature of chemical bonding in materials and predict their properties.
3. To comprehend various analytical techniques/ methods towards qualitative and quantitative analysis.
4. To outline synthesis procedures and separation techniques of some engineering substances.
5. To apply specific models and processes for better understanding of material properties and applications.
6. The students would be able to apply basic chemical concepts and principles in understanding simple real-life problems.

UNIT IWATERTECHNOLOGY (9)

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination (No problems) – Hardness – Types and estimation by EDTA method (No problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverseosmosis.

UNIT II ELECTROCHEMISTRY ANDSTORAGEDEVICES (9)

Electrolytic conductance-application (conductometric titration)- Electrochemical cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - Fe^{2+}vs dichromate) –-Batteries- Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H_2-O_2 Fuel Cell.

UNIT III FUELSAND COMBUSTION (9)

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method - Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, Combustion of fuel-Introduction-GCV-NCV- Problems on Calculation of GCV & NCV - Flue gas analysis.

UNIT IVCORROSION SCIENCE (9)

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings – Organic coatings-Paints - Constituents and functions –Inorganic coatings-Metallic coatings - Electroplating of Cu over Fe and Electro less plating (Ni) - Surface conversion coating - Hot dipping.- Anodizing of Al

UNIT V SURFACE CHEMISTRY ANDPHASERULE (9)

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm- Role of adsorbents in industries (catalysis and water softening).

Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company (P) Ltd., Chennai.	2012

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3rd Reprint NewDelhi.	2013
2.	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5th edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010
3.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009
4.	Dara.S.S	Text book of Engineering Chemistry.	S.Chand&Co.Ltd., New Delhi	2008
5.	Sharma.B. K	Engineering Chemistry	Krishna Prakasam Media (P) Ltd., Meerut	2001

WEBSITES:

1. http://www.studynotes.ie/leaving-cert/chemistry/
2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html3.http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
4. http://ocw.mit.edu/courses/#chemistry

16BTCE104 BASIC CHEMICAL ENGINEERING 3 0 0 3 100

OBJECTIVES

1. To study the basic unit operations and unit processes in Chemical industry
2. To study the Process instrumentation and safety
3. To introduce the student with basic concepts of ChemicalEngineering
4. Mastery of the basic principles of science and engineering science that underlie modern chemical and biological technologies
5. Creative application of this mastery of basic principles to the solution of problems in a broad range of career paths
6. Appreciation of the broader context of environmental, social, safety and economic issues that affect their decisions, and highest standards of ethical practice.

COURSE OUTCOMES:

1. Students will be able to convert units of simple quantities from one set of units to another set of units
2. Students will be able to calculate quantities and /or compositions, energy usages, etc.in various processes and process equipment such as reactors, filters, dryers, etc.
3. Gain knowledge of chemical processes and the need of safety in industries.
4. the ability to apply basic mathematics, physics, chemistry and biology that underlie the practice of modern technology.
5. The ability to apply the engineering sciences of mass and energy balances, thermodynamics of physical and chemical equilibria, and heat, mass and momentum transfer that underlie the analysis and design of process engineering components.
6. The ability to apply science and engineering in the analysis and evaluation of process engineering components and systems.

INTRODUCTION (Not included for examination) **3**

Introduction to chemical engineering; history of chemical engineering and chemical technology; Scope of Chemical Engineering, Nature of Industries.

UNIT I BASIC CHEMICAL CALCULATIONS 8

Basic Concepts: concept of mole, weight percent, mole percent, normality, molarity, molality, vapor pressure, partial pressure.

UNIT II UNIT PROCESSES 8

Introduction to unit processes with simple examples like sulfonation, polymerization, oxidation, hydrogenation, saponification, etherification, nitration, chlorination.

UNIT III UNIT OPERATIONS-I 8

Introduction, Definition, examples like Size reduction, sedimentation, filtration, Distillation, evaporation, absorption, extraction, fluid handling, mixing, solid handling, fluid-solid contacting, fluid-solid separation, fluid storage, crystallization, drying, leaching.

UNIT IVUNIT OPERATIONS-II **9**

Heat Transfer- Conduction, Convection, Radiation concepts and Heat Exchangers.Principle of Ion exchange, techniques and applications. Solid and liquid membranes; concept of osmosis; reverse osmosis; electro dialysis; ultrafiltration Fluid properties, fluid flows, flow measurement devices.

UNIT V BASIC CONCEPT OF CHEMICAL PROCESSES **9**

Conversion, Yield, efficiency, flow diagram, flow sheets, & block diagram, with examples.

Total: 45 hours

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	W.L. McCabe and J.C. Smith and Peter Harriott,	Unit operations in chemical engineering	Mc Graw Hill	1993
2	Coulson J M and Richardson J F	Chemical Engineering, Vol. I and II	Pergamon Press,NY	1990

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Himmelblau, D.H	Basic Principles and Calculations in Chemical Engineering	Prentice Hall, New York	1990
2	Badger and Banchero	Introduction to Chemical Engineering	McGraw Hill,	1954

WEBSITES

http://biochemie.lf2.cuni.cz/anglicky/biox2zimni/seminare/Chemistry%20calculations%20I.pdf

http://www.docbrown.info/page04/4_73calcs07mam.htm

https://docs.google.com/file/d/0B6mmcxyrKnEhdEY0ZTMzeHNVSHM/edit

16BTBT105 BASIC ELECTRICAL ANDELECTRONICSENGINEERING 3 0 0 3

OBJECTIVES

1. To impart the basic knowledge about the Electric circuits.
2. To understand the working of various Electrical Machines.
3. To know about various measuringinstruments.
4. To understand the basic concepts in semiconductor devices and digitalelectronics.
5. Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
6. Provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.

COURSE OUTCOMES:

1. The students shall develop an intuitive understanding of the circuit analysis, basic concepts of electrical machines, basics of electronics and be able to apply them in practical situation.
2. Predict the behavior of any electrical and magnetic circuits.
3. Formulate and solve complex AC, Dc circuits.
4. Identify the type of electrical machine used for that particular application.
5. Realize the requirement of transformers in transmission and distribution of electric power and other applications.
6. Function on multi-disciplinary teams.

UNITI ELECTRIC CIRCUITS& MEASUREMENTS 9

Ohm"s Law – Kirchoff"s Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase balanced Circuits.

UNIT II ELECTRICAL MACHINES 9

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III MEASURING INSTRUMENTS 9

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT IV SEMICONDUCTOR DEVICES AND APPLICATIONS 9

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics

UNITV DIGITALELECTRONICS 9

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems- simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mittle, V.M	Basic Electrical Engineering	Tata McGraw Hill Edition, New Delhi	2004
2	SedhaR.S	Applied Electronics	S. Chand & Co	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Muthusubramanian R, and Muraleedharan K A	Basic Electrical, Electronics and Computer Engineering	Tata McGraw Hill, Second Edition	2006
2	Nagsarkar T K and Sukhija M S	Basics of Electrical Engineering	Oxford press	2005
3	Mahmood Nahvi and Joseph A. Edminister	Electric Circuits	Schaum‟ Outline Series, McGraw Hill	2002
4	Premkumar N	Basic Electrical Engineering	Anuradha Publishers	2003

16BTPH111/16BTPH211 ENGINEERINGPHYSICSLABORATORY 0 0 4 2

COURSE OBJECTIVES:

1. To develop basic laboratory skills and demonstrating the application of physical principles.
2. Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components.
3. Analyze the behavior and characteristics of various materials for its optimum utilization.
4. Learn about the various electronic communication mechanisms and their usage in a practical manner
5. To design and plan the experimental procedure and to record and process the results.
6. To reach non trivial conclusions of significant of the experiments.

COURSE OUTCOMES:

1. The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technological applications.
2. The student will learn to draw the relevance between theoretical knowledge and the means to imply it in a practical manner by performing various relative experiments.
3. The student will be enabled to know about the characteristics and the behavior of various materials in a practical manner and gain knowledge about various communication mediums and its usage
4. Relate and apply the moment of inertia of the disc.
5. Translate sensory input into physical tasks
6. Recognize standards to perform a skill or task correctly

LIST OF EXPERIMENTS – PHYSICS

1. Determination of velocity of sound and compressibility of liquid – Ultrasonicinterferometer.
2. Determination of wavelength of mercury spectrum – spectrometergrating.
3. Determination of Young’s modulus of the material – Non uniform bending (or) Uniform bending.
4. Determination of Viscosity of liquid – Poiseuille’smethod.
5. Spectrometer Dispersive power of aprism.
6. Torsional pendulum – Determination of Rigiditymodulus.
7. Particle size determination using DiodeLaser
8. Determination of Laser parameters – Wavelength, and angle ofdivergence.
9. Determination of acceptance angle in an opticalfiber.
10. Determination of thickness of a thin wire – Air wedgemethod
11. Determination of Band Gap of a semiconductormaterial.
12. Determination of Specific resistance of a given coil of wire – WheatstoneBridge

16BTCH111/16BTCH211 ENGINEERING CHEMISTRY LABORATORY0 0 4 2

COURSE OBJECTIVES:

1. To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technicalcompetence.
2. To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence
3. To Provide the students with a solid foundation in Chemistry laboratory required to solve engineering problems.
4. To provide students with the knowledge of practical implementation of fundamental concepts.
5. The students with practical knowledge of the basic phenomenon/concepts of chemistry, the student face during course of their study in the industry and engineering field.
6. The students will be able to understand and explain scientifically the various chemistry related problems in the industry/engineering and develop experimental skills for building technical competence.

COURSE OUTCOMES:

1. The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
2. Analyze & generate experimental skills.
3. Enhance the thinking capabilities in the modern trends in Engineering & Technology.
4. Learn and apply basic techniques used in chemistry laboratory for preparation, purification and identification.
5. Employ the basic techniques used in chemistry laboratory for analyses such as chromatography, spectroscopy, volumetric titrations, conductometric, Pensky-Martens apparatus and stalagmometer.
6. Learn safety rules in the practice of laboratory investigations.

LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of alkalinity of Watersample.
2. Estimation of hardness of Water byEDTA
3. Estimation of chloride in Water sample (Argentometricmethod)
4. Determination of corrosion rate by weight lossmethod.
5. Conductometric Titration (Simple acidbase).
6. Conductometric Titration (Mixture of weak and strongacids).
7. Conduct metric Titration using $BaCl_2$ vs Na_2SO_4.
8. pH Titration (acid &base).
9. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or$K_2Cr_2O_7$).
10. Estimation of Ferric ion bySpectrophotometry.
11. Determination of water of crystallization of a crystalline salt (Coppersulphate).
12. Determination of molecular weight and degree of polymerization usingViscometry.
13. Determination of chemical oxygendemand.

16BTCE112 ENGINEERING WORKSHOP PRACTICE 0 0 4 2

COURSE OBJECTIVES:

1. To provide exposure to the students with hands on experience on various basic engineering practices in Mechanical, Electrical and Electronics Engineering.
2. The objective of the course to impart fundamental knowledge about some selected aspects of chemistry
3. To present fundamentals of graphics and drafting appropriate for developing functionalskill in computer aided drafting
4. To provide students with adequate knowledge and experience in preparing engineering drawings using AutoCAD
5. To teach students to read, construct and understand basic engineering drawings.
6. To help students acquire the skills pertinent to the production of properly detailed, formatted and dimensioned Engineering drawings.

COURSE OUTCOMES:

1. To provide exposure to the students with hands on experience on various basic Engineering practices in Civil and Mechanical Engineering
2. To provide exposure to the students with hands on experience on various basic Engineering practices in Electrical and ElectronicsEngineering.
3. Students will be able to analyze the material on the basis of their properties and thus assigning different weight age to their use for technical purposes.
4. Understand modern manufacturing operations, including their capabilities, limitations, and how to design economically.
5. Gain insight into how designers influence manufacturing schedule and cost, and cost of different components.
6. Learn how to analyze products and be able to improve their manufacturability and make the cost effectively.

PART – A (MECHANICAL)

i. WELDING

i. Preparation of arc welding of butt joints, lap joints and teejoints.

ii. BASICMACHINING

i. Simple Turning and Taperturning
ii. Drilling andTapping
iii. Sheet MetalWork
iv. Model making – Trays, funnels,etc.

iii. DEMONSTRATIONON

i. Smithyoperations
ii. Foundryoperations
iii. PlumbingWorks
iv. CarpentryWorks

PART –B (ELECTRICAL & ELECTRONICS)

iv. ELECTRICALENGINEERING

i. Study of electrical symbols and electricalequipment.
ii. Construct the wiring diagram for Stair casewiring.
iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energymeter.
iv. Measurement of electrical quantities – voltage, current, power & power factor in Rload.
v. Measurement of energy using single phase energy meter.

v. ELECTRONICSENGINEERING

i. Study of Electronic components– Resistor (color coding), capacitors and inductors.
ii. Soldering practice – Components Devices and Circuits – Using general purpose.
iii. Study of logic gates AND, OR, NOT, NOR and NAND.

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Jayachandran, K., Natarajan, S. and Balasubramanian, S	A Premier on Engineering Practices Laboratory	Anuradha Publishers, Kumbakonam	2007
2	Jeyapoovan, T., Saravanapandian, M	Engineering Practices Laboratory Manual	Vikas Puplishing House Pvt. Ltd, Chennai	2006
3	Bawa, H.S	Workshop Practice	Tata McGraw –Hill Publishing Company Limited, NewDelhi	2007

16BTBT113 **ENGINEERING GRAPHICS** **1 0 3 3 100**

OBJECTIVES

1. To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
2. To expose them to existing national standards related to technical drawings.
3. Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views
4. Understand the application of industry standards and techniques applied in engineering graphics
5. Apply auxiliary or sectional views to most practically represent engineered parts
6. Dimension and annotate two-dimensional engineering drawing

COURSE OUTCOMES:

On Completion of the course the student will be able to

1. perform free hand sketching of basic geometrical constructions and multiple views of objects.
2. do orthographic projection of lines and plane surfaces.
3. draw projections and solids and development of surfaces.
4. prepare isometric and perspective sections of simple solids.
5. demonstrate computer aided drafting.
6. Use the drawing instruments effectively and able to dimension the given figures

UNIT I INTRODUCTION **9**

Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

UNIT II SCALES AND PLANE CURVES **8**

SCALES:Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

UNIT III FREE HAND SKETCHING **9**

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT IV PROJECTION OF POINTS, LINES AND PLANE SURFACES **8**

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT V PROJECTION OF SOLIDS **8**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

Introduction to Drafting Software/Package (Not for Exam) **3**

Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings.Introduction to 3D primitives.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venugopal K and Prabhu Raja V	Engineering Graphics	New Age International Publishers	2007
2	VTU	A Primer on Computer Aided Engineering Drawing	Belgaum	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kumar M S	Engineering Graphics	D D Publications, Chennai	2007
2	Bureau of Indian Standards	Engineering Drawing Practices for Schools and Colleges SP 46-2003	BIS, New Delhi	2003
3	Luzadder W J	Fundamentals of Engineering Drawing	Prentice Hall Book Co., New York	1998

WEB REFERENCES

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawingsheets.
2. IS 9609 (Parts 0 and 1) – 2001: Technical products Documentation –Lettering.
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technicaldrawings.
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of TechnicalDrawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

16BTCC151 **YOGA** **1 0 0**

COURSE OBJECTIVES:

1.Yoga Education Helps To Develop The Self Discipline, Self Control, Awareness, Concentration And Higher Level Of Consciousness.

2.Yoga is to impart knowledge of yoga to graduates in order to enable them to teach yoga to the students in schools and colleges and to the interested public of all age groups.

3. To provide the necessary knowledge of the theory and practice of yoga so that the students learn to practice and also to teach yoga to all age groups for promoting their health and effectiveness

4.To give them a basic understanding of Yoga and its nature, scope, Development of yoga through the ages, Different types of yoga like Karma Yoga, Bhakti Yoga, Jnana Yoga, Raja yoga, Hatha yoga and Mantra Yoga, Meditation and Its nature and scope, Different types of meditation, the concepts Hatha Yoga Pradipika and GherandaSamhitha, Chakra theory and Kundalini yoga and relevance to the modern life.

5. To provide the necessary knowledge of human anatomy & physiology of Cell structure. systems in the body like Skeletal system, Muscular system, Digestive system, Circulatory system, Respiratory system, Excretory system, Endocrine system,

6. To provide the necessary knowledge of nature ,characteristics and development of Indian philosophy, Indian Philosophical systems like Vedic thought, Nyaya Philosophy, Vaisesika Philosophy ,Samkya Philosophy and Sankara philosophy.

COURSE OUTCOMES:

1. Demonstrate basic skills associated with yoga activities including strength and flexibility, balance and coordination. Demonstrate the ability to perform yoga movements in various combination and forms.
2. Understand and apply the knowledge of basic sequencing, and effective group management.
3. Demonstrate the ability to create and present various yoga sequences.
4. Demonstrate an understanding of health-related fitness components
5. Demonstrate an understanding of health-related fitness components: cardiorespiratory endurance, flexibility and body composition.
6. The student can understand the knowledge about the theory and practice of Yoga and its nature,scope, Development of yoga through the ages, Different types of yoga like Karma Yoga, Bhakti Yoga, Jnana Yoga, Raja yoga, Hatha yoga and Mantra Yoga, Meditation and Its nature and scope, Different types of meditation, the concepts Hatha Yoga Pradipika and GherandaSamhitha, Chakra theory and Kundalini yoga and relevance to the modern life.

AIM : To Enable The Student To Have Physical Health And Mental Health.

UNIT- I

Introduction To Yoga- Meaning Of Yoga – Concept Of Yoga- Aim And Objectives Of Yoga – History Of Yoga - Systems Of Yoga.- Stages (Or) Limbs Of Yoga

UNIT- II

Asanas-Surya Namashkar- Thdasana- Veerabadhra Asana- Trikonasana- Utkatasana- ArdhaChakrasana- Ardha Kati Chakrasana- Thandasana- Gomugasana- Padmasana- Vajrasana- Paschimottasana- Matsyendrasana-BavanaMukthasana- SuptaPadhangusthasana-Sethubhandhasana- Navasana- ArdhaBavanamukthasana- Mathasyasana- Naukasana- Bujangasana- Salabasana- Makkarasana-Dhanurasana.

UNIT- III

Advance Asanas- Sirasasana- Garudasana- Natrajasana- Rajakoptasana- Chakrasana- Kukutasana- Virikshasana- Sarvagasana- Halasana-. Mayurasana.

UNIT- IV

Pranayama- Meaning- Types Of Pranayama- Bhastrika- Bhramari- Udgeeth- Kabalbhati- Bahya- AnulomVilom- Pranay Pranayama- Benefits Of Pranayama. Neti - JalaNeti , Sutra Neti, Nouli- Three Types, Douthy-Three Types

UNIT- V

Mudras- Uses Of Mudras- Gyan- Shoonya- Apaan- Prana- Vayu- Prithvi- Linga- Apana- AdiMudra-- Agni Mudra- Surya Mudra- Varuna- Hakini Mudra.

REFERENCES:

S. No.	Author Name	Title Of Book	Publisher	Year of Publication
1.	Dr.K.Chandrasekaran	Sound Health Through Yoga	Prem Kalyan	2009
2.	B.K.S.Iyangar	Light On Pranayama	Crossroad Centuary	2013
3.	Thirumular	Thirumandhiram	Sriramakrishna Math	2016

SEMESTER II

16BTCC201ABUSINESSCOMMUNICATION 3 0 0 3

COURSE OBJECTIVES:

1. To help students comprehend the role of listening skills in effective communication.
2. To familiarize students with verbal and non-verbal communication.
3. To expose students to neutral accent.
4. To develop emotional intelligence skills in them for enhancing their self-esteem.
5. To assist them in setting goals and developing positive attitude.
6. To enable students to acquire decision making skills, problem solving skills and assertive skills.

COURSE OUTCOMES:

1. Design and deliver a persuasive presentation that convinces the audience of the topic's relevance and overcomes resistance, using appropriate visual support and adhering to a specified time limit.
2. Use a strategic communication model and critical thinking to identify objectives, analyze audiences, and choose the most effective structure and style for delivering strategically sound written and spoken messages.
3. Practice principles of effective business writing and document design in all written documents.
4. Build an understanding of different organizational cultures, business practices, and social norms to communicate more effectively in domestic and cross-cultural business contexts.
5. Develop their soft skills and inter personal skills, which will make the transition from college to workplace smoother and help them excel in their job.
6. To draft effective business correspondence with brevity and clarity.

UNIT I

What is Business Communication? - Types of Communication – Formal and informal communication – Process of Communication- modes of Communication – Barriers to communication.

UNIT II

Written Business Communication – Style- word-usage- organization of Ideas – mechanics of writing and fill up of forms - Cover Letter- Letter for Job Application-Letters ofComplaint -Memos- Resumes - Email- Reports Revising and proofreading- Advertising slogans- jargons- interpretation of graphs using expressions of comparison and contrast .

UNIT III

Reading and Understanding the news articles - Oral Business Communication - First Impressions - Attire – Effective Presentation strategies- Nuances of delivery – Controlling nervousness and stage fright- Visual aids Presentations- Capturing Audience - Tone - Behavior – TelephoneEtiquette- Non - verbal communication - Eye contact - Facial expressions - Posture - Gestures - Body langage – Etiquette- Organization of presentation – brain storming- Negotiations.

UNIT - IV

Difference between goals and dreams - SMART goal setting - 3 Ds of goal setting- Determination, Discipline and Direction - Developing the right attitude - Motivation - Intrinsic and Extrinsic motivation - Dealing with change - Dedication - Taking responsibilities - Decision making.

UNIT - V

Intrapersonal skills - Self-analysis - Thought process – Interpersonal skills - Confidence building - Resolving conflicts- Analytical skills - Team Building - Leadership skills - Planning/organizing - Ability to work independently - Professional ethics - Communicating via e-mail. Ethical perspectives and their implications for responsible communication - Proposal Presentation

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Meenakshi Raman ; Prakash Singh	1. Business Communication	Oxford University Press	2012

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Murthy, G .R. K.	Soft Skills for Success.	TheICFAI University Press, Hyderabad.	2008
2	Jagadeesan, G &Santanakrishnan, R.	Soft Skills Development:Training and Evaluation.	TheICFAI University Press, Hyderabad.	2008
3	Sherfield, Robert M., Rhonda J. Montgomery, & Patricia G. Moody	Developing Soft Skills.	Pearson Education, New Delhi.	2005

WEBSITES

http://tribehr.com/social-hr-software/talent-management/skills-trackingwww.ispeakyouspeak.blogspot.com
https://alison.com/subjects/6/Personal-Development-Soft-Skills
www.learningdevelopment.hr.toolbox.comhttp://www.niit.com/solution/soft-skill-training

16BTCC201B TECHNICAL ENGLISH 3 0 0 3

COURSE OBJECTIVES:

1. To motivate learners to acquire listening & speaking skills in both formal and informal context.
2. To focus on question forms & to make them understand the importance of using question tags and also the functional use of transformation of sentences.
3. To improve their reading habit and to train them in critical and analytical reading.
4. To equip them to write for academic as well as work place context.
5. To enable students to face interviews.
6. To prepare students to sit for assessments and evaluations such as tests and quizzes in order to test.

COURSE OUTCOMES:

1. Acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicativestrategies.
2. Enhance them reading texts critically andanalytically.
3. Develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluativewriting.
4. Enrich the ability to face interviews withconfidence.
5. Understand how to critically analyze data from research; incorporate it into assigned writing clearly, concisely, and logically; and attribute the source with proper citation.
6. Practice the unique qualities of professional rhetoric and writing style, such as sentence conciseness, clarity, accuracy, honesty, avoiding wordiness or ambiguity, using direct order organization, readability, coherence and transitional devices

UNIT-1 LSRW SKILLS &GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (9)

Listening - Difference between Hearing & Listening –Listening to informal conversation. **Speaking** - Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., **Reading** – Extensive and Intensive reading. **Writing** – Report writing - Writing a covering letter.

Grammar&Vocabulary (Function Grammar & Technical Vocabulary)

Regular & Irregular verbs - Kinds of sentences - Question tags. Homonyms and Homophones.

UNIT-II LSRW SKILLS &GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (9)

Listening – Note Taking- Improving grasping ability.**Speaking**– Welcome address - Vote of thanks - Master of ceremony.**Reading**– Active and Passive reading - Reading for vocabulary- Reading for a purpose. **Writing** - Writing a review (Film review) - Summary of a story.**Grammar&Vocabulary (Function Grammar & Technical Vocabulary**)

Modal verbs – Conjunction - Expression of cause and effect.Phrasal verbs - Idioms.

UNIT –III LSRW SKILLS & GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) **(9)**

Listening - Barriers to listening (Physical, Psychological, Linguistic & Cultural). **Speaking** – Stress, Pause and Intonation. **Reading** – Rapid reading – Skimming, Scanning and Surveying. (SQ3R)**Writing-** Essay writing - Minutes of meeting - Agenda

Grammar&Vocabulary (Function Grammar & Technical Vocabulary)

Active and Passive voice - Purpose expression. Same words used as noun and verb - Often misspelt and confused words.

UNIT-IV LSRW SKILLS & GRAMMAR, CAREER ORIENTED

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) **(9)**

Listening – Listening to telephone conversation - Viewing model interviews. **Speaking** – Group Discussion - Correlation between verbal & non - verbal communication.**Reading**– Reading comprehension (short & long text) - Reading job advertisements and profile of a company.**Writing**– Checklist preparation.

Grammar&Vocabulary (Function Grammar & Technical Vocabulary) **Grammar** - Numerical expressions – Collocations. Singular and Plural (Nouns)

UNIT- V LSRW SKILLS & GRAMMAR, FIELD WORK

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) **(9)**

Listening – Types of listening- Improving listening comprehension**. Speaking** - Oral presentation - Vocal communication techniques - Voice, quality, volume, pitch etc., **Reading** -Note making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation writing – Short essays writing-

Grammar&Vocabulary (Function Grammar & Technical Vocabulary)

Transformation of sentences (Simple, Compound & Complex).Collection of Technical Vocabularies with th meanings.

Note: Students shall have hands on training in improving listening skill in the language laboratory@ 2 periods each unit.

Total

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Sangeeta Sharma, Meenakshi Raman	Technical Communication:Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Lakshminarayanan, K.R. &Murugavel, T.	Communication Skills for Engineers	SCITECH Publications, Chennai	2008
2	Rizvi Ashraf, M	Effective Technical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES :

www.learnerstv.com– Listening/ Speaking/ Presentation
www.usingenglish.com– Writing/ Grammar
www.englishclub.com– Vocabulary Enrichment/ Speaking
www.ispeakyouspeak.blogspot.com– Vocabulary Enrichment/ Speaking
www.teachertube.com– Writing Technically
www.Dictionary.com– Semantic /Grammar

16BTCE202 ENGINEERINGMATHEMATICSII 3 2 0 4

COURSE OBJECTIVES:

1. To have knowledge in integral calculus and Vector calculus
2. To expose the concept of Analytical function and Complexintegration.
3. To introduce the basic concepts required to understand, construct, solve and interpret differential equations.
4. To teach methods to solve differential equations of various types.
5. To give an ability to apply knowledge of mathematics on engineering problems
6. To introduce the concept of Vector differentiation and integration that finds applications in various fields like solid mechanics, fluid flow, heat problems and potential theory.

COURSE OUTCOMES:

1. Solve problems in Fluid Dynamics, Theory of Elasticity, Heat and Mass Transfer etc.
2. Find the areas and volumes using Multiple Integrals
3. Improve their ability in Vector calculus
4. Expose to the concept of Analytical function.
5. Apply Complex integration in their Engineering problems
6. Students will be able to compare and analyze the methods in differential equations, multiple integration, integral calculus

UNITI INTEGRALCALCULUS (12)

Definite and indefinite integrals – Techniques of integration – Substitution rule, Trigonometric integrals, Integration by parts , Integration of rational functions by partial fraction, Integration of irrational functions – Improper Integrals.

UNITII MULTIPLEINTEGRALS (12)

Double integral – Cartesian coordinates – Polar coordinates – Area as double integrals- Change the order of integration – Triple integration in Cartesian co-ordinates.

UNITIII VECTORINTEGRATION (12)

Integration of vectors – line integral- surface integral- volume integral- Green‟s theorem - Gauss divergence theorem and Stoke‟s theorems (Statement Only), hemisphere and rectangular parallelopipeds problems.

UNITIV ANALYTIC FUNCTIONS (12)

Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms – Sufficient condition for an analytic function (Statement Only) - Properties of analytic functions – Constructions of an analytic function - Conformal mapping: w = z+a, az, 1/z and bilinear transformation.

UNITV COMPLEXINTEGRATION (12)

Complex Integration – Cauchy's integral theorem and integral formula (Statement Only) – Taylor series and Laurent series - Residues – Cauchy's residue theorem (Statement Only) - Applications of Residue theorem to evaluate real integrals around unit circle and semi-circle (excluding poles on the real axis).

Total: 60

TEXT BOOKS:

S.NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics I & II	McGraw-Hill Education Pvt.Ltd, New Delhi	2014
2	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2014

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Erwin Kreyszig	Advanced Engineering Mathematics.	John Wiley & Sons. Singapore	2011
2	Venkataraman, M. K.	Engineering Mathematics.	The National Publishing Company, Chennai	2005
3	Narayanan. S, Manicavachagam pillay.T.K and Ramaniah.G	Advanced Mathematics for Engineering Students.	Viswanathan S.(Printers and Publishers) Pvt. Ltd. Chennai.	2002
4	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

WEBSITES:

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.sosmath.com/diffeq/laplace/basic/basic.html
4. www.mathworld.wolframe.com

16BTCC204 ENVIRONMENTALSCIENCES 3 0 0 3

COURSE OBJECTIVES:

1. To give a comprehensive insight into natural resources, ecosystem and biodiversity.
2. To educate the ways and means of the environment
3. To protect the environment from various types of pollution.
4. To impart some fundamental knowledge on human welfaremeasures.
5. To recognize the interconnectedness of multiple factors in environmental challengesengage constructively with diverse forms of knowledge and experience
6. To identify the multiple scales, actors, and stakes of an issuerecognize and apply methodological approaches of the social sciences, natural sciences, and humanities

COURSE OUTCOMES:

1. Students will prepare themselves to go ecofriendly and help preserving the nature and environment.
2. Students will possess the intellectual flexibility necessary to view environmental questions from multiple perspectives, prepared to alter their understanding as they learn new ways of understanding.
3. Students will solve problems systematically, creatively, and reflexively, ready to assemble knowledge and formulate strategy
4. When encountering environmental problems students will assess necessary scientific concepts and data, consider likely social dynamics, and establish integral cultural contexts.
5. When faced with questions that lie beyond their current knowledge base, students will actively research data, concepts, histories, and narratives necessary for adequate consideration of the issue.
6. Students will communicate with precision, effective art, and sound rhetoric in writing, in speech, and in digital media

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES (9)

Definition, Scope and Importance – Need for publicawareness-Forestresources: Useandover-exploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources- role of an individual in conservation of natural resources.

UNIT II ECOSYSTEM (9)

Chemistry and Environment- Environmental segments, Composition and Structure of atmosphere-Concept of an ecosystem- Structure, components and function of an ecosystem Energyflowingthe ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marineecosystem)

UNITIII BIODIVERSITY (9)

Introduction to biodiversity,Definition-Geneticdiversity,Species diversity and Ecosystem diversity, Biogeographical classification of India, Importance of biodiversity-Value of biodiversity - Hot Spots of biodiversity-Threats to biodiversity - Endangered and Endemic Species of India–Conservationofbiodiversity-In-Situ and Ex-Situconservationof biodiversity.

UNIT IVENVIRONMENTALPOLLUTION (9)

Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control measures of urban and industrial wastes– Role of an individual in prevention of pollution–Disaster management-earthquake, tsunami, cyclone andlandslides.

UNIT V SOCIAL ISSUESANDENVIRONMENT (9)

From Unsustainable to Sustainable development, Urban problems related to energy sources, Water conservation, Rain water harvesting and Watershed management, Resettlement and rehabilitation of people, its problems and concerns, Environmental ethics- Issues and possible solutions- Climate change- Green house effect and Global warming, Acid rain, Ozonelayer

depletion, Wasteland reclamation- Environment Protection Act- Human Rights- Value education, Role of Information Technology in Environment and Human health-Population growth, Variation of population among nations-Populationexplosion.

Total: 45

TEXT BOOKS:

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Ravikrishnan, A	Environmental Science	Sri Krishna Hi tech PublishingCompany Private Ltd.,Chennai	2012
2.	Anubhakaushik C.P. Kaushik	Environmental Scienceand Engineering	New Age International (P) Ltd., New Delhi.	2010

REFERENCES:

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William P.Cunningham	Principles of Environmental Science	Tata Mc Graw -Hill Publishing Company, New Delhi.	2008
2.	Linda D. Williams	Environmental Science Demystified	Tata Mc Graw -Hill Publishing Company Ltd., New Delhi.	2005
3.	BharuchaErach	Environmental Science Demystified	Mapin Publishing (P) Ltd., Ahmedabad.	2005
4.	Tyler Miller G. Jr	Environmental Science	Thomson & Thomson Publishers, New Delhi.	2004
5.	Trivedi, R.K. and Goel, P.K	Introduction to Air Pollution	Techno-Science Publications, Jaipur.	2003

WEBSITES:

1. http://people.eku.edu/ritchisong/envscinotes1.html
2.http://nptel.ac.in/courses.php?disciplineId=120
3.www.newagepublishers.com/samplechapter/001281.
4.www.unesco.org/ext/field/beijing/scienceb.htm,www.infinitepower.org/education.htm
5. http://www.sciencedaily.com/news/top/environment/

16BTCE205 ENGINEERINGMECHANICS 3 0 0 3 100

COURSE OBJECTIVES:

1. To develop capacity to predict the effect of force and motion in the course of carrying out the design functions ofengineering.
2. students will learn a process for analysis of static objects; concepts of force, moment, and mechanical equilibrium; how to analyze forces and moments in two and three dimensions
3. They will be able to analyze forces in various systems such as frames, machines, trusses, beams and cables
4. The tools learned in this course will provide the basis for later courses and a career in engineering
5. To make them learn the fundamentals of Mechanics, equation of static equilibrium & dynamic equilibrium of particles and rigid bodies.
6. To learn the effect of friction on equilibrium¬

COURSE OUTCOMES:

1. Ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity andacceleration.
2. Ability to analyse the forces in anystructures.
3. Ability to solve rigid body subjected to dynamicforces.
4. Add forces and moments in two and three dimensions, and find a component of a force or moment in a given direction.
5. Construct free body diagrams of an object or a system of connected objects.
6. Describe conditions of equilibrium and their associated component equations.

UNIT I STATICS OF PARTICLES 9

Forces – system of forces – concurrent forces in plane and space– resultant – problems involving the equilibrium of a particle–free body diagram–equilibrium of particle in space.

UNIT II STATICS OF RIGID BODIES IN TWO DIMENSIONS 9

Rigid bodies–moment of force about an axis–moments and couples–equivalent system of coplanar forces–Rigid body in equilibrium–problems involving equilibrium of rigid body–types of supports–reactions of beams.

UNIT III CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA 9

Centroids of areas, composite areas, determination of moment of inertia of plane figures, polar moment of inertia – radius of gyration – mass moment of inertia of simple solids.

UNIT IV KINEMATICS OF PARTICLES 9

Introduction – plane, rectilinear motion – time dependent motion – rectangular coordinates – projectilemotion.

IMPULSE AND MOMENTUM: Concept of conservation of momentum – Impulse–Momentum principle– Impact – Direct central impact – Oblique central impact – Impact of elastic bodies.

UNIT V KINETICS OF PARTICLES AND FRICTION 9

Kinetics of Particles: Equations of motion–rectilinear motion–Newton's II law – D'Alembert's principle – Energy – potential energy–kinetic energy–conservation of energy–work done by a force – work energy method.

Laws of friction – coefficient of friction–problems involving dry friction – wedge and ladder friction.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Beer F P and Johnson E.R	Vector Mechanics for Engineers–Statics and Dynamics	Tata Mc–Graw Hill Publishing Co. Ltd., New Delhi	2012
2	Rajasekaran.S and Sankarasubramanian G	Engineering Mechanics–Statics and Dynamics	Vikas Publishing House Pvt. Ltd., New Delhi	2009

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Bansal R K	Engineering Mechanics	Laxmi Publications Pvt. Ltd., New Delhi	2006
2	Young D H and Timashenko S	Engineering Mechanics	Tata McGraw–Hill, New Delhi	2006
3	JivanKhachane and Ruchi Shrivastava	Engineering Mechanics: Statics and Dynamics	ANE Books, New Delhi	2006

WEB REFERENCES

1. http://nptel.iitm.ac.in/courses/Webcourse–contents/IIT%20Guwahati/engg_mechanics/index.htm
2. http://nptel.iitm.ac.in/video.php?subjectId=112103108
3. http://web.mit.edu/emech/dontindex–build/index.html
4. http://www.indiabix.com/engineering–mechanics/questions–and–answers/

16BTCE112 COMPUTER PRACTICE ANDPROGRAMMINGLABORATORY 1 0 43

COURSE OBJECTIVES:

1. To familiarize with open source office packages
2. To write programs for Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings andFunctions.
3. The students should be able to apply mathematical, scientific, electronic and computer engineering principles to identify, understand, evaluate and formulate solutions to meet industry and societal needs.
4. The students should utilize their aptitude, expertise and experience to solve industry oriented problems regarding Information Technology field and would lead in their professional area with their economic and managerial skill and field oriented knowledge.
5. The students should be able to nourish their research skill and involving themselves to current research oriented works.
6. The students will be provided with an educational foundation that prepares them to become entrepreneurs in the field of development and deployment of software, information systems and information management tools

COURSE OUTCOMES:

1. Study, analyze and understand logical structure of a computer program, and different construct to develop a program in „C language
2. Apply knowledge of mathematics, science and algorithm in solving complex Computer engineering problems.
3. Generate solutions by conducting experiments and applying techniques to analyze and interpret data
4. Design component, or processes to meet the needs within realistic constraints.
5. Identify, formulate, and solve Software Engineering, Networking and Data Mining problems.
6. Comprehend professional and ethical responsibility in computing profession

THEORY:

What is computer- Computer Components- What is C- C Character set- Constants, Variables and Keywords-General form of C Program - Relational and Logical Operators - Selection Structures- If and nested if - Switch Case - Loops-Definition and types- Functions- Arrays- Introduction to Strings- Pointers.

PRACTICALS:

1. Working with word Processing, Spreadsheet and presentation software inLinux

2. Programming inScratch:
   Practicing fundamental concepts of programming like sequence, selection decision statements, working of loops and event driven programming

3. CProgramming:
   Practicing programs to get exposure to basic data types, algebraic expressions, Conditional statements, Input and Output Formatting, Decision Statements, Switch Case, Control

structures, arrays, Strings and function, implementation of pointers.

Total Hours: 45

REFERENCES:

1. E. Balagurusamy, " Computing Fundamentals and C Programming", TMH Education, 5th Edition, 2014
2. YashavantKanetkar, " Let us C", BPB Publications, 13th Edition,2013

16BTCE213 PHYSICALCHEMISTRYLAB 2 0 2 3 100

OBJECTIVES

1. To Learn the chemical process kinetics and the distribution laws
2. To gain practical knowledge of rate constant and activation energy
3. The course provides training in advanced physical chemistry laboratory techniques.
4. The experiments are guided by demonstrators and are designed both to illustrateϖ applications of theory covered in the Chemical Physics and lecture courses, and to introduce typical instrumentation.
5. The investigation provides an introduction to research methods: a group of 3-4ϖ students are given a theme or problem and some apparatus; they must devise, build and execute experiments using less guidance than for the standard experiments.
6. Data analysis and structured report writing are key components of the course

COURSE OUTCOMES:

1 To determine the properties and characteristics ofsolvents and mixtures

2 Developed expertise relevant to the professional practice of chemistry

3 Developed an understanding of the breadth and concepts of physical chemistry

4 An appreciation of the role of physical chemistry in the chemical sciences and engineering

5 Developed an understanding of the role of the chemist and chemical engineer in tasks employing physical chemistry

6 An understanding of methods employed for problem solving in physical chemistry 6. Experience in some scientific methods employed in basic and applied physical chemistry

UNITI CHEMICAL KINETICS

Rate of a reaction-Order of a reaction – Examples and rate equations for Zero order, First order, Second order and Third order reactions –Molecularity of a reaction – Unimolecular and Bimolecular reactions – Half-life period– Kinetics of parallel and opposing reactions – Activation energy – Arrhenius equation – Collision theory of reaction rates – Theory of absolute reaction rates – Michalis Menton kinetics of enzyme catalyzed reactions.

UNIT II COLLOIDS

Introduction to colloids – properties of colloids – coagulation of solutions – Origin of charge on colloidal particles – Determination of size of colloidal particles – Donnan Membrane equilibrium – Emulsions – Gels – Applications of colloids – Nanoparticles (Au, Ag, Pt)– Preparation – Characterization – Properties – Application in catalysis and drug delivery systems.

UNITIIITHE DISTRIBUTION LAW

Distribution co-efficient - Distribution Law — Conditions for the validity of the Distribution law – I2–CCl4–H2O System – Nature of interaction of the solute with one of the solvents Dissociation-Association

Experiments

1. Determination of partition co-efficient of iodine between two immisciblesolvents

2. Determination of partition co-efficient of benzoic acid between two immisciblesolvents
3. Determination of Ka of the weakacid
4. Conductometric experiments- Verification of Oswald’sDilutionLaw
5. Determination of Rate Constant(K)
6. Determination of Activation Energy(ΔE)
7. Determination of standard electrode potential (Zn, Cu,Ag)
8. To study the adsorption of Acetic acid on charcoal and construct theIsotherm.
9. Application of Phase Rule to Phenol-Watersystem
10. To study the inversion of cane sugar bypolarimeter.
    a. Polarimeter-Inversion of canesugar
    b. Refractometer

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kund and Jain	Physical Chemistry	S.Chand and Company, New Delhi	1996
2	Puri B.H. Sharma L.R. and M.S.Prathama	Principles of Physical Chemistry	S.Chand and Company, New Delhi	2001

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Gordon M. Barrow	Physical Chemistry	Sixth Edition, Tata McGraw Hill	1998
2	Peter Atkins & Julio de Paula Atkins	Physical Chemistry	7th Edition, Oxford university press	2002
3	B.S.Bahl, Arun Bahl and G.D.Tuli	Essentials of Physical Chemistry	S.Chand and Company, New Delhi	2005

17BTCC251 **BUSINESSPLAN** **1 0 0 _**

COURSE OBJECTIVES:

1 To explain relevance of Ethics while taking business decisions.

2 Market & Opportunity Identification Intense market and industry research

3 Basic financial metrics and statements

4 Concepts of organizational structure and design

5 Negotiation and decision making

6 Team styles and leadership techniques

COURSE OUTCOMES:

1. Understands, explains and justifies the need for a business plan for a business venture.
2. An Understanding of Business Functions Providing Global Perspectives
3. Developing Critical and Analytical Thinking Abilities
4. Interpersonal Skill Development
5. Creating Social Sensitivity and Understanding CSR, Ethical and Sustainable
6. Business Practices Demonstrate sensitivity to social, ethical and sustainability issues Developing Entrepreneurship

Unit I

Entrepreneurship – Types- Entrepreneurial Competencies -Business Plan – Meaning - Basic parameters - Project parameters - Factors of successful business - Term Loans and Working Capital Management.

Unit II

Business Plan Process - Sources of Information – Online Resources - Offline Resources - Sources of Market Research - Benefits of market study - Coverage of market study.

Unit III

Business Plan components - Company description - Industry Analysis - Target Market - Competition - Strategic position - Risk assessment - Technology plan - Management and Organization – Government policy

Reference books:

1. Rhonda Abrams " The Successful business Plan Secret $ Strategies " PrenticeHall
2. Rhonda Abrams “The business plan in a day" PrenticeHall.
3. Business plan preparation - Entrepreneurship Development Institute ofIndia

SEMESTER III

16BTCE301 PROBABILITYANDSTATISTICS 3 2 0 4

COURSE OBJECTIVES

1. To introduce the concept of probability and Sampling techniques.
2. To understand the fundamentals of Experimental Designs and Quality Control.
3. Identify the types of data (qualitative, quantitative, discrete, and continuous).
4. Identify the types of sampling (random, stratified, systematic, cluster).
5. Identify the misuses of statistics.
6. Apply graphical methods of displaying data.

COURSE OUTCOMES:

1. The students would be exposed to statistical methods designed to contribute to the process of making scientific judgments in the face of uncertainty and variation.
2. How to calculate and apply measures of location and measures of dispersion -- grouped and ungrouped data cases.
3. How to apply discrete and continuous probability distributions to various business problems.
4. Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Understand the concept of p-values.
5. Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit
6. understand both the meaning and applicability of a dummy variable and the assumptions

UNIT-I PROBABILITY (11)

Probability – Definition – Law - conditional probability-Bayes theorem- Probability mass function - Probability density functions.

UNIT-II RANDOM VARIABLES (13)

Introduction to one dimensional random variables – Discrete – Continuous - Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Regression.

UNIT-III TESTINGOFHYPOTHESIS (12)

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions – Tests for independence of attributes and Goodness of fit.

UNIT –IV DESIGNOFEXPERIMENTS (12)

Analysis of variance – one way classification – CRD – Two-way classification – RBD – Latinsquare.

UNIT –V RELIABILITY ANDQUALITYCONTROL (12)

Concepts of reliability – hazard functions – Reliability of series and parallel systems – control charts for measurement ($\bar{X}$ and R charts) - Control charts for attributes (p, c and np charts).

TOTAL: 60

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	P.S.S.Sundar Rao and J.Richard	Introduction to Biostatistics and Research Methods	Prentice Hall of India, New Delhi.	2012
2	R.A.Johnson and C.B.Gupta	Miller and Freund"s Probability and Statistics for Engineers	Pearson Education Asia, New Delhi.	2007
3	S.C.Gupta and V.K.Kapoor	Fundamentals of Applied Statistics	Sultan Chand& Sons, NewDelhi	2007

WEBSITES

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld.Wolfram.com

17BTCE302 **ORGANIC CHEMISTRY** **3 0 0 3 100**

COURSE OBJECTIVES:

1. To enable the students to learn the type of components in which organic reactions take place and also to know the preparation of the essential organic compounds.
2. Laboratory skill acquisition (tactile skills as well as technical skills)
3. Intellectual skill development (including problem solving, scientific thinking, studying, research *etc.*)
4. Development of a scientific curiosity (thinking about how and why things happen in the way that they do)
5. Team / cooperative skill development
6. Understand the language and diagrammatic notation of organic chemistry and be able to communicate and apply this knowledge

COURSE OUTCOMES:

1. At the end of the course students will be in a position to have knowledge on various reaction mechanisms, preparation of organic compounds and their properties.
2. This will be a precursor for the study on Chemical Reaction Engineering.
3. Perform accurate and precise analysis in the field of analytical chemistry
4. students will be able to keep records of all performed analysis in the manner which is required in modern analytical laboratory.
5. Student will be able to do statistical analysis and evaluate repeatability of obtained results
6. Perform quantitative and qualitative analysis of known standards as well as unknown samples

UNITI CARBOHYDRATES 9

Introduction – various definitions and classifications of carbohydrates – Preparation, Physical & Chemical properties, Structure and Uses of Monosaccharides (Glucose & Fructose) Interconversions – Aldo pentose to aldo hexose–Aldo hexose to aldo pentose- aldose to isomeric Ketose – Ketose to isomeric Aldose – Aldose toepimer

UNITII HETEROCYCLIC COMPOUNDS 9

Preparation, Physical & Chemical properties and Uses of Pyrrole, Furan, Furfural, TetrahydroFuran, Thiophene, Indole, Pyridine, Quinoline and Isoquinoline.

UNITIII DYE CHEMISTRY 9

Witt‟s theory and modern theory of colors – Synthesis of Methyl red, Methyl orange, Congo red, Malachite green, para-rosaniline, phenolphthalein, fluorescence, Eosin dyes.

UNITIV SYNTHETIC ORGANIC CHEMISTRY 9

Preparation and Synthetic utilities of Grignard reagent, Ethyl aceto acetate and Malonic ester.

UNITV PHARMACEUTICALCHEMISTRY 9

Synthesis of Antimalarial drugs – isopentaquine and chloroquine Synthesis of Antibacterial drugs – Sulphaniliamide and Sulphapyridine.

TOTAL : 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	R.T. Morrison and R.N. Boyd	Organic Chemistry	VI Edition Prentice Hall Inc USA.	1996
2	K.S. Tiwari, N.K. Vishnoi and S.N. Malhotra	A text book of Organic Chemistry	Second Edition, Vikas Publishing House Pvt. Ltd New Delhi	1998

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Bahl B.S. and Arun Bahl	Advanced Organic Chemistry	3rd Edition, S. Chand & Co, New Delhi	2005
2	Felix A. Carroll	Perspectives on Structure and Mechanism in Organic Chemistry	John Wiley & Sons	2011

16BTCE303 PROCESS CALCULATIONS 3 1 0 4 100

COURSE OBJECTIVES

1. To teach concept of degree of freedom and its application to solution of mass and energy balance equations for single and network of units and introduce to processsimulators.
2. To perform stoichiometric calculations for chemical and non-chemical systems and to understand quantitative relationships between matter and energy involved in physiochemical processes
3. Perform basic engineering calculations
4. Perform mass balance calculations on existing processes (involving single and multiple units).
5. Use basic, applied chemistry/ thermodynamics in material balance calculations.
6. Successfully practice or apply the principles of Chemical Engineering in a variety of employment areas.

COURSE OUTCOMES:

1. understand and apply different systems of dimensions and , calculate compositions mixtures/solutions and determine pressure, volume and temperature of gasesusing equations ofstate
2. apply the law of conservation of mass for different batch and continuous unit operations
3. apply the law of conservation of mass for unit processes andevaluateyield,conversion, recycle ratio /purge /bypass of chemical reactors
4. apply energy balances for reacting systems and understand the effect of temperatureand pressure on heat of reaction
5. understand and apply molarity, molality, normality and molar fraction
6. Apply the heterogeneous mixtures (percentage by weight and by volume).

UNIT I UNITS AND DIMENSIONS 9

Conversion of Equations, Systems of Units,Fundamental Concepts: Basic and derived units, use of different system of units in process calculations. Introduction to Chemical Engineering Calculations: Basis, Mole Fraction and Mole Percent, Mass Fraction and Mass Percent, Concentration of different forms, Conversion from one form to another, Roult"s Law, Henry"s law, Antoine"s Equation. Clausius ClapeyronEquation.

UNIT II MATERIAL BALANCE WITHOUT CHEMICAL REACTION 9

Material Balance during Mixing, Humidity and Application of Psychrometric Chart, Solubility and Crystallization, Evaporator, Distillation Column, Absorption Column, Drier, Liquid - Liquid and Solid - Liquid ExtractionUnits.

UNIT III MATERIAL BALANCE WITH CHEMICAL REACTION 9

Single Reaction, Multiple Reactions, Reactions with Recycle, Purge and By-pass, Combustion Reaction, Calculation of Excess Air, Material Balance of Unsteady State Reaction systems.

UNIT IV ENERGY BALANCE 9

Enthalpy calculation for systems (single component and multi components) without Chemical Reaction with Mean and Temperature dependent Heat Capacity, Enthalpy calculation for systems

with Chemical Reactions.Heat of Reaction from Heat of Formation and Heat of Combustion Data, Effect of Temperature and Pressure on Heat of Reaction, Hess's Law, Adiabatic Flame Temperature, Theoretical Flame Temperature.

UNIT –V COMBUSTION 9

Fuels and combustion; Calculation of theoretical and excess air from combustion of solid, liquid and gaseous fuels.Composition of flue gases by Orsat analyzer.

Lecture:45, Tutorial:15, TOTAL:60

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Himmelblau D.M	Basic Principles and Calculations in Chemical Engineering	8 th Edition, Prentice Hallof India, NewDelhi	2013
2	Venkataramani V. and Anantharaman N. and Meera SheriffaBegam K.M.	Process Calculations	2nd Edition, Prentice Hall of India, New Delhi	2011

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	HougenO.A.,Watson K. M. and Ragatz R. A.,	Chemical Process Principles. Part I. Material and Energy Balances	2 nd Edition, John Wiley & Sons, New York	1956
2	Bhatt B.L and Vora S.M	Stoichiometry	4^{th} Edition, Tata McGraw Hill Publishing Company, New Delhi	2004

WEBSITES

http://www.msubbu.in/sp/pc/http://che31.weebly.com/uploads/3/7/4/3/3743741/lect12-recycle-bypass-purge.pdfhttp://facstaff.cbu.edu/rprice/lectures/

http://che31.weebly.com/course-materials.html

16BTCE304 **FLUID MECHANICS** **3 0 0 3 100**

COURSE OBJECTIVES:

1. To impart to the students the knowledge on fluid properties, fluid statics, dynamic characteristics for through pipes and porous medium, flow measurement and fluid machineries.
2. a foundation in the fundamentals of fluid mechanics;
3. practice in the analytical formulation of fluid mechanics problems using Newton's Laws of motion and thermodynamics;
4. an introduction to experimental methods;
5. an exposure to practical applications, work on a small design project, and the writing of a technical report related to the design project
6. understanding basic laws, principles and phenomena in the area of fluid mechanics

COURSE OUTCOMES:

1. Comprehend the principles of fluid properties, fluid statics and fluid flow problems and apply the same in chemical process industries
2. Analyze flow behavior of solid and liquid and to demonstrate the understanding of packed and fluidized bed
3. Understand and select fluid moving machinery for different applications in process industries
4. Understand and select characteristics of pumps, flow meters and valves for different applications in process industries.
5. Identify how properties of fluids change with temperature and their affect on pressure and fluid flow.
6. Describe fluid pressure and its measurement

UNITI FLUIDPROPERTIES **9**

Methods of analysis and description - fluid as continuum – Velocity and stress field - Newtonian and non-Newtonian fluids – Classification of fluid motion.

UNIT II FLUID STATICS **9**

Fluid statics – basic equation - equilibrium of fluid element – pressure variation in a static fluid - application to manometry – Differential analysis of fluid motion – continuity, equation of motions, Bernoulli equation and Navier- Stokes equation.

UNITIII PRINCIPLES OF FLUID FLOW **9**

The principle of dimensional homogeneity – dimensional analysis, Rayleigh method and the Pi-theorem - non-dimensional action of the basic equations - similitude - relationship between dimensional analysis and similitude - use of dimensional analysis for scale up studies

UNITIV FLUIDFLOWS 9

Reynolds number regimes, internal flow - flow through pipes – pressure drop under laminar and turbulent flow conditions – major and minor losses; Line sizing; External flows - boundary layer concepts, boundary layer thickness under laminar and turbulent flow conditions- Flow over a sphere – friction and pressure drag - flow through fixed and fluidized beds.

UNITV FLOW MEASUREMENT 9

Flow measurement - Constant and variable head meters; Velocity measurement techniques; Types, characteristics and sizing of valves; Classification, performance characteristics and sizing of pumps, compressors and fans

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	McCabe W.L., Smith J.C. and Harriot P	Unit Operations in Chemical Engineering	7 th Edition, McGraw Hill International Edition, New York	2006.
2	Noel de Nevers	Fluid Mechanicsfor ChemicalEngineers	3rdEdition, McGrawHill, New York	2004.

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Cengel, YunusandCimbala JohnM	Fluid Mechanics Fundamentals and Applications	2 nd Edition, Tata McGraw Hill Publishing Company, New Delhi	2006
2	Munson B.R., Young D.F., Okiishi T.H. and HuebschW.W	Fundamentals of Fluid Mechanics	6thEdition, Wiley India, New Delhi,	2010
3	James O Wilkes and Stacy G Bike,	Fluid Mechanics for Chemical Engineers	Prentice Hall PTR (International series in ChemicalEngineering)	2013
4	John F. Douglas	Fluid Mechanics	Pearson/Prentice Hall	2005

WEBSITES

1. https://books.google.co.in/books?id=FzQz6A6SnyoC&printsec=frontcover#v=onepage&q&f

1. 2. http://eprints.staffs.ac.uk/222/1/engineering-fluid-mechanics%5B1%5D.pdf

2. 3. http://nptel.ac.in/downloads/103104043/

3. 4. http://chemical.eng.usm.my/notes/HEKARL/notes/ekc212_notes.pdf

16BTCE305 MECHANICAL OPERATIONS 3 0 0 3 100

COURSE OBJECTIVES:

1. In this course, the students will learn characterization of solids, size reduction techniquesof solid – fluid separation andmixing.
2. To understand particulate solid characterization and storage and transportation of solids
3. To understand principles of size reduction and equipment for size reduction
4. To understand solid-liquid, liquid-liquid, gas-solid and solid-solid Mechanical separation
5. Study different properties of particulate solids, handling and mixing of solid particles.
6. Study principles of communition and different types of equipment for size reduction like crushers, grinders

COURSE OUTCOMES:

1.Apply the principles of size analysis, handling, storage and transportation for handling solids in chemical processindustries

2.Analyze the size reduction techniques of solids by selecting proper equipments such as crushers, grinders,etc.

3.Understand the working principles of gravity settling tank, cyclone separators, Filters and other mechanical separationdevices

4. Recognize mixing and agitation equipments, power calculation and selection of mixing

5. Knowledge of size reduction machineries for various industries and calculate power requirement

6.Knowledge to design Gravity and Centrifugal settling processes for various applications, including pollution control in industry

UNITI CHARACTERISTICS ANDSCREENING 9

Characteristics and General characteristics of solids, different techniques of size analysis, shape factor, surface area determination, estimation of particle size. Screening methods and equipment, screen efficiency, ideal and actualscreens.

UNITII SIZE REDUCTION 9

Laws of size reduction, energy relationships in size reduction, methods of size reduction, classification of equipments, crushers, grinders, disintegrators for coarse, intermediate and fine grinding, power requirement, work index; size enlargement - principle of granulation, briquetting, pelletisation, andflocculation.

UNITIII MECHANICAL SEPARATIONS 9

Gravity settling, sedimentation, thickening, elutriation, double cone classifier, rake classifier, bowl classifier. Centrifugal separation - continuous centrifuges, super centrifuges, design of basket centrifuges; industrial dust removing equipment, cyclones and hydro cyclones, electrostatic and magnetic separators, heavy media separations, floatation, jigging.

UNITIV FILTRATION 9

Theory of filtration, Batch and continuous filters, Flow through filter cake and filter media, compressible and incompressible filter cakes, filtration equipments - selection, operation and design of filters and optimum cycle of operation, filteraids.

UNITV MIXINGAND AGITATION 9

Mixing and agitation - Mixing of liquids (with or without solids), mixing of powders, selection of suitable mixers, power requirement for mixing. Storage and Conveying of solids - Bunkers, silos, bins and hoppers, transportation of solids in bulk, conveyer selection, different types of conveyers and their performancecharacteristics.

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	McCabe, W.L., Smith, J.C., and Harriot, P	Unit Operations in Chemical Engineering	7th Edn., McGraw-Hill	2005
2	Badger W.L. and BancheroJ.T	Introduction to Chemical Engineering	Tata McGraw Hill	1997

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Coulson, J.M. and Richardson, J.F	Chemical Engineering	Vol. I, 4th Edn.,Asian Books Pvt. Ltd.,India	1998
2	Badger Walter L. and Banchero Julius T	Introduction to Chemical Engineering	Tata McGraw Hill Publishing Company, New Delhi	Reprint 2008.
3	Dr. CM Narayan and Dr. B.C. Bhattacharya	Mechanical Operation for Chemical Engineers.	CBS Publishers & Distributors Pvt. Ltd	2010

16BTCE311 **ORGANIC CHEMISTRY LABORATORY** **0 0 3 2 100**

COURSE OBJECTIVES:

1. To learn basic principles involved in analysis and synthesis of different organic derivatives
2. to provide a solid foundation of organic chemistry for students considering advanced studies in chemistry and other important areas such as biochemistry, medical fields, applied life sciences that require a though understanding of organic chemistry
3. provide practical training on identification of various functional group present in organic compounds
4. To characterize the structure of the organic compound by interpreting IR, UV, 1H NMR and Mass spectral data.
5. To learn about the estimation methods for glucose, Phenol etc. and preparation by multistage method
6. To understand the shapes of different orbitals. nd understand different principles for filling electrons.

COURSE OUTCOMES:

1. The student is able to identify what distinguishes a strong and weak nucleophile and recall the rules ofreactions.
2. The student shows their mastery of nomenclature since ethyl bromide is not drawnout.
3. The student analyzes a list of compounds and determines their reactivity.
4. Gain an understanding of composition of matter and its properties.
5. Recognize the ways that elements are combined to form compounds (ionic, covalent, and dative bonding).
6. Be able to write and balance chemical equations and perform calculations involving equations.

LIST OF EXPERIMENTS

1. Quantitative analysis of organic compounds – Identification of aliphatic/aromatic, saturated/unsaturatedcompounds.
2. Identification and characterization of various functional groups by theircharacteristic reactions:
   a) alcohol, b) aldehyde, c) ketone, d) carboxylic acid, e) phenol, f) ester, g)primary, secondary and tertiary amines h) imide i) nitrocompounds.
3. Analysis of an unknown organic compound and preparation of suitable solidderivatives
4. Analysis of carbohydrates.
5. Analysis ofproteins.
6. Methodology of filtration andrecrystallization.
7. Introduction to organic syntheticprocedures:
   i. Acetylation – Preparation of acetanilide from aniline.
   ii. Hydrolysis – Preparation of salycilic acid from methylsalyciliate.

iii. Substitution – Conversion of acetone toiodoform.

iv. Nitration – Preparation of m-dinitrobenzene fromnitrobenzene.

v. Oxidation – Preparation of benzoic acid from benzaldehyde/ benzylalcohol

TOTAL: 45

16BTCE312 FLUID MECHANICS LABORATORY 0 0 3 2 100

COURSE OBJECTIVES:

1. To learn experimentally to calibrate flow meters, find pressure loss for fluid flows and determine pumpcharacteristics.
2. To provide practice in estimating friction losses.
3. To impart training to use various flow measuring devices for making engineering judgments
4. Demonstrate the classical experiments in fluid mechanics and hydraulic machinery.
5. Correlate various flow measuring devices such as Venturimeter, orifice meter and notches etc.
6. Discuss the performance characteristics of turbines and pumps

COURSE OUTCOMES:

On completion of the course the students will be able to

1. determine the coefficient of discharge for venturi / orifice meter, open drum orifice and-notch, validate the Moody's diagram for flowthrough straight pipe / concentric pipes and helicalcoil
2. assess the frictional loss coefficient for different valves and pipefittings
3. appraise pressure drop through packed bed and estimate minimum fluidization

   velocity influidized bed
4. Understanding of basic physics of fluids,Gaining knowledge to calculate and design engineering applications involving fluid.
5. Understanding of analyzing flow systems in terms of mass, momentum, and energy balance.
6. Having knowledge about current research topics about fluid mechanics.
7. Verification of Bernoulli's Equation and Impact of jet on vanes and Performance test on Pelton wheel turbine

1.

LIST OF EXPERIMENTS

1. Viscosity measurement of nonNewtonian
2. Calibration of constant and variable headmeters
3. Calibration of weirs and notches
4. Open drum orifice and drainingtime
5. Flow through straightpipe
6. Flow through annularpipe
7. Flow through helical coil and spiralcoil
8. Losses in pipe fittings and valves
9. Characteristic curves ofpumps
10. Hydrodynamics of fluidizedbed
11. Drag coefficient of solidparticle

TOTAL: 45

16BTCE313 STRENGTH OF MATERIALS AND METALLURGY LABORATORY 0 0 3 2 100

COURSE OBJECTIVES:

1. To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally appliedloads.
2. This would enable the student to have a clear understanding of the design for strength andstiffness.
3. Develop an understanding of the fundamental principles of mechanics of materials (strength of materials) ;
4. Develop an ability to analyze engineering structures using finite element analysis.
5. Develop an ability to measure mechanical properties of deformable bodies.
6. To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads.

COURSE OUTCOMES:

On completion of the lab course the students will be able to

1. Analyze how different types of forces are to be considered and how to quantify them.
2. Design. Study of different types of stresses and strains occurring in various components of the structure.
3. Know the advantages and disadvantages of various geometric sections available for engineeringdesign.
4. Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials.
5. Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings.
6. Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels.

LIST OFEXPERIMENTS

1. Tensile test on metals–stress straincharacteristics
2. Cupping test on metal sheets–load deformation characteristics, cupping load,cupping number.
3. Hardness test on metals–Brinell and Rockwell Hardnesstests.
4. Impact test on metals–Charpy, Izod impacttests.
5. Shear test on metals–direct shear strength, single shear, doubleshear.
6. Tests on helical springs–compression, tension springs–load deformationcharacteristics, stiffness, shear stress, modulus of rigidity, energy.
7. Torsion test on beams–torque and angle of twist characteristics, shear

stress,modulusof rigidity,energy.

8. Microscopic examination of i) Hardened samples ii) Hardened and temperedsamples.
9. Tempering – Improvement of Mechanical properties –Comparison for i)Unhardened specimen ii) Quenched specimen iii) Quenched and temperedspecimen.
10. Study of low carbon steel and medium carbonsteel.

TOTAL	**45**

16BTCE314 COURSE ORIENTED PROJECT I 0 0 2 1 100

17BTCE351 SOFTSKILLS 1 0 0 - 100

COURSE OBJECTIVES:

1. To help the students understand interpersonal skills.
2. To support them in building interpersonal skills.
3. To better the ability to work with others.
4. to help formulate problem solving skills,
5. to guide students in making appropriate and responsible decisions, to create a desire to fulfill individual goals,
6. to educate students about unproductive thinking, self-defeating emotional impulses, and self-defeating behaviors.

COURSE OUTCOMES:

1. ability to communicate smartly and effectively with co-workers, relationship enhancement
2. Improvement of time management and organizational skill.
3. development of leadership teamwork, creativity, efficiency &productivity
4. development of presentation skills
5. ability to recognize stress symptom & develop stress deflecting strategies
6. brain storming &problem-solving strategies to increase creativity and collaborative COURSE OUTCOMES:

UNIT I 4

Overview to communication, self-Introduction, Presentation on their own topic, Extempore, Group Activity

UNIT II 3

Group Discussion, Do's and Don"ts of Group Discussion, Body language, Grooming and Resume, Resume correction

UNIT III 4

Introduction to HRM – Questions - Do's and Don"t's - Interview - Mock GD - Stress Management

UNIT IV 4

Personality Development - Presentation skills, Interpersonal skills, Critical thinking, Confidence building and Stress management.

TOTAL 15

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Barun K Mitra	Personality Development and Soft Skills	Oxford University Press- New Delhi	2012
2	Rajiv K. Mishra	Personality Development	Rupa & Co	2012

SEMESTER IV

16BTCE401 **CHEMICAL TECHNOLOGY** **3 0 0 3 100**

COURSE OBJECTIVES:

1. To impart the basic concepts of chemical technology.
2. To develop understanding about unit process and operations in various chemical industries.
3. To learn manufacturing processes of organic and Inorganic Chemicals and its applications.
4. To study process technologies of various organic and inorganic process industries.
5. Differentiate the different unit operations and unit processes involved in conversion of monomer to polymers
6. Interpret various kinds of applicationoriented problems faced in chemical industries using analytical techniques

COURSE OUTCOMES:

On completion of the course the students will be able to

1. understand the role of chemical engineers in process industries and develop block diagrams and flow charts for manufacture of different chemicals
2. comprehend the unit operations/ processes in chloroalkalies, nitrogen and sulphur industries
3. gain knowledge in the manufacture of plant nutrients, agrichemicals and fertilizers
4. apply principles of chemical engineering in wood chemicals, oils, fats/ soap manufacturing Units.
5. The student learnt the importance of chemical process industries over the other manufacturing industries.
6. The student had a brief introduction of chemical process equipment, the application of thermodynamics, the chemical process principles, the equipment design and so on

UNITI PRODUCTION PROCESSES

Production of pulp, paper and rayon, Manufacture of sugar, starch and starch derivatives, Gasification of coal and chemicals fromcoal.

UNIT II INDUSTRIAL MICROBIAL PROCESSES AND EDIBLE OILS 9

Fermentation processes for the production of ethyl alcohol, citric acid and antibiotics, Refining of edible oils and fats, fatty acids, Soaps and detergents.

UNIT III ALKALIES AND ACIDS 9

Chlor - alkali Industries: Manufacture of Soda ash, Manufacture of caustic soda and chlorine - common salt. Sulphur and Sulphuric acid: Mining of sulphur and manufacture of sulphuric acid. Manufacture of hydrochloric acid.

UNIT IV CEMENT GASES, WATER AND PAINTS 9

Types and Manufacture of Portland cement, Glass: Industrial Gases: Carbon dioxide, Nitrogen, Hydrogen, Oxygen and Acetylene - Manufacture of paints - Pigments

UNIT V FERTILISERS **9**

Nitrogen Fertilisers; Synthetic ammonia, nitric acid, Urea, Phosphorous Fertilisers: Phosphate rock, phosphoric acid, super phosphate and Triple Super phosphate.

TOTAL : 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	George TAustin	Shreve's ChemicalProcess Industries - International Student Edition	McGraw Hill Inc	2015
2	Sittig M. and Gopala Rao M	Dryden's Outlines of Chemical Technology for the 21st Century	WEP East West Press	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	SrikumarKoyikkal	Chemical Process Technology and Simulation	PHI Learning Ltd	2013
2	Shukla and G.N. Pandey	Text book on Chemical Technology	Vikas publishing company	2009

16BTCE402 CHEMICAL ENGINEERING THERMODYNAMICS 3 1 0 4 100

COURSE OBJECTIVES:

1. Students will learn PVT behavior of fluids, laws of thermodynamics, thermodynamic property relations and their application to fluid flow, power generation and refrigeration processes.
2. To understand and be able to use the first law of thermodynamics for open and closed systems, to set up energy balances for steady- and unsteady-state processes and to solve them for simple and classic cases.
3. To understand and be able to use the second law of thermodynamics, to set up entropy balances for steady- and unsteady-state processes and to solve them for simple and limiting cases to establish bounds for solutions to engineering problems.
4. To evaluate thermodynamic properties of pure substances with special emphasis on fluids.
5. To understand and be able to use the first law of thermodynamics for open and closed systems, to set up energy balances for steady- and unsteady-state processes and to solve them for simple and classic cases. 2. To understand and be able to use the second law of thermodynamics, to set up entropy balances for steady- and unsteady-state processes and to solve them for simple and limiting cases to establish bounds for solutions to engineering problems.
6. To be able to calculate heat transfer rates associated with processes involving phase changes and reactions. To be able to calculate standard heats of reaction.

COURSE OUTCOMES:

On completion of the course the student will be able to

1. apply thermodynamic concepts and the laws of thermodynamics to various systems and processes
2. understand the properties of solution and determine the partial molar properties from mixture properties and vice-versa
3. apply the criterion for equilibrium between phases to engineering systems with two or more co-existingphases
4. apply chemical reaction equilibrium for thermodynamic analysis of homogeneous reactions
5. Students will derive fundamental equations that govern the estimation of solution properties. *(Understanding)*
6. Students will compute phase equilibrium data and construct P-x-y, T-x-y diagram for ideal binary miscible vapour-liquid systems.

UNIT –I LAWS OFTHERMODYNAMICS 12

Laws of Thermodynamics Laws of Thermodynamics: Basic concepts; Zeroth l aw; First Law - applications to non-flow and flow processes; Second Law - heat engines, Carnot cycle and theorem, Entropy calculations; Third Law ofthermodynamics.

UNIT –II PROPERTIES OF REAL GASES AND THERMODYNAMICS FORMULATIONS 12

Propertiesof Real Gasesand Thermodynamics Formulations: PVT behavior of fluids - compressibility factor, two- and three-parameter theorems of corresponding states; Equation of states- Virial, VanderWaals, Redlich-Kwong and Peng-Robinson equations; Basic energy relations; Maxwellrelations.

UNIT –III PROPERTIESOFSOLUTIONS 12

Partial molar properties; chemical potential; fugacity and activitycoefficients; Gibbs - Duhem equation; enthalpy , entropy and Gibbs free energy changes in mixing of ideal solution.

UNIT –IV PHASEEQUILIBRIA 12

Phase equilibrium and stability; criteria for equilibrium between phases in single and multi - component non-reacting systems; vapor-liquid equilibrium of binary ideal and non-ideal solutions; azeotropes; Raoult's l aw and Henry's law; P-x- y and T-x- y diagrams using Antoineequations.

UNIT – V CHEMICALREACTION EQUILIBRIA 12

Criteria of equilibrium; standard free energy change and react ion equilibrium constant; effect of temperature and pressure on reaction equilibrium constant; homogeneous chemical reactions - thermodynamic analysis and prediction of equilibriumcompositions.

TOTAL: 60

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Smith, J.M., Van Ness, H.C and Abbot M.M	Introduction to Chemical Engineering Thermodynamics	McGraw Hill Publishers, VI edition	2003
2	Narayanan, K.V	A Textbook of Chemical Engineering Thermodynamics	Prentice Hall India	2004

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kyle, B.G.	Chemical and Process Thermodynamics III Edition	Prentice Hall of India Pvt. Ltd	2005
2	Elliott J.R, Lira, C.T.	Introductory chemical engineering thermodynamics	Prentice Hall	2003
3.	Rao, Y.V.C	Chemical Engineering Thermodynamics	Universities Press	2005
5	Gopinath Halder	Introduction to Chemical Engineering Thermodynamics	PHI Learning Ltd	2009

16BTCE403 **HEAT TRANSFER** **3 0 0 3 100**

.COURSE OBJECTIVES:

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1. To enable the students to learn heat transfer by conduction, convection and radiationand heat transfer equipments like evaporator and heatexchanger
2. to provide opportunity to student for performing actual experiments on heat transfer mechanism and related phenomenon
3. To learn about the numerical treatment of diffusive, convective and transient heat transfer
4. To learn about the numerical treatment of fluid flow problem
5. How to use basic principles of heat transfer to solve thermal problem
6. solve one-dimensional, steady conduction heat transfer problems in various geometries with constant and variable thermal conductivity

INTENDED COURSE OUTCOMES:

On completion of the course the students will be able to

1. Understand the fundamental principles of conduction
2. acquire knowledge in convection and radiation heat transfer
3. familiarize with the fundamentals of boiling and condensation
4. apply the knowledge of heat transfer in the design of evaporators
5. design and analyze the performance of heatexchangers
6. The student should be able to evaluate the amount of heat exchange for plane, cylindrical & spherical geometries and should be able to compare the performance of extended surfaces and heat exchanger

UNITI CONDUCTION 9

Importance of heat transfer in Chemical Engineering operations - Modes of heat transfer - Fourier"s law of heat conduction - one dimensional steady state heat conduction equation for flat plate, hollow cylinder, - Heat conduction through a series of resistances - Thermal conductivity measurement; effect of temperature on thermal conductivity; Heat transfer in extendedsurfaces.

UNITII CONVECTION 9

Concepts of heat transfer by convection - Natural and forced convection, analogies between transfer of momentum and heat - Reynold"s analogy, Prandtl and Coulburn analogy. Dimensional analysis in heat transfer, heat transfer coefficient for flow through a pipe, flow past flat plate, flow through packedbeds.

UNITIII BOILINGAND CONDENSATION 9

Heat transfer to fluids with phase change - heat transfer from condensing vapours, drop wise and film wise condensation, Nusselt equation for vertical and horizontal tubes, condensation of superheated vapours, Heat transfer to boiling liquids - mechanism of boiling, nucleate boiling and film boiling.

UNITIV RADIATION AND EVAPORATION 9

Theory and design procedure of evaporation. Concept and nature of thermal radiations - Concept of Black and grey bodies; Stefan Boltzmann, Kirchhoff,,s, Planck,,s and Wien laws; Radiation between surfaces – configuration factor; radiationshield.

UNITV HEAT EXCHANGERS 9

Types of heat exchangers Log mean temperature difference - use of correction factor charts; ssurface area calculations for double pipe and shell and tube heat exchangers ,heat exchangers effectiveness and number of transfer units - Chart for different configurations – Foulingfactors.

TOTAL : 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Holman, J. P.	Heat Transfer	10 thEdn., McGraw Hill	2009
2	Ozisik, M. N.	Heat Transfer: A Basic Approach	McGraw-Hill	1984
3	Kern, D.Q	Process Heat Transfer	McGraw-Hill	2012
4	B. K. Dutta	Heat Transfer: Principles And Applications	PHI Learning Pvt. Ltd., New Delhi	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	McCabe, W.L., Smith, J.C., and Harriot, P.	Unit Operations in Chemical Engineering	6th Edn., McGraw-Hill	2013
2	Coulson, J.M. and Richardson, J.F	Chemical Engineering	Vol. I, 4thEdn.,Asian Books Pvt. Ltd,India	2013

16BTCE404 PROCESS ORGANIC SYNTHESIS 3 0 0 3 100

COURSE OBJECTIVES:

1. To impart knowledge on various aspects of production engineering and enable the students to understand the practical methods of production process in a chemical industry.
2. Organic synthesis allows the synthesis of molecules that broadly impact our lives through application in healthcare, materials science, food processing and fundamental research. Organic chemistry has the reputation of being a difficult topic
3. Introduction to fundamental methods and procedures used in the synthesis of organic compounds at micro and semi-micro scale.
4. The synthetic work will demonstrate how organic reactions provide a basis for different industries such as the pharmaceutical industry, the food industry, animal health, electronics, flavour and fragrance and other industries based on organic fine chemicals
5. The course will also give an introduction to analytical organic chemistry through the use of qualitative analyses and infrared spectroscopy for structural analysis (functional groups) of organic compounds.
6. The principles of structural analysis of organic compounds will be discussed. Experimental laboratory work with modern synthetic reactions will illustrate the importance of organic chemistry for our society.

COURSE OUTCOMES:

1. Understand the various unit processes in synthesis of organiccompounds
2. Understand the application of organic compounds in variousindustries
3. Analyze chemical reactions and reactionconditions
4. Identify reaction schemes and mechanisms for a number of important reactions used in organicsynthesis
5. Fundamental practical knowledge in isolating and purifying synthetic organic compounds
6. Fundamental knowledge on the characterization of organic compounds by the use of infrared spectroscopy

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UNIT –I NITRATION ANDAMINATION9

Principle of Nitration-N-Nitro compounds and Nitration esters, industrial equipment and processes. Amination; methods – reduction and Ammonolysis. Catalytic reaction and manufacture of amino compounds.

UNIT –II HYDROGENATION AND ALKYLATION9

Production and Properties of Hydrogen, Catalytic hydrogenation and Hydrogenolysis; Methanation and Fischer-Tropsch reactions. Types and Factors affecting alkylation, Industrial alkylation process**.**

UNIT –III OXIDATION, HYDROLYSIS ANDESTERFICATION 9

Types of Oxidation reaction-Liquid-phase and Vapor-phase; Hydrolysis-processes and equipment. Esterification of organic and inorganic acids-applications in chemical industries.

UNIT –IV HALOGENATION, SULFONATION AND SULFATION9

Halogenation- Chlorination reaction; Sulfonation and sulfation; Desulfonation reactions.

UNIT –V DYE AND DRUGSYNTHESIS9

Synthesis of Dyes - Congo red. Triphenylmethane dyes -Malachite green, Para Rosaniline, Alizarin, Eosin; Drug Synthesis - Sulphanilamide, Sulphapyrindine, Chloroquinine, penicillin, erythromycin.

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Groggins P.H	Unit Processes in Organic Synthesis	5th Edition (Reprint), McGraw Hill International Co	2007
2	Austin G.T	Shreve's Chemical Process Industries	5th Edition (Special Reprint Edition), McGraw Hill International Co	2005

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Tiwari K.S. and VishnoiN.K	A Textbook of Organic Chemistry	3rd Edition, Vikas Publishing House, New Delhi	2007.
2.	Graham Solomons T.W., Craig B. Fryhle and Scott A. Student Snyder	Organic Chemistry	11th Edition, International Version, John Wiley & Sons Inc., New York	2013.

16BTCE405 MATERIAL SCIENCE AND ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES:

1. To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.
2. To review physics and chemistry in the context of materials science & engineering.
3. To describe the different types of bonding in solids, and the physical ramifications of these differences
4. to give the students the basis for more advanced course work (e.g. materials processing) required for an in-depth and comprehensive program in materials science and engineering
5. To understand the correlation between bonding and structure, and bonding and properties.
6. To introduce concept of crystal structure, and the myriad of structures possible in metals and ceramics, as well as crystalline polymers, including crystal planes and diffraction

COURSE OUTCOMES:

On completion of the course the students will be able to

1 Comprehend the criterion for selection of materials for chemical process industries.
2 outline the properties and applications of smart materials and nano and bio materials
3 apply the knowledge about various materials used in chemical processindustries
4 select materials for high temperature and Sour service and gain knowledge of modern engineering materials.
5 an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
6 an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

UNITI NATURE OFMATERIALS 9

Selection process of engineering materials (General aspects), Chemical and physical properties of materials, chemical structure, Micro and macro structure, corrosion resistance, chemical reactivity.Mechanical properties, stress, strain, strength, hardness, malleability, ductility, elasticity, plasticity, toughness, thermal stability. Types of deformation: Plastic, viscous; plastic deformation of single crystal, poly crystalline metals, slip, twinning, dislocations, viscoelasticity, creeps in metals, amorphous materials.

UNITII METALLURGY 9

Extractive Metallurgy: Hydro, pyro and electro metallurgy, refining of metals. Powder Metallurgy: methods of production of metal powder, mixing of metal powders, compaction of powders - applications. Extraction process of Iron: manufacture of pig iron, blast furnace operations, chemistry of reactions. Manufacture of cast iron, varieties of cast iron, effect of impurities. Production of steel , Bessemer process ,open-hearth process ,L D methods. Classification of steel, effect of impurities. Heat treatment process: annealing, hardening, tempering, normalizing and gas carburizing. Fe-Carbon phasediagram.

UNITIII COMPOSITES AND ADHESIVES 9

Polymer composites: Introduction, Types of composites, particle reinforced, fiber reinforced, structural composites, examples. Matrix materials, reinforcement materials-, Kevlar, Polyamides, fibers, glass, carbon fibers, ceramics and metals. Techniques for producing FRP, applications.UNITIV BIOMATERIALS 9

Classification of bio-materials (based on tissue response) ,Comparison of properties of some common biomaterials , Metallic implant materials (stainless steel, cobalt-based and titanium-based alloys),Polymericimplantmaterials(Polyamides,polypropylene,AcrylicresinsandHydrogels) ,Tissue replacement implants , Soft and hard tissue replacements ,Skin implants, Tissue engineering, Biomaterials for organ replacement (Bone substitutes), Biosensor.

UNITV MODERNENGINEERINGMATERIALS 9

Smart materials , Shape memory alloys, Electrostatics, Irreversible Marten sites, Domain Walls, Nature of Shape Memory, Shape Memory Alloy Materials, Ferromagnetic Shape Memory Alloys, Relation to Shape Memory Alloys, Actuator and Sensor Materials Chromic materials (Thermo, Photo and Electro) ,Rheological fluids , Metallicglasses.

TOTAL :45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Thiruvadigal. J. D, Ponnusamy. ,Sudha.D, and Krishnamohan. M.	Materials Sciences	2nd Edition, Vibrant Publication,Chennai	2013
2	Rajendran. V	Materials Science	3rdEdition, Tata McGraw-Hill,New Delhi,	2011

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Khanna. O.P	A Text book of Material science and Metallurgy	4^{th}Edition, Danpat Rai Publications	1999
2	Rajput. R.K.	A Text book of Material Science and Engineering	3^{rd}Edition, S.K Kataria& sons, Delhi	2003
3	Agarwal. C.V	Chemistry of Engineering materials	4^{th}Edition, Tata McCraws Hill	1997 .
4	William F.Smith.	Foundation of Materials Science and Engineering	2ndEdition, Tata McCraw Hill	1998

16BTCE411 SCIENTIFIC COMPUTING LABORATORY 2 0 2 3 100

OBJECTIVES

1. To introduce the scientific computing, covering some important aspects of solving algebraic equations, IVP, BVP.
2. To implement the methods using the spread sheet in Excel.
3. To make students familiar with the concepts of programming and the get them accustomed with high-level languages like Matlab, Mathematica, etc
4. To provide an overview of some of the issues and problems that arise in scientific computation, such as (non-)linear systems, numerical and symbolic integration, differential equations and simulation.
5. To make students familiar with the concepts of programming and the get them accustomed with high-level languages like Matlaben Mathematica
6. to give students a detailed description of the concepts of symbolic

LIST OF EXPERIMENTS

1. Finding solution of Transcendentalequation
   - i) Newton – RaphsonMethod
   - ii) Bisectionmethod
   - iii) Iterative method by reducing the equation to the form x=f(x)
2. Finding the dominant eigenvalue and eigenvector by powermethod
3. Numericalintegration
   - i) Gauss 2 point and 3 pointformulae
   - ii) Trapezoidalmethod
   - iii) Simpson‟s 1/3rule
4. Solution of initial value problems governed byODE
   - i) Runge - Kutta 4^{th} order method
   - ii) Modified Euler‟smethod
   - iii) Milne‟smethod
   - iv) Adam – Bashforth method
5. Solution of BVP governed byPDE
   - i) Laplace Equation
   - ii) One – dimensional heatequation
     - a) Explicit method : Bender – Schmidt‟smethod
     - b) Implicit method : Crank - Nicolson‟smethod
   - iii) One dimensional wave equation Implicit method

TOTAL 60 PERIODS

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Curtis F. Geraldand Patrick O.Wheatley	Applied Numerical Analysis	Pearson Education, South Asia	2009
2	Steven C. Chapra, Raymond P. Canale	Numerical Methods for Engineers	McGraw - Hill Pub. Co. Ltd	2014

16BTCE412 TECHNICAL ANALYSIS LABORATORY 0 0 3 2 100

COURSE OBJECTIVES:

1	To provide experience on preparation, analysis and testing of chemicals used for industrial raw materials and enduses
2	To train the students on basic principles involved in estimation and characterization of industrially important materials.
3	Describe technical analysis and how it is used,Identify trends, resistance & support
4	Understand the importance of analyzing volume
5	Calculate and interpret moving average indicators
6	Calculate and use technical trading oscillators

COURSE OUTCOMES:

1	At the end of this practical course, the student would have athoroughunderstanding on the estimation and analysis of chemicalcompounds.
2	Familiarization with equipment like viscometers, flash and fire point apparatusetc.
3	Familiarization of methods for determiningTDS
4	Familiarization of a few simple synthetic techniques for soap.
5	analyze the dynamics of financial time series by combining the basic principles of technical analysis (graphical approach) and analysis of the sentiment
6	Identify various semiconductor devices

LIST OF EXPERIMENTS (ANY 10 EXPERIMENTS)

1. SoapAnalysis

   a. Estimation of total fattyacid

   b. Estimation of percentage alkali content

2. OilAnalysis

   a. Estimation of free acid

   b. Determination of Saponificationvalue

   c. Determination of iodinevalue

3. CementAnalysis

   a. Estimation of Silicacontent

   b. Estimation of mixed oxidecontent

   c. Estimation of calcium oxidecontent

   d. Estimation of calcium oxide by rapidmethod

4. CoalAnalysis

   a. Estimation of Sulphur present incoal

   b. Ultimate analysis ofcoal

   c. Proximate analysis of coal

5. Analysis of BleachingPowder

a. Estimation of available chlorine

6. Analysis of Glycerol

   a. Estimation of purity of glycerol

7. Analysis of fuels

   a. Flash point b. Fire point c. Cloud point d. Pour point e. Aniline point.

8. Determination of the molecular weight of the polymer byviscometry.
9. Calorimetricmeasurements
10. Conductivity measurement of an electrolytesolution
11. pHMeasurements
12. Determination of sucrose content insugar
13. Determination of dissolved oxygen inwater
14. Determination of total nitrogen and ammoniacalnitrogen
15. Determination of SS, TDS, and VSS of a wastewatersample
16. Analysis of oil & grease in wastewatersample.
17. Study of analytical instruments: Spectrophotometer, pH meter, Gas Chromatograph, High Performance Liquid Chromatograph (HPLC), FTIR, Organic Carbon Analyser(TOC).

TOTAL: 45

16BTCE413 MECHANICAL OPERATIONS LABORATORY 0 0 3 2 100

COURSE OBJECTIVES:

1. To enable the students to develop a sound working knowledge on different types of crushing equipments
2. To enable the students to develop a sound working knowledge on different types of crushing equipments and separation characteristics of different mechanical operation separators
3. To understand the role of unit operations in Chemical industries, and the characteristics of particulate solids, Principles of size reduction, particle dynamics and separation of particles.
4. To provide an overview of the methods and techniques of Mechanical Operations and use of mechanical forces.
5. To understand the mineral processing techniques for the handling of raw materials for different chemical industries.
6. To identify the important physical mechanisms occurring in processes involving particles.

COURSE OUTCOMES:

1. Estimate crushing characteristics, power requirements and constants of crushing laws using Jaw and Roll Crusher
2. determine the critical speed and work index by using Ball mill
3. determine average particle size and specific surface area by conducting Sieve analysis, Beaker Decantation and Air permeability experiments
4. estimate specific cake and filter medium resistance using Filter press and Leaf filter
5. design a thickener using batch sedimentation data and assess the efficiency of Cyclone separator
6. Calculate size reduction ratio, grindability index using ball mill and jaw crusher.

LIST OF EXPERIMENTS

1. Sieveanalysis
2. Batch filtration studies using a Leaf filter
3. Batch filtration studies using a Plate and Frame Filterpress
4. Characteristics of batch Sedimentation
5. Reduction ratio in JawCrusher
6. Reduction ratio in Ball mill
7. Separation characteristics of Cycloneseparator
8. Reduction ratio of RollCrusher
9. Separation characteristics ofElutriator
10. Reduction ratio of Drop weightcrusher
11. Size separation usingSub-Sieving

TOTAL: 45

16BTCE413 COURSE ORIENTEDPROJECT2 002 1 100

16BTCE451 **PRODUCTION OF COMMERCIALL Y VALUABLE** **1 0 0 -100**

COMPOUNDS

OBJECTIVE:

1. To give hands on training on the development of industrially important biotechnology products
2. Develop marketing strategies based on product, price, place and promotion objectives
3. Analyze marketing problems and provide solutions based on a critical examination of marketing information
4. Assess and evaluate the existing commercials and their contents with suggestions for improvement
5. Customize advertisements based on Segmenting, Targeting and Position
6. Understand the advanced database features, backup and restore of information

COURSE OUTCOMES:

1. 1.Identify good design.
2. List personal goals and values, set living standards
3. Plan a balanced diet, enlist the principles of diet therapy and functioning of food service institutions
4. Comprehend the key aspects of human growth and development and realize the importance of mastering developmental tasks of each life span stage
5. Understand the concept of Extension Education and its importance
6. Identify the major influences on consumer behavior

1. Production of ethanol from molasses andgrapes
2. Production ofBiofertilizers
3. Production of Single cell protein (Spirullina)
4. Mushroom cultivation
5. Production of jam from mixedfruits

SEMESTER V

16BTCE501 CHEMICAL REACTION ENGINEERING - I 3 1 0 4 100

COURSE OBJECTIVES:

1. To impart knowledge on different types of chemical reactors, the design of chemical reactors under isothermal and non-isothermal conditions
2. basic concepts of chemical kinetics and chemical reactor design as related to simple reaction systems will be introduced. Topics covered will include the general mole balance, reactor types, conversion and reactor sizing, rate laws and stoichiometry and isothermal reactor design
3. the concepts developed in the first half of the course to describe real systems that deal with complex reactions and non-ideal reactors
4. students able to non-isothermal reaction design (energy balances), multiple reactions and reaction pathways,
5. students able to non-ideal reactors/residence time distribution, and heterogeneous reaction
6. student with principles and kinetic tools useful in analyzing the rates of chemical reactions for both homogeneous and heterogeneous reactions.

COURSE OUTCOMES:

On completion of the course the students will be able to

1. gain knowledge on the selection of the reactor for the reaction and its design
2. apply the principles of reaction kinetics and formulate rate equations and analyze the batch reactor data
3. understand the ideal reactor concepts and to develop the performance equation to workout conversion and spacetime
4. perform RTD analysis in non-ideal flow reactors and calculation of conversion
5. Describe the algorithm that allows the student to solve chemical reaction engineering problems through logic rather than memorization
6. Size isothermal and non-isothermal reactors for homogeneous and heterogeneous reactions

UNITI RATE EQUATIONS 12

Rate equation, elementary, non-elementary reactions, theories of reaction rate and Prediction; Design equation for constant and variable volume batch reactors, analysis of experimental kinetics data, integral and differential analysis

UNIT I1 DESIGN OF REACTORS 12

Design of continuous reactors - stirred tank and tubular flow reactor, recycle reactors, combination of reactors, size comparison of reactors.

UNIT III DESIGN OF REACTORS FOR MULTIPLE REACTIONS 12

Design of reactors for multiple reactions - consecutive, parallel and mixed reactions - factors affecting choice, optimum yield and conversion, selectivity, reactivity andyield

UNIT IV NON-ISOTHERMAL REACTOR SYSTEMS 12

Non-isothermal homogeneous reactor systems, adiabatic reactors, rates of heat exchanges for different reactors, design for constant rate input and constant heat transfer coefficient, operation of batch and continuous reactors, optimum temperatureprogression.

UNIT V NON-IDEAL FLOW REACTORS 12

The residence time distribution as a factor of performance; residence time functions and relationship between them in reactor; basic models for non-ideal flow; conversion in non-ideal reactors

TOTAL:60

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Levenspiel O	Chemical Reaction Engineering	Wiley Eastern Ltd., II Edition	2000
2	Smith, J.M	Chemical Engineering Kinetics	McGraw Hill, III Edition	1981
3	Fogler.H.S	Elements ofChemical ReactionEngineering	Prentice Hall of India Ltd IIIrd Edition	2000

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Froment. G.F. & K.B.Bischoff	Chemical Reactor Analysis and Design	John Wiley and Sons	1979
2	Smith, J.M., VanNess, H.C., & Abbot M.C	Introduction to Chemical Engineering Thermodynamics	McGraw Hill VII Edition	2004
3	Narayanan K.V	A Text Book of Chemical Engineering Thermodynamics	Prentice Hall of India Pvt. Ltd	2001

16BTCE502 **MASS TRANSFER - I** **3 1 0 4 100**

COURSE OBJECTIVES:

1. Students will learn to determine mass transfer rates under laminar and turbulent conditions.
2. The purpose of this course is to introduce the undergraduate students with the most important separation equipment in the process industry, and provide proper understanding of unit operations
3. To give insight of mass transfer basic principle and mass transfer mechanisms.
4. To understand design methods for distillation columns.
5. To understand design of extractor and leaching equipments.
6. To understand membrane separation.

COURSE OUTCOMES:

1. understand diffusional operations and theoriesofm ass transfer
2. understand the concept of interphase masstransfer
3. understand the concept gas-liquid mass transferoper ationslikehumidification
4. apply the knowledge gained in mass transfer toperfo rm simple calculations in drying
5. apply the knowledge gained in mass transfer to rm simple calculationsin perfocrystallizationprocess
6. Use the McCabe-Thiele Method, PonchonSavaritMethod for solving distillation problems and analyze Distillation process

UNITI DIFFUSION **9**

Introduction to mass transfer operations; Molecular diffusion in gases, liquids and solids; diffusivity measurement and prediction; multi-component diffusion

UNIT II INTERPHASE MASS TRANSFER **9**

Eddy diffusion, concept of mass transfer coefficients, theories of mass transfer, different transport analogies, application of correlations for mass transfer coefficients, inter phase mass transfer, relationship between individual and overall mass transfer coefficients. NTU and NTP concepts, Stage-wise and differential contractors.

UNIT III HUMIDIFICATION **9**

Humidification – Equilibrium, humidity chart, adiabatic and wet bulb temperatures; humidification operations; theory and design of cooling towers, dehumidifiers and humidifiers using enthalpy transfer unitconcept.

UNIT IV DRYING **9**

Drying– Equilibrium; classification of dryers; batch drying – Mechanism and time of cross through circulation drying, continuous dryers – material and energy balance; determination of length of rotary dryer using rate concept.

UNIT V CRYSTALLIZATION **9**

Crystallization - Equilibrium, classification of crystallizers, mass and energy balance; kinetics of crystallization – nucleation and growth; design of batch crystallizers; population balance model and design of continuous crystallizers

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Treybal, R.E	Mass Transfer Operations	3rd Edn, McGraw-Hill	2017
2	Geankoplis, C.J	Transport Processes and Unit Operations	4th Edition, Prentice Hall Inc., New Jersey	2003

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	McCabe, W.L., Smith, J.C., and Harriot, P	Unit Operations in Chemical Engineering	7th Edn., McGraw-Hill	2005
2	Coulson, J.M. and Richardson, J.F	Chemical Engineering" Vol. I and II	4th Edition,Asian Books Pvt. Ltd., India	1998
3.	J.D. Seader and E.J. Henley	Separation Process Principles	2nd Ed., John Wiley	2006
4	BinayK.Dutta	Principles of Mass Transfer and Seperation Processes	PHI Learning Ltd	2013

16BTCE503 CHEMICAL PROCESS PLANT SAFETY AND HAZARD ANALYSIS 3 0 0 3 100

COURSE OBJECTIVES:

1. To impart the importance of safety in industries and the various methods of safety measures and risk analysis in the industry
2. To teach fundamentals of chemical process safety and hazards management
3. To discuss the important component of the Risk Management Plan (RMP) i.e. hazards identification, hazard analysis, consequence analysis and emergency response
4. To discuss the advancement in the field of risk assessment (both intentional and unintentional threats)
5. To demonstrate practical aspects of accidents through case studies
6. Use problem solving sessions with examples to estimate Dow"s Fire & Explosion Index

COURSE OUTCOMES:

On completion of the course the students will be able to

1. demonstrate the awareness of plant safety standards, codes and MSDS in hand lingand storage of chemicals
2. exhibit the skill in classifying chemical, fire, explosion hazards and to understand the occupational diseases
3. investigate safety in operations and process by undergoing HAZOP and HAZAN studies
4. analyze the accident causes, costs, prevention techniques, accident proneness andcase studies
5. examine the legal aspects related to safety and emergency studies to know the basicrules and requirements which govern the chemical industries
6. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

UNIT –I SAFETYPRINCIPLES 9

Need for safety, Safety programs, Training & Education, Design for ventilation; Personal protective Equipments. Safety codes: NFPA, IS and OSHA standards; colour codes for pipe lines. Materials Safety Data sheets; safety in storage and handling of chemicals.

UNIT –II HAZARDS 9

Hazards- fire, explosion and radiation; Designs to prevent fires and explosions; relief and relief sizing. Occupational diseases - effects.

UNIT –III SAFETY IN OPERATIONSAND PROCESSES 9

Safety in operations and processes. Runaway reactions, unstable products; Safety Studies – HAZOPS, HAZANS, Fault tree, Event tree and risk analysis.

UINTIV INDUSTRIAL ACCIDENTS 9

Industrial accidents –types, nature/effects, causes, costs, prevention, investigation and analysis, accident proneness, case studies.

UNIT VLEGAL ASPECTS 9

Factories act, ESI act and Workmens compensation act, Role of Government, safety organizations, management and trade unions in promoting industrial safety. Emergency response systems for hazardous goods basic rules and requirements which govern the chemical industries.

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Fawcett H.H. and Wood W.S	Safety and Accident Prevention in Chemical Operation‖	2nd Edition, Interscience,	1982.
2	Gupta A.K	Industrial Safety and Environment	2nd Edition Reprint	2009

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William H.	Industrial Safety Handbook‖,	2nd Edition, McGraw Hill,	1968.
2	Loss Prevention and Safety Promotion in Chemical Process Industries		Vol. I, II, III Published by Institution of Chemical Engineers U.K	1983.

16BTCE504 INSTRUMENTAL METHODS OF ANALYSIS 3 0 0 3 100

COURSE OBJECTIVES:

1. To make the students understand the working principles of different types of instruments and their applications.
2. To be concerned with the theory and practice of instrumental methods for the separation, identification and quantitative analysis of chemical substances
3. students a working knowledge of analytical instrumentation typically employed in chemical and biochemical research laboratories
4. Recognize interferences in chemical and instrumental analysis.
5. Comprehend the concept of and perform instrument and method calibration.
6. Apply and assess concepts of availability and evaluation of analytical standards and formulate standardization methodology

COURSE OUTCOMES:

On completion of the course the students will be able to

1. comprehend the principles of electromagnetic radiation and classification of instrumental methods
2. grasp the principles and applications of UV, Visible, IR Spectroscopy and Photometric titrations
3. appreciate the importance of AAS and NMR spectroscopy in chemical analysis
4. gain knowledge about thermo gravimetric instruments and their applications
5. understand the principles and applications of chromatographic methods.
6. Proficiency in professional sampling and sample treatment prior to analysis

UNITI ELECTROMAGNETIC RADIATION 9

Various ranges, Dual properties, Various energy levels, Interaction of photons with matter, absorbance& transmittance and their relationship, Permitted energy levels for the electrons of an atom and simple molecules, classification of instrumental methods based on physical properties.

UNITII MOLECULARSPECTROSCOPY 9

Various electronic transitions in organic and inorganic compounds effected by UV, visible and infra-red radiations, various energy level diagrams of saturated, unsaturated andcarbonyl compounds, excitation by UV and Visible radiations, Woodward-Fischer rules for thecalculation of absorption maxima (dienes and carbonyl compounds), Effects of auxochromesandeffects of conjugation on the absorption maxima; Instrumentation for UV, VISIBLE and IRspectroscopies (source, Optical parts and Detectors), Photometric titration (Experimental set-up andvarious types of titrations), Applications of UV, VISIBLE and IR spectroscopies.

UNITIII AAS, NMRSPECTROSCOPY 9

Atomic Absorption Spectrophotometry: Principle instrumentation andapplications. Nuclear Magnetic Resonance: Introduction to NMR, principle and instrumentation (Proton NMR only). Relaxation, Chemical shift and its causes, reference compounds.

UNIT IVTHERMAL METHODS 9

Thermogravimetry: Instrumentation, factors affecting shapes of thermo grams, and applications. Thermogram of important compounds (CaSO4.5H2O; CaC2O4.2H2O) DifferentialThermal Analysis: Principle, instrumentation and applications. Differences between DSC &DTA.Application of DSC (Inorganic & Polymer samples). TGA - Principle, instrumentation andapplications.

UNIT V CHROMATOGRAPHIC METHODS9

Classification of chromatographic methods; Column, Thin layer, Paper, Gas, High Performance Liquid Chromatography (principle, mode of separation and technique).Separation of organic compounds by Column and Thin Layer, Mixture of Cu, Co and Ni by PaperChromatography. Separation of amino acids by Paper Chromatography. Estimation of organiccompounds by GC and HPLC.

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Willard H.H., Merritt I., Dean J.A. and Settle F.A	Instrumental Methods of Analysis	7th Ed, CBSPublishers, New Delhi	1986
2	Ewing, Galen W	Instrumental Methods of Chemical Analysis	7th Ed, McGraWHill Company, New Delhi	1985

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Skoog D.A. and West D.M	Fundamentals of Analytical Chemistry	7th Edition, Saunders College Publishing, New York	1996.

2	Banwell. G. C	Fundamentals of Molecular Spectroscopy	Tata McGraw-Hill, New Delhi	2006

16BTCE511 **HEAT TRANSFER LABORATORY** **0 0 3 2 100**

COURSE OBJECTIVES:

1. To enable the students to develop a sound working knowledge on different types of heat transfer equipment
2. Define the fundamental concepts to students in the area of heat transfer and its applications.
3. Recognize the practical significance of various parameters those are involved in different modes of heat transfer.
4. Apply the knowledge of heat transfer in an effective manner for different applications
5. students will study about the various heat transfer processes, so as to train the students practically to utilize this knowledge in industry
6. students will study about the various heat transfer processes, so as to train the students practically to utilize this knowledge in industry

COURSE OUTCOMES:

On completion of the Lab course the student will be able to

1. determine Stefan Boltzmann constant at different temperatures
2. assess the heat transfer coefficient for natural and forced convection systems, double pipe heat
3. exchanger / shell and tube heat exchanger and condensers
4. develop temperature profile in unsteady state heat transfer system
5. evaluate the convective and radiative heat transfer coefficients using radiation experiment
6. appraise the fin efficiency and estimate the steam economy in an evaporator

LIST OF EXPERIMENTS

1. Performance studies on CoolingTower
2. Batch drying kinetics using TrayDryer
3. Heat transfer in Open PanEvaporator
4. Boiling HeatTransfer
5. Heat Transfer through PackedBed
6. Heat Transfer in a Double Pipe HeatExchanger
7. Heat Transfer in a Bare and Finned Tube HeatExchanger
8. Heat Transfer in aCondenser
9. Heat Transfer in HelicalCoils
10. Heat Transfer in Agitated Vessels

TOTAL:45

16BTCE51 PROCESS EQUIPMENT DESIGN ANDDRAWINGI 0 0 3 2100

COURSE OBJECTIVES:

1. To develop skill to design and install process equipment's used widely in the chemical industry
2. Understand general design considerations involving process design development.
3. Learn basic concepts of economic analysis for process, involving equipment cost, and profitability.
4. Acquire basic understanding of design parameters, knowledge of design procedures for pressure vessels.
5. Acquire knowledge of shell & tube heat exchanger Design.
6. Demonstrate procedures in designing of tray distillation columns including minimum reflux ratio, number of stages, feed stage, and column diameter.

COURSE OUTCOMES:

On successful completion of the course the students will be able to

1. design machine elements and Piping system/presentation of PFD andPID
2. apply the skill in thermal design of heat transfer equipment's like shell and tube and double pipe heatexchangers
3. perform the process design ofevaporators
4. apply the skill in design of equipments like crystallizer andcentrifuge
5. understand the concepts involved in design of pressure vessel, storage vessel and tall columns
6. Design and modify process equipment relating to heat and mass transfer Will handle process parameters to alter and design process Equipment

LIST OF EXPERIMENTTS:

- Basic design and drawing considerations of machineelements
- Design of HeatExchangers
- Design ofEvaporators
- Design ofCrystallizers
- Design of Pressurevessel

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Towler C. Gavin and Sinnott Ray	Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design	2nd Edition, Elsevier	, 2008
2	Thakore S.B. and Bhatt B.I	Introduction to Process Engineering and Design‖,	2nd Reprint, Tata McGraw-Hill Publishing Company Ltd.,	2009

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	SinnotR.K	Chemical Equipment Design: Chemical Engineering	Volume – 6,4thEdition, Elsevier- Butterworth	2005
2	Joshi M.V. and Mahajan V.V	Process Equipment Design	3rd Edition, Macmillan India Ltd	1996.

16BTCE513 **CHEMICAL REACTION ENGINEERING LABORATORY** **0 0 4 2 100**

COURSE OBJECTIVES:

1. To impart knowledge on design of reactors
2. to understand the chemical kinetics for homogeneous and heterogeneous reactions and their applications in design of batch and flow reactors
3. RTD in packed bed and multiphase reactors
4. To understand the basic principle of chemical reaction engineering
5. understanding the basic fundamental principles of chemical reaction engineering by performing different experiments
6. Provide the kinetics and design concepts for these systems

COURSE OUTCOMES:

1. Determine the order and rate constant of the rate equations for Batch/ Mixed / Plug flow reactor
2. estimate the conversion in Batch/Semi-batch/Mixed/Plug flow reactors
3. determine the effect of temperature on rate of reaction to validate Arrhenius equation
4. evaluate the performance of combined Mixed and Plug flow reactor system
5. conduct residence time distribution studies to develop C, E & F- curve for Mixed/Plug flow reactor/Packed-bed reactor
6. Determine the volume of reactor systems based on kinetic data and mass and heat balances

LIST OF EXPERIMENTS

1. Kinetic studies in a Batchreactor
2. Kinetic studies in a Plug flowreactor
3. Kinetic studies in aCSTR
4. Kinetic studies in a Packed bedreactor
5. Kinetic studies in a PFR followed by aCSTR
6. RTD studies in aPFR
7. RTD studies in a Packed bedreactor
8. RTD studies in a CSTR
9. Studies on micellarcatalysis
10. Study of temperature dependence of rate constant usingCSTR.
11. Kinetic studies in Sonochemicalreactor
12. Batch reactivedistillation
13. Kinetics of photochemicalreaction
14. Demonstration of heterogeneous catalyticreaction
15. Demonstration of gas-liquid reaction

	TOTAL	45

16BTCE514 **COURSE ORIENTED PROJECT** **30021 100**

16BTCE551 **PIPE STRESS ANALYSIS(CAEAR-II)** **1 0 0 -100**

OBJECTIVES

1. To understand the engineering principles in a pipe stress analysis
2. To study Nozzle loading and flexibility
3. sufficient flexibility for thermal expansion.
4. Proper pipe routing so that simple & economical supports can be constructed.
5. Piping material & section properties commensurate with the intended services, temperature, pressure & anticipated loading.
6. If necessary, the layout solution should be iterated until a satisfactory balance between stress & layout efficiency is achieved.

COURSE OUTCOMES:

1. Examine piping stress analysis for flexibility and stiffness under different load conditions
2. Assess pipe stress analysis to determine the maximum stresses, displacements, forces and moments at restraints
3. Make recommendations for necessary modifications to satisfy the ASME Code Requirements for limits of sustained, displacement & occasional load allowable stresses
4. Identify the different types of stresses affecting piping flexibility, code criterion's, and methods of analysis, including simple and comprehensive methods and computerized methods
5. Ways of controlling and reducing forces acting on a pipe system in operating conditions.
6. Operation and maintenance considerations as set forward in ASME B.31.3 and piping relevant Norsok standards

UNIT I **4**

Introduction to CAESAR II, General modeling in CAESAR II, Pipe stress theory, Stress analysis according to a design codes

UNIT II **3**

Load-based piping design (e.g. earthquake and wind), Flange and nozzle analysis, Structural steel, Expansion joints

UNIT III **4**

Hanger sizing, Fiberglass piping, Buried piping, Generation of isometric drawings

TOTAL 15

16BTCE552 **IN–PLANT TRAINING** **- - - -100**

OBJECTIVES

- To know the basic knowledge on industry and itsenvironment.
- To understand the psychology of the workers, their habits, attitudes and approach to problems along with the practices followed either at factory orsite.

Students will undergo industrial training for four weeks during the vacation at the end of IV semester and a report with the training completion certificate from the industry will be subsequently submitted to the department within a week after completion. Viva – Voce exam will be conducted at the end of V semester and 100 marks will be awarded.

SEMESTER VI

16BTCE601 CHEMICAL REACTION ENGINEERING - II 3 1 0 4 100

COURSE OBJECTIVES:

1. To enable the students to learn the gas-solid catalytic and non-catalytic reactors and gas-liquid reactors
2. basic concepts of chemical kinetics and chemical reactor design as related to simple reaction systems will be introduced.
3. the concepts developed in the first half of the course to describe real systems that deal with complex reactions and non-ideal reactors
4. non-isothermal reaction design (energy balances), multiple reactions and reaction pathways, non-ideal reactors/residence time distribution
5. To train students how to analyze chemical reactors and reaction systems
6. To provide practice at developing critical and creative thinking skills related to reaction engineering

COURSE OUTCOMES:

1. Understand the ideal reactor concepts and heterogeneous reactors..
2. Understand the basics of catalysis and industrial catalytic reactors such as gas-solid reactors
3. Identify non-ideality present and predict its effects on performance of reactor
4. Understand the behavior of various types of contacting patterns and phases involved in the reaction
5. Develop rate expression, select and design suitable reactor for heterogeneous reaction
6. Prepare and characterize various supported catalysts

UNITI CATALYSTS 12

Nature of catalysts, surface area and pore-volume distribution, catalyst preparation.

UNITII HETEROGENEOUS REACTORS 12

Rate equations for heterogeneous reactions, adsorption isotherms, rates of adsorption and desorption, surface reaction analysis of rate equation and rate controlling steps.

UNITIII GAS-SOLID CATALYTIC REACTORS 12

Diffusion within catalyst particle, effective thermal conductivity, mass and heat transfer within catalyst pellets, effectiveness factor, Thiele Modulus, fixed bed reactors.

UNITIV GAS-SOLID NON-CATALYTIC REACTORS 12

Models for explaining kinetics; volume and surface models; controlling resistances and rate controlling steps; time for complete conversion for single and mixed sizes, fluidized and static reactors.

UNITV GAS-LIQUID REACTORS 12

Absorption combined with chemical reactions; mass transfer coefficients and kinetic constants; application of film, penetration and surface renewal theories; Hatta number and enhancement factor for first order reaction, tower reactor design.

TOTAL: 60

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Levenspiel, O	Chemical Reaction Engineering	III Edition, John Wiley	1999
2	Fogler. H. S	Elements ofChemical ReactionEngineering	III Edition, Prentice Hall of India	1999

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Smith J.M.	Chemical Engineering Kinetics	III Edition, McGraw-Hill, New York	1981
2	Froment G.F & K.B. Bischoff	Chemical Reaction Analysis and Design	John Wiley and Sons	1979

16BTCE602	MASS TRANSFER - II	3 1 0 4 100

COURSE OBJECTIVES:

1. To provide introduction to physical and thermodynamic principles of mass transfer with an emphasis on how these principles affect the design of equipment and result in specific requirements for quality and capacity
2. the most important separation equipments in the process industry, and provide proper understanding of unit operations
3. To teach the students different separation techniques.
4. students will come to know the design of a distillation column
5. TO design of aadsorber and calculations involved in liquid liquid extraction and solid liquid extraction
6. To impart the knowledge of separation processes like distillation, adsorption, and extraction.

COURSE OUTCOMES:

1. Understand absorption and distillation operations and select methods of separation of mixtures based on mass transfer concepts
2. Design a distillation tower
3. Perform calculations in adsorption operation
4. Apply the ternary equilibrium diagram concepts to determine the number of stages required for separation of liquid-liquid and solid -liquid mixtures
5. Ability to calculate material balances and minimum solvent rates of single component absorption operations.
6. Ability to apply mass transfer principles to various phase equilibrium-based separation processes viz. perform graphical calculations for binary distillation.

UNIT I ABSORPTION 12

Gas Absorption and Stripping – Equilibrium; material balance; limiting gas-liquid ratio; tray tower absorber - calculation of number of theoretical stages, tray efficiency, tower diameter; packed tower absorber – rate based approach; determination of height of packing using HTU and NTU calculations

UNIT II DISTILLATION 12

Vapour liquid equilibria - Raoult‟s law, vapor-liquid equilibrium diagrams for ideal and non-ideal systems, enthalpy concentration diagrams. Principle of distillation - flash distillation, differential distillation, steam distillation, multistage continuous rectification, Number of ideal stages by Mc.Cabe - Thiele method and Ponchan - Savarit method, Total reflux, minimum reflux ratio, optimum reflux ratio. Introduction to multi-component distillation, azeotropic and extractive distillation

UNIT III LIQUID-LIQUID EXTRACTION 12

Liquid - liquid extraction - solvent characteristics-equilibrium stage wise contact calculations for batch and continuous extractors- differential contact equipment - spray, packed and mechanically agitated contactors and their design calculations-packed bed extraction with reflux. Pulsed extractors, centrifugal extractors-Supercritical extraction

UNIT IV LEACHING 12

Solid-liquid equilibria- leaching equipment for batch and continuous operations – calculation of number of stages - Leaching - Leaching by percolation through stationary solid beds, moving bed leaching, counter current multiple contact (shank‟s system), equipments for leaching operation, multi stage continuous cross current and counter current leaching, stage calculations, stage efficiency.

UNIT V ADSORPTION 12

Adsorption - Types of adsorption, nature of adsorbents, adsorption equilibria, effect of pressure and temperature on adsorption isotherms, Adsorption operations - stage wise operations, steady state moving bed and unsteady state fixed bed adsorbers, break through curves.

TOTAL:60

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Wankat, P.	Equilibrium Stage Separations	Prentice Hall	1993
2	Treybal, R.E	Mass Transfer Operations	3rd Edn., McGraw-Hill	1981
3	Geankoplis, C.J	Transport Processes and Unit Operations	4th Edition, Prentice Hall Inc., New Jersey	2003

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Seader, J.D. and E.J. Henley	Separation Process Principles	2nd Ed., John Wiley	2006
2	McCabe, W.L., Smith, J.C., and Harriot, P	Unit Operations in Chemical Engineering	7th Edn., McGraw-Hill	2005
3	King, C. J	Separation Processes	2ndEdn.,Tata McGraw-Hill	1980

16BTCE603 **PROCESS DYNAMICS CONTROL AND INSTRUMENTATION** **3 0 0 3 100**

COURSE OBJECTIVES:

1. To impart knowledge about the elements and techniques involved in process dynamics and control
2. To provide fundamental knowledge on process control strategies.
3. To impart knowledge on theoretical analysis of open loop and closed loop systems
4. To maintain a process at the desired operating conditions, safely and efficiently, while satisfying environmental and product quality requirements.
5. Proper application of process control can actually improve the safety and profitability of a process
6. assess performance of control loop systems

COURSE OUTCOMES:

On completion of the course the students will be able to

1. understand the prerequisites of control strategies to design different process control systems
2. evaluate the suitable controllers for different chemical process
3. familiarize the closed loop response of control loops and characteristics of control valves
4. analyze and assess the control systems unto stability
5. know the tuning procedures and advanced control techniques
6. explain the working of electric, hydraulic and pneumatic controllers, demonstrate the working and application of different type of actuators and control valves

UNITI INSTRUMENTATION **9**

Principles of measurements and classification of process instruments, measurement of temperature, pressure, fluid flow, liquid weight and weight flowrate, viscosity, pH, concentration, electrical and thermal conductivity, humidity of gases.

UNITII OPEN LOOPSYSTEMS **9**

Laplace transformation and its application in process control. First order systems and their transient response for standard input functions, first order systems in series, linearization and its application in process control, second order systems and their dynamics; transportation lag.

UNITIII CLOSED LOOPSYSTEMS **9**

Closed loop control systems, development of block diagram for feed-back control systems, servo and regulatory problems, transfer function for controllers and final control element, principles of pneumatic and electronic controllers, transient response of closed-loop control systems and their stability.

UNITIV FREQUENCY RESPONSE **9**

Introduction to frequency response of closed-loop systems, control system design by frequency response techniques, Bode diagram, stability criterion, tuning of controllers Z-N tuning rules, C-C tuning rules.

UNITV ADVANCEDCONTROL SYSTEMS 9

Introduction to advanced control systems, cascade control, feed forward control, Smith predictor, control of distillation towers and heat exchangers, introductionto computer control of chemical processes.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	D.R. Coughanour	Process Systems analysisand Control	Mc.GrawHill	1991
2	Stephanopoulous	Chemical Process Control – Theory and Practice	Prentice Hall of India Ltd	1984

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.A.Smithand A.B.Corripio	Principle and Practiceof Automatic Process Control	John Wiley and Sons	1985
2	W.L.Luyben	ProcessModelling Simulationand Control for ChemicalEngineers”	Mc.Graw Hill	1990
3	D.W.Seborg, T.F.Edger, and D.A.Millichamp	Process Dynamics and Control	John Wiley and Sons	1994
4	Peter Harriott	Process Control	Tata McGraw Hill Publishing Co	1964

16BTCE604 PROCESS ECONOMICS FOR CHEMICAL ENGINEERING 3 0 0 3 100

OBJECTIVES

1. To enable students to understand the fundamental economic concepts applicable to engineering
2. To learn the techniques of incorporating inflation factor in economic decision making, sensitivity and risk analysis.
3. To provide a conceptual and methodological framework for evaluating the cost, revenue, profitability and processes
4. the ability to successfully participate in teams
5. the ability to communicate effectively through oral presentations and written reports
6. (professional and ethical responsibilities and current technological issues

COURSE OUTCOMES:

1. Gain knowledge on cost and asset accounting, time value of money, profitability, alternative investments, and minimum attractive rate of return, sensitivity and risk analysis.
2. Analyze fluid flow problems with the application of the mass, momentum and energy equations and Evaluate practical problems associated with pipe flow systems
3. Conceptualize and describe practical flow systems such as boundary layers and their importance in engineering analysis
4. Estimate fluid properties and solve basic problems using property tables, property diagrams and equations of state
5. Analyze and solve problems related to closed systems and steady-flow devices by applying the conservation of energy principle
6. Analyze the second law of thermodynamics for various systems and to evaluate the performance of heat engines, refrigerators and heat pumps

UNITI PRINCIPLES OF MANAGEMENTAND ORGANISATION 12

Planning, organization, staffing, coordination, directing, controlling, communicating, organization as a process and a structure; types of organizations. Method study; work measurement techniques; basic procedure; motion study; motion economy; principles of time study; elements of production control; forecasting; planning; routing; scheduling; dispatching; costs and costs control, inventory and inventorycontrol.

UNITII INVESTMENT COSTS ANDCOST ESTIMATION 8

Time Value of money; capital costs and depreciation, estimation of capital cost, manufacturing costs and working capital, capital budgeting and project feasibility.

UNITIII PROFITABILITY, INVESTMENT ALTERNATIVE ANDREPLACEMENT9

Estimation of project profitability, sensitivity analysis; investment alternatives; replacement policy; forecasting sales; inflation and its impact.

UNITIV ANNUAL REPORTS AND ANALYSISOFPERFORMANCE 8

Principles of accounting; balance sheet; income statement; financial ratios; analysis of performance and growth.

UNITV ECONOMICBALANCE 8

Economic decisions in Chemical Plant - Economics of size - Essentials of economic balance – Economic balance approach, economic balance for insulation, evaporation, heat transfer.

TOTAL : 45 PERIODS

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Peters, M. S. and Timmerhaus,	, “Plant Design and Economics for Chemical Engineers”	III Edn, McGraw Hill,	2003
2	Holand, F.A., Watson, F.A. and Wilkinson, J.K	., "Introduction to process Economics",	2ndEdn, John Wiley	2007

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M.L.Jhingan	Principles of Economics	Konark Publications	2010
2	Prasanna Chandra	Fundamentals of Financial Management	Tata McGraw Hill, New Delhi.	2007
3	D.M.Mithani	Money, Banking, International Trade & Public Finance	Himalaya Publishing House	2004

16BTCE611 **MASS TRANSFER LABORATORY** **0 0 3 2 100**

COURSE OBJECTIVES:

1. To train the students to develop sound working knowledge on different types of mass transfer equipment
2. These experiments will demonstrate the operation and the design of unit operations that incorporate heat and mass transfer phenomena.
3. will provide an overview of mass transfer operations at basic to an intermediate level
4. the concepts of diffusion mass transfer, mass transfer coefficients, convective mass transfer, interphase mass transfer, equipment for gas-liquid operations, absorption, and distillation.
5. Each topic will be covered in logical sequence with relevant examples
6. Basic concepts of Mass Transfer, Staged and Continuous Contact equipment design, gas absorption, humidification and drying

COURSE OUTCOMES:

On completion of the course the students will be able to

- determine diffusivity and mass transfer co-efficient of a given system
- generate vapour liquid equilibrium data and liquid equilibrium data for different systems
- Design experiments to obtain mass transfer coefficients like diffusion coefficient in liquids and gases. CO2 : Apply the concepts of mass transfer and thermodynamics to the design
- evaluate the performance and determine the design Parameters of Simple /Packed / Steam
- distillation units
- appraise the performance of a simple leaching process

LIST OFEXPERIMENTS

1. Separation of binary mixture using Simpledistillation
2. Separation of binary mixture using Steamdistillation
3. Separation of binary mixture using Packed columndistillation
4. Measurement of diffusivity
5. Liquid-liquidextraction
6. Drying characteristics of VacuumDryer
7. Drying characteristics of Traydryer
8. Drying characteristics of Rotarydryer
9. Water purification using ion exchangecolumns
10. Mass transfer characteristics of Rotating disccontactor
11. Estimation of mass/heat transfer coefficient for coolingtower
12. Demonstration of Gas – Liquidabsorption

TOTAL 45

16BTCE612 PROCESS EQUIPMENT DESIGN AND DRAWING-II 0 0 3 2 100

COURSE OBJECTIVES:

1. To enable the students to learn the methods and practices followed in the design of process equipment and to draw the designed equipment to scale.
2. To impart practical knowledge on the shape and drawing of the process equipment
3. To become a design engineers on process equipment design
4. Create awareness amongst students about the social/industrial demands and role of chemical engineer in the society
5. Incorporate a culture of research and Innovation by providing students with latest facilities
6. Provide a platform to the students to interact with leading teachers, scientists and industry practitioners

COURSE OUTCOMES:

1. Apply the skill in thermal design of heat transfer equipments like condensers and reboilers
2. Estimate the design parameters of reactors
3. Perform the process design of distillationcolumn
4. Apply the skill in design of absorptioncolumn
5. Design storage and agitator vessel for the specified requirement as per standard codes.
6. Design shell and tube heat exchangers and evaporators for the industrial demand by considering standard codes.

LIST OFEXPERIMENTS

- Design ofCondensers
- Design ofreactors
- .Design of distillationColumn
- Design of AbsorptionColumn
- Design ofDryers

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Walas, Stanley M	Chemical Process Equipment Selection and Design	3rd Edition,Butterworth - Heinemann, Boston	2012.
2	Lloyd E.Brownell and Edwin H. Young	Process Equipment Design	John Wiley and Sons	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nicholas P. Cherimisinoff.	Handbook of Chemical Processing Equipment	Butterworth	2000
2	Uzimann	Principles of Chemical Reactor Analysis and Design	2nd Edition, John Wiley andSons	2009

16BTCE651 **MINI PROJECT** **0 0 1 -100**

COURSE OBJECTIVES:

1. The main objective is to give an opportunity to the student to get hands on training of a complete working model, which is designed bythem.

The students may be grouped into 2 to 4 and work under a project supervisor. The device/ system/component(s) to be set as a model may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of theDepartment.

16BTCE652	TECHNICAL PRESENTATION	1 0 0 -100

OBJECTIVES

- To equip the students with effective technicalpresentation
- To understand the barriers and bridges tocommunication
- To improve the public speaking capabilities, body language andposture

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.

Students are encouraged to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

TOTAL 15

SEMESTER VII

16BTCE701 PROFESSIONAL ETHICS, PRINCIPLES OF MANAGEMENT 3 0 0 3 100
AND ENTREPRENEURSHIP DEVELOPMENT

COURSE OBJECTIVES:

1. To enable the students to create an awareness on Engineering Ethics, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.
2. To acquaint with the basic principles of management, ethics, communication techniques and entrepreneurship
3. to enable the students to understand that management is the specific organ of a modern institution on which the very performance and survival of that institution depends.
4. It is the function of management to use all resources available to their organization for the realization of results, so as to enable the firm to earn surplus funds to meet the growth and expansion of its needs.
5. The main objective of management is to attain maximum results with minimum efforts and resources.
6. Management is basically concerned with discovering and utilizing human, material and financial resources in such a manner that they result in best combination. This combination results in the reduction of various costs.

COURSE OUTCOMES:

On completion of the course the students will be able to

1. Develop managerial skills
2. Cultivate engineering ethics with oneself
3. Develop. stress managing attitude and entrepreneurship.
4. Inputs include raw materials, human resources, capital, technology and information.
5. The transformation process turns these inputs into finished products or services through employees' work activities, management activities, and the organisation's technology and operations methods.
6. Outputs include products and services, financial results (profits, break-even or losses) information, and human results such as employees' levels of job satisfaction and productivity

UNIT I HISTORICAL DEVELOPMENT, PLANNING, ORGANISING 9

Definition of Management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies and Planning Premises– Forecasting – Decision–making – Formal and informalorganization – Organization Chart–.

UNIT II DIRECTING AND CONTROLLING 9

Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment –Process of Communication – System and process of Controlling – Requirements for effective control – Control of Overall Performance – Direct and Preventive Control – Reporting

UNIT III ENGINEERINGETHICS 9

Senses of 'Engineering Ethics' – variety of moral issued – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – Models of Professional Roles – theories about right action – Self–interest – customs and religion – uses of ethicaltheories.

UNIT IV FACTORS OF CHANGES 9

Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws. Social changes – Meaning and nature – Theories.

UNIT V ENTREPRENEURSHIP AND MOTIVATION 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur –Achievement

Motivation Training, self rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harold Kooritz and Heinz Weihrich	Essentialsof Management	Tata McGraw Hill, New Delhi	2010
2	Khanka S.S	Entrepreneurial Development	S.Chand and Co. Ltd., NewDelhi	2006
3	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw–Hill, NewYork	2005

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Tripathy P.C and Reddy P.N	Principlesof Management	Tata McGraw Hill, New Delhi	2008
2	Rabindra N Kanungo	Entrepreneurship and innovation	Sage Publications, New Delhi	1998
3	Charles E Harris, and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, New Delhi	2013

WEB REFERENCES

1. http://www.managementstudyguide.com/taylor_fayol.htm
2. http://tutor2u.net/business/gcse/people_motivation_theories.htm
3. http://lfkkb.tripod.com/eng24/gilliganstheory.html
4. http://www.developingeyes.com/five–types–of–entrepreneurs/

16BTCE702	TRANSPORT PHENOMENA	3 0 0 3 100

COURSE OBJECTIVES:

1. Different types of fluids, their flow characteristics and different mathematical models applied to actual situations
2. Mechanism of fluids in motion under different conditions.
3. To impart knowledge about individual and simultaneous momentum, heat and mass transfer, model development along with appropriate boundary conditions.
4. Explain the physical properties of a fluid and their consequences on fluid flow and heat transfer, expressed in terms of the Reynolds number, Nusselt number, and other dimensionless quantities
5. Use conservation principles of mass, momentum, and energy to develop models of fluid flow and heat transfer systems that can be used to predict the behavior of real world systems.
6. To introduce students to the physics and mathematics of momentum, heat, and mass transfer in chemical engineering processes.

COURSE OUTCOMES:

On completion of the course the students will be able to

1. apply the shell momentum balances and velocity distribution in laminar flow and understand
2. equation of continuity and motion
3. establish the shell energy balances and temperature distributions in solids and apply the equations of change to solve heat transfer problems
4. determine the shell mass balance and concentration distributions in systems involving diffusion and reactions
5. analyze the analogy between the transports processes of heat, momentum and mass transfer
6. Determine the interrelationship between the molecular, microscopic and macroscopic descriptions of transport processes and compare the various coordinate systems to formulate Continuity, Navier-Stokes and Euler equations.

UNIT I FUNDAMENTALS OFTRANSPORTPHENOMENA AND VELOCITY DISTRIBUTION IN LAMINAR FLOW 9

Importance of transport phenomena: analogous nature of transport process, basic concepts, conservation laws. Phenomenological laws of transport properties Newtonian and Non-Newtonian fluids, Rheological models, Theories of transport properties of gases and liquids, effects of pressure and temperature.Shell Momentum Balances and Boundary conditions- Flow of a Falling Film- Flow Through a Circular Tube- Flow through an Annulus- Flow of Two Adjacent Immiscible Fluids- Creeping Flow around a Sphere.

UNIT II EQUATION OF CHANGE FOR ISOTHERMAL PROCESS 9

The Equations of Change in Terms of the Substantial Derivative-The Equation of Continuity- The Equation of Motion- Use of the Equations of Change to Solve Flow Problems- Dimensional Analysis of the Equations of Change.

UNIT III VELOCITY DISTRIBUTION IN TURBULENT FLOW 9

Comparisons of Laminar and Turbulent Flows- Time-Smoothed Equations of Change for incompressible Fluids- The Time-Smoothed Velocity Profile near a Wall- Empirical Expressions for the Turbulent Momentum Flux- interphase transport in isothermal system- Definition of Friction Factors- Friction Factors for Flow in Tubes- Friction Factors for Flow around Spheres - Friction Factors for Packed Columns-Ergunequation.

UNIT IV SHELL ENERGY BALANCES ANDTEMPERATURE DISTRIBUTIONS IN SOLIDS AND LAMINARFLOW 9

Shell Energy Balances; Boundary Conditions-Heat Conduction with an Electrical Heat Source-Heat Conduction with a Nuclear Heat Source- Heat Conduction with a Viscous Heat Source- Heat Conduction through Composite Walls- Heat Conduction in a Cooling Fin- Forced Convection-Free Convection-Use of equations of change to setup steady state heat transferproblems.

UNIT V CONCENTRATION DISTRIBUTIONS IN SOLIDS AND LAMINAR FLOW 9

Shell Mass Balances; Boundary Conditions- Diffusion through a Stagnant Gas Film- Diffusion with a Heterogeneous Chemical Reaction- Diffusion with a Homogeneous Chemical Reaction-Diffusion into a Falling Liquid Film (Gas Absorption)- Diffusion into a Falling Liquid Film (Solid Dissolution)- Diffusion and Chemical Reaction inside a Porous Catalyst- Diffusion in a Three-Component Gas System- equations for change for Multi Component Systems- The Equations of Continuity for a MulticomponentMixture.

TOTAL :45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Byron R.Bird, Warren E. Stewart	Transport Phenomena	John Wiley & Sons, New York	2002
2	Sissom L.E., and Pitts D.R	Elements of Transport Phenomena	McGraw Hill	1972

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Brodkey R.S. and Hershey H.C	Transport Phenomena - A United Approach	McGraw Hill,	1988
2	R.W.Fahien.	Elementary Transport Phenomena	McGraw Hill,	1983
3	WeltyJ.R.,Wicks C.E., WilsonR.E	Fundamentals of momentum, heat and mass transfer	John Wiley & sons	2007

16BTCE711 COMPUTATIONAL METHODS IN CHEMICAL ENGINEERING LABORATORY 0 0 3 2 100

COURSE OBJECTIVES:

1. To impart computational techniques for chemical engineering calculation
2. Formulate a chemical engineering problem as a mathematical model, and select an appropriate solution method.
3. Understand the computational requirements of various solution options and use this understanding in the selection of the solution method
4. Select the MATLAB to perform the numerical solution to a chemical engineering problem.
5. Formulate and solve process design problems, based on fundamental analysis and using mathematical models of chemical processes
6. deals with solving the various models by means of various numerical methods by computer simulation.

COURSE OUTCOMES:

1. The current rapid development of these combinatorial methods promises solutions to more complex problems, including the creation of new bio synthetic pathways.
2. Computational methods are also developing quickly.
3. The approaches will allow us to generate the efficient, effective catalysts needed by the pharmaceutical, food and chemicals industries and should open up new opportunities for producing energy and chemicals from renewable resources.
4. Analyze a complete chemical process plant and assess alternative process flow sheets by decomposing the process flow sheets with the help of tearing- precedence ordering techniques.
5. Develop MATLAB/C Programming codes to calculate performance indices like batch time, equilibrium conversion of ideal batch and continuous flow reactors.
6. Generate MATLAB or C Programming codes to compute the design parameters for tubular exchanger, surface condenser, evaporator, crystallizer and storage tank.

LIST OFEXPERIMENTS

Writing Programs and Sub ProgramsusingC/C++ and MATLAB/SCILAB forSolving

1. Jacobi Methods, Cramer‟s Rule- "Multiple Effect Evaporator and SimilarProblems."
2. "Phase Equilibrium Problems, Equation of State Determination of Bubble and Dew Poin"t Differential Distillation- Minimum Reflux RatioCalculations.
3. "Mass Transfer Problems- Rayleigh‟s Equation", NTU in Absorption, Determination of Drying time from batch drying data- Determination of reactorsize.
4. "Milne‟s Method, Laplace Equation, Predictor-CorrectorMethods".
5. "Heat conduction problems and chemical reaction" Engineeringproblems

COMPUTER AIDED DESIGN

Design, Rating and Simulation of Chemical Engineering Equipment Using Aspen Plus / ChemcadSoftware:Mixer, Flow splitter; Flash column; pipe line and pipe pressure drop; Pump; Single and multistage compressors; Heat Exchangers; Distillation Columns; Reactors etc.

COMPUTER AIDED SIMULATION

Simulation Exercises Using Aspen Plus /Chemcad: Physical property estimations; Simulation of a flow sheet:Mass and Energy balances; Handling user specifications on output streams.

4

- Introduction to HYSYS Software, HYSYS User Interface, Defining the SimulationBasis, Selecting a Unit Set, Adding a Stream, FlashCalculations

3

- Adding Utilities, The Stream Property Value, Flash Calculations of a Ethanol-Water Mixture, Gas PlantExample**4**
- Optimization in HYSYS, Set and Adjust Logic Operations, Flash Calculation, PFD Preparation, Sizing of Columns, Oil Manager / Characterization, Pipe Sizing and Pressure Drop in HYSYS, Simulation of liveProject

TOTAL 45

16BTCE712 PROCESS CONTROL LABORATORY 0 0 3 2 100

COURSE OBJECTIVES:

1. To determine experimentally the methods of controlling the processes including measurements using process simulationtechniques.
2. To experimentally verify the process control concepts on the selected process control loops.
3. Explain the characteristics and significance of Final Control Element
4. Design and implement controllers for various processes
5. Tune the controller and improve the performance of the process
6. Design and control complex systems

COURSE OUTCOMES:

1. Students would have knowledge on the development and use of right type of control dynamics for process control under different operative conditions.
2. controller tuning
3. type of controller that can be used for specific problems in chemical industry
4. design of controllers for interacting multivariable systems
5. design of digital control systems
6. Demonstrate the concepts of instrumentation for the measurement, control and classification of systems by utilizing the analog / digital control devices.

LIST OF EXPERIMENTS

1. Single capacity liquid levelprocess
2. Time constant of athermocouple
3. Calibration of resistancethermometer
4. Response of a dialthermometer
5. Two capacity liquid level process withoutinteraction
6. Two capacity liquid level process withinteraction
7. Heat transfer dynamics of stirredtank
8. Computer controlled level processanalyser
9. Computer controlled flow processanalyser
10. Computer controlled pressure processanalyser
11. Computer controlled temperature processanalyser
12. Computer controlled heat exchangersystem
13. Triangle simulatortrainer.

TOTAL 45

16BTCE791 **PROJECT WORK PHASE I** **0 0 8 4 100**

COURSE OBJECTIVES:

1. To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of theDepartment.

16BTCE891 PROJECT WORK - PHASE II & VIVA-VOCE 0 0 32 16 300

COURSE OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of theDepartment.

PROFESSIONAL ELECTIVES

16BTCE5E01 **FOOD TECHNOLOGY** **3 0 0 3 100**

COURSE OBJECTIVES:

1. To enable the students to learn to design processing equipment for Food Industries
2. To acquaint with principles of different techniques used in processing and preservation of foods.
3. To acquaint with properties and role of various constituents in foods, interaction and changes during processing.
4. To develop an understanding and methodologies of instrumental techniques in food analysis used for objective methods of food quality parameters
5. To acquaint with different groups of micro-organisms associated with food, their activities, destruction and detection in food
6. To acquaint the students with packaging methods, packaging materials, packaging machineries, modern packaging techniques etc.

COURSE OUTCOMES:

1. Identify the major and minor constituents of food and its standards
2. Analyse the spoilage and deterioration mechanisms in foods and methods to control
3. Apply principles of food preservation and evaluate variation in processing parameters
4. Evaluate the suitability of packaging material for a particular type of food.
5. Point out processing and preservation techniques of cereals, pulses, fruits and vegetables, egg, Meat, and milk and its products.
6. After completion of the course, the students should be able to understand unit operations in food processing, separation and mixing and food biotechnology.

UNIT I AN OVERVIEW **9**

General aspects of food industry; world food needs and Indian situation.

UNIT II FOOD CONSTITUENTS, QUALITY AND DERIVATIVE FACTORS **9**

Constituents of food; quality and nutritive aspects; food additives; standards; deteriorative factors and their control

UNIT III GENERAL ENGINEERING ASPECTS AND PROCESSING METHODS **9**

Preliminary processing methods; conversion and preservation operations.

UNIT IV FOOD PRESERVATION METHODS **9**

Preservation by heat and cold; dehydration; concentration; drying irradiation; microwave heating; sterilization and pasteurization; fermentation and pickling; packing methods.

UNIT V PRODUCTION AND UTILISATION OF FOOD PRODUCTS **9**

Cereal grains; pulses; vegetables; fruits; spices; fats and oils; bakery; confectionery and chocolate products; soft and alcoholic beverages; dairy products; meat; poultry and fish products.

TOTAL **45**

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Heid J.L. Joslyn M.A.,	Fundamentals of Food Processing Operation	The AVI publishing Co., West port	1967
2	Potter N.N	Food Science	The AVI publishing Co., Westport	1963

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Heldman D.R.,	Food Process Engineering	The AVI publishing co	1975
2	Charm S.E	The Fundamentals of Foods Engineering	The AVI Publishing Co., Westport	1963

16BTCE5E02 ENERGY TECHNOLOGY AND CONSERVATION 3 0 0 3 100

COURSE OBJECTIVES:

1. To motivate the students by highlighting the importance of Energy technology and various energy management concepts
2. To produce energy professionals, strong in energy resources, technologies and management fundamentals, and capable in addressing the present and potential future energy problems.
3. To produce energy professionals, who are sensitive to, and well aware of, the energy issues and concerns, and who can apply their specialized knowledge for the sustainable energy management
4. List and generally explain the main sources of energy and their primary applications in the US, and the world.
5. Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment.
6. Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources

COURSE OUTCOMES:

1. Infer environmental sustainability and to implement in more suitable ways to the society.
2. Identify methods for reducing energy consumption and to implement lower carbon technologies to achieve sustainable society.
3. Collect and organize information about historical perspectives of sustainability and for further development of sustainable industries.
4. Compare the balance between food production and population growth to plan the optimal usage of water resources and to evaluate the solution for the problems of urban sprawl.
5. Explore the fossil fuels formation of oil, natural gas and coal, environmental effects of mining and metals processing and it's time to depletion.
6. Understand the current energy scenario and the need for energy auditing.

UNIT I FUELS TECHNOLOGY

Introduction – Solid fuels – Coal origin, analysis and properties, efficient utilisation, storage and applications, Liquid fuels – Petroleum- Production and consumption, refining, properties and petroleum products, Gaseous fuels – natural gas, producer gas, water gas, gasification of coal; gases from biomass

UNIT II COMBUSTION 9

Distinct features of combustion of solid, liquid and gaseous fuels - determination of gross and net calorific values - combustion of solid fuels including pulverized fuels, stoking and ash removal - fluidized bed combustion of solid fuels - combustion of liquid fuels - burners and nozzles - combustion of gaseous fuels - types of combustion: surface combustion, submerged combustion and pulsating combustion

UNIT III HYBRID SYSTEMS 9

Wind-PV systems, Wind-DG systems, Wind-Hydel systems, Gasifier DG- Wind systems and Application areas, Hybrid conventional and geothermal power plants, Integrated coal gasifier and fuel cell power plant

UNIT IV ENERGY AUDIT 9

Energy Audit: Types and Methodology; Energy Audit Reporting Format; Understanding.Energy Costs; Benchmarking and Energy Performance; Matching Energy Usage to Requirement; Maximising System Efficiency; Fuel and Energy Substitution; Energy Audit Instruments; Duties and responsibilities of energyauditors

UNIT V ENERGY MANAGEMENT 9

Definition and objectives of Energy Management; Importance; Indian need of Energy Management; Energy action planning, Energy Organization, energy costing, budgeting, Equipment professionals, staffing, Monitoring and targeting – Data and Information Analysis; Relating Energy Consumption and Production, Design of energy managementprograms

TOTAL 45

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Gupta	Elements of fuels, furnaces andrefractories	Khanna Publishers	2010
2	Rao S.& Dr. ParulakarB.B	EnergyTechnology	Khanna Publishers	1994
3	SamirSarkar,	Fuels andCombustion	UniversityPress	2009

16BTCE5E03 BIOCHEMICAL ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES:

1. This course mainly discusses the role of enzymes and microbes in biotechnology sectors
2. To apply the chemical engineering principles in biological systems.
3. Description of biomolecule and cell types, their structure and composition
4. Gene expression, regulation, protein synthesis, biomolecule and cell conformation, differentiation, ionic transport communication and mutations and recombinant DNA technology
5. Description of the role of enzymes and development of mechanistic models for enzyme kinetics
6. Description of the various pathways by which cells consume and generate the energy currency allowing them to function and grow.

COURSE OUTCOMES:

1. calculate and analyze the kinetic parameters for microbial growth.
2. analyze bioprocess design and operation.
3. select suitable bioreactor
4. Identify suitable process instrumentation for monitoring and control of bioreactors
5. Design a complete bioreactor based on targets, constraints and physical properties.
6. Know and select process unit operations for product recovery and purification

UNIT-1 INTRODUCTION

Industrial biochemical processes with typical examples, comparing chemical and biochemical processes, development and scope of biochemical engineering as a discipline. Industrially important microbial strains; their classification; structure; cellular genetics.

UNIT II KINETICS OF ENZYME ACTION 9

Kinetics of enzyme catalyzed reaction: the enzyme substrate complex and enzyme action, modulation and regulation of enzyme activity, types of inhibition. Immobilized enzyme technology: enzyme immobilization, Immobilized enzyme kinetics: effect of external mass transfer resistance.

UNIT III KINETICS OF MICROBIAL GROWTH 9

Kinetics of cellular growth in batch and continuous culture, models for cellular growth unstructured, structured and cybernetic models , medium formulation. Thermal death kinetics of cells and spores, stoichiometry of cell growth and product formation , Design and analysis of biological reactors

UNIT IV TRANSPORT PHENOMENA 9

Transport phenomena in bioprocess systems: Gas-liquid mass transfer in cellular systems, determination of oxygen transfer rates, power requirements for sparged and agitated vessels, scaling of mass transfer equipment, heattransfer.

UNIT V DOWN STREAM PROCESSING 9

Downstream processing: Strategies to recover and purify products; separation of insoluble products, filtration and centrifugation; cell disruption-mechanical and non-mechanical methods; separation of soluble products: liquid-liquid extractions, membrane separation (dialysis, ultra filtration and reverse osmosis),chromatographic separation-gel permeation chromatography, electrophoresis, final steps in purification –crystallization and drying

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	J.E.Bailey and D.F.Ollis	Biochemical engineering fundamentals	McGraw Hill	1986
2	Michael L. Shuler and FikretKargi	Bioprocess Engineering	Pearson education	2000

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	James M.Lee	Biochemical engineering	Prentice-Hall	1992
2	Pauline M. Doran	Bioprocess engineering principles	Academic Press	1997
3	H.W. Blanch and D.S. Clark	Biochemical Engineering	Marcel Dekker	1997

16BTCE5E04 FERTILIZER TECHNOLOGY 3 0 0 3 100

COURSE OBJECTIVES:

1. To enable the students to learn the fertilizer manufacturing including new or modified fertilizer products and new techniques.
2. provide exposure to Nitrogenous and Complex fertilizer production technologies.
3. Overview to the most recent Nitrogenous fertilizer production technologies.
4. Improve participants' technical knowledge over a varied range of fertilizer production techniques, understanding the best available technology options with cost effective, minimal energy consumption along with the best approaches to safety and environmental management.
5. Enhance the participants' analytical and trouble-shooting skills by generating awareness to identify and resolve operational inefficiencies, if any, of their facilities.
6. Provide a platform to exchange ideas on a varied range of production topics, opportunity for active interaction with leading technology experts and workshop participants.

COURSE OUTCOMES:

1. Introduce students to the different types of nutrients that plants need to grow upand students to the use of fertilizers to improve soil productivity and crop yield
2. Use reactions and unit operations steps in manufacturing of various fertilizers
3. Characterize fertilizers on the basis of different properties.
4. Identify engineering problems in fertilizer manufacturing.
5. Handle the fertilizers.
6. Select appropriate synthesis fertilizer

UNIT 1 INITROGENOUS FERTILISERS

Methods of production of nitrogenous fertilizer-ammonium sulphate, nitrate, urea and calcium ammonium nitrate; ammonium chloride and their methods of production, characteristics and specifications, storage and handling.

UNIT II PHOSPHATIC FERTILISERS 9

Raw materials; phosphate rock, sulphur; pyrites etc., processes for the production of sulphuric and phosphoric acids; phosphates fertilizers – ground rock phosphate; bone meal-single superphosphate, triple superphosphate, triple superphosphate, thermal phosphates and their methods of production, characteristics and specifications

UNIT III POTASSIC FERTILISERS 9

Methods of production of potassium chloride, potassium schoenite, their characteristics and specifications.

UNIT IV COMPLEX AND NPK FERTILISERS 9

Methods of production of ammonium phosphate, sulphate diammonium phosphate, nitrophosphates, urea, ammonium phosphate, mono-ammonium phosphate and various grades of NPK fertilizers produced in the country.

UNIT V MISCELLANEOUS FERTILISERS 9

Mixed fertilizers and granulated mixtures; biofertilisers, nutrients, secondary nutrients and micro nutrients; fluid fertilizers, controlled release fertilizers, controlled release fertilizers.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Handbook of fertilizer technology		Association of India, New Delhi	1977
2	Menno, M.G	Fertilizer Industry - An Introductory Survey	Higginbothams Pvt. Ltd	1973

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Sauchelli, V.	The Chemistry and Technology of Fertilizers	ACS MONOGRAPH No.148, Reinhold Publishing Cor.New York	1980
2	Fertiliser Manual	United Nations Industrial Development Organisation	United Nations, New York	1967
3	Slack, A.V.;	Chemistry and Technology of Fertilisers,	Interscience, New York	1966

16BTCE6E01 FLUIDIZATION ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES:

1. To enable the students to learn the design aspects of fluidized beds.
2. Introduce students to different organic and inorganic fertilizer production methods.
3. Introduce students to the classification of fertilizers: solid, liquid, and suspension fertilizers.
4. Introduce students to the different types of the nitrogenous, phosphatic and potash fertilizers.
5. Expose students to numerical exercises in the compounding of fertilizers.
6. Expose students to a practical exercise to produce NPK fertilizers.

COURSE OUTCOMES:

1. Be familiar with: Various aspects of fertilizers Various types of phosphate fertilizers Various types of potash fertilizers Various types of NPK fertilizers, fluid and mixed fertilizers
2. Various pollution standards of fertilizer industries
3. They will understand the various methods of production and the processes involved in the manufacture of various fertilizers.
4. They will be able to manage and produce NPK fertilizers (liquid, solid, and suspension) practically
5. Use reactions and unit operations steps in manufacturing of various fertilizers
6. Characterize fertilizers on the basis of different properties.

UNITI BASICS OFFLUIDIZATION 9

Packed bed – Velocity – Pressure drop relations – Correlations of Ergun, Kozneykarman – On set of fluidization – Properties of fluidized beds – Development of fluidization from fixed bed.

UNITII FLUIDIZED BED TYPES 9

Minimum fluidization conditions – Expanded bed – Elutriation – Moving solids and dilute phase – spouted bed.

UNIT IIIDESIGN ASPECTS 9

Channeling – Bed expansion in liquid – Solid and gas – Solid fluidizations. Design aspects of fluidized bed systems.

UNIT IV HEAT AND MASS TRANSFER INFLUIDIZED BEDS 9

Heat and mass transfer in fluidized bed systems – Industrial applications and case studies of fluidized bed systems.

UNIT V OTHER TYPESOFFLUIDIZATION 9

Single stage and multistage fluidization – Collection of fines – Use of cyclones.

TOTAL : 45PERIODS

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Levenspiel	Fluidization Engineering	2nd Edition, Butterworth–Heinmann,	1991
2	Robert H. Perry and Don W. Green	Perry‟s Chemical Engineer‟sHandBook	7th Edition, Mc Graw Hill – International	1997

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Roweand Davidson	Fluidization	Academic Press	1971
2	Leva, M	Fluidization	McGraw Hill Book Co	1959
3	Wen-Ching Yang.,	Handbook of Fluidization and Fluid-Particle Systems	Marcel Dekker Inc	2003

16BTCE6E02 PETROLEUM REFINING ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES:

1. To understand the formation and composition of petroleum
2. To understand the various treatment techniques of petroleum
3. Making students familiarize with upgrading process of petroleum products
4. To understand and know origin, occurrence, exploration, drilling and production of crude oil and be aware of the challenges involved in crude refining from viewpoint of product specifications, economic considerations and environmental regulations.
5. fundamentals of secondary and finishing refining processes as well as covers advanced concepts of these processes, for both fuel and lube refineries.
6. the current scenario of petrochemical industry in India, together its present and future feed stocks and learn the production techniques and challenges of various intermediate and value-added petrochemicals

COURSE OUTCOMES:

1. Assess the quality of refinery products -Liquified Petroleum Gas (LPG), Gasoline, Jet fuel, Diesel, Kerosene and Lube oils using analytical procedures
2. Ascertain distillation characteristics of crude and analyze the physical and chemical properties of refinery products
3. Illustrate the processes of atmospheric distillation, vacuum distillation, gasoline treatment, kerosene treatment, lube treatment, wax removal from petroleum fractions and sulphur recovery
4. Develop flowcharts for thermal and catalytic processes
5. Design distillation column, tube still heaters and evaluate the economics
6. To Identify different types of petroleum products, their specifications and different quality control test with their significance

UNIT –I FORMATION AND COMPOSITIONOFPETROLEUM 9

Origin and formation of petroleum; composition; types and classification; Petroleum reserves.

UNIT – II PROPERTIES AND TESTING METHODS9

Physical properties and testing methods – crude and petroleum products;

UNIT– III TREATMENT TECHNIQUES9

Desalting of crudes, dehydration and fractionation methods; Thermal and catalytic cracking processes – vis-breaking, Dubbs two coil process, coking, FCC, Hydro crackingprocesses.

UNIT–IV UPGRADINGPROCESSES 9

Solvent extraction; hydro treatment processes; Reforming and Alkylation; Isomerization; polymerization; finishing and purification processes.

UNIT –V MATERIAL ANDENERGYBALANCES 9

Material and Energy balances calculation; controlling hydrocarbon losses in refinery; application of pollution control techniques.

TOTAL: 45

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	BhaskaraRao B.K	Modern Petroleum Refining Processes	5th Edition, Oxford and IBH Publishing Company, New Delhi	2008
2	Nelson W.L	Petroleum Refinery Engineering	4th Edition, McGraw Hill Publishing Company Limited	1958

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Watkins R.N	Petroleum Refinery Distillation	2nd Edition, Gulf Publishing Company, Texas	1979
2	Hobson G. D	Modern Petroleum Technology	Part 1&2, 5th Edition, Wiley Publishers	1984

16BTCE6E03 PULP AND PAPER TECHNOLOGY 3 0 0 3 100

COURSE OBJECTIVES:

1. Focused on papermaking science and technology and is intended to be especially valuable to students majoring in programs leading to careers in corporate or government positions which would interface with the paper related industries.
2. Gain a more complete understanding of papermaking terms, equipment, process technology, science, and engineering fundamentals, operations, and variables.
3. Learn how one part of the mill affects other operations.
4. Understand process – product relationships, and troubleshooting product quality problems.
5. Gaining a comprehensive overview of pulp & paper industry, mill operations, products, process variables, equipment, and terminology.
6. Increasing knowledge of how the P&P processes affect product properties

COURSE OUTCOMES:

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1. Apply reactions and unit operations steps to manufacture pulp.
2. Use reactions and unit operations steps appropriately in manufacturing of paper.
3. Use reactions and unit operations appropriately in manufacturing cellulose and various lignin chemicals.
4. Apply waste disposal techniques.
5. Perform various chemical tests to monitor quality of raw material, output quality and influent/effluent
6. Identify requirements for process control and quality assurance in pulp and paper manufacturing processes.

UNIT I INTRODUCTION 9

Introduction Basic pulp and paper technology – Wood haves dry – Wood as a raw material

UNIT II WOODYARD OPERATION 9

Woodyard operation - Mechanical pulping – Chemical pulping – Secondary fibre pulp processing

UNIT III PAPER MACHINE 9

Paper Machine wet and addition paper machine dry and operation – Paper machine - Wet and operation

UNIT IV PAPER AND PAPERBOARD 9

Paper and paperboard frames and products – Surface treatments – Finishing operation– End uses

UNIT V PROPERTIES AND TESTING OF PULP AND PAPER 9

Properties and Testing of pulp and paper Process control – Quality assurance – Water and air pollution control

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kenneth W. Brittt	Handbook of Pulp and Paper Technology	2nd Revised Edition, John Wiley & Sons	1971
2	SmookG.A	Handbook for Pulp & Paper Technologists	3 rd Edition, Angus Wilde Publications, Incorporation	2003

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Austin, G.T	Shreve's Chemical Process Industries	5 th Edition, McGraw-Hill International Book Company, Singapore	1984
2	Kent J.A	Riggel's Hand Book of Industrial Chemistry	Van Nostrant Reinhold	1974

16BTCE6E04 **POLYMER TECHNOLOGY** **3 0 0 3 100**

COURSE OBJECTIVES:

1. To enable the students to compute molecular weight averages from the molecular weight distribution, Condensation polymerization and transition in polymers.
2. To study industrial manufacturing process advantages disadvantages, process parameters of the thermoplastics like PVC CellulosicsSpeciality polymers etc
3. To give understanding of properties like physical mechanical thermal rheological etc and structure properties and relationship
4. To make aware of practical applications of thermoplastics.
5. To study basic processing methods coating applications related to of the thermoplastics
6. To make aware of basics and developments in biopolymers dendrimers LCP etc

COURSE OUTCOMES:

1. Ability to apply Polymer engineering, Polymer science knowledge for the manufacturing of thermoplastic c Polymers like PVC CellulosicsSpeciality Polymers etc
2. Ability to understand properties of polymers, their structure properties and relation as well as to analyze and interpret data
3. Ability to identify, formulate and know practical applications of thermoplastics
4. Ability to use, know polymer processing techniques, skills and modern engineering tools necessary for polymer fabrication, so as to be easily adaptable to polymer industry and coating industry
5. Understanding basics and developments in biopolymers dendrimers LCP and their impact on environment, engineering community and society at large
6. indicate how the properties of polymeric materials can be exploited by a product designer

UNIT I INTRODUCTION **9**

History of Macromolecules – structure of natural products like cellulose, rubber,proteins – concepts of macro molecules – Staudinger's theory of macromolecules – difference between simple organic molecules andmacromolecules

UNIT II ADDITION POLYMERIZATION **9**

Chemistry of Olefins and Dienes – double bonds – Chemistry of free radicals – monomers – functionality – Polymerization: Initiation – types of initiation – free radical polymerization – cationic polymerization – anionic polymerization – coordination polymerization – industrial polymerization – bulk, emulsion, suspension and solution polymerization techniques – Kinetics – Copolymerization concepts

UNIT III CONDENSATION POLYMERIZATION **9**

Simple condensation reactions – Extension of condensation reactions to polymer synthesis – functional group reactivity – polycondensation – kinetics of polycondensation- Carother's equation – Linear polymers by polycondensation – Interfacial polymerization – crosslinked polymers by condensation – gel point.

UNIT IV MOLECULAR WEIGHTS OF POLYMERS **9**

Difference in molecular weights between simple molecules and polymers – number average and weight average molecular weights – Degree of polymerization and molecular weight – molecular weight distribution – Polydispersity – molecular weight determination. Different methods – Gel Permeation Chromatography – Osmometry, Light Scattering.

UNIT V TRANSITIONS IN POLYMERS **9**

First and second order transitions – Glass transition, Tg – multiple transitions in polymers – experimental study – significance of transition temperatures – crystallinity in polymers – effect of crystallization – in polymers – factors affecting crystallization crystal nucleation and growth – relationship between Tg and Tm – Relationship between properties and crystalline structure

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Billmeyer.F.W.,Jr	Text Book of Polymer Science	Ed. Wiley-Interscience	1984
2	Seymour.R.B., and Carraher.C.E., Jr.,	Polymer Chemistry	2nd Ed., Marcel Dekker	1988
3	Gowariker.V.T., Viswanathan.N.V., and Sreedar.J.	Polymer Science	Wiley Eastern Ltd.	1988

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Joel,R.F	Polymer Science and Technology	Eastern Economy Edition	1999
2	Rodriguez, F., Cohen.C., Oberic.K and Arches, L.A.	Principles of Polymer Systems	5^{th} edition, Taylor an	2000

16BTCE6E05 DRUGS AND PHARMACEUTICAL TECHNOLOGY 3 0 0 3 100

COURSE OBJECTIVES:

1. To give the students an understanding of the polytechnical nature of engineeringand drug discovery in the pharmaceutical industry involving Chemical Engineering.
2. To produce pharmacist workforce competent for the society.
3. To produce pharmacy graduates with employable skills and high technical competence in pharmaceutical industry and health care sectors
4. To inculcate research activity and develop passion for discovery and innovations
5. To develop entrepreneurship qualities that support growth of pharmaceutical intellectual property and contribute for economic development throughout the world.
6. Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

COURSE OUTCOMES:

1. Students would have studied about the gross morphology, structure and functions of cell, skeletal, muscular, cardiovascular system of the humanbody.
2. They would have understood the various homeostatic mechanisms and their imbalances.
3. Students would able to identify the different types of bones in human body.
4. Students would be able to identify the various tissues of different systems of human body.
5. Students would learn about the various experimental techniques related to physiology.
6. They would have learnt various techniques like blood group determination, blood pressure measurement, blood cells counting

UNITI INTRODUCTION 9

Development of drugs and pharmaceutical industry; organic therapeutic agents uses and economics

UNITII DRUG METABOLISM AND PHARMACO KINETICS MICROBIOLOGICAL ANDANIMALPRODUCTS 9

Drug metabolism; physico chemical principles; pharma kinetics-action of drugs on human bodies. Antibiotics- gram positive, gram negative and broad spectrum antibiotics; hormones

UNITIII IMPORTANT UNIT PROCESSES ANDTHEIRAPPLICATION 9

Chemical conversion processes; alkylation; carboxylation; condensation and cyclisation; dehydration, esterification, halogenation, oxidation, sulfonation; complex chemical conversions fermentation.

UNITIV MANUFACTURING PRINCIPLES & PACKING AND QUALITYCONTROL 9

Compressed tablets; wet granulation; dry granulation or slugging; advancement in granulation; direct compression, tablet presses formulation; coating pills; capsules sustained action dosage forms; parential solutions, oral liquids; injections; ointments; standard of hygiene and manufacturing practice. Packing; packing techniques; qualitycontrol.

UNIT V PHARMACEUTICAL PRODUCTS &PHARMACEUTICAL ANALYSIS 9

Vitamins; cold remedies; laxatives; analgesics; nonsteroidal contraceptives;

external antiseptics; antacids and others. Analytical methods and tests for various drugs and pharmaceuticals - spectroscopy, chromatography, fluorimetry, polarimetry, refractometry,pHmetry

TOTAL : 45 PERIODS

TEXT BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	RawlinesE.A	Bentleys Text book of Pharmaceutics	III Edition Bailliere Tindall, London	1977

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Yalkonsky, S.H.; Swarbick. J	Drug and Pharamaceutical Sciences	Vol.I, II, III, IV, V, VI and VII, Marcel Dekkar Inc., New York	1975
2	Remingtons	Pharmaceutical Sciences	Mack Publishing Co	1975

16BTCE6E06 CORROSION ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES:

1. This course will give an appreciation of the fundamental principles on corrosion engineering.
2. To provide an understanding of the corrosion principles and engineering methods used to minimize and prevent the corrosion.
3. Defining corrosion and recognize each form of corrosion, corrosion resistance of materials. Describe the economic, environmental, and safety significance of corrosion.
4. Recognize terms and definitions of basic electrochemistry. Understand electrochemical processes and concepts.
5. Establishing corrosion rate. Understand principal corrosion control methods ƒ Control corrosion by design, materials selection, and modification of environment, protective coatings, and cathodic and anodic protection. Effects of different types of polarization.
6. Understanding mechanisms of corrosion reaction including reduction and oxidation reactions, galvanic series, polarization and passivation.

COURSE OUTCOMES:

1. Students know how to approach the problem of choosing an alloy for a particular application.
2. Students know how to approach the design of a heat treatment for an alloy for a particular application.
3. Students know how to slow or defeat corrosion.
4. Students know how to troubleshoot problems in the use of metals and alloys.
5. Students have a basic knowledge of polymerization
6. Students know basic elements of chainmicrostructure (branching, tacticity, networks, etc)

UNITI **9**

Electrochemical and thermodynamic principles, Nernst equation and electrode potentials of metals, EMF and galvanic series, merits and demerits; origin of Pourbaix diagram and its importance to iron, aluminium and magnesiummetals.

UNITII **9**

Exchange current density, polarization - concentration, activation and resistance, Tafelequation; passivity, electrochemical behaviour of active/passive metals, Flade potential, theories of passivity.

UNITIII **9**

Atmospheric, pitting, dealloying, stress corrosion cracking, intergranular corrosion, corrosion fatigue, fretting corrosion and high temperature oxidation; causes and remedial measures.

UNITIV **9**

Purpose of testing, laboratory, semi-plant and field tests, susceptibility tests for IGC, stress corrosion cracking and pitting, sequential procedure for laboratory and on-site corrosion investigations, corrosion auditing and corrosion map of India.

UNITV **9**

Corrosion prevention by design improvements, anodic and cathodic protection, metallic, non-metallic and inorganic coatings, mechanical and chemical methods and various corrosion inhibitors.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	RajNarayan	An Introduction toMetallic Corrosion and itsPrevention	Oxford and IBH	1983
2	Fontana M. G., Greene N. D	Corrosion Engineering	McGraw Hill	1985

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	DennyJones	Principles and Preventionof Corrosion	Prentice Hall	1996

16BTCE6E07	PIPING ENGINEERING	3 0 0 3 100

COURSE OBJECTIVES:

1. To understand the construction and working principle of various piping design.To learn requirements of piping modelling, learn the requirements of piping analysis.
2. Role of a Piping Engineer in various fields of industry.Concept of EPC (Engineering Procurement Construction) Projects
3. Piping design and engineering principles,Terminology, symbols, and abbreviations used in piping design
4. Components of piping systems – fittings, flanges and valves, Pipe Supports,Piping specifications and piping codes
5. Piping materials,Plant layout fundamentals and workflow procedures,terminology and symbols used in plant layout
6. Instrument symbols and abbreviations,Process flow diagrams (PFDs),Piping and instrumentation diagrams (P&IDs)

COURSE OUTCOMES:

1. Describe the responsibilities of piping field engineer and Use pipe's standard tables for different calculations.
2. Describe the functions and features of various piping components/Element
3. Apply various codes and standard for piping in a given situation. Measure pressure in pipes.
4. Explain precautions to be taken in piping fabrication to minimise loss in head due to flow of fluid through piping
5. Interpret and use various simple piping drawings in a given situation
6. Plan and supervise process of surface preparation and painting/coating and Perform the process of pipe shaping, bending and forming

UNIT I INTRODUCTION TO PIPING ENGINEERING 9

Fluid flow, types of fluids and examples, different pipe fittings. Friction factor, pressure drop for flow Newtonian and non-Newtonian fluids, pipe sizing, economic velocity.Pipe line networks and their analysis for flow in branches, restriction orifice sizing.Pressure drop calculations for non-Newtonian fluids.two phase flow, types of two phase flow, two phase flow as encountered in piping for steam, distillation column, pressure drop, vibrations in two phase flow.

UNIT II MATERIALS FOR PIPING 9

Selection of material for piping, desirable properties of piping materials, materials for various temperature and pressure conditions, materials for corrosion resistance. Common ASTM and IS specifications for: Seamless / ERW pipes, pipe fittings, flanges, and fasteners, materials for valves. Gaskets: Functions and properties, types of gaskets and their selection.

UNIT III CONTROL & SAFETY IN PIPING 9

Types of valves, control valves, safety valves, constructional features, criteria for selection.Piping components, pressure relieving devices, constructional features, selection criteria and application, safety features. Calculations for line sizing, steam traps, P.R.V. &condensive systems.

UNIT IV PIPING SYSTEM DESIGN 9

Design principles, calculation of pipe diameter, thickness, important system characteristics and design principles related to steam flow at high and low pressures. Design principles and line sizing for vacuum pipelines, slurry pipelines, surge drums and flare stacks, vacuum devices including ejector system. Considerations governing pump selection, analysis of system and pump characteristics in connection with series, parallel flow, and minimum flow and equalizing lines, NPSH, allowable nozzle loads in various codes. Design principles and line sizing of pneumatic conveying of solids, components of conveying systems, dust and fume extraction systemsprinciples.

UNIT V PIPING LAYOUTS 9

Introduction to P & I Diagrams, Process flow diagrams, standard symbols and notations. Introduction to various facilities required guidelines for Plot Plan / Plant Layout. Introduction to equipment layout, piping layout, piping isometrics and bill of material. Typical piping system layout considerations for following systems: (i) Distillation columns and heat exchangers, (ii) Reactors, (iii) Pipe racks, (iv) Storage tanks, (v) Pumps.

TOTAL 45

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	McAllister E.W.	Pipeline Rules of Thumb Handbook	Gulf Publication	2009
2	Kellogg	Design of Piping System	M.W. Kellogg Co	2009
3.	Weaver R	Process Piping Design	Gulf Publication	1989

16BTCE6E08 **NANO TECHNOLOGY** **3 0 0 3 100**

COURSE OBJECTIVES:

1. To understand the functions and design principles of nanotechnology
2. Apply the scientific knowledge of Physics, Mathematics, Chemistry, and Engineering for deeper understanding of the matter at nanoscale.
3. Identify, formulate, research literature, and analyze advanced scientific problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
4. Design solutions for advanced scientific problems and design system components or processes.
5. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
6. Create, select, and apply appropriate techniques, resources, and modern scientific and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

COURSE OUTCOMES:

1. Apply principles of basic science concepts in understanding, analysis and prediction of matter at Nano scale.
2. To introduce interdisciplinary subjects/concepts/ideas for interdisciplinary application of Science and engineering concepts.
3. To introduce advanced ideas and techniques required in emergent area of nanotechnology.
4. To develop human resource with specialization in theoretical and experimental techniques required for career in academia and Nano technology driven industry.
5. Engage in lifelong learning and adapt to changing professional and societal needs.
6. Understand and apply principles of physics, chemistry and engineering for understanding the scientific phenomenon in nano domain.

UNIT I **9**

Background and Definition of Nanotechnology. Why Nano? Applications in Different Fields, Chemical Approaches to Nanostructured Materials, Molecular Switches and Logic Gates, Solid StateDevices.

UNIT II **9**

Carbon Nanotubes - Structure of Carbon Nanotubes, Synthesis of Carbon Nanotubes, Growth Mechanisms of Carbon Nanotubes, Properties of Carbon Nanotubes, Carbon Nanotube-Based Nano-Objects, Applications of Carbon Nanotubes, Nano wires – Synthesis, Characterization and Physical Properties of Nanowires, Applications.

UNIT III **9**

Basic Microfabrication Techniques, MEMS Fabrication Techniques, Nanofabrication Techniques, Stamping techniques - High Resolution Stamps, Microcontact Printing, Nanotransfer Printing, Applications.

UNIT IV **9**

Material aspects of NEMS and MEMS – Silicon, Germanium-Based Materials, Metals, GaAs, InP, and Related III-V Materials, MEMS Devices and Applications - Pressure Sensor, Inertial Sensor, Optical MEMS, RF MEMS, NEMS Devices and Applications, Current Challenges and FutureTrends.

UNITV **9**

Microscopy - Scanning Tunneling Microscope, Atomic Force Microscope, Scanning Electron Microscopy, Principles of Noncontact Atomic Force Microscope (NC- AFM)

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	B.Bhushan	Springer handbookof nanotechnology	Springer–Verlag	2004
2	Charles P.Poole; Frank K. JOwens	Introduction to Nanotechnology	A John Wiley andSons	2000

16BTCE7E01 ELECTROCHEMICAL ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES:

1. To solve problems related to the production, storage, distribution and utilization of electrochemical energy and the associated environmental issues.
2. learn and retain more, and also to help them develop insight and intuition about electrochemical
3. The knowledge is applied to understand general methodologies for analysis and design of electrochemical systems.
4. To provide knowledge and competency to students in Chemical and Electrochemical Engineering complemented by the appropriate skills and attributes.
5. To make them equally creative and innovative with design and soft skills to carry out various problem solving tasks
6. To enable students to work both individually and as teams on multidisciplinary projects with effective communication skills, individual, supportive and leadership qualities with the right attitudes and ethics.

COURSE OUTCOMES:

1. Understand principles of electrochemical processes.
2. Grasp electroanalytical methods and their use.
3. Have knowledge of different applications of Electrochemistry in areas such as synthesis, materials, environment and energy.
4. Link principles of electrochemistry and electroanalytical results to electrochemical processes and suggest design solutions to engineering problems
5. Students are able to recognize and balance oxidation-reduction reactions.
6. Students recognize the different types of electrochemical cells.

UNIT I 9

Review basics of electrochemistry: Faraday‟s law -Nernst potential –Galvanic cells – Polarography, The electrical double layer: It‟s role in electrochemical processes –Electro capillary curve –Helmoltz layer–Guoy –Steven‟s layer – fields at the interface.

UNIT II 9

Mass transfer in electrochemical systems: diffusion controlled electrochemical reaction –the importance of convention and the concept of limiting current. Over potential, primary-secondary current distribution –rotating disc electrode.

UNIT III 10

Introduction to corrosion, series, corrosion theories derivation of potentialcurrent relations of activities controlled and diffusion controlled corrosion process. Potential-pH diagram, Forms of corrosion- definition, factors and control methods of various forms of corrosion-corrosion control measures industrial boiler water corrosion control –protective coatings –Vapor phase inhibitors –cathodicprotection,sacrificialanodes–Paintremovers.

UNIT IV **8**

Electro deposition –electro refining –electroforming –electro polishing – anodizing –Selective solar coatings, Primary and secondary batteries –types of batteries, Fuel cells.

UNIT V **9**

Electrodes used in different electrochemical industries: Metals-Graphite –Leaddioxide –Titanium substrate insoluble electrodes –Iron oxide –semi conducting type etc. Metal finishing-cell design.types of electrochemical reactors, batch cell, fluidized bed electrochemical reactor, filter press cell, Swiss roll cell, plug flow cell, design equation, figures of merits of different type of electrochemicalreactors.

TOTAL : 45 PERIODS

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Picket	Electrochemical Engineering	Prentice Hall	1977
2	J. S	Electrochemical systems	Prentice Hall	1973

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Barak, M. and	Electrochemical Power Sources	McGraw Hill	1980
	Stevenge U. K	- Primary and Secondary Batteries	McGraw Hill	1990
2	Mantell, C	Electrochemical Engineering	McGraw Hill	1972

16BTCE7E02 COMPUTATIONAL FLUID DYNAMICS 3 0 0 3 100

COURSE OBJECTIVES:

1. To make the students to demonstrate competence in setting up computational fluid dynamics models for some industrially important applications. This technical competence in building and conducting CFD simulations is a skill which enhancesemployability.
2. The course covers numerical methods for physical simulations of gas and liquid flows. The course is based on the finite difference method and the finite element method with emphasis on fluid dynamics and includes various computational problems in fluid dynamics such as boundary conditions and meshing
3. the student to widely used techniques in the numerical solution of fluid equations, issues that arise in the solution of such equations, and modern trends in CFD
4. To provide brief introduction of Computational Fluid Dynamics along with chemical engineering application specifically, analysis of fluid mechanics and heat transfer related problems.
5. basic knowledge of CFD which will permit them to function competently in both an industrial setting and in further graduate studies involving CFD and its applications
6. The emphasis of the course is to teach CFD techniques for solving incompressible and compressible N-S equation in primitive variables, grid generation in complex geometry, transformation of N-S equation in

COURSE OUTCOMES:

1.Able to use and develop flow simulation software for the most important classes of flows in engineering and science.
2.Able to critically analyze different mathematical models and computational methods for flow simulations
3.Able undertake flow computations using current best practice for model and method selection, and assessment of the quality of results obtained.
4. The student will demonstrate the ability to use modern CFD software tools to build flow geometries, generate an adequate mesh for an accurate solution, select appropriate solvers to obtain a flow solution, and visualize the resulting flow field.
5.The student will demonstrate the ability to analyze a flow field to determine various quantities of interest, such as flow rates, heat fluxes, pressure drops, losses, etc., using flow visualization and analysis tools.
6. The student will demonstrate an ability to recognize the type of fluid flow that is occurring in a particular physical system and to use the appropriate model equations to investigate the flow.

UNIT I CONSERVATION LAWSANDTURBULENCE MODELS 9

Governing equations of fluid flow and heat transfer –mass conservation, momentum and energy equation, differential and integral forms, conservation and non-conservation form. Characteristics of turbulent flows, time averaged Navier Strokes equations, turbulence models-one and two equation, Reynolds stress, LES and DNS.

UNIT II FINITEDIFFERNCE APPROXIMATION 9

Mathematical behaviour of PDE, finite difference operators, basic aspects of discretization by FDM, explicit and implicit methods, error and stabilityanalysis

UNIT III FINITEVOLUME METHOD 15

Diffusion problems – explicit and implicit time integration; Convection-diffusion problems properties of discretisation schemes, central, upwind, hybrid, QUICK schemes; Solution of discretized equations.

UNIT IV FLOWFIELD COMPUTATION 6

Pressure velocity coupling, staggered grid, SIMPLE algorithm, PISO algorithm for steady and unsteady flows

UNIT VGRIDGENERATION 6

Physical aspects, simple and multiple connected regions, grid generation by PDE solution, grid generation by algebraic mapping.

TOTAL : 45 PERIODS

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Anderson, J. D	Computational Fluid Dynamics: The Basics with Applications	McGraw-Hill	1995
2	Fletcher, C. A. J	Computational Techniques for Fluid Dynamics	Springer Verlag	1997
3	Versteeg, H.K. andMalalasekera, W	An Introduction to Computational Fluid Dynamics: The Finite Volume Method	Pearson Education Ltd	2007

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Chung T.J	Computational Fluid Dynamics	Cambridge University Press	2003
2	Muralidhar, K., and Sundararajan, T	Computational Fluid Flow and Heat Transfer	NarosaPublishing House, New Delhi	2001
3	Ghoshdastidar, P.S	Computer Simulation of flow and heat transfer	Tata McGraw – Hill Publishing Company Ltd	1998
4	Subas, V. Patankar	Numerical heat transfer fluid flow	Hemisphere Publishing Corporation	1980
5	Taylor, C and Hughes, J.B	Finite Element Programming of the Navier Stock Equation	Pineridge Press Limited, U.K	1981

COURSE OBJECTIVES:

1. To focus on the wastewater transport system and the theory and design technique for the wastewater treatmentprocess.
2. Student can apply knowledge of basic water chemistry (equilibrium, thermodynamics) to solve problems associated with water/wastewater treatment and natural water quality.
3. Student can apply knowledge of redox reactions to solve problems associated with water/ wastewater treatment and natural water quality.
4. Student can apply knowledge of Acid-base reactions and alkalinity/acidity to solve problems associated with water/wastewater treatment and natural water quality.
5. Student can apply knowledge of two phase (water and solid) reactions and solubility to solve problems associated with water/wastewater treatment and natural water quality
6. Distinguish between conditioning, thickening, and dewatering .List the factors that affect which conditioning, thickening, and dewatering methods are used. Describe four methods of sludge conditioning

COURSE OUTCOMES:

1. Select or construct appropriate treatment schemes to remove certain pollutants present in water or wastewater.
2. Design a water or wastewater treatment component.
3. Balance chemical reactions and use balanced reactions to determine the distribution of species at equilibrium.
4. Develop a mass balance expression for contaminants under different case scenarios and design a simple system to meet desired needs
5. Learn how to characterize wastewater, and the BAT for physical, chemical and microbiological treatment of wastewater.
6. Understand selected contemporary global water and wastewater issues such as water shortage, wastewater reuse and emerging contaminants.

UNIT I WASTE WATER TREATMENTANOVERVIEW 9

Terminology – Regulatios – Health and Environment Concerns in waste water management – Constituents in waste water inorganic – Organic and metallic constituents.

UNIT II PROCESS ANALYSISAND SELECTION 9

Components of waste water flows – Analysis of Data – Reactors used in waste water treatment – Mass Balance Analysis – Modeling of ideal and non-ideal flow in Reactors – Process Selection.

UNIT III CHEMICALUNIT PROCESSES **9**

Role of unit processes in waste water treatment chemical coagulation – Chemical precipitation for improved plant performance chemical oxidation – Neutralization – Chemical Storage.

UNIT IVBIOLOGICAL TREATMENT **9**

Overview of biological Treatment – Microbial metabolism – Bacterial growth and energatus Aerobic biological oxidation – Anaerobic fermentation and oxidation – Trickling filters – Rotating biological contractors – Combined aerobic processes – Activated sludge film packing.

UNIT V ADVANCED WASTE WATER TREATMENT **9**

Technologies used in advanced treatment – Classification of technologies Removal of Colloids and suspended particles – Depth Filtration – Surface Filtration – Membrane Filtration Absorption – Ion Exchange – Advanced oxidation process.

TOTAL : 45 PERIODS

TEXT BOOKS

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Metcalf, Eddy	Waste Water Engineering Treatment and Reuse	2nd Edition, Tata McGraw Hill Company, NewYork	2002
2	Tchobanoglous G	Industrial Waste Water Management, Treatment	3rd Edition, Tata McGraw Hill Professional Publishing Company, New York	2008

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Eckenfelder W.W	Industrial Water Pollution Control	2nd Edition, McGraw-Hill	1999
2	ArceivalaS.J	Wastewater Treatment for Pollution Control	3rd Edition, McGraw-Hill	2006

16BTCE7E04 TOTAL QUALITY MANAGEMENT 3 0 0 3 100

COURSE OBJECTIVES:

- To facilitate the understanding of Quality Management principles and process.
- To understand the concept of Quality
- To understand the Implication of Quality on Business
- To Implement Quality Implementation Programs
- To have exposure to challenges in Quality Improvement Programs

COURSE OUTCOMES:

1. Given a product or a service type, the student manager will be able to enumerate and justify the dimensions of product quality or service quality for the same.
2. Given the quality gurus (Deming/ Juran/ Taguchi/ Crosby), the student manager will be able to justify their philosophies/ contributions in Quality Management.
3. Given a quality problem/ failure mode, the student manager will be able to identify causes and sub causes of the effect/ problem draw and justify Ishikawa Diagram.
4. Given the defective item analysis (type of defect, frequency, number of defects), the student manager will be able to draw and justify the Pareto chart to prioritize the defects.
5. For a given type of organization, the student manager will be able to enlist and justify the four levels of benchmarking and/ or enlist and brief seven step benchmarking model
6. Given a product/ service (at the design stage), the student manager will be able to enlist the customer requirements and technical/ design requirements and draw and justify the house of quality and quality function deployment for the same.

UNITI INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

UNIT IITQM PRINCIPLES 9

Leadership - Strategic quality planning, Quality Councils – Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership-Partnering,Supplier selection, Supplier Rating.

UNIT III TQM TOOLS ANDTECHNIQUESI 9

The seven traditional tools of quality - New management tools - Six sigma: Concepts,Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA -Stages,Types.

UNIT IV TQM TOOLS ANDTECHNIQUESII **9**

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development(QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performancemeasures.

UNIT VQUALITY SYSTEMS **9**

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors..

TOTAL: 45 PERIODS

TEXT BOOKS

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dale H. Besterfiled, et at	Total quality Management	Pearson Education Asia, Third Edition, Indian Reprint	2006

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	James R. Evans and William M. Lindsay	The Management and Control of Quality	8th Edition, First Indian Edition, Cengage Learning	2012
2	Suganthi.L and Anand Samuel	Total Quality Management	Prentice Hall (India) Pvt. Ltd	2006
3	Janakiraman. B and Gopal .R.K	Total Quality Management - Text and Cases	Prentice Hall(India) Pvt. Ltd	2006

16BTCE8E01 PROCESS OPTIMIZATION 3 0 0 3 100

COURSE OBJECTIVES:

1. To know the design experiments and formulate optimization modelsofchemical processes/equipments.
2. Provide students with the basic mathematical concepts of optimization.
3. Provide students with the modeling skills necessary to describe and formulate optimization problems.
4. Provide students with the skills necessary to solve and interpret optimization problems in engineering.
5. Enhance students' skills related to optimization in chemical engineering, open-ended problem solving, critical thinking and life-long learning.
6. Learn classical optimization techniques and numerical methods of optimization

COURSE OUTCOMES:

1. Apply knowledge of optimization to formulate and solve engineering problems.
2. Understand the different methods of optimization and be able to suggest a technique for a specific problem.
3. Understand how optimization can be used to solve industrial problems of relevance to the chemical and oil industries.
4. Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems.
5. Use classical optimization techniques and numerical methods of optimization.
6. Describe the basics of different evolutionary algorithms.

UNIT –I DEVELOPING MODELSFOR OPTIMIZATION 9

Scope and hierarchy of optimization, Essential features of Optimization problems, Classification of Models, Building a model, Factorial experimental designs, Degree of freedom

UNIT – IIBASIC CONCEPTS 9

Formation of COURSE OBJECTIVES: function, continuity of functions, NLP problem statement, convexity and applications, Interpretation of COURSE OBJECTIVES: function based on its Quadratic approximation

UNIT – III OPTIMIZATION OFUNCONSTRAINEDFUNCTIONS 9

Methods for one dimensional search, Newton,,s method and Quasi – Newton methods for uni dimensional search. Polynomial approximation methods

UNIT – IV UNCONSTRAINEDMULTIVARIABLE OPTIMIZATION 9

Methods using function value only, methods using first derivative, Newton,,s method, Quasi – Newtonmethods.

UNIT – VLINEARPROGRAMMING 9

Simple method, Barrier method, sensitivity analysis, Linear mixed integer programs, Examples

TOTAL: 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Edgar T.F., Himmelblau D.M., and Ladson L.S	Optimization of Chemical Practice	2nd Edition, McGraw Hill International Company, New York,	2003
2	Kalyanmoy Deb	Optimization for Engineering Design: Algorithms and Examples	Prentice Hall of India, New Delhi	2005

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Joshi M.C., and Kannan M. Moudgalya	Optimization, Theory and Practice	Narsoa Publication, New Delhi	2004
2	Urmila M. Diwaker	Introduction to Applied Optimization	Kluwer Academic Publication	2003

16BTCE8E02 PILOT PLANT AND SCALE UP METHODS 3 0 0 3 100

OBJECTIVES

1. To understand about the pilot plants, models, similarity and scale up methods
2. To understand the scale-up of reactors, columns and dryers, unit operations equipment, sand its limitations
3. To understand the importance of process equipment geometry and to provide concepts, methods and analysis to translate various chemical processes from laboratory scale to plant scale
4. To understand different scale up methods in chemical engineering and applying the knowledge to scale up the reactors for industrial scale operations.
5. Preparation and providing of Master Manufacturing Formula for manufacturing.
6. Evaluation and Validation for process and equipment. and formula to assess the batch stability.

COURSE OUTCOMES:

1. Scale-up the fluid phase and fluid-fluid reactor.
2. Scale-up the mixing units and separation units.
3. Scale-up for mass transfer processes.
4. Demonstrate the practice and the process of technology transfer from lab scale to commercial.
5. Scaling up of equipment like heat exchangers, evaporator, and packed towers, agitated vessel and chemical reactors.
6. Analyze the problems involved in chemical engineering equipment

UNIT –I FUNDAMENTALS OF SCALE UP, DIMENSIONAL ANALYSIS AND SCALE-UP CRITERION 9

Principles of Similarity, Pilot Plants and Models, Introduction to Scale-up Methods, Dimensional Analysis, Regime Concept, Similarity Criterion and Scale up Methods used in Chemical Engineering.

UNIT – II SCALE-UP OF HEATTRANSFER EQUIPMENT 9

Typical Problems in Scale-up of Mixing Equipment and Heat Transfer Equipment.

UNIT – III SCALING UPOFREACTORS 9

Scale-up Techniques available for Tubular Reactor, CSTR and Catalytic Reactors.

UNIT – IV SCALE-UP OF MASSTRANSFER EQUIPMENT 9

Distillation Column and Packed Towers: Scale-up of Distillation Columns and Packed Towers for Continuous and Batch Processes and Dryers

UNIT – V SCALE UP OF MISCELLANEOUS EQUIPMENTAND LIMITATIONS 9

Scaling up of Ball Mill, Pressure Jet Nozzle and Centrifugal Disk Atomizers and Screw Extruders, Furnaces and Kilns, Analogue Models, Limitations of Scale up Techniques.

TOTAL : 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Johnstone R.E. and Thring M.W	Pilot Plants Models and Scale-up methods in Chemical Engineering	McGraw Hill, New York	1962
2	Marko Zlokarnik	Scale-up in Chemical Engineering	Wiley-VCH,Germany	2002

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Marko Zlokarnik	Dimensional Analysis and Scale-up in Chemical Engineering	Springer - Verlag, Berlin, Germany	1986
2	Donald G. Jordan	Chemical Process Development, Part-1 and 2	Intersciences Publishers	1988

16BTCE8E03 POLLUTION CONTROL IN PROCESS INDUSTRIES 3 0 0 3 100

OBJECTIVES

1. To impart the basic concepts of industrial pollution control
2. To develop understanding about water, air, light pollution control
3. Characterization and classification of different types of wastes are discussed along with existing norms for waste disposal.
4. Treatment methods of specific pollutant arising out of industrial process are explained.
5. To impart students with strong knowledge base through theory courses and sessional that makes them suitable for industries, academics, research and consultancies.
6. To develop students analytical, computational and research skills through assignments, weekly presentations and modeling software.

UNIT I INTRODUCTION 9

Man and Environment, Types of pollution, Pollution control aspects, Pollution monitoring and analysis of pollutant. Air pollution: Sources and effects, particulate control, control of gaseous pollutants (SOx, NOx, oxides of carbon, hydrocarbon pollutants), Air Quality Management.

UNIT II WATER POLLUTION 9

Types of water pollution, sources, water pollution control. Waste water treatment technologies and Recycle.

UNIT III SOLID WASTE MANAGEMENT 9

Sources, processing methods, waste disposal methods, energy recovery from solid waste

UNIT IV NOISE POLLUTION 9

Hazardous noise exposure, noise measuring instruments and noise pollution control technology. Regulations: ISO 14000, 9000, pollution Acts and Regulations.

UNIT V CASE STUDY 9

Pollution (Air, Water & Solid) control in the following process industries - Fertilizers, Petroleum Refinery and Petrochemical, Pulp and Paper, Cane Sugar, Tannery, Distilleries and Pharmaceutical Industry.

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.C. Bhatia	Environmental Pollution and control in chemical process industries	Khanna Publishers	2001
2	C.S.Rao	Environmental Pollution Control Engineering	Wiley Eastern	1992

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.P.Mahajan	Pollution control in Process Industries	Pollution control in Process Industries	1990
2	F. P. Lees	Loss prevention in process industries	Butter worth- Heinemann	1996
3	Martin Crawford	Pollution Control Theory	McGraw Hill	1976
4	Marell	Solid Wastes	John Wiley	1975

16BTCE8E04 STATISTICAL THERMODYNAMICS 3 0 0 3 100

COURSE OBJECTIVES

1. The student will acquire an introduction to concepts that link classical and statistical thermodynamics.
2. The course will also provide the student with the basic knowledge of statistical thermodynamics and its applications in chemistry and chemical engineering
3. converse with correct concepts of thermodynamics and statistical mechanics,
4. understand statistics of particles and statistics of fields,
5. perform mean field calculations, understand various models in statistical mechanics.
6. understand the significance and characteristics of critical phenomena, and understand the concepts of universality and scaling laws

COURSE OUTCOMES:

1. Account for the physical interpretation of partition functions and be able to calculate thermodynamic properties of model systems with using Boltzmann -, Fermi-Dirac and Bose-Einstein statistics.
2. Account for the physical interpretation of distribution functions and discuss and show how these can be used in calculations of basic thermodynamic properties.
3. Calculate physical characteristics of non-ideal gases and liquids using the most common models for fluids.
4. Account for the fundamental ideas in the Debye-Hückel theory and use the theory for calculations of properties of electrolytes.
5. Student can recover the laws of thermodynamics and the equipartition theorem from the statistical description using microstates.
6. Student uses the partition function for calculations about the canonical ensemble.

UNITI STATISTICAL-MECHANICAL ENSEMBLES AND THERMODYNAMICS 9

Ensembles and Postulates, Canonical Ensemble and Thermodynamics, Grand Canonical Ensemble, Microcanonical Ensemble, Entropy, Other ensembles, characteristic equations, Fluctuations

UNIT II GENERAL RELATIONS FOR INDEPENDENT MOLECULES 9

Thermodynamic equivalence of ensembles, Second law, Criteria for spontaneous change, Systems of distinguishable and indistinguishable particles, Boltzmann Statistics, Translational Partition Function.

UNITIII IDEAL MONOATOMIC AND DIATOMIC GAS 9

Ideal Monatomic Gas, Density of States, Thermodynamic Functions, Internal Degrees of Feedom, Homonuclear Diatomics, Molecular Partition Functions, Ideal Diatomic Gas, Vibrational, Rotational, Gas of Homonuclear Diatomics at Low Temperature, Quantum Statistics, Polyatomic Molecules

UNITIV CHEMICAL EQUILIBRIUM IN IDEAL MIXTURES 9

Chemical Equilibrium, General Relations, Statistical Derivation in a Special Case, Fluctuations in a Simple Chemical Equilibrium, Examples of Chemical Equilibriua.

UNIT V RATES OF CHEMICAL REACTIONS IN IDEAL MIXTURES 9

Potential Surfaces, Absolute Rate Theory, A Non-Chemical Application of the Eyering Theory

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Terrell. L, Hill	An Introduction to Statistical Thermodynamics	Dover Publications	1987

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Donald. A, McQuarrie	Statistical Mechanics	University Science Books Publishers	2000

16BTCE8E05 **PLANT UTILITIES** **3 0 0 3 100**

COURSE OBJECTIVES:

1. Equipping the students with knowledge on the various process utilities and importance in chemical process plants
2. To gain knowledge about different process utilities used in the chemical process
3. To enable the students to understand the process plant utilities and optimization techniques to optimize various parameters in chemical industries
4. To study requirement of different utilities for the process, along with its generation and it's effective utilization
5. To learn the operating principles, construction and working of temperature, pressure and level measuring devices
6. To select the most suitable measuring device based on its performance characteristics for specific measuring devices.

COURSE OUTCOMES:

- Acquire the knowledge for selection of different utilities.
- Understand basic calculations involved in steam generation, psychometric operation and refrigeration.
- Describe the different equipment used to run the process plant with different utilities.
- State the principles involved during water treatment
- Know different fuels used in boilerscalculate the requirements of water and air and their applications as utilities
- calculate the steam requirement and its applications as utility.
- evaluate and apply the various risk assessment methods in industries

UNIT I STEAM, COMPRESSORS AND VACUUM PUMPS **9**

Steam generation and its application in chemical process plants, steam distribution including appropriate mechanical valves and instrumentation, steam utilization, design of efficient steam heating systems, steam nozzles. Compressed air, process pumps, compressors, vacuum pumps, pressurized air distribution systems. Types of compressors and vacuumpumps.

UNIT II REFRIGERATION SYSTEMS AND INSULATION **9**

Refrigeration system and their characteristics, load calculation and load calculation and humidification and de humidification equipments, drying and cooling tower, air blending, exhaust, ventilation, cryogenics, their characteristics and production of liquid N2 and O2Importance of insulation for meeting for the process equipment, insulation material and their effect on various materials of equipment piping, fitting and valves, insulation for high, intermediate, low and subzero temperatures including cryogenic insulation, determination of optimum insulation thickness.

UNIT III WATER **9**

Water Resources, process water, boiler feed water, storage and distribution of water, reuse and conservation of water.

UNIT IV PIPING **9**

Piping: Role & scope of piping, line diagram, Process flow diagram and piping and instrumentationdiagram.

UNIT V PINCH ANALYSIS **9**

Pinch Analysis: Problem representation, temperature enthalpy diagram, simple match matrix. Heat content diagram, Temperature interval diagram. Heat Exchanger Network Synthesis using Pinch technology

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Jack Broughton	Process Utility Systems: Introduction to Design, Operation and Maintenance	IChemE	1994

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mahesh Rathore	Thermal Engineering	Tata McGraw Hill India	2010
2	Robin M. Smith	Chemical Process: Design and Integration	John Wiley & Sons Ltd., 2005.	2005

16BTCE8E06 INDUSTRIAL MANAGEMENT 3 0 0 3 100

COURSE OBJECTIVES:

1. To provide an opportunity to learn basic management concepts essential for business
2. explain how a business as well as leadership, organizing, strategic planning, and management control functions in an industrial organisation.
3. interpret an annual report from an industrial organisation, as well as be able to calculate and design the different parts of it at a basic level.
4. explain the structure of the industrial company's stream of payments.
5. construct, interpret and use cost calculations as part of the decision support for the industrial company's different situations.
6. To be able to explain how the different parts of the area fit together

COURSE OUTCOMES:

1. Understand the theories and principles of modern management and apply the concepts to the management of organizations in private and public sector
2. Understand how managers can effectively plan in today's dynamic environment, be familiar with the design of organization structure and describe how environmental uncertainty affects organization design.
3. Identify what strategies organizations might use to become more customer oriented and be more innovative. Identify the characteristics of effective teams and understand why teams have become so popular in organizations
4. Describe contemporary theories of motivation and discuss the challenges managers face in motivating unique group of workers
5. understand the impact of engineering solutions in a global, economic, environmental, and social context; A recognition of the need for, and an ability to engage in lifelong learning;
6. A knowledge of contemporary issues; and an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

UNIT I INTRODUCTION 9

Management - Definition – Functions – Evolution of Modern Management – Scientific Management Development of Management Thought. Approaches to the study of Management, Forms of Organization – Individual Ownership – Partnership – Joint Stock Companies – Co-operative Enterprises – Public Sector Undertakings, Corporate Frame Work – Share Holders – Board of Directors – Committees – Chief Executive –Trade Union

UNIT II FUNCTIONS OF MANAGEMENT 9

Planning – Nature and Purpose – Objectives – Strategies – Policies and Planning Premises – Decision Making – Organizing – Nature and Process – Premises – Departmentalization – Line and staff – Decentralization – Organizational culture, Staffing - selection and training – Placement – Performance appraisal – Career Strategy – Organizational Development. Leading – Managing human factor – Leadership – Communication, Controlling - Process of Controlling – Controlling techniques, productivity and operations management – Preventive control, IndustrialSafety.

UNIT III ORGANIZATIONAL BEHAVIOUR 9

Definition – Organization – Managerial Role and functions – Organizational approaches, Individual behaviour – causes – Environmental Effect – Behavior and Performance, Perception – Organizational Implications. Personality – Contributing factors - Dimension – Need Theories – Process Theories – Job Satisfaction, Learning and Behavior – Learning Curves, Work Design and approaches.

UNIT IV GROUP DYNAMICS 9

Group Behavior – Groups – Contributing factors – Group Norms, Communication – Process – Barriers to communication – Effective communication, leadership – formal and informal characteristics – Managerial Grid – Leadership styles – Group Decision Making – Leadership Role in Group Decision, Group Conflicts – Types – Causes – Conflict Resolution – Inter group relations and conflict, Organization centralization and decentralization – Formal and informal – Organizational Structures – Organizational Change and Development – Change Process – Resistance to Change – Culture and Ethics.

UNIT V MODERN CONCEPTS 9

Management by Objectives (MBO), Management by Exception (MBE), Strategic Management - Planning for Future direction – SWOT Analysis – Information technology in management – Decisions support system – Business Process Re-engineering (BPR) – Enterprises Resource Planning (ERP) – Supply Chain Management (SCM) – Activity Based Management(ABM).

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Herald Knottz and Heinz Weihrich	Essentials of Management	Tata McGraw Hill Education Pvt. Ltd.,	2010
2	Stephen P. Robbins	Organization Behaviour	Pearson Education Inc., 13 edition	2010

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ties, AF, Stoner and R.Edward Freeman	Management	Prentice Hall of India Pvt. Ltd. New Delhi	1992
2	Joseph J, Massie	Essentials of Management	Prentice Hall of India Pvt. Ltd	1985
3	P.C. Tripathi & P.N. Reddy	Principles of Management	Tata McGraw Hill	2006

16BTCE8E07 MODERN SEPARATION PROCESSES 3 0 0 3 100

COURSE OBJECTIVES:

1. To enable the students to learn the principle and technical concept of advanced separation processes.
2. Understand the basic principles of staged and continuous contact separation equipment involved in equilibrium staged operations such as distillation, absorption, liquid-liquid extraction, leaching, adsorption and other modern separation operations
3. Perform basic design calculations for staged and continuous contact equilibrium staged separation operations
4. Describe various types of equipment's and modern separation methods for high purity products widely used in separation operation
5. To be able to design distillation columns having multiple feed streams.
6. To be able to understand the operating principles behind the various types of modern separation methods and to be able to select appropriate method for a particular application.

COURSE OUTCOMES:

1. Ability to analyze and design pervaporation, chromatography and dialysis based separation processes
2. Describe basic principles of various equilibrium staged operations involving material and energy balances
3. Determine the number of equilibrium stages required for distillation and absorption units
4. Determine number of transfer units and height requirements required for extraction, leaching and adsorption units
5. Explain different column/equipment used for various separation applications
6. Recognize modern separation techniques applied in industries for high purity products

UNIT I BASICS OFSEPARATION PROCESS 9

Review of Conventional Processes, Recent advances in Separation Techniques based on size, surface properties, ionic properties and other special characteristics of substances, Process concept, Theory and Equipment used in cross flow Filtration, cross flow Electro Filtration, Surface based solid – liquid separations involving a secondliquid.

UNIT IIMEMBRANE SEPARATIONS 9

Types and choice of Membranes, Plate and Frame, tubular, spiral wound and hollow fiber Membrane Reactors and their relative merits, commercial, Pilot Plant and Laboratory Membrane permeators involving Dialysis, Reverse Osmosis, Nanofiltration, Ultra filtration and Micro filtration, Ceramic- Hybrid process and BiologicalMembranes.

UNIT III SEPARATIONBY ADSORPTION 9

Types and choice of Adsorbents, Adsorption Techniques, Dehumidification Techniques, Affinity Chromatography and Immuno Chromatography, Recent Trends in Adsorption.

UNIT IVINORGANICSEPARATIONS 9

Controlling factors, Applications, Types of Equipment employed for Electrophoresis, Dielectrophoresis, Ion Exchange Chromatography and Eletrodialysis, EDR, Bipolar Membranes.

UNIT VOTHER TECHNIQUES 9

Separation involving Lyophilisation, Pervaporation and Permeation Techniques for solids, liquids and gases, zone melting, Adductive Crystallization, other Separation Processes, Supercritical fluid Extraction, Oil spill Management, Industrial Effluent Treatment by Modern Techniques.

TOTAL : 45PERIODS

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	King., C. J	Separation Processes	Tata McGraw Hill	1982
2	Roussel, R. W	Handbook of Separation Process Technology	John Wiley, New York	1987
3	Nakagawal.O. V	Membrane Science and Technology	Marcel Dekkar	1992

16BTCE8E08 PROCESS MODELING AND SIMULATION 3 0 0 3 100

COURSE OBJECTIVES:

1. To give an overview of various methods of process modeling, different computational techniques for simulation.
2. Apply the knowledge of advanced topics in Chemical Engineering to meet contemporary needs of industry and research.
3. Use modern software tools for design of processes and equipment.
4. Identify issues related to ethics, society, safety, energy and environment in the context of Chemical Engineering applications.
5. Pursue self-learning to remain abreast with latest developments for continuous professional growth.
6. Recognizing and rigorously formulating the physics/chemistry of a process as a mathematical model,

COURSE OUTCOMES:

1. Understanding of the principles of molecular mechanics applicable in molecular modeling
2. Understanding of various simulation techniques and their use for model solutions
3. Ability to use molecular modeling software
4. Acquaintance with modern analysis techniques and visualization packages
5. Capability of developing/improving simulation experiments
6. Design measures to take care of environment, health and safety issues pertaining to chemical industries, communicate effectively and demonstrate leadership skills

UNITI INTRODUCTION 7

Introduction to modeling and simulation, classification of mathematical models, conservation equations and auxiliary relations.

UNITII STEADY STATELUMPEDSYSTEMS 9

Degree of freedom analysis, single and network of process units, systems yielding linear and non-linear algebraic equations, flow sheeting – sequential modular and equation oriented approach, tearing, partitioning and precedence ordering, solution of linear and non-linear algebraic equations.

UNIT III UNSTEADY STATELUMPEDSYSTEMS 9

Analysis of liquid level tank, gravity flow tank, jacketed stirred tank heater, reactors, flash and distillation column, solution of ODE initial value problems, matrix differential equations, simulation of closed loop systems.

UNIT IV STEADY STATEDISTRIBUTEDSYSTEM 7

Analysis of compressible flow, heat exchanger, packed columns, plug flow reactor, solution of ODE boundary value problems.

UNIT V UNSTEADY STATE DISTRIBUTED SYSTEM & OTHER MODELLING

APPROACHES **13**

Analysis laminar flow in pipe, sedimentation, boundary layer flow, conduction, heat exchanger, heat transfer in packed bed, diffusion, packed bed adsorption, plug flow reactor, hierarchy in model development, classification and solution of partial differential equations. Empirical modeling, parameter estimation, population balance and stochasticmodeling.

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ramirez. W	Computational Methods in Process Simulation	2nd Edn,Butterworths Publishers, New York	2000
2	Luyben, W.L	Process Modelling Simulation and Control	2nd Edn, McGraw-Hill Book Co	1990

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Felder, R. M. and Rousseau, R. W	Elementary Principles of Chemical Processes	John Wiley	2000
2	Franks, R. G. E	Mathematical Modelling in Chemical Engineering	John Wiley	1967
3	Amiya K. Jana	Process Simulation and Control Using ASPEN	2nd Edn,PHI Learning Ltd	2012
4	Amiya K. Jana	ChemicalProcess Modelling and Computer Simulation	2ndEdn,PHI Learning Ltd	2012

COURSES OFFERED BY OTHER DEPARTMENTS

OPEN ELECTIVES OFFERED BY

DEPARTMENT OF SCIENCE AND HUMANITIES

16BTSHOE01 PROBABILITY ANDRANDOMPROCESS 3 0 0 3

COURSE OBJECTIVES:

1. To gain knowledge in measures of central tendency.
2. To provide necessary basic concepts in probability and random processes.
3. To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
4. To understand the basic concepts of random processes which are widely used in IT fields.
5. To understand the concept of correlation and spectral densities.
6. To acquire the knowledge on random process in engineering disciplines.

INTENDED COURSE OUTCOMES:

1. Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
2. The students will have an exposure of various distribution functions, correlation and spectral densities.
3. To understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
4. To understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
5. To apply the concept random processes in engineering disciplines.
6. To understand and apply the concept of correlation and spectral densities.

UNIT-I MEASURES OF CENTRAL TENDENCY ANDPROBABILITY (9)

Measures of central tendency – Mean, Median, Mode - Standard Deviation Probability - Random variable - Axioms of probability - Conditional probability-Total probability – Baye‟stheorem.

UNIT-II STANDARDDISTRIBUTIONS (9)

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma(one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – Chebyshev's inequality.

UNIT-III TWO DIMENSIONALRANDOMVARIABLES (9)

Joint distributions - Marginal and conditional distributions - Probability mass function - Probability density functions – Covariance - Correlation and regression

UNIT-IV CLASSIFICATION OFRANDOMPROCESS (9)

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT -VCORRELATION ANDSPECTRALDENSITIES (9)

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

Total : 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Peebles Jr, P.Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Pubishers, NewDelhi.	2002

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Ross, S	A first Course in Probability	Pearson Education, New Delhi (Chap 2 to 8)	2012
2	Gupta, S.C. and Kapoor, V.K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2014
3	Veerarajan,T.	Probabilitiy, Statistics and Random process	Tata McGraw-Hill Education pvt. Ltd., New Delhi	2008
4	Henry Stark and John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002

WEBSITES:

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld.Wolfram.com

16BTSHOE02 **FUZZYMATHEMATICS** **3 0 0 3**

COURSE OBJECTIVES:

1. To know the fundamentals of fuzzyAlgebra.
2. To know the basic definitions of fuzzytheory
3. To know the applications of fuzzyTechnology.
4. Be able to apply basic fuzzy inference and approximate reasoning
5. To know the applications of fuzzy Technology.
6. Be able to acquire the knowledge on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology

COURSE OUTCOMES:

1. The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.
2. To understand the concept of fuzziness involved in various systems and fuzzy set theory.
3. To gain the methods of fuzzy logic.
4. To comprehend the concepts of fuzzy relations.
5. To analyse the application of fuzzy logic control to real time systems.
6. The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

UNITI FUZZYSETS (9)

Fuzzy Sets : Basics Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations – Level Sets – Fuzzy functions - Zadeh‟s Extension Principle

UNITII OPERATIONS ONFUZZYSETS (9)

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNITIII FUZZYRELATIONS (9)

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy RelationalEquations

UNITIV FUZZYMEASURES (9)

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures vs Possibility Measures

UNITV FUZZYINFERENCE (9)

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

Total : 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	George J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic : Theory and Applications	Prentice Hall of India, New Delhi.	2003

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Zimmermann H.J.	Fuzzy Set Theory and its Applications	Kluwer Academic publishers, USA.	2001
2	Michal Baczynski and Balasubramaniam Jayaram	Fuzzy Implications	Springer-Verlag publishers, Heidelberg	2008
3	Kevin M Passino and Stephen Yurkovich	Fuzzy Control	Addison Wesley Longman publishers, USA	1998

WEBSITES:

1. www.mathcentre.ac.uk
2. www.mathworld.Wolfram.com
3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

16BTSHOE03 LINEARALGEBRA 3 0 0 3

COURSE OBJECTIVES:

1. To know the fundamentals of linear Algebra.
2. To study about the linear transformations
3. To introduce the concepts of inner product spaces
4. To study about the linear transformations
5. To introduce the concepts of inner product spaces
6. To give the knowledge on the importance of Linear Algebra.

COURSE OUTCOMES:

The student will be able to

1. Recognize the underlying theory of vector spaces over a field and inner productspaces over real or complexnumbers
2. Visualize linear transformations as matrix form
3. Articulate the importance of Linear Algebra and its applications in branchesof Mathematics
4. To visualize linear transformations as matrix form
5. To recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
6. To articulate the importance of Linear Algebra and its applications in branches of Mathematics

UNITI VECTORSPACES (9)

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNITII EIGEN VALUES ANDEIGEN VECTORS (9)

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

UNITIII SYSTEM OFLINEAREQUATIONS (9)

Direct methods, Gauss elimination method, Gauss Jordan method, Crout‟s method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNITIV LINEARTRANSFORMATIONS (9)

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNITV INNERPRODUCTSPACES (9)

The Dot Product on R^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

Total : 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014

2	Shahnaz Bathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, NewDelhi.	2009

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES:

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com

16BTSHOE04 ENGINEERING ACOUSTICS3 0 0 3 COURSE

OBJECTIVES:

1. To provide mathematical basis for acoustics waves and the characteristic behavior of sound in pipes, resonators and filters.
2. To introduce the properties of hearing and speech
3. To introduce the features of architectural acoustics.
4. To identify the factors affecting the acoustics of building.
5. To impart the basic knowledge of transducers and receivers.
6. To divulge knowledge on the basics of pipe resonators and filters.

COURSE OUTCOMES:

1. The students will have the knowledge on acoustics waves , the characteristic behaviour of sound in pipes, resonators and filters and that knowledge will be used by them in different engineering and technology applications
2. Apply the concepts of radiation and reception of acoustic waves.
3. Explain the basic ideas of pipe resonators and filters.
4. Illustrate the basics of architectural acoustics.
5. Illustrate the transducers and receivers and its applications in various electronic devices.

UNITI INTRODUCTION (9)

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves - Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales.Reflection and Transmission:Transmission from one fluid to another normal and oblique incidence –method of images.

UNITII RADIATION AND RECEPTION OFACOUSTICWAVES (9)

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers.Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorptioncoefficient

UNITIII PIPES RESONATORSANDFILTERS (9)

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – fundamental properties of hearing – loudness level and loudness – pitch and frequency –voice.

UNITIV ARCHITECTURALACOUSTICS (9)

Sound in endosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design. Environmental Acoustics: Highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design ofportions.

UNITV TRANSDUCTION (9)

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers **Total: 45**

TEXT BOOK:

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	LawerenceE.K insler, Austin R.Frey,	Fundamentals of Acoustics	John Wiley & Sons	2000

REFERENCE:

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	F. AltonEverest& KenPohlmann	Master Handbook of Acoustics	McGraw Hill Professional	2014

WEBSITES:

1. www.acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www.ocw.mit.edu

16BTSHOE05 SOLIDWASTEMANAGEMENT 3 0 0 3

COURSE OBJECTIVES:

1. To understand about the solidwaste
2. To study about the waste treatment
3. To gain knowledge on the disposal of waste and waste management.
4. To get the information on energy conservation.
5. To acquaint the students with the basics of energy generation from waste materials.
6. To get the information on energy conservation.

COURSE OUTCOMES:

1. The students will know solid waste and energy conservation. They will understand the methodologies to disposal of solid waste and its management.
2. Identify the concepts of treatment of solid wastes (S)
3. Identify the methods of wastes disposals. (S)
4. Examine the level of Hazardousness and its management. (S)
5. Examine the possible of the energy production using waste materials. (S)
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNITI SOLID WASTE (9)

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

UNITII WASTETREATMENT (9)

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNITIII WASTE DISPOSAL (9)

Sanitary Land Fill Method of Solid Waste Disposal – Land Fill Classficaition, Types, Methods &Siting Consideration – Layout & Preliminary Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfillRemediation

UNITIV HAZARDOUSWASTEMANAGEMENT (9)

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure, Remediaiton, risk assessment.

UNITV ENERGY GENERATIONFROMWASTE (9)

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, Energy recovery systems. Biological & Chemical conversion technologies – Aerobic composting, low solids.Anaerobic digestion, high solids anaerobic digestion, Energy production from biological conversion products, other biological transformation processes. Chemical transformation processes.

Total: 45

TEXT BOOK:

S. No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dara.S.S,Mishra.D.D	A Text book of Environmental Chemistry and Pollution Control	S.Chand and Company Ltd., New Delhi.	2011

REFERENCES:

S. No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Naomi B. Klinghoffer and Marco J. Castaldi	Waste to Energy Conversion Technology (Woodhead Publishing Series inEnergy)	Woodhead Publishing Ltd., Cambridge, UK	2013
2.	Frank Kreith,GeorgeTchobanoglous	Hand Book of Solid Waste Management- 2nd edition	McGraw Hill Publishing Ltd., Newyork	2002
3.	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall (P) Ltd., New Delhi.	1999

WEBSITES:

1.www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.

2.http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/

3.www.alternative-energy-news.info/technology/garbage-energy/

16BTSHOE06 GREENCHEMISTRY 3 0 0 3

COURSE OBJECTIVES:

1. To understand about the greenchemistry
2. To study the atom efficient process and synthesiselaborately.
3. To gain knowledge on the green technology and renewable energyresources.
4. To get the information oncatalysis
5. To acquaint the students with the basic information on catalysis.
6. To inculcate the chemical principles in the field of engineering and technology

COURSE OUTCOMES:

1. Students will know the chemistry and application of green technology for energy sources. They will understand the role of green catalyst in industries.
2. Examine the different atom efficient process and synthesis elaborately (S)
3. Apply the concepts combustion of green technology (S)
4. Identify and apply the concepts of renewable energy (S)
5. Apply the concepts of green catalysts in the synthesis (S)
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNIT I INTRODUCTION TO GREEN CHEMICAL PRINCIPLES (9)

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternatesolutions.

UNIT II ATOMEFFICIENTPROCESSES (9)

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Streckersynthesis.

UNIT III BIOTECHNOLOGY AND GREEN CHEMISTRY (9)

Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air.Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

UNIT IV RENEWABLERESOURCES (9)

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

UNIT V CATALYSIS INGREEN CHEMISTRY (9)

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

Total: 45

TEXT BOOKS:

S. No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Sanjay K. Sharma, AckmezMudhoo	Green Chemistry for Environmental Sustainability	CRC Press , London	2010
2.	Ahluwalia V. K. and M.Kidwai	New Trends in Green Chemistry 2ndedition	Anamaya publishers., New Delhi.	2007

REFERENCES:

S. No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons., New Delhi.	2012
2.	Mukesh Doble. Ken Rollins, Anil Kumar	Green Chemistry and Engineering, 1st edition	Academic Press, Elesevier., New Delhi.	2007
3.	Desai K. R.	Green Chemistry	Himalaya Publishing House, Mumbai.	2005
4.	Matlack A. S.	Introduction to Green Chemistry	Marcel Dekker: New York	2001

WEBSITES:

1.http://www.organic-chemistry.org/topics/green-chemistry.shtm

2.http://www.essentialchemicalindustry.org/processes/green-chemistry.html

3. http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm

4. http://www.epa.gov/research/greenchemistry/

16BTSHOE07 APPLIEDELECTROCHEMISTRY 3 0 0 3

COURSE OBJECTIVES:

1. To get the information on electrochemicalmaterial.
2. To study about the conductingpolymers
3. To understand about thefuel
4. To gain knowledge on the batteries and powersources.
5. To impart knowledge on basic principals of solar cells and its applications
6. To inculcate the chemical principles in the field of engineering and technology

COURSE OUTCOMES:

1. Students will understand about the fuel. They will get knowledge on the batteries and power sources.
2. Examine the properties of conducting polymers (S)
3. Apply the concepts of electrochemistry in storage devices. (S)
4. Identify the concepts of storage devices and its applications. (S)
5. Apply the suitable materials for the manufacturing of storage devices. (S)
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNITI METALFINISHING (9)

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electroplating for electronic industry- Alloy plating, brass plating- Electro less plating of nickel- anodizing – Electroforming – Electro winning.

UNITII CONDUCTING POLYMERSANDELECTROCHEMICALS (9)

lectropolymerisation- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene- Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNITIII BATTERIES ANDPOWER SOURCES-I (9)

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNITIV BATTERIES ANDPOWER SOURCES-II (9)

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells,advantages.

UNITV ELECTROCHEMICAL MATERIALSCIENCE (9)

Solar cells- Preparation of CdS/Cu_2S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

Total: 45

TEXT BOOKS:

S. No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Cynthia G. Zoski	Hand Book of Electrochemistry	Academic Press, Elesevier.,UK	2007
2.	D.Pletcher and F.C.Walsh	Industrial Electrochemistry	Chapman and Hall, London	1990

REFERENCES:

S. No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M. Barak	Electrochemical Power Sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
2.	Bruno Scrosati	Applications of Electroactive Polymers	Chapman & Hall, London	1993
3.	K.L. Chopra and I. Kaur	Thin Film Devices and their Application	Plenum Press, New York.	1983
4.	M.M.Baizer	Organic Electrochemistry	Dekker Inc. New York	1983

WEBSITES:

1. http://www.anoplate.com/finishes/
2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html
3. http://inventors.about.com/od/sstartinventions/a/solar_cell.htm

16BTSHOE08 INDUSTRIALCHEMISTRY 3 0 0 3

COURSE OBJECTIVES:

1. To understand about thefuel
2. To study about the abrasives andlubricants.
3. To gain knowledge on inorganic chemicals and explosivematerials.
4. To get the information on agriculturechemicals.
5. To acquaint the students with the basics of **agriculture chemicals**.
6. To inculcate the chemical principles in the field of engineering and technology

COURSE OUTCOMES:

1. The student will acquire basic knowledge on cement. The student will understand the interaction of engineering materials and their utilization in industries.
2. Examine the uses of abrasives and refractories (S)
3. Identify the usage of the inorganic chemicals. (S)
4. Identify the concepts of explosives and smoke screens (S)
5. Identify the usage of the **agriculture** chemicals (S)
6. Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

UNITI CEMENT ANDLIME (9)

Manufacture of Portland cement – settling of hardening of portland cement – regauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials- manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – magnesian lime – dolomitic lime – hydrauliclime.

UNITII ABRASIVESANDREFRACTORIES (9)

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories – definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

UNITIIIINORGANICCHEMICALS (9)

Common salt and soda ash – manufacture – different grades – products – alkalis – Na_2CO_3, caustic soda and chlor-alkali industry – manufacture principles of electrolytic process – chlorine – storage. Hydrochloric acid – manufacture – absorption – uses, sulphur and sulphuric acid – extraction of sulphur – manufacture of H_2SO_4 – chamber – contact processes – industrialuses.

UNITIV EXPLOSIVES (9)

Explosives – uses – properties and tests – explosives for war – nitrocellulose – picric acid and T.N.T. – industrial explosives – nitroglycerin and dynamites – black powder – smoke screens – incendiaries – gasmask.

UNITV AGRICULTURECHEMICALS (9)

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

Total: 45

TEXT BOOKS:

S. No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Harikrishan	Industrial Chemistry	Goel Publishing House, Meerut.	2014
2.	B.K. Sharma	Industrial Chemistry	Goel Publishing House, Meerut.	2000

REFERENCES:

S. No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH Publishing CO. New Delhi.	1998
2.	James A. Kent	Hand Book of Industrial Chemistry, 9th edition	Van Nostrand Reinhold, New York.	1992
3.	R.N. Sherve	Chemical Process Industries	McGraw-Hill, Kugakuisha Ltd., Tokyo.	1984
4.	S.D. Shukla and G.N. Pandy	A Text book of Chemical Technology	Vikas Publishing House (P) Ltd, New Delhi.	1979

WEBSITES:

1. http://en.wikipedia.org/wiki/Cement
2. http://www.hon.ch/HONselect/Selection/D01.html
3. http://fas.org/man/dod-101/navy/docs/fun/part12.htm
4. http://toxics.usgs.gov/topics/agchemicals.html

16BTSHOE09 ENGLISHFORTECHNOCRATS 1 4 0 3

PURPOSE:

It provides techniques of writing and also trains the students to write without their influence of mother tongue. In addition to honing their skills as professional writers, students will develop technical vocabularies that will aid writing research articles and discussing articles produces by their peers.

COURSE OBJECTIVES:

1. Develop abilities to write technically and expressively,
2. Recognize writing as a constructive, meaning ful process,
3. Practise using reading strategies for effective writing.
4. Develop abilities to write technically and expressively.
5. Recognize writing as a constructive, meaningful process.
6. Practice using reading strategies for effective writing.

COURSE OUTCOMES:

Students undergoing this course are able to

1. Construct simple sentences, correct common grammatical errors in writtenEnglish.
2. Build confidence in English language by imbibing lexical and syntaxrules.
3. Enrich their reading ability for effectivewriting.
4. Elevate them to minimize word, sentence, and paragraph length without sacrificing clarity or substance
5. Familiarize with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.
6. Demonstrate the basic components of definitions, descriptions, process explanations, and other common forms of technical writing.

UNIT– I BASICS OFWRITING

Introduction to Technical Writing – Importance of Writing – Characteristics of Writing– Audience Recognition/ Analysis – Appropriateness of language –– Conciseness and Flow– Bias free and plain writing – Impersonal and Formal Language -Techniques of Technical Writing– Overcoming writer"s block – Prioritizing for effective writing– Avoiding plagiarism.

UNIT– 2 PARAGRAPHS ANDESSAYS

Expressing Ideas – Paragraph construction – Cohesion and Coherence – Adequate development – Kinds of paragraphs – Writing drafts – Paragraph length and pattern – Types of Essays – Characteristics of Essays – Salient point of sentence constructions.

UNIT– 3 LETTERS, MEMOS AND EMAIL

Formal written correspondence – Types of messages – Business letters – Structure of letters – Languageinletters–Tenseinletters–Coverletters–Resumes–Curriculumvitae–Memos–Emails
– Email Etiquette – Effectiveness andpurpose.

UNIT– 4 THE ART OF CONDENSATION AND TECHNICALPROPOSALS

Steps to Effective précis writing – Guidelines – Technical Proposals – Types of Proposals – Characteristics – Body of the Proposals – Style and appearance – Evaluation of proposals – Proof Reading – Book /Film Review – Travelogue – Dialogue Writing.

UNIT– 5 REPORTS AND RESEARCH ARTICLES

Discussion of newspaper articles -Objectives of Reports – Characteristics of Reports – Structure of Reports – Types of Reports – Writing an article – Writing research articles – Essential features of Dissertation – Organizing the structure of thesis and articles – Writing technical description.

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	V.N. Arora&LakshmiChandra	Improve Your Writing: Revised First Edition	OUP	2014

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Crème, P. and M. Lea.	Writing at University: A guide for students.	OUP	2003
2	Graham King	Collins Improve Your Writing	Collins; First edition	2009
3	David Morley	The Cambridge Intro. To Creative Writing	Cambridge	2008

WEBSITES:

http://www.stevepavlina.com/blog/2006/08/10-ways-to-improve-your-technical-skills/http://www.nyu.edu/classes/keefer/brain/net2.html https://www.udemy.com/technical-writing-and-editing/http://techwhirl.com/what-is-technical-writing/

OPEN ELECTIVES OFFERED BY DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

16BECSOE01 INTERNET PROGRAMMING 3 0 0 3 100

COURSE OBJECTIVES:

1. To introduce the Java programming language and explore its current strengths and Weaknesses
2. To study the way that object-oriented concepts are implemented in the Java programming language
3. To write working Java code to demonstrate the use of applets for client side programming
4. To study the way that exceptions are detected and handled in the Java programming language
5. To write working Java code that demonstrates multiple threads of execution
6. To understand about various Internet applications

COURSE OUTCOMES:

1. Know Java programming language and explore its current strengths and Weaknesses
2. Explain about object-oriented concepts
3. Learn Java code to demonstrate the use of applets for client side programming
4. To study the way that exceptions are detected and handled in the Java programming language
5. know Java code that demonstrates multiple threads of execution
6. use various Internet applications

UNIT I INTRODUCTION

9

Introduction - Network of Networks, Intranet, Extranet and Internet. World Wide Web- Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. TCP/IP- Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Sub netting and addressing- Classful and Classless Addressing, Sub netting

UNIT II HTML 9

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Color name, Color value. Image Maps- map, area, attributes of image area- Extensible Markup Language (XML)- Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts- Introduction- Environment Variable, GET and POST Methods.

UNIT III PERL 9

Introduction, Variable, Condition, Loop, Array, implementing data structure, Hash, String, Regular Expression, File handling, I/O handling- JavaScript- Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies- Definition of cookies, Create and Store a cookie with example. Java Applets-Container Class, Components, Applet Life Cycle, Update method, Applications.

UNIT IV Client-Server programming 9

Client-Server programming in Java - Java Socket, Java RMI. Threats - Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks- Network security techniques- Password and Authentication- VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH). Firewall- Introduction, Packet filtering, Stateful, Application layer, Proxy.

UNIT V INTERNET TELEPHON 9

Introduction, VoIP- Multimedia Applications- Multimedia over IP: RSVP, RTP, RTCP and RTSP-Streaming media, Codec and Plugins, IPTV- Search Engine and Web Crawler- Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

TOTAL:45

TEXT BOOKS:

Paul Deitel, Harvey Deitel and Abby Deitel, “Internet and World Wide Web-How to Program”, 5th Edition, 2011.

Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.

REFERENCES:

Rahul Banerjee, Internetworking Technologies, An Engineering Perspective, PHI Learning, Delhi, 2011.

Robert W. Sebesta, “Programming the World Wide Web”, Pearson Education, 2016

16BECSOE02 MULTIMEDIA AND ANIMATION 3003 100

COURSE OBJECTIVES:

□□□study the graphics techniques and algorithms
To study the multimedia concepts and various I/O technologies. □□□
To enable the students to develop their creativity □□□
To impart the fundamental concepts of Computer Animation and Multimedia.
To understand Techniques of Animation
To Learn about different 3D Animation

COURSE OUTCOMES:

After the course the student will be able to:

- Get Familiarised With Animation
- Types Of 3D Animation
- Know about motion caption
- Work With The Timeline And Tween-Based Animation
- Learn about 3D Animation
- Master the techniques of computer animation and multimedia

UNIT I Introduction 9

What is mean by Animation – Why we need Animation – History of Animation– Uses of Animation – Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects -Creating Animation.

UNIT II Creating Animation in Flash 9

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers - Action script.

UNIT III 3D Animation & its Concepts 9

Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation.

UNIT IV Motion Caption 9

Formats – Methods – Usages – Expression – Motion Capture Software’s – Script Animation Usage – Different Language of Script Animation Among the Software.

UNIT V Concept Development 9

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

TOTAL: 45

Text Books:
Computer Graphics, Multimedia and Animation-Malay K. Pakhira,PHI Learning PVT Ltd,2010

References:
Principles of Multimedia – Ranjan Parekh, 2007, TMH. (Unit I, Unit V)
Multimedia Technologies – Ashok Banerji, Ananda Mohan Ghosh – McGraw Hill Publication.
Encyclopedia of Multimedia and Animations-Pankaj Dhaka, Anmol Publications-2011

16BECSOE03 PC HARDWARE AND TROUBLE SHOOTING 3 0 0 3 100

COURSE OBJECTIVES:

- Assemble/setup and upgrade personal computer systems
- Perform installation, configuration, and upgrading of microcomputer hardware and software.
- Install/connect associated peripherals.
- Diagnose and troubleshoot microcomputer systems hardware and software, peripheral equipment.
- Know Multitasking and Multiprogramming
- Familiarise Various Types of faults

COURSE OUTCOMES:

After the course student will be able to:

- Familiarise Special Peripherals.
- Know Computer Organization
- Know about Memory Space
- Familiarise Motherboard Logic
- Know Programmable LSI's
- Know about Data Recovery

UNIT I Introduction 9

Introduction - Computer Organization – Number Systems and Codes – Memory – ALU – CU – Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques – Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC and User.

UNIT II Peripheral Devices 9

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices – FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNIT III PC Hardware Overview 9

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC.

UNIT IV Installation and Preventive Maintenance 9

Introduction – system configuration – pre installation planning – Installation practice – routine checks – PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery.

UNIT V Troubleshooting 9

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LSI's – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.

Text Books:

1. B. Govindarajalu, "IBM PC Clones Hardware, Troubleshooting and Maintenance", 2/E, TMH, 2002.

References:

1. Peter Abel, Niyaz Nizamuddin, "IMB PC Assembly Language and Programming", Pearson Education, 2007
2. Scott Mueller, "Repairing PC's", PHI, 1992

16BECSOE04 JAVA PROGRAMMING 3 0 0 3 100

COURSE OBJECTIVES:

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development.
- Have the ability to write a computer program to solve specified problems.
- Be able to use the Java SDK environment to create, debug and run simple Java programs
- To understand Object oriented programming concepts

COURSE OUTCOMES:

After the course student will be able to:

- Familiar with programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java and work with 2D shapes
- Be familiar with Arrays – Strings - Packages
- Have the ability to write a computer program to solve specified problems.
- Work on Java SDK environment to create, debug and run simple Java programs
- To understand abstract classes

UNIT I INTRODUCTION TO JAVA

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members –constructors – finalize method

UNIT II PACKAGES

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy –polymorphism – dynamic binding – final keyword – abstract classes

UNIT III I/O STREAMS

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes.

UNIT IV EXCEPTION HANDLING

Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions – Using exceptions for debugging

UNIT V THREADS

Introduction, Creating Threads, The Life Cycle of a Thread, Thread Methods, Using Threads, Synchronization of Threads, Summary

TEXT BOOKS:

1.Cay S. Horstmann and Gary Cornell Core Java: Volume I–Fundamentals Sun Microsystems

Press 2008

REFERENCE BOOKS:

1. K. Arnold and J. Gosling The JAVA programming language Third edition, Pearson Education, 2009.
2. Timothy Budd Understanding Object-oriented programming with Java Updated Edition, Pearson Education 2002.
3. C. Thomas Wu An introduction to Object-oriented programming with Java Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2008

WEBSITES:

1. http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/
2. http://www.winprog.org/tutorial/msvc.html
3. http://www.tutorialized.com/tutorials/Visual-C/1
4. http://www.freeprogrammingresources.com/visualcpp.html

LIST OF OPEN ELECTIVES OFFERED BY

ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT

16BEEEOE01 ELECTRIC HYBRID VEHICLES L T P C 3 0 0 3

COURSE OBJECTIVES:
To understand the basic concepts of electric hybrid vehicle.
To gain the knowledge about electric propulsion unit.
To understand and gain the knowledge about various energy storage devices.
To know the concept of electric hybrid vehicle
Understand the various energy storage schemes
Know about the various fuel efficiency schemes

COURSE OUTCOMES:

At the end of the course the student will be understand the concept of electric hybrid vehicle and itsenergy storage schemes.

1. Battery based energy storage and its analysis,
2. Familiarise Fuel Cell based energy storage and its analysis
3. Super Capacitor based energy storage and its analysis,
4. Understand Flywheel based energy storage and its analysis,
5. Know Hybridization of different energy storage devices.

UNIT I INTRODUCTION 9
History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies**.**

UNIT II HYBRID ELECTRIC DRIVE-TRAINS 9
Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT 9
Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE 9
Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices**.**

UNIT V ENERGY MANAGEMENT STRATEGIES 9
Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

TOTAL: 45

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press – 2nd edition	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	Standards media – 2nd edition	2009
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley – 2nd edition	2012

16BEEEOE02 ENERGY MANAGEMENT AND ENERGY AUDITING 3 0 0 3 100

COURSE OBJECTIVES:
To gain the knowledge about energy management.

1. To understand the basic concepts in economic analysis in energy management.
2. To understand the basic principles of energy audit.
3. To gain the knowledge about the basic concept of types of Energy Audit
4. To gain and Evaluate the different energy efficient motors
5. Understand the concept of Energy conservation.
6. To study about the behaviour changes of PF requirement in motor currents

COURSE OUTCOMES:
At the end of this course, students will demonstrate the ability to

1. Understand the concept of Energy Management.
2. Analyze the different methods for economic analysis
3. Knowledge about the basic concept of Energy Audit and types.
4. Evaluate the different energy efficient motors
5. Understand the concept of Energy conservation.
6. Investigate the different methods to improve power factor.

UNIT I ENERGY MANAGEMENT 9
Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS 9
Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worth method.

UNIT III BASIC PRINCIPLES OF ENERGY AUDIT 9
Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT IV ENERGY EFFICIENT MOTORS 9
Electric Motors: Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation –over motoring – motor energy audit-
Energy conservation: Importance-energy saving measures in DG set-fans and blower's pumps- air conditioning system- energy efficient transformers.

UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS 9
Power factor - methods of improvement, location of capacitors, p.f with nonlinear loads, effect of harmonics on p.f,- p.f motor controllers –Energy efficient lighting system design and practice- lighting control– Measuring Instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLCs.

TOTAL: 45

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Murphy W.R. and G.Mckay Butter worth	Energy Management	Heinemann Publications	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John.C.Andreas	Energy Efficient Electric Motors	Marcel Dekker Inc Ltd – 3rd edition	2005
2	W.C.Turner Steve Doty	Energy Management Handbook	Lulu Enterprises, Inc. - 8th Edition Volume II	2013

16BEEEOE03 PROGRAMMABLE LOGIC CONTROLLER 3 0 0 3 100

Course Objectives

1. To understand the basic principles of PLC systems.
2. To gain the knowledge about data handling functions.
3. To gain the knowledge of storage techniques in PLC
4. To acquire the knowledge about how to handle the data and functions
5. To study about flow charts of ladder and spray process system
6. To understand the principles of PID.

COURSE OUTCOMES:

1. At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.
2. To acquire the knowledge of storage techniques in PLC
3. Students know how to handle the data and functions
4. Students known about advanced controller in PLC applications
5. Students gather real time industrial application of PLC
6. Students gathered and evaluate the flow charts of ladder and spray process system

UNIT I INTRODUCTION 9

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING 9

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS 9

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS 9

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES 9

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TOTAL: 45

TEXT BOOKS

S. No. Author(s) Name Title of the Book Publisher Year of Publication
1 JR Hackworth and F.D Hackworth – Jr Programmable Logic Controllers – Programming Method and Applications Pearson 2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	2004
2	W.Bolton	Programmable Logic controller	Elsevier Newnes Publications, 5th Edition	2009

WEBSITE

http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logic controller

16BEEEOE04 RENEWABLE ENERGY RESOURCES L T P C 3 0 0 3

Course Objectives

1. To gain the knowledge about environmental aspects of energy utilization.
2. To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
3. To study about solar energy collectors and its storages
4. To study about the inter connected system in wind power
5. To understand the basic principles fuel cell, Geo thermal power plants.
6. To gain the knowledge about hydro energy.

COURSE OUTCOMES:

1. At the end of this course, students will demonstrate the ability to
2. Analyze the Energy Scenario in india
3. Understand the concept of Solar Energy
4. Understand the concept of Wind Energy
5. Understand the concept of Hydro Energy
6. Analyze the different energy sources
7. Students gathered the real time inter connected system modelling in wind power

UNIT I INTRODUCTION 9

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

UNIT II SOLAR ENERGY 9

Introduction to solar energy: solar radiation, availability, measurement and estimation– Solar thermal conversion devices and storage – solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

UNIT III WIND ENERGY 9

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNIT IV HYDRO ENERGY 9

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V OTHER SOURCES 9

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rai.G.D	Non-conventional sources of energy	Khanna publishers	2011
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rao.S. &Parulekar	Energy Technology	Khanna publishers, Eleventh Reprint	2013
2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis – 3rd edition	2015

WEBSITES

1. www.energycentral.com

2. www.catelelectricpowerinfo.com

OPEN ELECTIVES OFFERED BY

ELECTRONICS AND COMMUNICATION ENGINEERING TO OTHER DEPARTMENTS

16BEECOE01 REAL TIME EMBEDDED SYSTEMS **L T P C 100**
3 0 0 3

Course Objectives

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing
- To study about memory management
- To imparts knowledge on

COURSE OUTCOMES:

At the end of the course the students will be able to

- Understand overview of embedded systems architecture
- Acquire knowledge on embedded system, its hardware and software.
- Gain knowledge on overview of Operating system
- Discuss about task Management
- Gain knowledge about semaphore management and message passing.
- Gain knowledge about memory management.

UNIT-I INTRODUCTION TO EMBEDDED SYSTEM 9

Introduction- Embedded systems description, definition, design considerations &requirements-Overview of Embedded SystemArchitecture (CISC and RISC)-Categories of Embedded Systems-embedded processor selection &tradeoffs- Embedded design life cycle -Product specifications-hardware / software partitioning- iterations and implementation- hardware software integration – product testing techniques–ARM7.

UNIT-II OPERATING SYSTEM OVERVIEW 9

Introduction–AdvantageandDisadvantageofUsingRTOS–Multitasking–Tasks-RealTimeKernels – Scheduler- Non-Preemptive Kernels – Preemptive Kernels – Reentrancy- ReentrantFunctions–Round Robin Scheduling- Task Priorities- Static Priorities– Mutual Exclusion–Deadlock– Inter task Communication–Message Mailboxes–Message Queues- Interrupts- TaskManagement–Memory Management-Time Management–Clock Ticks.

UNIT-III TASK MANAGEMENT 9

Introduction-µ C/OS-II Features-Goals ofµ C/OS-II-Hardware and Software Architecture–Kernel Structures: Tasks–Task States–Task Scheduling–Idle Task–Statistics Task–Interrupts Under µC/OS-II –Clock Tick-µ C/OS- II Initialization. Task Management: Creating Tasks–Task Stacks–StackChecking–Task’sPriority–SuspendingTask–ResumingTask.TimeManagement: Delaying aTask–Resuming a Delayed Task–System Time. Event Control Blocks-Placing a Task in the ECB Wait List–Removing a Task from an ECB wait List.

UNIT-IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING 9

Semaphore Management: Semaphore Management Overview– Signaling a Semaphore. MessageMailbox Management: Creating a Mailbox –Deleting Mailbox–Waiting for a Message box–Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue– Deleting a Message Queue–Waiting for a Message Queue–Sending Message to a Queue– Flushing a Queue.

UNIT-V MEMORY MANAGEMENT 9

Memory Management: Memory Control Blocks–Creating Partition-Obtaining a Memory Block–Returning a Memory Block. Getting Started withµ C/OS-II–Installingµ C/OS-II–Portingµ C/OS-II:Development Tools–Directories and Files– Testing a Port -IAR Workbench withµ C/OS-II-µ

C/OS- II Porting on a 8051CPU– Implementation of Multitasking- Implementation of Scheduling andRescheduling –Analyze the Multichannel ADC with help ofµ C/OS-II.

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	JeanJ. Labrosse	Micro C/OS–II The Real Time Kernel	CMPBOOKS	2009
2	David Seal	ARM Architecture Reference Manual.	Addison-Wesley	2008
3	Steve Furbe,	ARM System-on-Chip Architecture,	Addison-Wesley Professional, California	2000

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	K.V.K.K.Prasad	Embedded Real-Time Systems: Concepts, Design & Programming	Dream Tech Press	2005
2	Sriram V Iyer, Pankaj Gupta	Embedded Real Time Systems Programming	Tata McGraw Hill	2004

16BEECOE02 CONSUMER ELECTRONICS L T P C 100
3 0 0 3

Course Objectives

- To study about various speakers and microphone
- To learn the fundamental of television systems and standards
- To learn the process of audio recording and reproduction
- To study various telephone networks
- To discuss about the working of home appliances
- To familiarize with TV services like ISDN.

COURSE OUTCOMES:

At the end of the course the students will be able to

- Understand working of various type of loud speakers
- Acquire knowledge on various types of picture tubes
- Demonstrate the working of various optical recording systems
- Distinguish various standards for color TV system
- Acquire knowledge on various telecommunication networks
- Demonstrate the working of various home appliances

UNIT I LOUDSPEAKERS AND MICROPHONES 9

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters – Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNITII TELEVISION STANDARDS AND SYSTEMS 9

Components of a TV system–interlacing–composite video signal.Colour TV– Luminance and Chrominance signal; Monochrome and Colour Picture Tubes- Color TV systems– NTSC, PAL, SECAM-Components of a Remote Control.

UNITIII OPTICAL RECORDING AND REPRODUCTION 9

Audio Disc– Processing of the Audio signal–readout from the Disc –Reconstruction of the audio signal–Video Disc–Video disc formats- recording systems–Playback Systems.

UNITIV TELECOMMUNICATION SYSTEMS 9

Telephone services-telephone networks–switching system principles–PAPX switching–Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network.Wireless Local Loop.VHF/UHF radio systems, Limited range Cordless Phones; cellular modems.

UNITV HOME APPLIANCES 9

Basic principle and block diagram of microwave oven; washing machine hardware and software; Components of air conditioning and refrigeration systems.

Total Hours: 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	S.P. Bali	Consumer Electronics	PearsonEducation	2007
2	J.S.Chitode	Consumer Electronics	Technical Publications	2007

REFERENCE:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Philip Hoff,Philip Herbert Hoff.	Consumer Electronics for Engineers.	Cambridge University Press	1998

16BEECOE03 NEURAL NETWORKS AND ITS APPLICATIONS L T P C 100
3 0 0 3

Course Objectives

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.
- To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
- To gain exposure in the field of neural networks and relate the human neural system into the digital world
- To provide knowledge of computation and dynamical systems using neural networks

COURSE OUTCOMES:

At the end of the course the students will be able to

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks
- Apply perception concept in design
- Design using ART phenomena
- Gain knowledge on SOM concepts
- Ability to develop the use of Soft Computing to solve

UNIT I INTRODUCTION TONEURAL NETWORKS 9

Introduction-biological neurons and their artificial models-learning, adaptation and neural network's learning rules-types of neural networks-single layer, multiple layer-feed forward, feedback networks

UNIT II LEARNING PROCESS 9

Error– correction learning– memory based learning- hebbian learning-competitive learning- Boltzmann learning-supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT III PERCEPTION 9

Single layer Perception-Adaptive filtering-unconstrained Optimization-Least-mean square algorithm-Leaning Curve-Annealing Technique-perception convergence Theorem-Relationship between perception and Baye’s Classifier-Back propagation algorithm

UNIT IV ATTRACT OR NEURAL NETWORK AND ART 9

Hopfield model-BAM model -BAM Stability-Adaptive BAM -Lyapunov function-effect of gain- Hopfield Design-Application to TSP problem-ART-layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP.

UNIT V SELF ORGANIZATION 9

Self-organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical Vector Quantization. Applications of self-organizing maps: The Neural Phonetic Type Writer Learning Ballistic Arm Movements.

Total Hours: 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SimonHaykin	Neural Networks and Learning Machines 3rd Edition	Pearson/Prentice Hall	2009
2	SatishKumar	Neural Networks: A Classroom Approach	TMH	2008

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Rajasekaran.S, VijayalakshmiPai. G.A	Neural Networks, Fuzzy Logic and Genetic Algorithms,	PHI, New Delhi.	2003
2	LaureneFausett	Fundamentals of Neural Networks: Architectures, Algorithms, and Applications	Pearson/PrenticeHall	1994
3	Wasserman P.D	Neural Computing Theory & Practice	Van Nortrand Reinhold	1989
4	Freeman J.A., S kapura D.M	Neuralnetworks, algorithms, applications, and programming techniques.	AdditionWesley	2005

16BEECOE04 FUZZY LOGIC AND ITS APPLICATIONS L T P C 100
3 0 0 3

Course Objectives

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.
- Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
- To learn about applications on Fuzzy based systems
- To familiarize with fuzzy fiction and de fuzzy fiction procedures

COURSE OUTCOMES:

At the end of the course the students will be able to

- Understand the basic concepts of Fuzzy logic and its applications in various domain
- Gain knowledge on theory of Reasoning
- Develop fuzzy controllers
- Understand concepts of adaptive fuzzy control
- Ability to develop how to use Fuzzy computation to solve real- world problems
- Design fuzzy based model for any application

UNITI 9

Basics of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT II 9

Theory of Approximate Reasoning: Linguistic variables, Fuzzy proportions, Fuzzy if-then statements, inference rules, compositional rule of inference-fuzzy models

UNIT III 9

Fuzzy Knowledge Based Controllers (Fkbc): Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzy fiction and de fuzzy fiction procedures–Design of Fuzzy Logic Controller

UNIT IV 9

Adaptive Fuzzy Control: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

UNIT V 9

Fuzzy based systems: Simple applications of FKBC-washing machines-traffic regulations-lift control-fuzzy in medical Applications-Introduction to ANFIS.

Total Hours: 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	D .Diankar ,H. Hellendoom and M .Rein frank	An Introduction to Fuzzy Control	Narosa Publishers India	1996
2	G.J. KlirandT.A. Folger	Fuzzy Sets Uncertainty and Information	PHI IEEE	1995

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Timothy J. Ross	Fuzzy Logic with Engineering Applications	McGraw Hill	1997
2	George. J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic	Prentice Hall, USA	1995

OPEN ELECTIVES OFFERED BY DEPARTMENT OF AUTOMOBILE ENGINEERING

16BEAEOE01 AUTOMOBILE ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES

- To impart knowledge on the constructional details and principle of operation of various automobile components.
- To learn the function and working of various components in transmission and drive lines.
- To study the concept and working of steering and suspension systems in an automobile.
- To give knowledge on the wheels, tyres and brakes of automobiles.
- To provide information on the current and future trends in automobiles.
- Identify and explain the types of steering system..

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Demonstrate the operating principles and constructional details of various automobile components.
- Explain the function and working of components in transmission and drive lines.
- Identify and explain the types of steering system.
- Identify and explain the types of suspension system.
- Classify and describe the types of wheels, tyres and brakes of automobiles.
- Discuss the current and future trends in the automobiles

UNIT-I ENGINE AND FUEL FEED SYSTEMS

Classification of Engine, construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburetor working principle, requirements of an automotive carburetor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNIT –II TRANSMISSION SYSTEMS

Requirements of transmission system. Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. COURSE OBJECTIVES: of the gearbox - Determination of gear ratios for vehicles. Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propeller Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

UNIT -III SUSPENSION SYSTEM

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension – Pneumatic suspension – Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

UNIT-IV BRAKES

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theory, Brake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System (ABS).

UNIT -V ELECTRICAL SYSTEM

Principle and construction of lead acid battery. Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator. Starting System and charging system.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2.	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., New Delhi	2003
3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publishes	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
2.	Crouse.W.H	Automobile Electrical Equipment", 3rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAE Inc	2001

16BEAEOE02 BASICS OF TWO AND THREE WHEELERS 3 0 0 3 100

COURSE OBJECTIVES

- The COURSE OBJECTIVES: of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.
- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
- Explain the servicing of two and three wheelers.

UNIT I INTRODUCTION

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS

2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburetor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHES AND TRANSMISSION

Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION

1.	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992.
2.	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century book house.	1988.

REFERENCES:

SL. NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M.M.Griffin.	Motor cycles from inside and outside.	Prentice Hall Inc, New Jersey.	1978.
2.	Bruce A. Johns, David D.Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAEOE03 AUTOMOBILE MAINTENANCE 3 0 0 3 100

COURSE OBJECTIVES:

- The COURSE OBJECTIVES: of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems in Automobile.
- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.
- Explain the fault diagnosis in the electrical and air conditioner systems

UNIT I MAINTENANCE OF RECORDS AND SCHEDULES

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF

				PUBLICATION
1.	John Doke	Fleet Management	McGraw Hill Co	1984
2.	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011
3.	Service Manuals from Different Vehicle Manufacturers			

16BEAEOE04 INTRODUCTION TO MODERN VEHICLE TECHNOLOGY 3 0 0 3 100

COURSE OBJECTIVES

- To impart knowledge on trends in the vehicle power plants.
- To learn the various advanced driver assistance systems.
- To study the working of advanced suspension and braking systems in an automobile.
- To give information about motor vehicle emission and noise pollution control.
- To provide knowledge of the vehicle telematics.
- To give information about the noise control techniques.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to:

- Distinguish and describe the various modern vehicle power plant systems.
- List and explain the various driver assistant mechanisms.
- Identify and describe the working of advanced suspension and braking systems.
- Apply the knowledge of motor vehicle emission and noise pollution control.
- Describe the noise control techniques
- Describe the vehicle telematics and its applications

UNIT I TRENDS IN POWER PLANTS

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles – Electric propulsion with cables - Magnetic track vehicles.

UNIT II DRIVER ASSISTANCE SYSTEMS

Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti-spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNIT III SUSPENSION BRAKES AND SAFETY

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT IV NOISE & POLLUTION

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT VTELEMATICS

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

TEXT BOOKS

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	LjuboVlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001
2.	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems –Progress in Technology	Automotive Electronics Series,SAE, USA.	1998

REFERENCES

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William B Riddens	“Understanding Automotive Electronics”, 5th Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold,	“Understanding Automotive Electronics”	SAE	1998
3.	Robert Bosch,	“Automotive HandBook”, 5th Edition	SAE	2000

LIST OF OPEN ELECTIVES

OFFERED BY CIVIL ENGINEERING

16BECEOE01 HOUSING, PLAN AND MANAGEMENT 3 0 0 3 100

COURSE OBJECTIVES

- To examine the role and tasks of basic housing policies and building bye laws
- Understand the process of integrated service delivery in the context of economic, social, environmental and institutional factors
- Analyze the Innovative construction methods and Materials
- Analyze city management strategies and strengthen the urban governance through a problem solving approach
- To know the Importance of basic housing policies and building bye laws
- To use Housing Programmes and Schemes

COURSE OUTCOMES:

- The students will be able to
- Know the Importance of basic housing policies and building bye laws
- Use Housing Programmes and Schemes
- Plan and Design of Housing projects
- Examine Innovative construction methods and Materials
- Know Housing finance and loan approval procedures
- Understand Construction as well as managing techniques

UNIT I INTRODUCTION TO HOUSING 9

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II HOUSING PROGRAMMES 9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organizations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems).

TOTAL HRS : 45

TEXT BOOKS

1.Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 2002.
2.Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 2001.

REFERENCES

1.Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.
2.UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 2000

16BECEOE02 BUILDING SERVICES 3 0 0 3 100

COURSE OBJECTIVES

- Defining and identifying of eng. services systems in buildings.
- The role of eng. services systems in providing comfort and facilitating life of users of the building.
- The basic principles of asset management in a building & facilities maintenance environment
- Importance of Fire safety and its installation techniques
- To Know the principle of Refrigeration and application
- To Understand Electrical system and its selection criteria

COURSE OUTCOMES:

The students will be able to

- Machineries involved in building construction
- Understand Electrical system and its selection criteria
- Use the Principles of illumination & design
- Know the principle of Refrigeration and application
- Importance of Fire safety and its installation techniques
- Know the principle behind the installation of building services and to ensure safety in buildings

UNIT I MACHINERIES 9

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS 9

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN 9

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilization factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS 9

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION 9

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

TOTAL HRS : 45

TEXT BOOKS

1. E.R.Ambrose, “Heat Pumps and Electric Heating”, John and Wiley and Sons, Inc., New York, 2002.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2005.

REFERENCES

1. Philips Lighting in Architectural Design, McGraw-Hill, New York, 2000.

2 A.F.C. Sherratt, “Air-conditioning and Energy Conservation”, The Architectural Press, London, 2005.

3 National Building Code.

16BECEOE03 MANAGEMENT OF IRRIGATION SYSTEMS 3 0 0 3 100

OBJECTIVES

- To enable the students for a successful career as water management professionals.
- To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.
- To expose the students the need for an interdisciplinary approach in irrigation water management
- To providing a platform to work in an interdisciplinary team.
- To provide students an ability to understand the applications of mathematical and scientific concepts to analyse intricate technical, social and environmental problems in irrigation water management and finding solutions for them.
- To promote student awareness for a life-long learning process and inculcate professional ethics and codes of professional practice in water management.

COURSE OUTCOMES:

At the end of this the students will be in a capacity to

- Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.
- Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management
- Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach.
- Gain insight on local and global perceptions and approaches to participatory water resource management
- Learn from successes and failures in the context of both rural and urban communities of water management.
- Exposure on the use of economic concepts in irrigation development and to impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector.

UNIT I. IRRIGATION SYSTEM REQUIREMENTS 9

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNIT II. IRRIGATION SCHEDULING 9

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III. MANAGEMENT 9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV. OPERATION 9

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V. INVOLVEMENT OF STAKE HOLDERS 9

Farmer’s participation in System operation – Water user’s associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL HRS : 45

TEXT BOOKS

1. Dilip Kumar Majumdar, “Irrigation Water Management – Principles and Practice”, Prentice Hall of India Pvt. Ltd., New Delhi, 2000
2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi

REFERENCES

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 2000
2. Maloney, C. and Raju, K.V., “Managing Irrigation Together”, Practice and Policy in India, Stage Publication, New Delhi, India, 2000

16BECEOE04 ADVANCED CONSTRUCTION TECHNOLOGY 3 0 0 3 100

COURSE OBJECTIVES:

- To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
- To study different methods of construction to successfully achieve the structural design with recommended specifications.
- To involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
- To study of construction equipment's, and temporary works required to facilitate the construction process
- To provide a coherent development to the students for the courses in sector of Advanced construction technology.
- To present the new technology of civil Engineering and concepts related Advanced construction technology.

COURSE OUTCOMES:

1. Implementation of new technology concepts which are applied in field of Advanced construction.
2. Different methods of construction to successfully achieve the structural design with recommended specifications.
3. Application of scientific and technological principles of planning, analysis, design and management to construction technology.
4. Will gain the Knowledge of construction equipment's, and temporary works required to facilitate the construction process
5. Development to the students for the courses in sector of Advanced construction technology.
6. The new technology of civil Engineering and concepts related Advanced construction technology.

UNIT - I MODERN CONSTRUCTION METHODS 9

Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT - II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES 9

Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines

UNIT - III MODERN CONSTRUCTION EQUIPEMENTS -I 9

Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting, Tunneling and hoisting

UNIT - IV MODERN CONSTRUCTION EQUIPEMENTS -II 9

Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant

UNIT - V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES 9

Principles and Practices of Temporary structures, Shoring, and Strutting, Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipment's

TOTAL HRS : 45

TEXT BOOKS

1.Peurifoyu , R. L., , Ledbette, W.B., Construction Planning , Equipment and Methods, Mc Graw Hill Co., 2000.

2. Antill J.M., PWD, Civil Engineering Construction, Mc Graw Hill Book Co., 2005

REFERENCE

1.Varma, M Construction Equipment and its Planning & Applications, Metropolitan Book Co., 2000

2.Nunnaly, S.W., Construction Methods and Management , Prentice – Hall, 2000

3.Ataev, S.S., Construction Technology, MIR , Pub. 2000ss

LIST OF OPEN ELECTIVES OFFERED BY MECHANICAL ENGINEERING

16BEMEOE01 COMPUTER AIDED DESIGN 3 0 0 3 100

COURSE OBJECTIVES:

1. To apply basic concepts to develop construction (drawing) techniques.
2. To ability to manipulate drawings through editing and plotting techniques.
3. To understand geometric construction and Produce template drawings.
4. To understand and demonstrate dimensioning concepts and techniques.
5. To understand Section and Auxiliary Views.
6. To become familiar with Solid Modelling concepts and techniques.

COURSE OUTCOMES:

1. Apply basic concepts to develop construction (drawing) techniques.
2. Ability to manipulate drawings through editing and plotting techniques.
3. Understand geometric construction and Produce template drawings.
4. Understand and demonstrate dimensioning concepts and techniques
5. Understand Section and Auxiliary Views
6. Become familiar with Solid Modelling concepts and techniques.

UNIT I OVERVIEW OF CAD SYSTEMS 9

Conventional and computer aided design processes-advantages and disadvantages. Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations. Networking of CAD systems.

UNIT II INTERACTIVE COMPUTER GRAPHICS AND GRAPHICS TRANSFORMATIONS 9

Generative, cognitive and image processing graphics. Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Two- and Three – Dimensional graphics concepts, Graphical input technique, Geometric transformations, Visual Realism, Computer animation, customizing graphics software.

UNIT III GEOMETRIC MODELING 9

Wireframe, surface, NURBS and solid modeling-applications and advantages. Creating primitive solids, sweeping solids, boolean operations. Extracting entities from a solid. Filleting of edges of solids. Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

UNIT IV PARAMETRIC DESIGN AND OBJECT REPRESENTATION 9

Types of co-ordinate systems. Parametric design - definition and advantages. Parametric representation of analytic and synthetic curves. Parametric representation of surfaces and solids - manipulations.

UNIT V PRODUCT DESIGN AND DEVELOPMENT 9

Automated 2D drafting - basics, mechanical assembly - bill of materials generation. Mass property calculations.

TOTAL HOURS 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vera B Anand	Computer Graphics and Geometric Modeling for Engineers	John Wiley & Sons, New York	2000

2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	Dhanpat Rai & Sons, New Delhi	2002
2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	William M Newman and Robert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994
5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998
6	Rao S S	Optimization Techniques	Wiley Eastern, New Delhi	2003

16BEMEOE02 INDUSTRIAL SAFETY AND ENVIRONMENT 3 0 0 3 100

COURSE OBJECTIVES:

- To recognize and evaluate occupational safety and health hazards in the workplace.
- To determine appropriate hazard controls following the hierarchy of controls.
- To analyse the effects of workplace exposures, injuries and illnesses, fatalities.
- To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
- To teach student the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
- To prevent or mitigate harm or damage to people, property, or the environment.

COURSE OUTCOMES:

- Recognize and evaluate occupational safety and health hazards in the workplace.
- Determine appropriate hazard controls following the hierarchy of controls.
- Analyse the effects of workplace exposures, injuries and illnesses, fatalities.
- Prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
- Understand the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
- Prevent or mitigate harm or damage to people, property, or the environment

UNIT I INTRODUCTION TO LOGISTICS 9

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNIT II PHASES OF SUPPLY CHAIN 9

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAIN MODELS 9

Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain with customer.

UNIT IV SUPPLY CHAIN ACTIVITIES 9

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNIT V SCM ORGANISATION AND INFORMATION SYSTEM 9

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERP Software's

TOTAL 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Shari.P.B and Lassen.T.S	Managing the global supply chain	Viva books, New Delhi	2000
2	Ayers.J.B	Hand book of supply chain management	The St. Lencie press	2000

REFERENCES

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nicolas.J.N	Competitive manufacturing management - continuous improvement, Lean production, customer focused quality	McGrawHill, New York	1998
2	Steudel.H.J and Desruelle.P	Manufacturing in the nineteen - How to become a mean, lean and world class competitor	Van No strand Reinhold, New York	1992

16BEMEOE03 TRANSPORT PHENOMENA 3 0 0 3 100

COURSE OBJECTIVES:

- To generalized equations for mass, momentum and heat.
- To understand the concepts of Reynolds and Gauss theorems.
- To learn combined diffusive and convective transport.
- To apply Film- and penetration models for mass and heat transfer.
- To apply Stefan-Maxwells equations for multi-component diffusion.
- To Solve the given set of equations either analytically or numerically.

COURSE OUTCOMES:

- Generalized equations for mass, momentum and heat.
- Understand the concepts of Reynolds and Gauss theorems.
- Learn combined diffusive and convective transport.
- Apply Film- and penetration models for mass and heat transfer.
- Apply Stefan-Maxwells equations for multi-component diffusion.
- Solve the given set of equations either analytically or numerically.

UNIT I INTRODUCTION AND BASIC CONCEPTS 9

General overview of transport phenomena including various applications, Transport of momentum, heat and mass , Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II PROPERTIES, UNITS AND OTHER PHYSICAL PARAMETERS 9

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III MOMENTUM TRANSPORT 9

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNIT IV ENERGY TRANSPORT 9

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heat transfer

UNIT V MASS TRANSPORT 9

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion- Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

TOTAL 45

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

WEB REFERENCE

1. https://laulima.hawaii.edu/portal

16BEMEOE04 INTRODUCTION TO BIOMECHANICS 3 0 0 3 100

COURSE OBJECTIVES:

- To describe the principles of the study of human movement.
- To describe the range of factors that influence the initiation, production and control of human movement.
- To identify the body's lever systems and their relationship to basic joint movement and classification.
- To distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
- To explain joint and muscle function and the forces acting upon the human body during various sporting activities.
- To relate the different body systems necessary for human movement to occur.

COURSE OUTCOMES:

- Describe the principles of the study of human movement.
- Describe the range of factors that influence the initiation, production and control of human movement.
- Identify the body's lever systems and their relationship to basic joint movement and classification.
- Distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
- Explain joint and muscle function and the forces acting upon the human body during various sporting activities.
- Relate the different body systems necessary for human movement to occur.

UNIT I INTRODUCTION 9

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNIT II KEY MECHANICAL CONCEPTS 9

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY 9

Gross (Whole-Body) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups - Anthropometric Data

UNIT IV ANATOMICAL DESCRIPTION 9

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNIT V MECHANICS OF THE MUSCULOSKELETAL SYSTEM 9

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit - Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle - Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control.

TOTAL 45

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Duane Knudson	Fundamentals of Biomechanics	Springer Science+ Business Media, LLC	2007
2	C. Ross Ethier Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

FACULTY OF ARCHITECTURE

B.ARCH

BACHELOR OF ARCHITECTURE

[5 YEAR FULL TIME UNDER GRADUATE DEGREE PROGRAM]

RECOGNISED BY THE COUNCIL OF ARCHITECTURE, NEW DELHI

REGULATIONS, CURRICULUM AND SYLLABUS

2016 – 2017 Batch (New Syllabus)

CHOICE BASED CREDIT SYSTEM

(CBCS)

FACULTY OF ARCHITECTURE

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be UniversityEstablished Under Section 3 of UGC Act 1956)

Pollachi Main Road, Eachanari Post, Coimbatore – 641 021. INDIA

B.ARCH SYLLABUS: 2016-2017 BATCH

SEMESTER 1

16ART101	ENVIRONMENTAL SCIENCE										SEMESTER-I	
Marks	**Internal**	**40**	**External**			**60**	**Total**		**100**	**Exam Hours**		**3**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	0			**Credits**		**2**

COURSE OBJECTIVE:

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To understand the renewable and Non – renewable resources
- To gain knowledge about Biodiversity and Conservation
- To understand the primary concept of Social impact & Pollution

COURSE OUTCOME:

1. Student will be able to master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Student will master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Student will know to appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Student will able to relate the environmental studies to the city planning strategies and Architecture
5. Student will be able to understand about the biodiversity and the conservation techniques
6. Student will be able to know methods to mitigate pollution

UNIT I- THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and importance; Need for public awareness. – Earth – renewable and non-renewable resources

UNIT II- RENEWABLE AND NON-RENWABLE RESOURCES

Natural resources and associated problems (a) Forest resources: Use and over-exploitation, deforestation, case studies.. (b) Water resources: Use and over-utilization of surface and ground water, dams-benefits and problems. (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture (e) Energy resources: case studies. (f) Land resources: Land as a resource, land degradation,

UNIT III -ECOSYSTEMS

Concept of ecosystem. Structure and function of an ecosystem. Procedures, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem:

(a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT IV -BIODIVERSITY AND ITS CONSERVATION

. Introduction - Definition: Genetic, species and ecosystem diversity. Bio geographical classification of India. Value of biodiversity: Consumptive use, productive use, social, ethical, and aesthetic and option values. Biodiversity at global, National and local levels

UNIT V- ENVIRONMENTAL POLLUTION

Definition Causes, effects and control measures of: (a) Air pollution b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear pollution Soil waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: Floods, earthquake, cyclone and landslides.

REFERENCE:

1. Miller T.G. Jr., Environmental Sciences, Wadsworth Publishing Co. (TB)

2. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental

Encyclopedia, Jaico Publ. House, Mumbai, 1196p.

16ART102	HISTORY OF ARCHITECTURE I						SEMESTER-I	
Marks	Internal	40	External	60	Total	100	Exam Hours	3
Instruction Hours /week	L	3	T	0	P/S	0	Credits	3

COURSE OBJECTIVE:

- To Gain the understanding of the Architecture from the prehistoric age
- To gain knowledge of the ancient civilization of the World
- To gain knowledge of the ancient civilization of Egypt
- To gain knowledgeon the Social fabric, Relevance design principles
- To gain knowledge of the construction materials and methods
- To gain knowledge on the different architectural styles across the world

COURSE OUTCOME:

1. An understanding about the spatial and stylistic qualities associated with architecture.
2. An understanding of the diversity of architecture in the world
3. An understanding to appreciate particular culture, symbolic, spatial and material qualities
4. An understanding about architecture and cities as givers of meaning and continuity.
5. An Understanding about the Greek Style through examples
6. An Understanding about the Egyptian, Mayan and Chinese architecture styles

UNIT-I

Introduction of Global History

Basic time line of History- Old stone age – middle stone age – new stone age- development of shelter- catalhuyuk,indus civilization- harrapa and mohenjadero-summeriancivilisation

UNIT-II

Introduction to Egypt,Greek Architecture

Egypt- evolution of pyramids- great pyramids- giza- Egyptian temples- Amon- karnac

Greek – orders in architecture- doric – ionic – Corinthian – acropolis- Athens- Parthenon- erecthion-agora- greek architectural features

UNIT-III

Introduction to Indian and south indian

Timeline - Dravidian style – Dravidian culture- rock cut productions of pallavas, shore temple- mahabalipuram- Dravidian order- Brahadeswara temple- Thanjavur- Evolution and form of gopurma – complexity – in temple plan- complexity in Rituals – meenakshiamman temple Maduarai- Chidambaram- Belur – Hampi – Halebedu- Bijapur- Padmanaban temple etc

UNIT-IV

South Indian History -Language and Culture

Language types- influences – Social – economic background studies- Arts and crafts – vernacular evolutions- pragmatic, iconic buildings

UNIT-V

Nativity Study – regional architecture

Coimbatore- Kumbakonam –karaikudi- chettinad style-Traditional settlements and the concept of buildings.

SUGGESTED READINGS:

1. Sir Banister Fletcher, A History of Architecture, University of London, The Antholone Press, 1986.
2. S.Lloyd and H.W.Muller, History of World Architecture - Series, Faber and Faber Ltd., London, 1986.
3. Francis D.K. Ching, A Global History of Architecture, John Willey & Sons Publishers, New Jersey,2007.
4. Provide Educational movies for each topic.

16ART103	MATHEMATICS IN ARCHITECTURE										SEMESTER-I	
Marks	**Internal**	**40**	**External**			**60**	**Total**	**100**			**Exam Hours**	**3**
Instruction Hours /week		**L**	3	**T**	0	**P/S**	0				**Credits**	**3**

COURSE OBJECTIVE :

- To develop analytical skills needed for problem solving a
- To develop creative thinking as well as an understanding of Geometry
- To develop the application of mathematical concepts in architecture.
- To develop the skill of Parmatric architecture
- To develop the Skill of programming by Mathemeatical Approach
- To develop an understanding of platonic solids through physical model making

COURSE OUTCOME:

1. Student will be trained on the basis of the topics of Mathematics necessary for effective understanding of architecture subjects.
2. Students will understand the advanced level applications by using coordinate geometry
3. Students will understand the Statistical charts and and variance for applications in architecture
4. Students will develop the skill and understating of Area & volume calculations for Applications in Architectural design
5. Students will understand the historical applications of mathematics and use of it in current context
6. Student would have an understanding of the basics of parametric design concept in architecture

UNIT-I

CO-ORDINATE GEOMETRY

Points, vectors and coordinate systems – Vector Algebra – Points vs Vectors – Rotation about an arbitrary axis – Parametric, Implicit and Explicit Equations – Lines – Parametric equations of lines – Implicit equation of lines – Distance from a point to a line – Conic sections – Parametric equation of conics.

UNIT-II

BASIC STATISTICS

Arithmetic Mean, Median, Mode, Standard Deviation and Variance – Graphical display of data in statistics through charts and graphs such as bar charts, histograms etc

UNIT-III

AREA AND VOLUME CALCULATIONS

Surface Area and Volume Calculations for simple 3D objects such as cube, cuboid, cylinder, cone, sphere, pyramid, prisms and their frustrums.

UNIT-IV

GEOMETRY IN ARCHITECTURE

Ratio and Systems of proportion – definition and derivation of golden ratio – Fibonacci series. Geometry of Muqarnas. – Making models for understanding the dimensions .

UNIT-V

PLATONIC SOLIDS

Geometry of Platonic Solids. (Concept and Application). Physical modeling of simple and complex geometric forms. - Making models for understanding the dimensions.

SUGGESTED READINGS:

1. T Veerarajan, Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd, NewDelhi, 2002.
2. B.S.Grewal, Engineering Mathematics, Khanna Publishers, Delhi 1998.
3. P.Kandaswamy, P.Thilakavathy and K.Gunavathy, Engineering Mathematics Vol I and II, S.Chandan Publishers, 1998.
4. Kappraff Jay, Connections: The Geometric bridge between art and science, McGraw Hill, USA,1991.
5. Geometry of Design: Studies in Proportion and Composition, Kimberly Elam.David Gibson
6. Computer aided geometric design by Thomas W.Sederberg 2014

<table>
<tr><td>16ARP111</td><td colspan="10">ART, CRAFT AND MODEL MAKING</td><td colspan="2">SEMESTER-I</td></tr>
<tr><td>Marks</td><td>Internal</td><td>60</td><td colspan="4">External</td><td>90</td><td>Total</td><td>150</td><td colspan="2">Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>1</td><td>T</td><td>0</td><td>P/S</td><td>4</td><td colspan="4">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:

- To introduce the vocabulary of art and the principles.
- To inform students about the various art forms through the ages within the cultural contexts.
- To develop presentation skills, visual expression and representation
- To Improve the imaginative thinking and creativity
- To develop the knowledge of Visualization by simple Two & Three dimensional exercises
- To develop the art skill by hands on working with various mediums and materials.

COURSE OUTCOME:

1. Student will understand the vocabulary of art and form principles
2. Student will understand to appreciate the art forms and analyse and apply the concept in architecture
3. Student will gain mastery in sketching, visualizing and expression through manual drawing, sensitized to culture, craft and context.
4. Student will gain Skill Development in Handling Materials and in Making Products and models.
5. Student will gain knowledge about various mediums of presentation
6. Student will gain deep understanding about the art Appreciation and essence of the Aesthetic value

UNIT-I to 5

Exploration in mixed media & collage to convey specific theme and meaning. Analytical Studies will be undertaken in two and three dimensions using various media.
Use of hand tools and materials: working with wood, metals, plaster, plastic, foam boards etc; techniques, safety & practice.

Suggestive exercises are:
Type 1: Making mount board models employing cubes cuboids, pyramid, cylinder and cones.
Type 2: Space frame models using match sticks straw, steel wires, bamboo splits.
Type 3: Building exterior – models – composition of forms
Type 4: Building interiors – Anthropometry – Space standards

Making Scaled models based on architectural concepts, anthropometric, proportions,Interiors etc
Making compositions of Design presentations using manual rendering techniques and computer aided techniques.

Suggested Presentation excercises :
Type 1 : Poster Design
Type 2 : Sketch of building , form exploration and concept sketches – manual presentation
Type 3 : Presentations using Design softwares

SUGGESTED READINGS:

1. Design Methods (Architecture) (Paperback), by John Chris Jones (Author).
2. Basics Design Ideas (Paperback) by Bert Bielefeld (Author), Sebastian El khouli (Author).
3. Design Drawing, Francis D. K. Ching.
4. The Nature of Design, Peg Faimon& John Weigand.
5. Foundations of Art and Design (Paperback) by Alan Pipes (Author)
6. John W.Mills- The Technique of Sculpture, B.T.Batsford Limited, New York - Reinhold Publishing Corporation, London, 1966.
7. C.Lawrence Bunchy - Acrylic for Sculpture and Design, 450, West 33rd Street, New York, N.Y.10001, 1972.
8. The Elements of Graphic Design: Space, Unity, Page Architecture, and Type (Paperback) by Alexander W. White (Author)
9. Geometry of Design: Studies in Proportion and Composition, Kimberly Elam.David Gibson
10. Model to design – Damdi, Damdi Publications
11. Architectural Models2 ,Damdi, Damdi Publications

<table>
<tr><td>16ARS121</td><td colspan="10">ARCHITECTURAL DESIGN I - BASIC DESIGN</td><td colspan="2">SEMESTER-I</td></tr>
<tr><td>Marks</td><td>Internal</td><td>160</td><td colspan="4">External</td><td>240</td><td>Total</td><td>400</td><td colspan="2">Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>10</td><td colspan="4">Credits</td><td>7</td></tr>
</table>

COURSE OBJECTIVE:

- To provide a comprehensive introduction to the discipline of Architectural Design Fundamentals
- To develop the skill in Visual Arts.
- To encourage creative thinking and design analysis by various Exercises
- To develop the dialogue & Communication visually & Verbally
- To develop the graphic thinking ability and provide a platform for graphical representation.
- To develop an understanding of the design process and develop aesthetic judgment.

COURSE OUTCOME:

1. Student will understand the qualities of different elements as well as their composite fusions.
2. Student will be able to engage and combine the elements of design in spontaneous as well as intentional ways in order to create desired qualities and effects.
3. Student will develop these required skills – observation / analysis / abstractions / interpretation / representations / expressions through models and drawings
4. Student will be able to develop the confidence to communicate effectively by explaining their own design product
5. Student will develop the art of Design Communication through his expression
6. Student will understand with whole design process from the concept tot the final product.

UNIT-I DESIGN DEFINITION:

Design Thinking: What is Design? Changing Role of the Designer; Route map of the Design Process; Components of Design Problems; Measurement, Criteria & Judgment in Design; Types and Styles of Thinking – Creative thinking, Guiding Principles.

UNIT -2 BASIC ELEMENTS OF DESIGN

Introduction to Elements of design. -Properties, qualities, and characteristics of (i) line, (ii) direction, (iii) shape, (iv) size, (v) texture, (vi) space (vii) time and motion (viii) value and (vii) colour. Exercises involving the same .Focus on Composition and Character of the elements of design addressed visually and conceptually (Exploration in any 2- Dimensional media). Exploration in mixed media & collage to convey a specific theme and meaning.Analytical Studies to be undertaken in two and three dimensions using various materials and tools.

UNIT -3 PRINCIPLES OF DESIGN:

The principles of design relationships/ Composition – Unity & Harmony, Balance, Scale & Proportion, Contrast and Emphasis, and Rhythm. Exercises involving the same.The analysis of design elements - Exercises involving the same.-Focus on Composition and Character of Basic elements of design addressed visually, and conceptually (Exploration in any 2- Dimensional media). -Exploration in mixed media & collage to convey specific theme and meaning.-Analytical Studies will be undertaken in two and three dimensions using various media.

UNIT- 4 DESIGN EXCERCISES AND MODEL:

Design thought process – Sketching various process designs- Subjective – Objective – priciples of design – oriented design – design context – Shape grammer – Fluidity – Parametric – Biomimicry etc -evolution of design – model making

UNIT -5 INTRODUCTION TO ARCHITECTURAL DESIGN:

Lecture introduction into the discipline of architecture, highlighting fundamentals that contribute to the complex totality that constitute a work of architecture: Placing Architecture (Site, Orientation, Climate, City and Landscape); History & Precedent; Materials & Construction; Representation and Realization. -Focus on design fundamentals realized artistically and practically in works by selected architects. Study of basic interrelationships of material, construction, site and program.

SUGGESTED READINGS:

1. Design Methods (Architecture) (Paperback), by John Chris Jones (Author).
2. Basics Design Ideas (Paperback) by Bert Bielefeld (Author), Sebastian El khouli (Author).
3. Foundations of Art and Design (Paperback) by Alan Pipes (Author)
4. The Elements of Graphic Design: Space, Unity, Page Architecture, and Type (Paperback) by Alexander W. White
5. Geometry of Design: Studies in Proportion and Composition, Kimberly Elam.David Gibson
6. Ching, F.D.K., "Design Drawing", Van Nostrand Reinhold, 1998
7. Neufert, P., "Architects" Data", 3rd Ed., Blackwell Science, 2000

16ARS122	BUILDING MATERIALS AND CONSTRUCTION- I										SEMESTER-I
Marks	**Internal**	**80**	**External**				**120**	**Total**	**200**	**Exam Hours**	**6**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	5			**Credits**	**4**

COURSE OBJECTIVE:

- To provide an understanding of the building materials
- To develop the knowledge of construction detailing.
- To develop basic knowledge of the various components of a built structure.
- To develop the knowledge of the Material properties
- To develop the Knowledge of the techniques in material usages
- To develop an understanding of the design execution methods

COURSE OUTCOME:

1. Students will learn about the properties of various building materials
2. Students will understand the properties of stone, brick and its usage through drawing
3. Student will be able to recognize the apt usage of materials through proper research
4. Students will be able to understand and submit drawing plates comprising of technical plan, elevation and section along with sketches and details.
5. Student will be able to understand the technical details and construction details of the subject
6. Students will gain knowledge in cost and availability by their field Survey and Site visits

UNIT-I

SOIL AND STONE

Soils: Formation – grain size distribution – soil classification systems - earth -

Stone: Classification of rocks - Building stones - their uses –physical properties - brief study of tests for stone – deterioration - preservation of stone - various stone finishes - cutting and polishing of granites.

UNIT-II

TRADITIONAL & RURAL MATERIALS

Mud as a building material - Soil stabilization, soil blocks - Cast- in-situ walls - flooring - roofing -plastering.Bamboo, Casuarina, Coconut, palm, Hay, Coir, Jute – properties and uses.Types of foundations - walls - simple roof trusses floors for rural structuresLime – types - properties and uses – Manufacturing process – Mortar: functions – requirements - mixes. – Market study

UNIT-III

BRICKS AND CLAY PRODUCTS – MATERIALS

Bricks - brief study on manufacture of bricks – properties and uses - suitability - types of bricks - uses in buildings, structural tiles, ceramics, terracotta – properties and uses.- market study

UNIT-IV

BUILDING COMPONENTS

Functional requirements of a building and its components - Drawings of foundations, plinth, superstructure, roofing. Openings: Doors, Windows and Ventilators.- Market Study

UNIT-V

BUILDING MATERIALS

Introduction to basic building materials- Observation of work at site – mixture ratio – material standards – material sample collections form market – Market study – local materials – imported materials – assignments – Introduction to bill of quantities – small material volume- basic – calculations

SUGGESTED READINGS :

1. J.S.Spencke and D.J.Cook, Building Materials in Developing Countries, John Wiley and Sons, 1983.
2. Kumar, S.K., "Building Construction", 19th Ed., Standard Publishers Distributors, 2001
3. Allen, E. and Iano, J., "Fundamentals of Building Construction: Materials and Methods", Wiley, 2004
4. Mehta, M., Scarborough, W. and Armpriest, Diane, "Building Construction: Principles, Materials and Systems", Pearson Prentice Hall, 2008

16ARS123	ARCHITECTURAL GRAPHICS- I										SEMESTER-I	
Marks	**Internal**	**60**	**External**				**90**	**Total**	**150**	**Exam Hours**		**6**
Instruction Hours /week		**L**	1	**T**	0	**P/S**	5	**Credits**				**3**

COURSE OBJECTIVE:

- To make them understand the nature of geometrical forms in terms of drawing plane and solid projections.
- To make them understand the representation of 2 dimensional and 3 Dimensional forms
- To make them understand the plans, sections, isometric and axonometric drawings of forms
- To develop the skill of doing perspectives
- To develop the Skill of technical Architectural Representation
- To develop the Skill of creating measure drawings

COURSE OUTCOME:

1. Student will be able to understand the 2 dimensional & the 3dimensional perspective of the objects
2. Student will be able to construct the 3d views and perspective drawings of the buildings.
3. Student will be able to draw the perspective drawings with sciography
4. Student will be able to do Architectural Rendering
5. Student will be able to do architectural detailed drawing for a smaller scale project.
6. Student will be able to do read and Do a technical Architectural Drawing

UNIT-I

GEOMETRICAL DRAWING – PLANE GEOMETRY -REPRESENTATION

Introduction to fundamentals of drawing/ drafting – Construction of Lines, Planes, form – grade of pencils and usage- Understanding the scale with units and dimensions – Construction of plane, object – Hollow and solid geometry – Development of surfaces and multifaceted forms – Understanding the graphical representations of arrows, lettering techniques, composition etc – Lineweights,Line type etc

UNIT-II

GEOMETRICAL DRAWING – ORTHOGRAPHIC PROJECTION

Isometric, Axonometric, Oblique and multiview orthographic projections to scale of various forms- Simple and complex objects- straight, curvilinear etc – Sections, Elevations of solid geometry – hollow objects etc

UNIT-III

PERSPECTIVE -SIMPLE & COMPLEX OBJECTS – SCIENTIFIC METHOD AND SHORT CUT METHOD

Introduction to perspective projections – One point perspective, Two point perspective, Three point perspective, - - Cone of Vision –scientific method and short cut method

UNIT-IV

SCIOGRAPHY AND RENDERING

Introduction to Sciography – Plan sciography,elevation sciography, perspective sciography-Light source Shade and shadow of the object- Manual rendering techniques- color pencils- watercolor- poster color

UNIT-V

MEASURED DRAWING OF FURNITURE/ OBJECT

Introduction to Furniture drawings- drafting and detailing of simple and complex components of the furniture

SUGGESTED READINGS:

1. Robert S. Oliver,, The Complete Sketch, Van Nostrand Reinhold, New York, 1989.
2. Tokyo Musashino Academy of Art - Introduction to Pencil Drawing, Graphic - Shaw Publishing Co. Ltd., Japan, 1991.
3. Freehand Drawing for Architects and Interior Designers (Paperback) by Magali Delgado Yanes (Author), Ernest Redondo Dominguez (Author)
4. Alwyn Cranshaw, Learn to paint with Water colours, Acrylic colours, Boats and Harbours, Sketch, Still life, landscapes, William Collins Sons and Co. Ltd., London, 1981.
5. Francis D. K. Ching, Architectural Graphics, Van Nostrand Rein Hold Company, New York, 1964.
6. Bhatt, N.D. and Panchal, V.M., "Engineering Drawing – Plane and Solid Geometry", 48th Ed., Charotar Publishing House, 1996
7. Griffin, A.W. and Brunicardi, V.A., "Introduction to Architectural Presentation Graphics", Prentice Hall, 1998
8. Ciriello, M., "Architectural Design Graphics", McGraw-Hill, 2002
9. Carpo, M., "Perspective, Projections and Design: Technologies of Architectural Representation", Routledge, 2008

SEMESTER – 2

<table>
<tr><td>16ART201</td><td colspan="10">THEORY OF ARCHITECTURE</td><td colspan="2">SEMESTER-II</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="4">External</td><td>60</td><td>Total</td><td>100</td><td colspan="2">Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>3</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="4">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:

- To impart knowledge about the various design philosophies
- To create an understanding of the evolution of various design processesin architecture
- To learn to apply the process of architectural design.
- To learn to use design as a problem-solving exercise
- To gain knowledge about various aspects in architectural design process
- To learn different styles of architecture

COURSE OUTCOME:

1. A thorough understanding on the architectural design process
2. An insight of the different tools used in the design process
3. An exposure to students on ideologies and philosophies of famous architects
4. Students will gain an understanding ofdifferent proportioning systems
5. Students will learn about the different aspects in site analysis
6. Students will learn representation methods of various site features

UNIT-I

Introduction to Design and Architecture

Definitions of Design, Architecture-context for architecture as satisfying human needs-functional, aesthetic and psychological – architecture as a discipline-introducing the various functional aspects of architecture: site, structure, skin, services, use, circulation etc. Introduction to the factors that lend meaning to architecture-architectural expression and symbolism-character and style-movements, philosophies, ideologies and theories-meaning and interpretation of architecture

UNIT- 2

Ordering Elements & Principals of Architecture

Point, line, plane, form, shape, motif, pattern, light, color, texture – understanding the elements with respect to architecture- Detailed study of the visual and emotional effects of geometric forms and their derivatives: sphere, cube, pyramid, cylinder and cone – Transformation of forms, Articulation of forms – mass-space/solid-void effects, articulation of edges, corners, surfaces -Proportion, scale, balance, rhythm, axis, symmetry, hierarchy, datum, unity, harmony, dominance with respect to architecture

UNIT- 3

Organisation of Form and Space

Spatial relationships: space within space, interlocking spaces, adjacent spaces, space linked by a common space -spatial organization: centralized, linear, radial, clustered, grid -form-space relationships-

UNIT- 4

Circulation and Organisation

Circulation as organizing element: building approach, building entrance, configuration of the path, path space relationship, form of circulation space

UNIT -5

Experiencing Architecture

Understanding architecture in totality in terms of the various aspects through first hand
Experience, analysis and interpretation using the case of a building, architectural style, work(s)
Of the contemporary architects

SUGGESTED READINGS :

1. Francis D.K.Ching, Architecture-Form, Space and Order, Van Nostrand Reinhold Company, New York, 1979.
2. Lorraine Farrelly. 2007 The Fundamental of Architecture. AVA Publishing SA 2007. Switzerland.
3. Ernest Burden - Elements of Architectural Design - A visual resource, Van Nostrand Reinhold, 1994.
4. V.S.Pramar, Design Fundamentals in Architecture, Somaiya Publications Pvt. Ltd., New Nelhi, 1973
5. Edward D. Mills – Planning:The Architects Hand Book -Bitterworth, London, 1985
6. G.Muthu Shoba Mohan 2008 Principles of Architecture Oxford & IBH publishing co. pvt. ltd. New Delhi.
7. Francis D.K. Ching 1995 A Visual Dictionary of Architecture. John Wiley & Sons, INC. New Delhi.
8. Paul Alan Johnson - The Theory of Architecture - Concepts and themes, Van Nostrand Co., New York, 1994.
9. Pierre Von Meiss, Elements of Architecture, Spon Press, New York, 2007.

<table>
<tr><td>16ART202</td><td colspan="8">HISTORY OF ARCHITECTURE – II</td><td colspan="2">SEMESTER-II</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="4">External</td><td>60</td><td>Total</td><td>100</td><td>Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>3</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="2">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:

- To Gain the understanding of the regional Architecture
- To understand the social Fabric, Relevance and Design Principles
- To understand various Construction materials and Methods used in different architectural styles
- To understand about the Indo Aryan Architecture
- To Gain knowledge in Buddhist Architecture
- To understand about evolution of Islamic &Mugal Architecture

COURSE OUTCOME:

1. Student will understand the various Architecture features and its outcome due to various social, political and economic upheavals, and its response to the cultural and context.
2. Student will understand about the spatial and stylistic qualities associated with Indo Aryan architecture.
3. Student will understand about the spatial and stylistic qualities associated with Buddhist architecture.
4. Student will understand about the spatial and stylistic qualities associated with Islamic architecture
5. Student will understand the Styles and Details of Mughal Architecture
6. Student will expertise in Spatial understanding of historical places by Sketching & reading

.

UNIT-I

BUDDHIST STYLE

Hinayana and Mahayana Buddhism - Interaction of Hellenic & Indian Ideas in Northern India - Architectural Production during Ashoka's rule - Ashokan Pillar, Saranath,Rock cut caves at Barabar, Sanchi Stupa.

Salient features of a Chaitya hall and Vihara, Rock cut architecture in the Western and Eastern ghats- Karli, Viharas at Nasik, Rani gumpha, Udaigiri. Takti Bahai, Gandhara.

UNIT-II

HINDU & INDO-ARYAN STYLES

Evolution of Hindu temple - Early shrines of the gupta and chalukyan periods -Tigawa temple, Ladh Khan and Durga temple, Aihold, Papanatha and Virupaksha temples, Pattadakal.

Indo-Aryan: Salient features of an Indo Aryan temple -Lingaraja Temple, Bhuvaneswar- Sun temple, Konarak. Kunds and Vavs – - Adalaj - Surya kund, Modhera.

UNIT-III

INTRODUCTION TO ISLAMIC ARCHITECTURE

History of Islam- Influences on Islamic Architecture - character of Islamic architecturewith examples. sources of Islamic Architecture in India and influences on them - Brief history development of architectural style during the rule of the slave, Khilji, Tuqlaq Sayyid and Lodhi Dynasties - important examples for each period.

UNIT-IV

PROVINCIAL STYLE AND ARCHITECTURE

Development of the provincial styles in different regions - Punjab, Jaunpur, Bengal, Gujarat, Malwa, the Deccan (Bijapur, Golconda, Bidar and Gulbarga) - important examples for each style.

UNIT-IV

MUGHAL ARCHITECTURE

Development of the Mughal style under the different rulers - Babur, Shershah, Humayun, Akbar, Jahangir, Shahjahan, Aurangazeb- important examples - development of the Mughal garden - important examples.

SUGGESTED READINGS :

1. Percy Brown, Indian Architecture (Buddhist and Hindu Period), Taraporevala and Sons, Bombay, 1983.
2. Satish Grover, The Architecture of India (Buddhist and Hindu Period), Vikas Publishing Housing Pvt. Ltd., New Delhi, 1981.
3. ChristoperTadgelli, The History of Architecture in India from the Dawn of civilization to the end of the Raj, Longmon Group U.K.Ltd., London, 1990.
4. Islamic Architecture, Form, Function and Meaning, Robert Hillenbrand, Edinburgh University Press, 1994.
5. Brown Percy, Indian Architecture (Islamic Period) Taraporevala and Sons, Bombay, 1983.
6. Satish Grover, The Architecture of India (Islamic) Vikas Publishing House Pvt. Ltd., New Delhi, 1981.
7. Christopher Tadgell- The History of Architecture in India - Penguin Books (India) Ltd., New Delhi 1990.
8. Francis D.K. Ching, A Global History of Architecture, John Willey & Sons Publishers, New Jersey,2007.

<table>
<tr><td>16ART203</td><td colspan="8">MECHANICS OF STRUCTURES - I</td><td colspan="2">SEMESTER-II</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="3">External</td><td>60</td><td>Total</td><td>100</td><td>Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>3</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="2">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:
- To gain understanding of basic structural form of any building
- To gain understanding of structural details of various materials and techniques
- To gain understanding about the theoretical aspects and the component aspects involved in a building
- To gain understanding about the forces and structural systems
- To gain understanding about the Structural sections
- To gain understanding about material properties

COURSE OUTCOME:
1. Student will understand the concepts of action of forces on a body and should be able to apply the equilibrium concepts.
2. Student will understand the basic geometric properties and the behavior of materials under effect of forces
3. Student will understand the various structural components of the building and its usage for strength of the structure.
4. Student will understand about the Reinforced structures structural system and ability
5. Student will understand about Steel Structures in Architectural Design
6. Student will be able to relate various building structural components

UNIT-I
INTRODUCTION TO STRUCTURES AND STRUCTURAL SYSTEMS
Overview of Structures - Concept of Structure in Architecture -Types of Structural Systems - Components of a Structure - Materials and their Structural Properties

UNIT-II
FORCES AND STRUCTURAL SYSTEMS
Types of force systems - Resultant of parallel forces - principle of moments - principle of equilibrium - simple problems

UNIT-III
ANALYSIS OF PLANE TRUSSES
Introduction to Determinate and Indeterminate plane trusses - Analysis of simply supported and cantilevered trusses by method of joints.

UNIT-IV
PROPERTIES OF SECTION
Centroid- Moment of Inertia - Section modules - Radius of gyration - Theorem of perpendicular axis - Theorem of parallel axis

UNIT-V
ELASTIC PROPERTIES OF SOLIDS
Stress strain diagram for mild steel, High tensile steel and concrete - Concept of axial and volumetric stresses and strains - Elastic constants - Relation between elastic constants - Application to problems.
Total: 45 hrs/ semester

SUGGESTED READINGS:

1. S.S.Bhavikatti, "Strength of Materials", VIKAS Publishing House Pvt. Ltd., Chennai,1997.
2. S.Ramamrotham, Strength of materials - Dhanpatrai& Sons, Delhi, 1990.
3. W.A.Nash, Strength of Materials - Schaums Series - Mcgraw Hill Book Company, 1989.
4. Building Structures--From Concepts to Design. Second Edition, by Malcolm Millais. Spon Press, London 2005
5. Buildings from Caves to Skyscrapers, Mario G Salvadori, Holiday House, 1985

16ARP211	COMPUTER APPLICATION -I									SEMESTER-II
Marks	**Internal**	**60**	**External**		**90**	**Total**	**150**		**Exam Hours**	**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4		**Credits**	**2**

COURSE OBJECTIVE:

- To introduce computer operation principles and explore image editing through a graphical composition.
- To impart training in computer aided 2D drafting and 3D modelling through projects.
- To enable the use of computer applications to develop a design from the initial stages to the final outcome
- To enable the rendering of a building so as to create a photo realistic image.
- To develop the skill of Digital Applications in Architecture
- To develop the skill of programming in Architecture

COURSE OUTCOME:

1. Student will be able to express using digital tools in the realm of visual composition, drafting, 3D visualization and rendering
2. Student will be able to draw measured drawings using the software
3. Student will be able to detail the building components using the software
4. Student will be able to produce accurate drawings faster using the software
5. Student will be able to give a rendered image of the Architectural Design by software
6. Student will be able to conceptualize. visualize and Produce digital drawings at ease

UNIT-I
SIMPLE APPLICATIONS
Creating technical documents and reports, Cost estimates with simple calculations, Presentations with graphics. – Charts – tables- Statistics-estimations

UNIT-II
SKETCHING TOOLS
Introduction to Sketch up models – Simple Buildings – Material Application– Vray rendering

UNIT-III
COMPUTER AIDED DRAFTING
Introduction to 2D application – Plan ,section, elevation drawings,3D applications

UNIT-IV
IMAGE EDITING AND ANIMATION
Introduction to image editing- color enhancement

UNIT-V
ADVANCED PROGRAMMING
Simple Programming laguages.

SUGGESTED READINGS:

1. Sketchup – latest Version - Tutorials
2. AutoCAD architectural users guide - Autodesk Inc.,
3. AutoCAD 2016 User Manual, Autodesk
4. Adobe Photoshop-Tutorials
5. Corel Draw – tutorials
6. Adobe premier

16ARS221	ARCHITECTURAL DESIGN - II						SEMESTER-II	
Marks	Internal	160	External	240	Total	400	Exam Hours	6
Instruction Hours /week	L	2	T	0	P/S	10	Credits	7

COURSE OBJECTIVE:

- Understanding a Simple Design Programme and the Components of the Design Problem.
- Investigate and Acquire the Knowledge to address the various aspects of the Design Problem and Process
- Develop Ability to Communicate Design Ideas throughout the Design Stages with multiple media.
- Ability to conceptualize a design idea by Sketching and other techniques
- Ability to do a frame work of Design methodology
- Ability to understand the process of Design and deliver the Architectural Design with Technical Drawings

COURSE OUTCOME:

1. Student shall understand the basic functional aspect of designing simple building type and its relevant spatial organization.
2. Student will be learning to reciprocate and sensitize the design/concept to the environment and the design skill of the project
3. Student will be able to transform the theoretical ideas to the tangible output of design.
4. Student will be able to understand the space organization, space- volume design approach
5. Student will be able to research, Analyse and Deliver a Architectural Design .
6. Student will be able to Communicate effectively through the design ideas

UNIT-I

Design Process: Basics: Drawing skills, Conventions, Abstraction and Expression; Application: Analysis, Exploration, Discovery and Verification; Communication: Process, Individual Design, Team Design, and Public Design. Evolution from Program and Conditions to Concept & Design - Graphical Representation of the Process.

UNIT-II

The study of space standards and anthropometrics related to each problem. Anthropometry as related to physically handicapped and elderly persons is required to be studied. Different Techniques shall be used for presentation.

UNIT-III

Design Strategies and Methods. Designing in Context; Design & Function; Constituents of Design; Working with materials and Structures; Arriving at Ideas. Methods: Nature & Geometry as generators; Music and Mathematics as models; Accident and the unconscious as sources; Rationalist Approaches; Precedent; Responses to Site; Generative Processes. Traditional Methods, New Methods, The Three Stage Process – Divergence, Transformation, Convergence; Choosing Design Strategies.

UNIT-IV

Horizontal movement - single bay - passive energy type spaces. Design Exercises shall be simple functional units with universal access compliance such as : Toilet for a physically handicapped person. Hostel room, bed room, kitchen, Shop, Workshop, pavilions, snack bar;

UNIT-V

The problems involve simple space organization. Design Exercises shall be multiple spaces and understanding their inter-relationships, such as : Residence, petrol bunk, fire station, police station, Cottage for an elderly couple.

The basics of building anatomy from parapet to foundation and an overview of the different building materials shall be explained at the beginning of the design studio.

SUGGESTED READINGS:

1. Paul Laseau, Graphic Thinking for Architects.
2. E and O.E. Planning, Lliffe Books Ltd., London, 1973.
3. De. Chiara and Callender, Time-saver Standards for Building Types, McGraw Hill Co., New York, 1973.
4. Sid Del Mar Leach, Techniques of Interior Design Rendering and presentation, McGraw Hill Co., New York, 1973.
5. Mike K. Lin, Drawing and Designing with Confidence: A Step by Step Guide.
6. Rendow Yee, Architecutral Drawing: A visual Compedium of types and Methods.
7. Francis D Ching, Design Drawing.
8. Francis D Ching, Drawing a Creative Process.
9. Mike. W. Lin, Architectural Rendering Techniques: A Colour Reference.
10. Richard M. Mc Garry, Marker Magic: The Rendering Problem Solver for Designers.
11. Michael. E. Doyle, Color Drawing: Design drawing Skills & Techniques for Architects, Landscape Architects & Interior Designers.

16ARS222	BUILDING MATERIALS AND CONSTRUCTION- II										SEMESTER-II
Marks	Internal	80	External				120	Total	200	Exam Hours	6
Instruction Hours /week		L	2	T	0	P/S	5			Credits	4

COURSE OBJECTIVE:

- To provide an understanding of the construction materials
- To provide an understanding of the construction methods through construction detailing
- To develop basic knowledge of the various components of a built structure
- Ability to understand by field study on all Topics
- Ability to understand materials like brick, clay and timber
- Ability to gain Knowledge about the techniques of Timber Construction

COURSE OUTCOME:

1. Student will gain Knowledge of properties and construction methods of brick, clay products and timber products.
2. Student will be able to detail structural and nonstructural components of simple buildings using the above materials.
3. Student will understand to integrate knowledge of properties and construction methods of basic building materials in the design of simple projects.
4. Student will understand about the Timber construction techniques for doors and windows.
5. Student will be able to gain advanced knowledge about Timber Roof Constructions.
6. Student will understand the building construction techniques of the timber staircases.

UNIT-I
BRICKS PRODUCTS - CONSTRUCTION
Structural members in brickwork – Brick piers, footings, Brick manufacture and process
Reinforced brick masonry - Arches - Lintels – Corbels - copings.

UNIT-II
CLAY PRODUCTS CONSTRUCTION
Hollow clay blocks - for walls - partitions - roofs
Roofing - Flat Roofs - Terrace roofs - Sloping roofs
.
UNIT-III
TIMBER CONSTRUCTION – DOOR, WINDOWS AND PANELLING
Fundamentals of timber- manufacture – uses – current developments – physical properties - Drawings of timber joinery for Windows, doors, ventilators, Timber partitions

UNIT-IV
TIMBER CONSTRUCTION – STAIRCASE
Timber staircase and design

UNIT-V
TIMBER CONSTRUCTION – TRUSS
Timber trusses - Lean to - close couple - Kingpost - Queen post - Trusses.

SUGGESTED READINGS:

1. Don A.Watson, Construction Materials and Processes, McGraw Hill Co., 1972.
2. W.B.Mckay, 'Building Construction', Vol.1, 2, 3 Longmans, U.K. 1981.
3. Alanwerth, Materials, The Mitchell Pub. Co. Ltd., London, 1986.
4. R.Chudleu, 'Building Construction Handbook', British Library Cataloguing in Publication Data, London, 1990.
5. S.C.Rangwala, Engineering Materials, CharotarPub.House, Anand, 1997.

16ARS223	ARCHITECTURAL GRAPHICS- II										SEMESTER-II	
Marks	**Internal**	**60**	**External**				**90**	**Total**	**150**	**Exam Hours**		**6**
Instruction Hours /week		**L**	1	**T**	0	**P/S**	5			**Credits**		**3**

OURSE OBJECTIVE:

- To involve students in a number of exercises that will help them develop the skill of representation in advanced drawing techniques
- To make them understand the measured drawing method
- To make them understand to document buildings of architectural interest
- To understand and Develop the skill of measured drawing of Sections & Elevations
- To understand and develop the set of Architectural working drawings
- To develop them in making the working drawings for the Site Execution

COURSE OUTCOME:

1. Student will be able to construct and draw detailed architectural working drawings
2. Student will understand the 3d views and perspective drawings of the buildings.
3. Student will understand the detailed specifications of a small construction drawing
4. Student will learn to Collect the building data and document accordingly
5. Student will develop the skill of making a Architectural Working Drawing
6. Student will develop the skill of reading a Interior working Drawing

UNIT-I

ARCHITECTURAL DRAWING & REPRESENTATION

Introduction to Architectural drawings – composition of various drawings- list of drawings –simple plans , sections , elevations – dimension – scale drawings- details – representations – arrows – stairs – material hatches etc

UNIT-II

ORTHOGRAPHIC PROJECTION – EXTERIOR AND INTERIOR SPACES

Isometric, Axonometric, Oblique and orthographic projections to scale of Exterior and interior spaces-multi level spaces in buildings –interior furniture etc. – shade and shadow

UNIT-III

BUILDING PERSPECTIVE-MANUAL & DIGITAL RENDERING

Perspective of large spaces and buildings – One point perspective, Two point perspective, Three point perspective – scientific method, short cut method -pencil ,pen rendering ,stippling-Shade and shadow- Sciography of plan ,elevation, isometric, axonometric views-rendering of the building silhouette by manual and digital techniques.

UNIT- 4

MEASURED DRAWING OF A BUILDING

Introduction to fundamentals of measured drawing, line value, lettering, drawing representation, methods and technique of measuring objects by measuring tape –photographs – aesthetic components and details

UNIT-V

DETAILED DOCUMENTATION OF A BUILDING

Documentation of a complete building of a special interest in terms of history, building Construction- architectural excellence or technology – examples like Post office, Police Station, Public School

SUGGESTED READINGS:

1. Francis Ching, Architectural Graphics, Van Nostrand and Reinhold Company, New York, 1975.
2. Edward J.Muller,Jemes G. Fauselt, Philip A. Graw Architecture Drawing and Light Construction Prentice hall Publishers Columbus. 1999.
3. Ernest Norling, Perspective drawing, Walter Fostor Art Books, California, 1986.
4. Bernard Alkins- 147, Architectural Rendering, Walter Foster Art Books, 1986.
5. Learn to paint with Water Colours, Acrylic colours, Boats and Harbours, Sketch, Still life, landscapes. Author: Alwyn Cranshaw, Publisher: William Collins Sons & Co. Ltd., London, 1981.
6. Architectural Rendering, A Technique of Contemporary Presentation, Author: Albert O. Halse, Publisher, Mc Graw Hill Book Company, New York, 1972.
7. Elisabetta Drudi, Figure Drawing for Fashion Design, The Pepin Press Singapore. 2001.
8. K.Venugopal, Engineering Drawing and Graphics + AutoCAD, New Age International Publishers, New Delhi,2007.
9. Kendra Schank Smith, Architects' Drawings, Architectural Press- An imprint Elservier Burlington 2006.

SEMESTER 3

16ART301	BUILDING SERVICES I								SEMESTER-III
Marks	Internal	40	External		60	Total	100	Exam Hours	3
Instruction Hours /week		L	3	T	0	P/S	0	Credits	3

COURSE OBJECTIVE:

- To get a Brief understanding about the list of Services involved in Building
- To understand the sequence and importance of the services in a Building during the planning
- To develop basic technical knowledge in water supply & Applications in Architecture
- To develop the technical knowledge in Electricl Supply & Applications in Architecture
- To develop sanitation, electrical, air conditioning, mechanical and firefighting systems.
- To develop basic technical knowledge in acoustics of a space

COURSE OUTCOME:

1. Student will understand about Building services and its integration in a building
2. Student will learn about water supply, sewage, drainage and waste systems in buildings.
3. Student will learn about the various electrical systems and applications in building
4. Student will understand about Heating, ventilation and air-conditioning systems in a building.
5. Student will learn about the Fire safety & Services in a building
6. Student will understand the importance of application of services in a building.

UNIT-I

WATER CHARACTERISTICS AND QUALITY

Surface and ground water sources - quality/quantity - nature of impurities

UNIT-II

FUNDAMENTALS OF SEWAGE TREATMENT AND SEWERAGE SYSTEMS

Environmental sanitation - Sanitation in buildings. Arrangement of sewerage systems in Housing, large factories, towns and cities - sewage pumping station - Rainwater harvesting and disposal

UNIT-III

ELECTRICAL SYSTEMS AND ILLUMINATION

A) Basics of electricity - Single/Three phase supply - Protective devices in electrical installations -Earthling for safety - Types of earthling- ISI specifications.

b) Principles of illumination: Modern theory of light - Synthesis of light - Additive and subtractive synthesis of color- Luminous flux - Candela - Solid angle illumination - Utilization factor - depreciation factor - MSCP - MHCP - Laws of illumination.

UNIT-IV

MECHANICAL SYSTEMS

a) Pumps – uses & types and their selection, installation and maintenance, Hot Water Boilers.

b) Basic refrigeration principles: Thermodynamics - Heat - Temperature, measurement transfer - Change of state - Sensible heat - Latent heat of fusion, evaporation, sublimation - Saturation temperature -Super-heatedvapor-sub cooled liquid - pressure temperature relationship for liquids – Refrigerants

UNIT-V

FUNDAMENTALS OF ACOUSTICS

Sound waves, frequency, intensity, wave length, measure of sound, decibel scale, speech and music frequencies.

Types of noises, transmission of noise, transmission loss, noise control and sound insulation and remedial measures, determination of density of a given building material, absorption co-efficient and measurements, choice of absorption material, resonance, reverberation, echo, exercises involving reverberation time and absorption co-efficient.

SUGGESTED READINGS :

1. William H.Severns and Julian R.Fellows, Airconditioning and Refrigeration, John Wiley and Sons, London, 1988.
2. Robert D.Finch, Introduction to Acoustics, Prentice Hall of India Private Limited, New Dehli, 2008.
3. MARK J. HAMMER MARK J. HAMMER, JR, Water and Wastewater Technology, PHI Learning Private Limited, New Delhi. 2009.
4. M.N.Rao, A.K.Datta, Waste Water Treatment, Oxford & IBH PUBLISHING CO. PVT. LTD,New Delhi,2007.
5. Section 11. Sanitary Appliances and Water Fittings. IS Code- SP: 21-1983.
6. Hand book on Water Supply and Drainage with Special emphasis on plumbing IS Code – SP : 35 – 1987.
7. Part of Section 1: Water Supply. IS CODE – SP : 7 – 1992.
8. IS Code of Basis Requirements for Water supply drainage and sanitation. IS Code – IS 1172: 1983.
9. Code of Practice for Water Supply in Buildings. IS Code – IS 2065: 1983.

16ART302	**HISTORY OF ARCHITECTURE – III**										**SEMESTER-III**	
Marks	**Internal**	**40**	**External**				**60**	**Total**	**100**	**Exam Hours**	**3**	
Instruction Hours /week		**L**	3	**T**	0	**P/S**	0			**Credits**	**3**	

COURSE OBJECTIVE:

- To Gain the understanding of the Architecture in the chronology 400B.C to 800 A.D
- To understand the social Fabric, Relevance, Design Principles & Construction materials and Methods.
- To understand about the Roman Architecture
- To Gain knowledge in Romanesque Architecture
- To understand about evolution of Gothic Architecture
- To Gain knowledge in Italian Renaissance

COURSE OUTCOME:

1. Student will understand the various Architecture features and its outcome due to various social, political and economic upheavals, and its response to the cultural and context.
2. Student will understand about the spatial and stylistic qualities associated with Roman architecture.
3. Student will understand about the spatial and stylistic qualities associated with Romanesque architecture.
4. Student will understand about the spatial and stylistic qualities associated with Italian Renaisance and Baroque architecture
5. Student will understand the Styles and Details of Gothic Architecture
6. Student will expertise in Spatial understanding of historical places by Sketching & reading

UNIT-I

ROMAN

Outline of architectural character: roman orders (Doric, ionic, Corinthian, Tuscan and composite)

Building Typology: Religious Buildings – Temple (Pantheon); Civic Buildings – Baths (Thermae of Caraculla), Theatres (Colloseum), Circus (Circus Maximus), Palace (Forum Romanum); Engineering works – Aqueducts, bridges

UNIT-II

ROMANESQUE

Factors influencing architecture - Building Systems - Use of arches, vaults, columns, piers, buttresses and roofs. Outline of architectural character of Italy, France and England - Examples: Pisa complex, Italy Abbay aux Hommes, Caen, Tower of London.

UNIT-III

GOTHIC

Outline of Gothic Architectural character - Examples: Notre Dame, Paris - Westminster Abbey, Hampton Court Palace, London, Doges Palace, Venice, Milan Cathedral.

UNIT-IV

ITALIAN RENAISSANCE

Renaissance – Introduction. Italian Renaissance - three phases – early Renaissance (Alberti - S. Andrea, Brunelleschi - Cathedral of Florence, Pazzi Chapel, Basilica San Lorenzo) , High Renaissance (Bramante - Santa Maria delle Grazie) , Late Renaissance (Michelangelo, Palladio -St. Peter'sBasilica, Villa Capra La Rotonda)

UNIT-V

NORTHERN RENAISSANCE AND BAROQUE

Northern Renaissance – Introduction; Characteristics of English Renaissance – Works of Sir Christopher Wren, Inigo Jones.

Baroque – Features and Elements of Baroque - St Paul's Cathedral, Palace of Versailles.,Winter Palace in Saint Petersburg.

SUGGESTED READINGS :

1. Sir Bannister Fletcher, A History of Architecture, University of London, The Antholone Press, 1986.
2. Robert Chitham, The Classical Orders of Architecture, Elsevier, London, 2005
3. Francis D.K. Ching, A Global History of Architecture, John Willey & Sons Publishers, New Jersey,2007.
4. S.Lloyd/H.W.Muller, History of World Architecture - Series, Faber Ltd., London, 1986.
5. Spiro Kostof, A History of Architecture - Settings and Rituals, Oxford University Press, London, 1985.
6. Pierre Pichard, TanjavurBrhadisvara, Ecole Francaise D' Extreme Orient, New Delhi, 1995

<table>
<tr><td>16ART303</td><td colspan="9">MECHANICS OF STRUCTURES- II</td><td colspan="2">SEMESTER-III</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="3">External</td><td>60</td><td>Total</td><td>100</td><td colspan="2">Exam Hours</td><td>3</td></tr>
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</table>

COURSE OBJECTIVE:

- To gain understanding of structural concepts in architecture
- To gain understanding of structural details of various Forces and techniques
- To gain understanding about the theoretical aspects and the component aspects involved in a building
- To gain understanding about the R.C.C structural elements
- To gain understanding about the Indeterminate Structures
- To gain understanding about the forces acting on structural elemnts

COURSE OUTCOME:

1. Student will understand the concepts of action of forces like bending moment and shear force
2. Student will understand the basic geometric properties and the behavior of beams under effect of stress
3. Student will understand the various structural components of the building like columns
4. Student will understand about the Reinforced structures structural system and ability
5. Student will understand about Indeterminate Structures in Architectural Design
6. Student will be able to relate various building structural components and their behavior

UNIT-I

SHEAR FORCE AND BENDING MOMENT

Concept of shearing forces and Bending Moments - shear force and bending Moment diagrams for cantilever and simply supported beams subjected to point load, uniformly distributed loads and their combinations

UNIT-II

STRESSES IN BEAMS

Theory of simple bending - bending stresses in beams, shear stresses in beams - examples on simple sections. Stress distribution diagrams,Span – depth of beam - prestressed.

UNIT-III

DEFLECTION OF BEAMS

Slope and deflection at a section - Double Integration and Macaulay's method for simply supported and cantilever beams

UNIT-IV

THEORY OF COLUMNS

Short and long columns - Euler's method and its limitations - Derivations of Euler's formula (for different end conditions) - Rankine's formula for columns, examples, effect of eccentric loading

UNIT-V

INTRODUCTION TO INDETERMINATE STRUCTURES

Introduction – Determination of degree of statical indeterminacy for beams and frames – Concept of Analysis (No Problems)

Total 45 Hrs/Semester

SUGGESTED READINGS :

1. S.S.Bhavikatti, "Strength of Materials", VIKAS Publishing House Pvt. Ltd., Chennai,1997.
2. S.Ramamrotham, Strength of materials - Dhanpatrai& Sons, Delhi, 1990.
3. W.A.Nash, Strength of Materials - Schaums Series - Mcgraw Hill Book Company, 1989.
4. R.K.Bansal - Engineering Mechanics and Strength of Materials - Lakshmi Publications, Delhi, 1990.
5. R.K. Rajput - Strength of Materials , S. Chand & Company Ltd., New Delhi 1996.

16ARP311	COMPUTER APPLICATION- II										SEMESTER-III	
Marks	**Internal**	**60**	**External**				**90**	**Total**	**150**		**Exam Hours**	**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	5				**Credits**	**2**

COURSE OBJECTIVE:

- To develop the advanced Digital knowledge and skills
- To develop the skills of three-dimensional rendering
- To develop the skill and knowledge of the Building information Modelling
- To develop the Skill related to building visualization,
- To develop the skill of multimedia presentations, brochures,
- To develop the skill of video presentations as required in architectural practice.

COURSE OUTCOME:

1. Student will be able to understand the use of digital tools in the realm of visual composition,
2. Student will understand the drafting & Details through Software
3. Student will develop the skill of 3D visualization and rendering
4. Student will understand the concept of BIM- building information modelling through the specific software
5. Student will gain the Skill of Multimedia & video making presentations required for Architectural practice
6. Student will gain knowledge about the latest developments of digital applications in Architecture

UNIT I to UNIT V

INTRODUCTION TO BUILDING INFORMATION MODELLING

New Features , Editing and Working with Families in a Project, Concepts, creating a sharedFamily, Project and System settings. Suggested Software: REVIT, ARCHICAD

BASIC MODELLING AND DOCUMENTATION

Creating the Basic Model, Adding Doors and Windows, Floors and Floor Openings, Roof and Ceiling,Staircases. Suggested Software: REVIT, ARCHICAD.Creating drawings, Creating detail from Building Model, Scheduling, Annotating and Dimensioning, Viewing the Mode

RENDERING

Applying Materials and textures, creating a perspective vies, rendering an Exterior view, rendering an Interiorviews, Creating and Recording Walkthroughs, creating 3D cutaways with Section Boxes

Suggested Software: ArchiCAD, Revit,3ds max, lumion

SUGGESTED READINGS :

1. AutoCAD 2011 User Manual, Autodesk 2011.
2. Revit reference manual - Autodesk UNC, 2010.
3. ArchiCAD architectural users guide -Graphisoft Inc., 2010.

<table>
<tr><td>16ARS321</td><td colspan="10">ARCHITECTURAL DESIGN-III</td><td colspan="2">SEMESTER-III</td></tr>
<tr><td>Marks</td><td>Internal</td><td>160</td><td colspan="4">External</td><td>240</td><td>Total</td><td>400</td><td colspan="2">Exam Hours</td><td>6</td></tr>
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</table>

COURSE OBJECTIVE:

- Understanding Complex Design Programme and the Components of the Design Problem.
- Investigate and Acquire the Knowledge to address the various aspects of the Design Problem and Process
- Develop Ability to Communicate Design Ideas throughout the Design Stages with multiple media.
- Ability to conceptualize a design idea by Sketching and other techniques
- Ability to do a frame work of Design methodology
- Ability to understand the process of Design and deliver the Architectural Design with Technical Drawings

COURSE OUTCOME:

1. Student shall understand the basic functional aspect of designing simple building type and its relevant spatial organization.
2. Student will be learning to reciprocate and sensitize the design/concept to the environment and the design skill of the project
3. Student will be able to transform the theoretical ideas to the tangible output of design.
4. Student will be able to understand the space organization, space- volume design approach
5. Student will be able to research, Analyse and Deliver the Architectural Design.
6. Student will be able to Communicate effectively through the design ideas

.

TOPICS

Introduction to site – inventory and Analysis – Graphical representation - time space activity analysis.

Single level planning in small scale, small span, horizontal movement and simple vertical movement, data collection, case studies, analysis and presentation of studies – Data collection with respect to design and detailing for physically handicapped persons - Concepts and presentation of design with scaled models - Examples: Residential buildings, Institutional buildings: banks, nursery or primary schools, primary health center, school for children with learning disabilities, neighborhood market, etc.

Design Process to be approached stage wise through Architectural Programming

SUGGESTED READINGS :

1. De Chiara and Callender, Time Saver Standards Building Types, McGraw Hill Co., 2nd Edition, 1980.
2. Edward D.Mills, Planning - The Architects Handbook - 10th Edition, British Library Cataloguing in Publication Data, 1985.
3. Wakita Linde, The Professional practice of Architectural working, drawing John Wiley & Sons, 1984.
4. Andrew Alpern, Handbook of Speciality Elements in Architecture, McGraw Hill Book Co., 1982.
5. Julius Panero& Martin Zelnik, Human Dimension and Interior Space, Whitney Library of Design Publication, 1979.
6. Neufert Architect's Data, RudollHerg, Crosby Lockwood and Sons Ltd., 1970.

16ARS322	BUILDING MATERIALS AND CONSTRUCTION -III									SEMESTER-III	
Marks	**Internal**	**80**	**External**			**120**	**Total**	**200**	**Exam Hours**		**6**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	4		**Credits**		**4**

COURSE OBJECTIVE:

- To give an introduction to cement and concrete as materials for building construction.
- To help understand the principles, types, methods of construction
- To understand aboutapplications of concrete
- To understand about structural and non-structural building components
- To understand and enable design and detail using concrete in buildings
- To understand about concrete staircase.

COURSE OUTCOME:

1. Student will learn about the concrete as a versatile material in different contexts.
2. Student will understand the concepts of concrete as a building construction material.
3. Student will be able to design and detail specific components in concrete in Architectural Design
4. Student will understand about concrete Footing, column by doing detailed drawings
5. Student will understand about concrete Slab, beams by doing detailed drawings
6. Student will understand about concrete Plinth, lintel, Sill by doing detailed drawings

Student will understand about concrete Staircase by doing detailed drawings

UNIT-I

CONCRETE, ITS INGREDIENTS MANUFACTURE & PROPERTIES

Ingredients - suitability requirements for aggregates, grading of aggregates - role of water in concrete - reinforcement - admixtures - properties of concrete.

Manufacture of concrete and concreting - mix proportioning - batching, mixing, transporting, placing, compaction, curing formwork - quality control - outline of tests for concrete - joints in concrete - concrete finishes.

UNIT-II

SPECIAL CONCRETE AND CONCRETING METHODS

Lightweight, high density, fibre reinforced, polymer concrete - outline of manufacture properties and uses of the above - ready mixed concrete -guniting- cold weather and underwater concreting - current developments in concrete products and methods of concreting.

FOUNDATIONS

Pile foundation, different types of piles, precast and cast insitu with reinforcement details for different types of grids, details of pile capping, jointing of precast piles and columns – Raft foundation

UNIT-III

CONCRETE CONSTRUCTION

Introduction to framed structures.Concrete in foundations - types of footings - isolated, combined, continuous, strap.

Concrete floors, walls and partitions,roof.Concrete lintels, arches, sunshades -Concrete slabs - types - concrete beams and columns.

UNIT-IV

CONCRETE STAIRCASES

Factors involving staircase design - types of staircases like straightflight, doglegged, quarterturn, bifurcated, spiral helical, etc. - different support conditions like inclined slab, cranked slab, continuous, cantilever - foundations finishes for staircases - detailing out of handrails and balusters. Designing and detailing for physically handicapped.

UNIT-V

D.P.C- WEATHERING COURSE – WATER PROOFING

Introduction to DPC – Damp Proof Course – Water Proofing – Details and techniques – types

Exercises involving simple bill of Quantities

SUGGESTED READINGS :

1. M.S.Shetty, Concrete Technology, S.Chand& Co. Ltd., New Delhi, 1986.
2. Dr.B.C.Punmia, Building Construction, Laxmi Publications Pvt. Ltd., New Delhi, 1993.
3. Arthur Lyons, Materials for Architects and Builders - An introduction, Arnold, London, 1997.
4. W.B.Mckay, Building Construction, Longmans, UK, 1981.
5. Francis D.K.Ching, Building Construction Illustrated VNR, 1975.

16ARS323	CLIMATE RESPONSIVE ARCHITECTURE I										SEMESTER-III
Marks	**Internal**	**60**	**External**			**90**	**Total**	**150**	**Exam Hours**		**6**
Instruction Hours /week		**L**	1	**T**	0	**P/S**	5			**Credits**	**3**

COURSE OBJECTIVE:

- To study about climatic factors and its influence
- To understand about the of external and internal factors of Climate for a certain location
- To understand deeply about the Microclimatic influences in a building
- To understand about the Solar geometry and its impacts in a building
- To understand the Air movement & its principles and Applications for humanthermal comfort
- To understand about the Classification of climate and Design strategies recommendations for each climatic Zone

COURSE OUTCOME:

1. Student will understand the whole climatic scenario of the world
2. Student will learn about the Solar geometry, sun path its irradiation effects and control
3. Student will learn about heat transfer in buildings due to materials and design implications.
4. Student will understand about the Various ventilation principles and techniques for good ventilation
5. Student will understand hybrid design strategies and its design applications for different climatic zones
6. Student will develop the skill of doing a climatic design for any building with optimum recommendations.

UNIT-I

CLIMATE

Introduction of the earth formation,sun-Latitide , longitude, Altitude-Types of Climate -Factors that determine climate -Climate of a location- Climatic zones of the world,India – Components of Climate – Climate classifications for building designers in tropics – Climate characteristics. Human body heat balance – Human body heat loss – Effects of climatic factors on human body heat loss – Effective temperature – Human thermal comfort – Use of C.Mahony'stables,Psychrometric chart

UNIT-II

SOLAR GEOMETRY

Movement of sun – Locating the position of sun – Sun path diagram – Solictice-Overheated period–Solar shading–Shadow angles – Types of shading devices and materilas

UNIT-III

HEAT FLOW THROUGH BUILDING ENVELOPE CONCEPTS

The transfer of heat through solids – Definitions – Conductivity, Resistivity, Specific heat, Conductance, Resistance and Thermal capacity – Surface resistance and air cavities– Air to air transmittance (U value) – Time lag and decrement

UNIT-IV

IMPACT OF AIR MOVEMENT DUE TO NATURAL AND BUILT FORMS /VENTILATION

The wind – The effects of topography on wind patterns – Air currents around the building – Air movement through the buildings – The use of fans – Thermally induced air currents – Stack effect, Venturi effect – Use of court yard.

UNIT-V

DESIGN STRATEGIES AND RECOMMENDATIONS

Design strategies in warm humid climates, hot humid climates, hot and dry climates and cold climates – Climate responsive design exercises

SUGGESTED READINGS ::

1. O.H. Koenigsberger and others (1993), Manual of Tropical Housing and Building – Part I - Climate design, Orient Longman, Madras, India.
2. Bureau of Indian Standards IS 3792 (1987), Hand book on Functional requirements of buildings other than industrial buildings, (Part I – IV), Manakbhavan, 9, Bahadur Shah Zafar Marg, New Delhi – 110002 SUGGESTED READINGS :
3. Martin Evans (1980), Housing Climate and Comfort – Architectural Press, London
4. B. Givoni (1981), Man, Climate and Architecture, Architectural Sciences Series - Applied Science Publishers Ltd., London
5. B. Givoni (1994) Passive and Low Energy Cooling of building,VanNortrand Reinhold New York, USA..
6. Galloe, Salam and Sayigh A.M.M. (1998) "Architecture, Comfort and Energy", Elsivier Science Ltd. , Oxford, U.K.
7.Arvind Krishan " Climate responsive Architecture".
8. Sun,Wind and Light – Architectural design strategies – Mark Dekay, G.Z. Brown- Third and fourth edition

SEMESTER 4

16ART401	BUILDING SERVICES -II									SEMESTER-IV	
Marks	Internal	40	External			60	Total	100		Exam Hours	3
Instruction Hours /week		L	3	T	0	P/S	0			Credits	3

COURSE OBJECTIVE:

- To inform about the principles and laws of Water distribution systems in buildings.
- To inform about the principles and laws of sewerage systems in buildings.
- To inform about the principles and laws of plumbing systems
- To inform about the electrical layout for residential Building
- To understand about compressors, evaporators and refrigerant control devices
- To Inform about the integration of service with the Architectural Design

COURSE OUTCOME:

1. Student will gain Knowledge of design of Water distribution systems in buildings
2. Student will learn and understand about the sewerage systems in buildings.
3. Student will learn and understand about the plumbing systems
4. Student will understand the electrical layout for residential Building
5. Student will gain basic knowledge about compressors, evaporators and refrigerant control devices
6. Student will understand the Applications of building Services in advanced level by detailed Drawings

UNIT-I

Water Distribution

Water supply systems – Domestic – Commercial – usages - Distribution systems in buildings - Types of pipes used - Laying, jointing, testing - prevention of water wastage and reuse of water - Internal water supply in buildings - Relevant byelaws and regulations.

UNIT- 2

SEWAGE AND SOLID WASTE MANAGEMENT

Arrangement of sewerage systems in buildings - sewage treatment plant- Solid waste Disposal: Collection, conveyance and disposal of town Solid waste

UNIT- 3

Plumbing Systems

Materials and construction details of sewers and connections – plumbing fixtures - testing for water tightness - plumbing system for building types. – Toilets kitchen etc., Relevant Plumbing Codes

UNIT- 4

Electrical Systems And Lighting Design

Study of electrical layout for residential Building - Types of wires, wiring systems and their choice - Main and distribution boards - Electrical load calculation – Details - Classification of lighting - Artificial light sources - spectral energy distribution - luminous efficiency - colour temperature - colour rendering – lighting fixtures.

UNIT- 5

Air-Conditioning System And Applications

Vapour compression cycle - compressors - evaporators - Refrigerant control devices - electric motors - Starters - Air handling units - Cooling towers.

Window type and packaged air-conditioners - chilled water plant - fan coil systems - water piping - cooling load - Airconditioning systems for different types of buildings - Protection against fire to be caused by A.C.ystems.

SUGGESTED READINGS :

1. Robert D.Finch, Introduction to Acoustics, Prentice Hall of India Private Limited, New Dehli, 2008.
2. MARK J. HAMMER MARK J. HAMMER, JR, Water and Wastewater Technology, PHI Learning Private Limited, New Delhi. 2009.
3. M.N.Rao, A.K.Datta, Waste Water Treatment, Oxford & IBH PUBLISHING CO. PVT. LTD,New Delhi,2007.
4. S.P.Arora,S.P.Bindra, Building Construction, dhanpat rai publication, New Delhi. 2009.
5. Section 11. Sanitary Appliances and Water Fittings. IS Code- SP: 21-1983.
6. Hand book on Water Supply and Drainage with Special emphasis on plumbing IS Code – SP : 35 – 1987.
7. Part of Section 1: Water Supply. IS CODE – SP : 7 – 1992.
8. IS Code of Basis Requirements for Water supply drainage and sanitation. IS Code – IS 1172: 1983.
9. Code of Practice for Water Supply in Buildings. IS Code – IS 2065: 1983.
10. William H.Severns and Julian R.Fellows, Airconditioning and Refrigeration, John Wiley and Sons, London, 1988.
11. D.J.Groomet- Noise, Building and People -Pergumon Press - 1977.

16ART402	CONTEMPORARY ARCHITECTURE I										SEMESTER-IV	
Marks	Internal	40	External				60	Total	100	Exam Hours		3
Instruction Hours /week		L	3	T	0	P/S	0	Credits				3

COURSE OBJECTIVE:

- To give exposure to the critiques of modern architecture.
- To understand about influence of new materials in modern architecture
- To study in detail the different postmodern directions in architecture
- To study about the influence of industrial revolution in Architecture
- To understand about the Modern era of Architecture
- To understand the evolution of Western Architecture

COURSE OUTCOME:

1. Student will understand the spread and varied later directions of modern architecture across the world.
2. Student will understand the architectural production from the 1960s as driven by large scale changes across the world.
3. Student will become familiar with contemporary forces and directions in architecture across the world.
4. Student will understand the basis of Architecture revolutuons and its changes in every decade
5. Student will understand the Ideologies of various Arhitects& their Works
6. Student will impart this Knowledge in his Arhitectural Design

UNIT-I

EVOLUTION OF MODERN ARCHITECTURE & INFLUENCE OF NEW MATERIALS

Reasons for the evolution of Modern Architecture, origins-Neo ClassicismIndustrial revolution and its impact – Emergence of new building typologies, New Materials and Technologies- steel, glass and concrete

UNIT- 2

REVIEWING INDUSTRIALISATION

Arts & Crafts movement in Europe and America; Art nouveau, and the works of Horta, Guimard, Gaudi and Macintosh; Organic Architecture -Early works of F.L.Wright. Chicago school; Art deco Architecture in Europe and America.

UNIT- 3

EVOLUTION OF MODERNISM, POST MODERNISM AND CRITIQUE

Viennese secession, Adolph Loos and debates on ornamentation ; Futurism, Expressionism works ofMendelssohn&Taut, Cubism, Constructivism, De stijl and their influence on Architecture. Bauhaus school &Walter gropius, Modernism and the International style, Brutalism, Writings of Venturi - Jane Jacobus - Aldo Rossi - Christopher Alexander.

UNIT- 4

CONTEMPORARY ARCHITECTS AND THEIR WORKS- PART1

Modernism-Ideas and works of Richard Meier (Smith House, Connecticut and Getty Centre, Brent Wood, LosAngeles), Charles Moore (Architect's Own House at Orinda and Piazza d'Italia, New Orleans), Bernard Tschumi (Kyoto Railway Station Project and Parc de la Villete, Paris), Frank Gehry (AeroSpace Museum, Santa Monica and Guggenheim Museum, Bilbao), Norman Foster (Hong Kong Shanghai Bank and Renault Distribution Centre, Swindon, England), tadaoando,….etc

UNIT-V

CONTEMPORARY ARCHITECTS AND THEIR WORKS- PART2

Zaha Hadid (The Peak Club, HongKong and IBA Housing Block 2, West Berlin), Daniel Leibskind(Jewish Museum, Berlin and World Trade Centre, New York), Rem Koolhas(Dance Theatre, The Hague and Netherlands Sports Museum), Santiago Calatrava(Lyon- Satolas Railway Station and Olympic Stadium at Athens), Renzo Piano(Pompidou Centre, Paris and Menil Museum, Houston) - Deconstructivist Theory – Parametric – Criticlal regionalism.

SUGGESTED READINGS :

1. Charles Jencks, The Language of Post-Modern Architecture, 1984.
2. D.Ghirardo, Architecture After Modernism, Thames and Hudson, London, 1990.
3. Kenneth Frampton, Modern Architecture: A Critical History, Thames and Hudson, London, 1994.
4. Miki Desai et.al, Architecture and Independence, Oxford University Press, New Delhi, 1998.
5. Peter Szalapaj, Contemporary Architecture ,Architectural Press- An imprint Elsevier, Burlington, 2008.
6. Catherine Slessor Contemporary Architecture Images Publishers Australia. 2002.
7. A Global History on Architecture – Francis D.K. Ching

<table>
<tr><td>16ART403</td><td colspan="10">DESIGN OF STRUCTURES I</td><td colspan="2">SEMESTER-IV</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="4">External</td><td>60</td><td>Total</td><td>100</td><td colspan="2">Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>3</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="4">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:

- To get introduced to basic structural members in timber and steel.
- To give knowledge to design different timber components in a building.
- To enable an understanding of the types, efficiency and strength, advantages and disadvantages of rivet joints
- To enable an understanding of the types, efficiency and strength, advantages and disadvantages of welded joints
- To enable the design of tension (beams) and compression (columns) steel members in a building under different conditions.
- To Understand the concept of Structural system of Steel & Timber

COURSE OUTCOME:

1. Student will understand about Various Timber sections
2. Student will understand about the design timber beams and columns by applying the code provisions.
3. Student will understand about the Steel Sections and its usage.
4. Student will be able to design steel joints for maximum efficiency and strength.
5. Student will be able to design tension and compression members for different conditions by applying the code provisions.
6. Student will be able to design different types of laterally unsupported & supported beams for different conditions.

UNIT-I

TIMBER – BEAMS

Grading of Timber – Permissible Stresses – Design of timber beams – Madras terrace roof.

UNIT-II

STEEL SECTIONS AND WELDED JOINTS

Properties of rolled steel sections, Types of welded joints – Advantages and disadvantages – Design of Fillet welds (Excluding eccentric connections).

UNIT-III

TENSION MEMBERS

Introduction – Net sectional area – permissible stresses. Design of Axially loaded Tension member

UNIT-IV

COMPRESSION MEMBERS

Introduction – various sections – built up section – Design of columns (excluding Lacing, Battening and other connections.)

UNIT-V

STEEL BEAMS

Allowable stresses, General specifications, Design of laterally supported beams.

SUGGESTED READINGS :

1. Ramachandra S., Design of Steel Structures, Standard Book House, Delhi, 1984.
2. A.S.Arya, Structural Design in Steel, Masonry and Timber, Nemchand and Bros, Roorkee, 1971.
3. National Building Code of India, 1983, Part VI, Structural Design.
4. Gurucharan Singh, Design of Steel Structures, Standard Publishers, New Delhi, 1982.
5. Negi "Design of steel Structures" - Tata Mcgraw Hill Book Company, New Delhi 1997.
6. Elias G.Abu-Saba Design of Steel Structures CBC Publishers New Delhi. 1997.
7. IS Code of practice for BIS 800:2007 IS, Code of practice for Timber design

16ARP411	SURVEYING&SITE PLANNING									SEMESTER-IV	
Marks	Internal	60	External				90	Total	150	Exam Hours	6
Instruction Hours /week		L	0	T	0	P/S	4			Credits	2

COURSE OBJECTIVE:

- To understand the principles of surveying, classification, types of surveys
- To understand the applications of surveying
- Know about techniques of surveying.
- Understand the concepts of levelling and its applications.
- Get exposed to total station surveying, GIS and GPS.
- To understand the site, its premises and various factors involved

COURSE OUTCOME:

1. Student will understand the various systems of Surveying
2. Student understand the concept of levelling and its applications on site for various types of buildings.
3. Student will understand about the larger survey context using the total station and GIS mapping
4. Student will understand about the Site Inventory and Site analysis
5. Student will learn aout Hill survey and method of Contouring
6. Student will learn about the item planning principles, methods and its applications in architectural design.

UNIT-I

SURVEYING

Definition, classification, principles of surveying, chain surveying and compass surveying.

UNIT-II

PLANE TABLE SURVEY

Plane table and accessories, methods of plane table survey, Radiation, Intersection, traversing and resection.

UNIT3

LEVELING.

Definition, classification, booking and reduction of levels.

Theodolite – study of instruments, definition of different terms, temporary adjustments, uses, measuring horizontal and vertical angles, method of repletion, extension lines.

UNIT-IV

CONTOURING

Characteristics of contours, direct and indirect methods of contouring, interpolation, uses of contours, setting out works such as centre lines of a building, grade for sewer. Earth work calculation , area and volume.

UNIT-V

TOTAL STATION & GIS

Introduction and Characteristics – Handling and setting up a Total Station – Angle and Distance Measurement – Traversing – Introduction to GIS – Concept of GIS Mapping

SUGGESTED READINGS :

1. Rangwala, Surveying &Levelling,Charotar Publishing House, Gujarat, 2005.
2. Duggal, S. K. “Surveying (Vol – I)”, Tata McGraw-Hill publishing Company Ltd., New Delhi, 1996.
3. Surveying and leveling (Part I) by Kanetkar TP and Kulkarni SV
4. Wolf, Paul R. and Ghilani, Charles D., Elementary Surveying an Introduction to Geomatics: Fifth Edition, Upper Saddle River, New Jersey: Pearson Prentice Hall, 2006
5. Banister.A&Raymond.S – 1992, Surveying , ELBS 6th Edition
6. Punmia.B.C, 2000, Surveying, Volumes I, II. III, Laxmi publications.

<table>
<tr><td>16ARS421</td><td colspan="10">ARCHITECTURAL DESIGN -IV</td><td colspan="2">SEMESTER-IV</td></tr>
<tr><td>Marks</td><td>Internal</td><td>160</td><td colspan="4">External</td><td>240</td><td>Total</td><td>400</td><td colspan="2">Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>10</td><td colspan="4">Credits</td><td>7</td></tr>
</table>

COURSE OBJECTIVE:

- To create understanding of human built environment as a holistic, living entity from macro to micro scales, and shaped by geographic and socio-cultural forces as well as by historic, political and economic factors, through study of and design within the context of rural settlements.
- Understanding the Design Programme and the Components of the Design Problem&Investigate and Acquire the Knowledge to address the various aspects of the Design Problem and Process
- Develop Ability to Communicate Design Ideas throughout the Design Stages with multiple media&Ability to conceptualize a design idea by Sketching and other techniques
- Ability to do a frame work of Design methodology
- Ability to understand the process of Design and deliver the Architectural Design with Technical Drawings
- To enable a comprehensive **study of rural settlement** and architecture in order to understand them as exemplar of collective design that evolved through various parameters.

COURSE OUTCOME:

1. Student will be able collect data, assimilate and integrate knowledge in a holistic manner.
2. Student will learn about the Sensitivity towards the nature and values of unselfconscious and collective design aswellas the interconnectedness of human society and environment
3. Student will learn about traditional techniques and concepts of Architecture.
4. Student will learn about the evolution and transformation of the rural settlements according to the time and cultural context.
5. Student will understand the essence of rural planning
6. Student will develop the skill of design process for the Rural settlements

.

CONTENT:

UNIT-I to 5:

RURAL PROJECT

Problems related to Rural Housing - Visits to selected village – based on Rural surveys on socio-economic, physical, housing and visual surveys, etc. to study existing conditions - analysis of survey data - preparation of report and presentation in a seminar - preparation of design brief solutions for housing and community facilities.

SUGGESTED READINGS :

1. De Chiara and Callender, Time Saver Standard for Building Types, McGraw Hill Co., 2nd Edition, 1980.
2. Edward D.Mills, Planning - The Architects Handbook - 10th Edition, British Library Cataloguing in Publication Data, 1985.
3. Wakita Linde, The Professional Practice of Architectural Working, Drawing John Wiley & Sons, 1984.
4. Andrew Alpern, Handbook of Speciality Elements in Architecture, McGraw Hill Book Co., 1982.
5. Julius Panero& Martin Zelnik, Human Dimension and Interior Space, Whitney Library of Design Publication, 1979.
6. Neufert Architect's Data, Rudolf Herg, Crosby Lockwood and Sons Ltd., 1970.

16ARS422	BUILDING MATERIALS AND CONSTRUCTION -IV										SEMESTER-IV	
Marks	**Internal**	**80**	**External**				**120**	**Total**	**200**		**Exam Hours**	**6**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	5				**Credits**	**4**

COURSE OBJECTIVE:

- To give an introduction to metals as material for building construction.
- To give knowledge about the principles, methods of construction and applications of metals for structural and non-structural building components.
- To provide familiarity with market forms of metals and finishes for them.
- To gain Knowledge about Steel floor & Steel Staircase
- To understand about Door, windows & partitions
- To provide familiarity with market forms of metals and finishes for them.

COURSE OUTCOME:

1. Knowledge of properties of ferrous and non ferrous metals as materials for buildings.
2. An understanding of possibilities of steel as an important building construction material.
3. Ability to design and detail structural and non structuralcomponents of simple buildingsusingmetals.
4. Ability to use metal innovatively in building projects.
5. Student will gain Knowledge about Steel Floors & Staircase
6. Student will understand about the details of Door, windows & Partitions by detailed Drawings.

UNIT-I

FERROUS METALS

Brief study on manufacture, properties and uses of cast iron, wrought iron, pig iron and steel - anticorrosive measures for steel - mechanical and heat treatment of steel - market forms of steel - structural steel, stainless steel, steel alloys - properties and uses - current developments.

UNIT-II

STEEL CONSTRUCTION

Structural steel sections - types of connections in steel - steel in foundations, columns and beams - different types of steel roof trusses including northlight truss - space frames - materials for roof covering. Steel staircases and handrails, balusters..

UNIT-III

STEEEL STAIRS, DOORS, WINDOWS

Steel doors and windows – safety doors, dock doors, cold storage doors, revolving doors - collapsible gates - rolling shutters. Steel in furniture and other interior uses

UNIT-IV

NON FERROUS METALS

Aluminum and Aluminum Alloys - brief study on manufacture, properties and uses -Aluminum products - extrusions, foils, castings, sheets, etc. - brief study of other non-ferrous metals like copper, bronze brass, tin and lead, properties and uses - current developments.

UNIT-V

CONSTRUCTION USING NON-FERROUS METALS

Aluminum doors - revolving, sliding, pivoted. Aluminum windows and ventilators - sliding, fixed, pivoted, top hung, bottom hung, louvered, fixed. Aluminum partitions, false ceiling, Aluminium roofing -northlight glazing bar. Use of other nonferrous metals like copper, bronze, brass, etc. in architectural construction.

SUGGESTED READINGS :

1. S.C.Rangwala, Engineering Materials, Charotar Publishing House, India, Recent Edition
2. B.C.Punmia, Building Construction, Laxmi Publications Pvt. Ltd., New Delhi, recent edition
3. Arthur Lyons - Materials for Architects and Builders - An Introduction - Arnold, London, 1997.
4. Harold B.Olin, Construction Principles Materials and Methods, The Institute of Financial Education, Chicago, 1980.
5. W.B.Mckay Building Construction, Longmans, U.K. 1981.
6. Building Construction Illustrated – Francis D.K. Ching
7. Barry – Buildin Construction

16ARS423	**CLIMATE** RESPONSIVE ARCHITECTURE II										SEMESTER-IV	
Marks	**Internal**	**60**	**External**				**90**	**Total**	**150**		**Exam Hours**	**6**
Instruction Hours /week		**L**	1	**T**	0	**P/S**	4				**Credits**	**3**

COURSE OBJECTIVE:

- To study about climatic factors and Passive design concepts
- To understand about the of external and internal factors of Climate for a certain location
- To understand deeply about the Microclimatic influences in a building
- To understand about the Solar geometry and its impacts in a building
- To understand the Air movement & its principles and Applications for humanthermal comfort
- To understand about the Classification of climate and Design strategies recommendations for each climatic Zone

COURSE OUTCOME:

1. Student will understand the whole climatic scenario of the world
2. Student will learn about the Solar geometry, sun path its irradiation effects and control
3. Student will learn about heat transfer in buildings due to materials and design implications.
4. Student will understand about the Various ventilation principles and techniques for good ventilation
5. Student will understand hybrid design strategies and its design applications for different climatic zones
6. Student will develop the skill of doing a climatic design for any building with optimum recommendations.

UNIT-I

INTRODUCTION TO PASSIVE DESIGN AND MICROCLIMATE

Over view of the different Passive design Techniques & Climate responsive design features adopted in the traditional / vernacular architecture of various places in different climate zones – Control of Micro-climate around the building by settlement pattern, built form – open space relationship & façade articulation & appropriate use of building materials in historic buildings

Unit -2

Microclimate

Land form & orientation – Vegetation & Pattern – Water Bodies – Open Space & Built form - Plan form & Elements – Roof form – Fenestration pattern & Configuration

UNIT-III

SOLAR ENERGY & BUILDING

Solar geometry and built form – Various techniques of shading to reduce heat gain in tropical climate –
Various methods of maximizing exposure to solar radiation in cold & temperature climate. Heating & cooling loads – Energy estimates - Energy conservation – Efficient day lighting – Solar Water heatingsystem. Exercises on heating and cooling load calculations in buildings.

UNIT-IV

PASSIVE DESIGN STARTEGIES

Heating: General principles – Direct gain systems - Glazed walls, Bay windows, Attached sun spaces etc. Indirect gain systems – Trombe wall, Water wall, Solar Chimney, Transwall, Roof pond, Roof radiation trap, Solarium etc - Isolated gain systems – Natural convective loop etc. Cooling: General principles – Evaporative cooling, Nocturnal radiation cooling, Passive Dessicant cooling, induced ventilation, earth sheltering, Berming, Wind Towers, earth – Air tunnels, Curved Roofs & Air Vents, Insulation, Vary Thermal wall etc.

UNIT-V

INTRODUCTION TO SUSTAINABILITY IN ARCHITECTURE

Sustainability – Design Methods – Resource Optimization – Biomimetics – Green Architecture - Green Building Rating Systems – Case studies of selected sustainable buildings.– Building envelope & finishes. Choosing between Active-Passive-Hybrid Design Systems-Social / economy/ Environment

SUGGESTED READINGS :

1. MiliMajunder, Teri – Energy – Efficient Bldg in India – Thomson Press , New Delhi – 2001
2. Arvind Krishnan & Others – Climate Responsive Architecture, Tata Mcgraw –Hill New Delhi 2001.
3. Ralph M .Lebens – Passive Solar Architecture in Europe – 2, Architecture Press, London 1983.
4. Charles. J. Kibert, 'Sustainable Construction' John Wiley and sons Inc, USA.
5. N.D. Kaushika, Energy, Ecology and Environment, Capital Publishing Company, New Delhi.
6. Manual of tropical housing- O.H. Koinesberger
7. Sun wind and light- Mark Dekay , G. Z. Brown
8. Man Climate and architecture –Baruch Givoni
9. Design with climate -

SEMESTER 5

16ART501	**CONTEMPORARY ARCHITECTURE-II**							**SEMESTER-V**
Marks	**Internal**	**40**	**External**	**60**	**Total**	**100**	**Exam Hours**	**3**
Instruction Hours /week	**L**	3	**T**	0	**P/S**	0	**Credits**	**3**

COURSE OBJECTIVE:

- To provide the student an in-depth knowledge of modern design philosophies in the evolution of innovative architectural forms and designs in the Indian context.
- To give an outline of architectural approaches across the world from late 20th century.
- To study in detail the different post-modern directions in architecture. +
- To provide information about the Alternate Practice
- To understand about the evolution of Architectural design of pre – independence
- To understand the Recent trends in Architecture

COURSE OUTCOME:

1. Student will learn about the spread and varied later directions of modern architecture across the world.
2. Student will become familiar with contemporary forces and directions in architecture across the world and in India
3. Student will understand about the post-independence architecture in India contemporaneous with the rest of the world, along with its own particular influences.
4. Student will understand abou the Post- independence revolution of design in India
5. Student will know about the Alternate practices
6. Student will gain knowledge in recent trends of Architecture & Design

UNIT-I

ALTERNATIVE PRACTICE

Ideas and Works of Fathy - Baker - Ando -Soleri – Bawa – Buckminister fuller
Architects of Auroville .

UNIT-II

PRE – INDEPENDENT ARCHITECTURE IN INDIA

Monumental buildings of Early colonial period – Examples – St.Pauls Cathedral, Calcatta& Bombay Townhall –Architectural character of Indo-Saracenic and Classical revival –University of Madras Senate House & Victoria Memorial hall, Calcatta – Later Colonial period – Contribution of Edwin Lutyens & Herbert Baker to the lay-out and Architecture of New Delhi – Rashtrapathi Bhavan & Parliament House.

UNIT-III

POST-INDEPENDENT ARCHITECTURE IN INDIA

Post-Independence Architecture in India – Works of Corbusier in Chandigarh and Ahmedabad (Legislative Assembly Complex including High Court, Legislative assembly and Secretariat, Chandigarh and Mill Owners' Building, Ahmadabad) Louis Kahn's contributions – the IIM, Ahmedabad, Koenigsberger and the Bhubaneswar experiment.

UNIT-IV

CONTEMPORARY INDIAN ARCHITECTS AND THEIR WORKS

Ideas and works of BV Doshi (Institute of Indology Ahmedabad, IIM-Bangalore and Gufa, Ahmedabad), Charles Correa (RamaKrishna House, Ahmedabad, KanchenJunga Apartments, Mumbai and MRF Headquarters, Chennai), Raj Rewal (Pragati Maidan, New Delhi and Asian Games Village, New Delhi), Achyut Kanvinde(IIT, Kanpur and Nehru Science Centre, Mumbai), Uttam Jain(Lecture Theatres, Jodhpur and Engineering College, Kota), Lauire Baker(Centre for Development Studies, Thiruvananthapuram and St. John Cathedral at Tiruvalla) and Anant Raje(IIFM, Bhopal and Management Development Centre, IIM-Ahmedabad)

UNIT-V

RECENT TRENDS IN INDIAN ARCHITECTURE

Recent developments in architecture of India – works of Selected architects – Current architecture practice.
Sanjay Mohe, Christopher benninger, Hafeez contractor, Chitra viswanath,

SUGGESTED READINGS :

1. Morgan, Ann Lee & Taylor Colin, 1987, Contemporary Architecture, 2nd Edition, St.James Press
2. Sarabjit Bahga. S, Modern Architecture in India,
3. Ar.Pramod Beri, 2009, Form follows feeling, Anjali Prakashan, New Delhi

16ART502	DESIGN OF STRUCTURES-II										SEMESTER-V
Marks	**Internal**	**40**	**External**				**60**	**Total**	**100**	**Exam Hours**	**3**
Instruction Hours /week		**L**	3	**T**	0	**P/S**	0			**Credits**	**3**

COURSE OBJECTIVE:

- To introduce the material properties of reinforced cement concrete
- To enable students to carry out limit state method of design of flat slabs, beams, columns and foundation using BIS codes and hand books.
- To introduce the concepts in limit state design
- To enable use of limit state design for the analysis and design of columns.
- To enable the learning of design of structural elements like footings, retaining walls and masonry walls.
- To enable use of limit state design for design of staircases

COURSE OUTCOME:

1. Students will get introduced to the material properties of steel and concrete
2. An understanding of the different concepts in designing footings and columns and masonry walls using LSD methods.
3. An understanding of theconcepts in limit state design
4. An understanding of how to use of limit state design for the analysis and design of columns
5. An understanding ofdesign of structural elements like footings, retaining walls and masonry walls
6. An understanding of how to use limit state design for design of staircases

UNIT-I

UNIT-I

PROPERTIES OF STEEL AND CONCRETE

Structural properties of concrete - Grades and Strength of Concrete - durability - code provisions and design requirements of steel and concrete.

UNIT-II

LIMIT STATE DESIGN - INTRODUCTION

Various limit stages - characteristic load and characteristic strength of materials - partial safety factor - stress-strain relationship of steel and concrete - safety and serviceability requirements.

UNIT-III

LIMIT STATE DESIGN OF BEAMS & SLABS

Analysis and Design of rectangular sections for bending - singly and doubly reinforced. Design of one way and two way slabs using IS Code co-efficients for various edge conditions.

UNIT-IV

LIMIT STATE DESIGN OF COLUMNS

Types of columns – Analysis and Design of Short Columns for Axial, Uniaxial and biaxial bending – Use of Design aids.

UNIT-V

LIMIT STATE DESIGN OF STAIRCASE

Types of staircases - Design of doglegged staircase.

SUGGESTED READINGS :

1. P.Dayaratnam, Design of Reinforced Concrete Structures, Oxford and IBH Publishing Co., 1983.
2. N.C.Sinha and S.K.Roy, Fundamentals of Reinforced Concrete, S.Chand& Co., New Delhi, 1983.
3. S.N. Sinha,' Reinforced Concrete Design ' Tata McGraw Hill, New Delhi 1998.
4. Dr.B.C.Punmiya, Reinforced Concrete Structures, Standard Laxmi publication , Delhi, 1994.
5. Chu-Kia Wang, Charles G.Salmon, Reinforced Concrete Design, Addison Wesley Educational Publishers, New Delhi,1998.
6. SS Mahadevan , Reinforced Concrete Design, The Science & Technology Book Publishers, Chennai. 2007.

S.Unnikrishna Pillai, Devdas Menon, Reinforced Concrete Design, Tata McGraw-Hill Publishing Company Ltd, New Delhi. 2008.

16ARS521	ARCHITECTURAL DESIGN -V										SEMESTER-V	
Marks	**Internal**	**160**	**External**				**240**	**Total**	**400**	**Exam Hours**		**6**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	10			**Credits**		**7**

COURSE OBJECTIVE:

- Understanding Complex Design Programme and the Components of the Design Problem.
- Investigate and Acquire the Knowledge to address the various aspects of the Design Problem and Process
- Develop Ability to Communicate Design Ideas throughout the Design Stages with multiple media.
- Ability to conceptualize a design idea by Sketching and other techniques
- Ability to do a frame work of Design methodology
- Ability to understand the process of Design and deliver the Architectural Design with Technical Drawings

COURSE OUTCOME:

1. Student shall understand the basic functional aspect of designing simple building type and its relevant spatial organization.
2. Student will be learning to reciprocate and sensitize the design/concept to the environment and the design skill of the project
3. Student will be able to transform the theoretical ideas to the tangible output of design.
4. Student will be able to understand the space organization, space- volume design approach in large scale projects
5. Student will be able to research, Analyse and Deliver a Mixed-use Architectural Design.
6. Student will be able to Communicate effectively through the design ideas

TOPICS

Small complexes - multi planning circulation analysis - massing problems involving building technology - Design and detailing for movement of physically handicapped and elderly persons within and around buildings. examples, shopping centre (Commercial) , apartments (residential)Nursing home (institutional) home for aged. Construction and manipulation of three dimensional building data bases, Rendering 3D images. Presentation techniques, preparing scaled models using different materials.

Design Process to be approached stage wise through Architectural Programming. Site Planning fundamentals as relevant to small projects to be introduced in the design.

SUGGESTED READINGS :

1. Edward D.Mills, Planning, 4 volumes, Newnes, Butterworths, London, 1976.
2. E and O.E. Planning. Lliffee Books Ltd., London, 1973.
3. National Building Code IST
4. De Chiara Callender, Time Saver Standard for Building Types, McGraw Hills Co., 1973.

16ARS522	**BUILDING MATERIALS AND CONSTRUCTION -V**							**SEMESTER-V**
Marks	**Internal**	**80**	**External**	**120**	**Total**	**200**	**Exam Hours**	**6**
Instruction Hours /week	**L**	2	**T**	0	**P/S**	5	**Credits**	**4**

COURSE OBJECTIVE:

- To give an introduction to glass as a material in architectural construction
- To give an introduction about plastic
- To give an introduction about composite materials
- To understand about the design of timber furniture's, paneling, partition etc.
- To give an introduction to cladding, flooring and painting in building construction.
- To provide familiarity with advanced building construction techniques (shell structures) and materials as well as design with them.

COURSE OUTCOME:

1. Student will learn about the Composition, manufacturing method, treatment, properties and uses of glass
2. Student will learn about Plastic building products
3. Student will learn about Timber floors , build in furnitures , interior details
4. Student will gain Knowledge of glass, plastics, paints and finishes in building construction.
5. Student will become familiar with Secondary Building products – windows, doors, sky light domes
6. Student will gain knowledge about Smart Materials: Characteristics, classification, properties, energy behaviour, intelligent environments.

UNIT I

GLASS

Composition of glass - brief study on manufacture, treatment, properties and uses of glass - special types of glass, sheet glass, plate glass, safety glass, tint coated glass - Glass blocks - properties and applications in the building industry - current developments

UNIT II

PLASTICS, COMPOSITE MATERIALS

Primary Plastic building products – walls, partitions and roofs – design and construction details

Secondary Building products – windows, doors, sky light domes – handrail - design and construction details

UNIT III

TIMBER, ALLIED PRODUCTS

Timber floors , build in furnitures , interior details- wall paneling,false ceiling –partition

UNIT IV

CLADDING,FALSE CEILING, FLOORING AND PAINTING

Stone, ACP, wood, Glass, curtain wall, Structural glazing,(reflected ceiling plan), Flooring and painting

UNIT V

INTRODUCTION TO CURRENT DEVELOPMENTS IN BUILDING INDUSTRY

Smart Materials: Characteristics, classification, properties, energy behaviour, intelligent environments.
Recycled and ecological materials and energy saving materials: card board, earthsheltered structures, recycled plastics, recycled tyres, paper-crete
Exercises of the above through case studies and drawings

SUGGESTED READINGS :

1. S.C.Rangwala, Engineering Materials, Charotar Publishing House, India, 1997.

2. B.C.Punmia, Building Construction, Laxmi Publications Pvt. Ltd., New Delhi, 1993.

3. Arthur Lyons - Materials for Architects and Builders - An Introduction - Arnold, London, 1997.

4 Harold B.Olin, Construction Principles Materials and Methods, The Institute of Financial Education, Chicago, 1980.

5. W.B.Mckay Building Construction, Longmans, U.K. 1981.

16ARS523	BUILDING SERVICES -III									SEMESTER-V	
Marks	**Internal**	**80**	**External**			**120**	**Total**	**200**		**Exam Hours**	**6**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	5			**Credits**	**4**

COURSE OBJECTIVE:

- To inform about the principles and laws of Water distribution systems in buildings.
- To inform about the principles and laws of sewerage systems in buildings.
- To inform about the principles and laws of plumbing systems
- To inform about the electrical layout for residential Building
- To understand about compressors, evaporators and refrigerant control devices
- To Inform about the integration of service with the Architectural Design

COURSE OUTCOME:

1. Student will gain Knowledge of design of Water distribution systems in buildings
2. Student will learn and understand about the sewerage systems in buildings.
3. Student will learn and understand about the plumbing systems
4. Student will understand the electrical layout for residential Building
5. Student will gain basic knowledge about compressors, evaporators and refrigerant control devices
6. Student will understand the Applications of building Services in advanced level by detailed Drawings

UNIT-I To 5

-Water Distribution – external layout – internal layout

- Sewage and drainage – external layout – internal layout

- Electrical systems- external layout and internal layout

- HVAC systems- external and Internal Layout

- Firefighting and BMS – External Layout and Internal Layout

Integrated service drawing such as site service layout, reflected ceiling plan, ceiling profiles etc. containing all above services may be prepared as part of architectural design project.

SUGGESTED READINGS :

1. William H.Severns and Julian R.Fellows, Airconditioning and Refrigeration, John Wiley and Sons, London, 1988.
2. Robert D.Finch, Introduction to Acoustics, Prentice Hall of India Private Limited, New Dehli, 2008.
3. MARK J. HAMMER MARK J. HAMMER, JR, Water and Wastewater Technology, PHI Learning Private Limited, New Delhi. 2009.
4. M.N.Rao, A.K.Datta, Waste Water Treatment, Oxford & IBH PUBLISHING CO. PVT. LTD,New Delhi,2007.
5. Section 11. Sanitary Appliances and Water Fittings. IS Code- SP: 21-1983.
6. Hand book on Water Supply and Drainage with Special emphasis on plumbing IS Code – SP: 35 – 1987.
7. Part of Section 1: Water Supply. IS CODE – SP: 7 – 1992?
8. IS Code of Basis Requirements for Water supply drainage and sanitation. IS Code – IS 1172: 1983.
9. Code of Practice for Water Supply in Buildings. IS Code – IS 2065: 1983.
10. S.P Arora ,S.P.Bindra – bulding construction , dhanpat rai publication , newdelhi 2009

16ARES531A	PHYSICAL PLANNING									SEMESTER-V	
Marks	Internal	40	External			60	Total	100	Exam Hours		6
Instruction Hours /week		L	0	T	0	P/S	4		Credits		2

COURSE OBJECTIVE:
- To introduce the vocabulary, elements and classification of human settlements.
- To learn about the planning theories
- To give exposure to planning concepts at different scales of settlements.
- To understand about the planning aspects by means of Survey
- To gain understanding about the land use planning
- To give an understanding of planning addressing current issues.

COURSE OUTCOME:
1. Student will understand morphology of settlements and their generating forces and characteristics.
2. Student will understand the role of planning processes in making positive changes to settlements.
3. Student will gain knowledge and awareness of planning interventions with respect to the current world.
4. Student will gain understanding about the city evolution process due to planning
5. Student will gain Knowledge about existing settlements by Survey studies
6. Student will gain vast knowledge about Landsue patterns and planning theories

UNIT-I
HUMAN SETTLEMENTS AND PLANNING THEORIES
Origins, evolution and growth of settlements. Relation between urban and rural settlements
Urbanisation, Industrialisation and urban growth, definitions and inter relationship. Trends in urbanization in India since Independence. Growth of metropolitan cities and their management.

UNIT-II
PLANNING THEORIES
Enunciated by Ebenezer Howard, Patrick Geddes, Soria Y Mata, Doxiadis, Le-Corbusier, Clarence Stein, Clarence Arthur perry, Hilberseimer.

UNIT-III
EVOLUTION OF CITY
Evolution of city and Components of a city - Central business district of a city, Special economic zone, coastal regulatory zone, fringe area.

UNIT-IV
LANDUSE PLANNING
Land use classification for cities, analysis of land uses in Indian cities. Demography pattern, social & physical infrastructure, environmental and pollution, traffic and road network.

UNIT-V
PLANNING TECHNIQUES
Study and analysis of existing settlements, methodology of conducting diagnostic surveys and studies, land use survey, socio economic survey, traffic surveys and presentation of data

SUGGESTED READINGS :

1. Gallion and Eisner, The Urban Pattern: City Planning and Design, Van Nostrand, 5th Edition, 1986
2. Chapin,UrbanLanduse Planning, University of Illinois Press, Chicago, 1995.

16ARES531B	**STRUCTURES & ARCHITECTURE**							**SEMESTER-V**
Marks	**Internal**	**40**	**External**	**60**	**Total**	**100**	**Exam Hours**	**6**
Instruction Hours /week	**L**	0	**T**	0	**P/S**	4	**Credits**	**2**

COURSE OBJECTIVE:

- To learn about the structural design of the pre industrial era
- To learn about the historic evolution of structural design
- To learn about the structural design of the postindustrial era
- To learn about the large span structures of the contemporary period
- To learn about the prototype structures
- To learn the advanced level structures in airport, railway station

COURSE OUTCOME:

1. An understanding of the Structural design of the Pre industrial period
2. An understanding of evolution of various structures and design changes
3. An understanding of the post-industrial structural design
4. An understanding of the structural design through case studies
5. An understanding of the large-scale structural design
6. An understanding ofthe advanced level structures in Airport, railway station

UNIT-I

HISTORY OF STRUCTURAL DESIGN IN THE PRE INDUSTRIAL ERA

Development of monolithic and rock cut structures- trabeated construction-arcuate constructionvaults And flying buttresses- tents and master structures and bridges through ancient and medieval history.

UNIT-II

HISTORY OF STRUCTURAL DESIGN IN THE POST INDUSTRIAL PERIOD

Post Industrial modular construction of large span and suspension structures in steel and concrete-projects of Pier Nuigi Nervi, Maillart, Candella, Buckminster Fuller and Eero Saarinen.

UNIT-III

CONTEMPORARY STRUCTURAL EXPRESSION THROUGH CASE STUDY

The select case studies could include KCR Terminal at Hung Hom, Hong Kong, B3 Offices in Stockley Park , Sainsbury Centre for Visual Art, Renault Centre and Swindon UK by Normal Foster and Standsted Airport Terminal, London, UK by Fosters/Arup British Pavilion EXPO 1992, Seville, Spain and Waterloo International Terminal by Nicholas Grimshaw

UNIT-IV

CONTEMPORARY STRUCTURAL EXPRESSION THROUGH CASE STUDY – II

The select case studies could include Inmos Microchip Factory, Centre Commercial St. Herbtain, PA Technology, Princeton and Fleetguard, Quimper UK by Richard Rogers Athens Olympic Stadium and Village, Bridges and Public Bus Stop in St. Gallen , Railway Station, Lyon, France and Stadelhofen Railway station, Zurich Schweiz by Santiago Calatrava Kansai International Airport, UNESCO Workshop, the Jean-Marie Tjibaou Cultural Center, Menil Museum, Thomson Optronics Factory, IBM Traveling Exhibition Pavilion, Columbus International Exposition, Genoa Italy and Lowara Officers, Montecchio Maggiore Italia by Reno Piano Building Workshop

UNIT 5

SEMINAR

Seminar to present a study of architectural form and structural expression through select cases which will aid understanding of structural philosophy and analysis, building envelope and services and construction sequence.

SUGGESTED READINGS :

1. “Paper Arch” and Japan Pavilion at Expo 2000 in Hannover by Shigeru Ban
2. Greene King Draught Beer Dept and Schlumberger Cambridge Research Centre, UK by Michael Hopkins
3. Design Center, Linz, Austria and Two Family House in Pullach Thomas Herzog
4. King Abdul Aziz International Airport, Haj Terminal by SOM
5. Pavilion of the Future, Expo 92, Seville by Martorell, Bohigas& Mackay (MBM)
6. Daring Harbour Expo Center, Sydney Australia by P. COX
7. Olympic Archery Building by EnricMiralle& Carme Pinos
8. Eagle Rock House by Ian Ritchie
9. Le Grande Arche de La Defense by J O Spreckelsen

16ARES531C	SUSTAINABLE ARCHITECTURE							SEMESTER-V
Marks	Internal	40	External	60	Total	100	Exam Hours	6
Instruction Hours /week	L	0	T	0	P/S	4	Credits	2

COURSE OBJECTIVE:

- To understand the concept of sustainability
- To understand the impacts of environment today and to follow the steps to sustainability
- To work towards sustainable development and to understand low impact construction practices,
- To understand the life cycle costs and alternative energy resources.
- To familiarize the students with the various rating systems for building practices with case studies.
- Through case studies to understand the concept of sustainable communities and the economic and social dimensions.

COURSE OUTCOME:

1. Student will understand about climate change and the need for the sustainable buildings
2. Student will understand the energy-based concepts and resource optimisation
3. Student will understand about the environmental impacts of today and Follow the Susainable approach
4. Student will gain ability to design energy efficient buildings
5. Student will understand the green concepts and apply them in every aspect and approach towards sustainable architecture
6. Student will understand about the building simulation for energy analysis and for various design solutions

UNIT-I

Concept of Sustainability – Carrying capacity, sustainable development – Bruntland report – Ethics and Visions of sustainability.

UNIT-II

Eco system and food chain, natural cycles – Ecological foot print – Climate change and Sustainability.

UNIT-III

Selection of materials Eco building materials and construction – Biomimicry, Low impact construction, and recyclable products and embodied energy. Life cycle analysis. Energy sources – Renewable and non-renewable energy.

UNIT-IV

Green building design – Rating system –LEED, GRIHA,etc., with case Studies.

UNIT-V

Urban ecology, social and economic dimensions of sustainability, urban heat Island effects, sustainable communities – Case studies.

SUGGESTED READINGS:

1. Sustainable Architecture and Urbanism: Concepts, Technologies and examples by Gauzin- Muller(D) – Birkhauser 2002.
2. Eco-Tech : Sustainable Architecture and High Technology by Slessor© - Thames and Hudson 1997.
3. Ecodesign : A manual for Ecological Design by Yeang(K) – Wiley Academy 2006.
4. Sustainable Architecture : Low tech houses by Mostaedi (A) – CarlesBroto 2002.
5. HOK guide book to sustainable design by Mendler (S) & Odell (W) – John willey and sons 2000.
6. Environmental brief : Path ways for green design by Hyder(R) – Taylor and Francis 2007.
7. Green Architecture: Design for a sustainable future by Brenda and Vale (R) – Thames and Hudson 1996.
8. Sun , Wind and light – Arch design strategies – Mark Dekay and G.Z.Brown
9. Heating, Cooling ,Lighting – Norbert Lechner
10. Man,Climate and Architecture- Baruch Givoni.
11. Arvind Krishnan & Others – Climate Responsive Architecture, Tata Mcgraw –Hill New Delhi 2001.
12. How Buildings Work- Natural order of Architecture – Edward Allen
13. Charles. J. Kibert, 'Sustainable Construction' John Wiley and sons Inc, USA.
14. N.D. Kaushika, Energy, Ecology and Environment, Capital Publishing Company, New Delhi.
15. O.H. Koenigsberger and others (1993), Manual of Tropical Housing and Building –Part I - Climate design, Orient Longman, Madras, India.

16ARES531D	**ACOUSTICS**							**SEMESTER-V**
Marks	**Internal**	**40**	**External**	**60**	**Total**	**100**	**Exam Hours**	**6**
Instruction Hours /week	**L**	0	**T**	0	**P/S**	4	**Credits**	**2**

COURSE OBJECTIVE:

- To understand the science behind acoustical design
- To expose students to understand noise control, sound transmission
- To familiarize the students with various building and interior elements for Acoustics
- To familiarize the students with the basic principles of acoustic design
- To familiarize the student with the applications of Acoustical materials
- To familiarize the students with construction methods used in insulation

COURSE OUTCOME:

1. Student will understand the theoretical concepts of acoustics
2. Student will understand the theoretical ideas and concepts sound transmission and absorption
3. Student will be able to understand the basics of noise reduction and design applications of noise control
4. Student will be able to understand the construction methods for noise control
5. Student will understand about basic principles in designing open air theatres, cinemas, broadcasting studios, concert halls, class rooms, lecture halls, schools, residences
6. Student will understand about efficient insulation of fittings and gadjets, machine mounting and insulation of machinery

UNIT-I

FUNDAMENTALS

Sound waves, frequency, intensity, wave length, measure of sound, decibel scale, speech and music frequencies, human ear characteristics - Tone structure.

UNIT-II

SOUND TRANSMISSION AND ABSORPTION

Outdoor noise levels, acceptable indoor noise levels, sonometer, determinate of density of a given building material, absorption co-efficient and measurements, choice of absorption material, resonance, reverberation, echo, exercises involving reverberation time and absorption co-efficient.

UNIT-III

NOISE CONTROL AND SOUND ABSORPTION

Types of noises, transmission of noise, transmission loss, noise control and sound insulation, remedial measures and legislation.

UNIT-IV

CONSTRUCTIONAL MEASURES

Walls/partitions, floors/ceilings, widow/doors, insulating fittings and gadjets, machine mounting and insulation of machinery.

UNIT-V

ACOUSTICS AND BUILDING DESIGN

Site selection, shape, volume, treatment for interior surfaces, basic principles in designing open air theatres, cinemas, broadcasting studios, concert halls, class rooms, lecture halls, schools, residences. Call Centers, Office building and sound reinforcement systems for building types.

SUGGESTED READINGS :

1. Dr.V.Narasimhan - An Introduction to Building Physics - Kabeer Printing Works, Chennai-5 - 1974.
2. D.J.Groomet - Noise, Building and People - Pergumon Press - 1977.
3. Thomas D.Northwood - Architectural Acoustics - Dowden, Hutchinson and Ross Inc. – 1977.
4. B.J.Smith, R.J.Peters, Stephanie Owen - Acoustics and Noise Control - Longman Group Ltd., - New York, USA 1982.
5. David Eagan concepts in Architectural Acoustics.
6. Harold Burris – Meyer and Lewis Good friend, Acoustics for Architects – Reinhold

<table>
<tr><td>16ARES531E</td><td colspan="10">ENVIRONMENTAL PLANNING</td><td colspan="2">SEMESTER-V</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="3">External</td><td>60</td><td>Total</td><td>100</td><td colspan="2">Exam Hours</td><td colspan="2">6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>0</td><td>T</td><td>0</td><td>P/S</td><td>4</td><td colspan="3">Credits</td><td colspan="2">2</td></tr>
</table>

COURSE OBJECTIVE:

- To understand the impact of man's activities on the environment
- To gain knowledge about the ecology of the whole world
- To gain knowledge about the Environmental impacts
- To understand about the Assessment methods of Environment
- To understand about the Renewable & Non – renewable sources
- To gain knowledge about the Environmental laws

COURSE OUTCOME:

1. Student will understand about the ecosystem and approach towards sustainability
2. Student will gain knowledge about the environmental impacts
3. Student will gain knowledge in
4. Student will be able to understand the current environmental conditions and to work towards a sustainable approach
5. Student will know to integrate the global environmental situation with the policy level decisions
6. Student will become capable of envisioning for the future environmental benefits.

UNIT-I to 5

Man – biosphere – ecosystems – resource identification and its implications for development – soil water,land,plants,animals, renewable energy and non-renewableenergy. preparation and analysis or resource inventories

Environmental Impact Assessment – methodologies and techniques

Environment legislation – significance of law – relationship to development – evolution of planning legislation – National environmental policy

SUGGESTED READINGS :

1.Richard p. Dober – Environmental design – VNR company – Newyork 1969

2.Albert J. Rutledge – Anatomy of a Park – Mc Graw hill book co., USA 1971

3.Harvey m. Rubenstein – A Guide to site and environmental planning , vol 3 – John wiley and sons , Newyork, 1987

16ARE531F	VERNACULAR ARCHITECTURE									SEMESTER-V	
Marks	**Internal**	**40**	**External**				**60**	**Total**	**100**	**Exam Hours**	**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4			**Credits**	**2**

COURSE OBJECTIVE:

- To introduce the study of vernacular architecture as a process and not a product.
- To provide an overview of the various approaches and concepts to the study of vernacular architecture.
- To study the various vernacular architecture forms in the different regions of the country.
- To gain Knowledge about the methods & techniques of Vernacular Architecture
- To gain understanding about the climatic considerations & Design aspects of vernacular Architecture
- To gain understanding about socio- economic aspects of the vernacular & Traditional Architecture

COURSE OUTCOME:

1. Student will understand the Indian vernacular architecture as a process and to also provide an overview of various approaches and concepts towards its study.
2. Student will gain Knowledge of vernacular architectural forms in different regions.
3. Student will gain understanding of the impact of colonial rule on vernacular architecture in India
4. Student will understand about the climatic consideration & Design aspects
5. Student will understand the socio-economic aspects existed in thevarious regions through the study of vernacular Architecture
6. Student will gain knowledge in the vernacular methods of construction and ways to incorporate in this modern architecture.

UNIT-I

INTRODUCTION

Definition and classification of Vernacular architecture – Vernacular architecture as a process – Survey and study of vernacular architecture: methodology- Cultural and contextual responsiveness of vernacular architecture: an overview

UNIT-II

APPROACHES AND CONCEPTS

Different approaches and concepts to the study of vernacular architecture: an over view – Aesthetic, Architectural and anthropological studies in detail

UNIT-III

VERNACULAR ARCHITECTURE OF THE WESTERN NORTHERN REGION OF INDIA

Forms spatial planning, cultural aspects, symbolism, colour, art, materials of construction and construction technique of the vernacular architecture of the following: - Deserts of Kutch and Rajasthan; Havelis of Rajasthan

- Rural and urban Gujarat; wooden mansions (havelis); Havelis of the Bohra Muslims - Geographical regions of Kashmir; house boats

UNIT-IV

VERNACULAR ARCHITECTURE OF SOUTH INDIA

Forms, spatial planning, cultural aspects, symbolism, art, colour, materials of construction and construction technique, proportioning systems, religious beliefs and practices in the vernacular architecture of the following -Kerala: Houses of the Nair &Namboothri community; Koothambalam, Padmanabhapuram palace.

- Tamil Nadu: Houses and palaces of the Chettinad region; Agraharams.

UNIT-V

WESTERN INFLUENCES ON VENRACULAR ARCHITECTURE OF INDIA

Colonial influences on the Tradition Goan house

Evolution of the Bungalow from the traditional bangla, Victoria Villas – Planning principles and materials and methods of construction. Settlement pattern and house typologies in Pondicherry and Cochin.

SUGGESTED READINGS :

1. Paul Oliver, Encyclopedia of Vernacular Architecture of the World, Cambridge University Press, 1997.
2. Amos Rapoport, House, Form & Culture, Prentice Hall Inc. 1969.
3. R W Brunskill: Handbook on Vernacular Architecture
4. V.S. Pramar, Haveli – Wooden Houses and Mansions of Gujarat, Mapin Publishing Pvt. Ltd., Ahmedabad, 1989.
5.. Kulbushanshan Jain and Minakshi Jain – Mud Architecture of the Indian Desert, Aadi Centre, Ahmedabad 1992.
6. G.H.R. Tillotsum – The tradition of Indian Architecture Continuity, Controversy – Change since 1850, Oxford University Press, Delhi, 1989.
7. Carmen Kagal, VISTARA – The Architecture of India, Pub: The Festival of India, 1986.
8. S. Muthiah and others: The Chettiar Heritage; Chettiar Heritage 2000

SEMESTER 6

<table>
<tr><td>16ART601</td><td colspan="9">PROJECT MANAGEMENT</td><td>SEMESTER-VI</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="3">External</td><td>60</td><td>Total</td><td>100</td><td>Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>3</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td></td><td>Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:

- To introduce different Project management techniques
- To learn about project control, updating & Monitoring
- To Know about network concepts, network elements and inter - relationships
- To know about PERT network
- To understand about the project Costing
- To enable understanding of management systems for accomplishing the task efficiently in terms of quality, time and cost.

COURSE OUTCOME:

1. Student will understand a project from concept to commissioning,
2. Student will understand the feasibility study & facility programme, design, construction to commissioning.
3. Student will be able to apply project management techniques in achieving objectives of a project like client needs, quality, time & cost.
4. Student will understand about the Project Costing
5. Student will understand about the various software of project management.
6. Student will gain understanding of principles of management, construction scheduling, scope definition and team roles

UNIT-I

INTRODUCTION TO PROJECT MANAGEMENT

Introduction to project Management concepts - background of management, purpose, goal and objectives, characteristics of projects and different aspects of management.

Traditional management system, Gantt's approach load chart, progress chart, bar chart merits and limitation. Schedule time, estimates units

UNIT-II

PROJECT PROGRAMMING

Project programming, resources balancing, phasing of activities, programs, scheduling, project control, reviewing, updating and monitoring. Exposure to relevant software such as MS Project, Primavera, Introduction to modern management, concepts, uni-dimensional management techniques - Introduction to PERT and CPM introduction to network concepts, network elements and inter-relationships.

UNIT-III

NETWORK TECHNIQUES

Network techniques, network logic - interrelationships, activity information, data sheets, development of network. CPM for management, CPM network analysis, identification of critical path float computation result sheets.

UNIT-IV

PERT NETWORK

PERT Network, introduction to the theory of probability and statistics, probabilistic time estimation for the activities of PERT network

UNIT-V

PROJECT COST

Introduction to two dimensional network analysis, activity cost information. Cost time relationship, crashed estimates for the activities, compression potential, cost slope, utility, data sheet, project direct cost and indirect cost. Crashed programmes, network compression least cost solution least time solution, optimum time solution. Network techniques, PERT/CPM, generating alternative strategies using computers

SUGGESTED READINGS :

1. Project management for design professionals By William Ramroth
2. Jerome D. Wiest and Ferdinand K. Levy, A Management Guide to PERT/CPM, Prentice Hall of Indian Pub.Ltd. New Delhi, 1982.

16ART602	HOUSING									SEMESTER-VI	
Marks	Internal	40	External			60	Total	100		Exam Hours	3
Instruction Hours /week		L	3	T	0	P	0			Credits	3

COURSE OBJECTIVE:

- Understanding of the various issues involved in urban housing
- Understand the various issues of Rural housing
- Understand about the planning and design solutions for low income groups.
- Understanding about the housing Policies & Agencies involved
- Understanding about the housing design aspects in a Larger scale
- Understanding about the Socio-economic Aspects

COURSE OUTCOME:

1. Student will learn the various schemes and policies in Housing in India
2. Student will understand the importance of socio-economic aspects of the People and need for Housing
3. Student will learn about housing standards
4. Student will learn about the Housing design Process
5. Student will learn about government housing, orivate& cooperative housing
6. Student will be able to arrive at design ideas for large scale Housing Projects

UNIT-I

INTRODUCTION

Review of housing typology, Housing demand and supply – Calculation of future need.
Housing resources and options available in housing

UNIT-II

HOUSING AGENCIES AND POLICIES

Housing Agencies and their contributions to housing development – HUDCO, State Housing Boards, Housing Co-operatives and Banks. Housing Policies in India and other countries.

UNIT-III

SOCIO ECONOMIC ASPECTS

Social factors influencing Housing Design, affordability, economic factors and housing concepts – Slum upgrading and sites and services schemes.

UNIT-IV

HOUSING STANDARDS

Different types of Housing standards – Methodology of formulating standards – Relevance of standards in Housing Development.

UNIT-V

HOUSING DESIGN PROCESS

Different stages in project development – Layout design including utilities and common facilities – Housing design as a result of environmental aspects, development of technology and community interests.Case studies of Public Sector housing, Government housing, Private and Co-operative housing – their Advantages and disadvantages.

SUGGESTED READINGS :

1. Babur Mumtaz and Patweikly, Urban Housing Strategies, Pitman Publishing, London, 1976.
2. GeofreyK.Payne, Low Income Housing in the Development World, John Wiley and Sons, Chichester, 1984.
3. John F.C.Turner, Housing by people, Marison Boyars, London, 1976.
4. Martin Evans, Housing, Climate and Ocmfort, Architectural Press, London, 1980.
5. Forbes Davidson and Geoff Payne, Urban Projects Manual, Liverpool University Press, Liverpool, 1983.

16ARP611	COMPUTER APPLICATION-III										SEMESTER-VI	
Marks	Internal	80	External				120	Total	200		Exam Hours	6
Instruction Hours /week		L	1	T	0	P/S	4				Credits	3

COURSE OBJECTIVE:

- To develop the advanced Digital knowledge and skills
- To develop the skills of two-dimensional rendering
- To develop the skill and knowledge of the Building information Modelling
- To develop the Skill related to building visualization,
- To develop the skill of multimedia presentations, brochures,
- To develop the skill of video presentations as required in architectural practice.

COURSE OUTCOME:

1. Student will be able to understand the use of digital tools in the realm of visual composition,
2. Student will understand the drafting & Details through Software
3. Student will develop the skill of 3D visualization and rendering
4. Student will understand the concept of BIM- building information modelling through the specific software
5. Student will gain the Skill of Multimedia & video making presentations required for Architectural practice
6. Student will gain knowledge about the latest developments of digital applications in Architecture

CONTENT
UNIT I TO UNIT V

1. Advanced techniques in rendering with differential lighting for realistic rendering

2. Animations and Walkthroughs

3. Simulating gravity, wind and other effects in the scene, distributed rendering

4. Application of videography in architecture

5.Basics of developing and hosting websites

Recommended Software: 3ds Max, rhino, lumion, vector works, BIM, Ecotect, v-ray rendering techniques

SUGGESTED READINGS :

1. Rendering Techniques for mixed reality, Thomas Girlinger, Daniel Dauch, Andre Stork, Springer, Berlin, October 2009
2. 3D Computer Animated Walk Throughs, Clark Cory, Scott Meador, William Rosi, McGraw Hill 2009.
3. The Animation Book: A complete guide to animation and film making, Kit Laybourne, Three Rivers Press, December 1998
4. Creating a website, Matthew McDonald, Pogue Press, January 2009

16ARS621	ARCHITECTURAL DESIGN -VI									SEMESTER-VI	
Marks	**Internal**	**160**	**External**			**240**	**Total**	**400**		**Exam Hours**	**6**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	10			**Credits**	**7**

COURSE OBJECTIVE:

- Understanding Complex Design Programme and the Components of the Design Problem.
- Investigate and Acquire the Knowledge to address the various aspects of the Design Problem and Process
- Develop Ability to Communicate Design Ideas throughout the Design Stages with multiple media.
- Ability to conceptualize a design idea by Sketching and other techniques
- Ability to do a frame work of Design methodology
- Ability to understand the process of Design and deliver the Architectural Design with Technical Drawings

COURSE OUTCOME:

1. Student shall understand the basic functional aspect of designing simple building type and its relevant spatial organization.
2. Student will be learning to reciprocate and sensitize the design/concept to the environment and the design skill of the project
3. Student will be able to transform the theoretical ideas to the tangible output of design.
4. Student will be able to understand the space organization, space- volume design approach in large scale projects
5. Student will be able to research, Analyse and Deliver a Mixed-use Architectural Design.
6. Student will be able to Communicate effectively through the design ideas

CONTENT

UNIT I to UNIT V

Small complexes - multi planning circulation analysis - massing problems involving building technology - Design and detailing for movement of physically handicapped and elderly persons within and around buildings. examples, shopping Centre (Commercial), Apartments (residential)Nursing home (institutional) home for aged. Construction and manipulation of three-dimensional building data bases, Rendering 3D images. Presentation techniques, preparing scaled models using different materials.

Design Process to be approached stage wise through Architectural Programming. Site Planning fundamentals as relevant to mid-scale projects to be introduced in the design.
Building services to be applied in Architectural design.

SUGGESTED READINGS:

1. Joseph De Chiara, Michael J Crosbie, 'Time Saver Standards for Building Types', McGraw Hill Professional, 2001.
2. Ernst Neuferts Architects Data', Blackwell ,2002.
3. Stephen A. Kliment, Editor 'Building Type Basics' Series, Wiley.
4. Wolfgang Preiser, Korydon H. Smith, 'Universal Design Handbook', 2nd Edition, McGraw-Hill, 2010.
5. Rem Koolhaas et al, 'Project on the City II: The Harvard Guide to Shopping', Taschen, 2001.
6. Peter Coleman, 'Shopping Environments: Evolution, Planning and Design', Routledge, 2006.
7. LMVRDV, 'FARMAX- Excursions on Density', 010 Publishers, 2006.
8. Jos Boys, 'Disability, Space, Architecture: A Reader', Routledge, 2017.
9. Emily Talen, 'Design for Diversity', Routledge, 2012.
10. luis Alexandre Casanovas Blanco (Ed), 'After Belonging: Objects, Spaces, and Territories of the Ways We Stay in Transit', Lars Muller Publishers, 2016.
11. Manuel Gausa, 'Housing: New Alternatives, New Systems', Birkhäuser Basel 1999
12. Mark Hutter, 'Experiencing Cities (The Metropolis and Modern Life)', Routledge, 2015.

16ARS622	ARCHITECTURAL DETAILING AND WORKING DRAWING										SEMESTER-VI	
Marks	**Internal**	**80**	**External**				**120**	**Total**	**200**		**Exam Hours**	**6**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	4				**Credits**	**4**

COURSE OBJECTIVE:

- To enable students to appreciate the challenges in detailing for both the newly designed buildings as well as while carrying out additions and alterations to existing buildings.
- To enable students to understand the various Fittings, Furniture & Equipment (FFE) that are needed in buildings and their installation methods.
- To create architectural drawings for construction
- To understand the structural & services drawings
- To refer & integrate all the architectural and supporting working drawings
- To design, incorporate and detail architectural and interior components of the architectural design project

COURSE OUTCOME:

1. Student will gain understanding of all the aspects that go into the making of a building through study of drawings related to construction.
2. Student will gain the ability to resolve spatial concerns with technical aspects and services of a building.
3. Student will understand to design and detail components within a building.
4. Student will gain knowledge in interior detailing and planning
5. Student will gain knowledge in Interior furniture, fixtures as per the functionality
6. Student will gain understanding in the installation methods of cladding, integrated services by means of detailed drawings etc

UNIT-I

DETAILING OF RESIDENTIAL BUILDING

a) Detailing of a residence –Working Drawing,Door Window schedule, Floor, Wall, Roof Detailing.

UNIT-II

DETAILING OF WALLS, ROOF, FLOORING FOR COMMERCIAL BUILDINGS

a) Detailing of shop-fronts, office spaces for commercial buildings including detailing of crucial elements such as entrance porches, main doors, staircases, show-windows, enclosed and air-conditioned atrium spaces.

b) Detailing of façade and selected spaces for apartment buildings, hotels and hostels.

Exercises of the above through case studies and drawings.

UNIT-III

DETAILING OF BUILT-IN FURNITURE AND FITTINGS

Detailing of built-in elements like kitchen counters, cupboards, cabinets, toilets, toilet fitting, Structural Glazing, Staircase, Flooring. Exercises of the above through case studies and drawings.

UNIT-IV

DETAILING OF EXTERIOR AND INTERIOR ARCHITECTURAL ELEMENTS

Detailing of architectural elements like indoor fountains, water walls, transparent floors, street furniture, hard and soft landscape, swimming pools, water bodies and courtyard spaces. Detailing of interior architectural elements in existing buildings (e.g. Staircase in bookshops, restaurants, playpen in restaurants, reception areas in hotel lobbies etc.) Exercises of the above through case studies and drawings.

UNIT-V

DETAILING OF EXTERIOR AND INTERIOR

Detailing of building services – Toilet Water & Plumbing Details – Air conditioning details – Fire suppression & alarm – Electrical Layouts – Lift &Escalators etc.

SUGGESTED READINGS :

1. De Chiara and Callendar, Time Saver Standard Building Types, McGraw Hill Co,1980.
2. Richardson Die truck, Big Idea and Small Building, Thames and Hudson, 2002
3. Edward D Mills, Planning – The Architecture Handbook, British Library Cataloguing in Publication Data, 1985
4. Susan Dawson, Architect's Working Details(Volume 1-10), 2004
5. Swimming Pools, Lane Book Company, Menlo Park, California
6. Nelson L Burbank, House Carpentry Simplified, Simmons-Board- Man
7. Publishing Corporation, New York,
8. Landscape Construction
9. Grant W. Reid, Landscape Graphics, Whitney Library of Design, 1987

16ARES631A	**LANDSCAPE ARCHITECTURE**										**SEMESTER-VI**
Marks	**Internal**	**40**	**External**				**60**	**Total**	**100**	**Exam Hours**	**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4			**Credits**	**2**

COURSE OBJECTIVE:

- To introduce the various aspects of outdoor design and site planning
- To teach them to enhance & improve the quality of built environment, functionally and aesthetically.
- To stress on the role of landscape design in sustainability, to provide an overview of ecological balance and impacts of human activities and the need for environmental protection and landscape conservation.
- To study the historical method of garden Design
- To understand the significance of urban landscape.
- To provide familiarity with the various elements of landscape architecture and the principle of landscape design.

COURSE OUTCOME:

1. Student will understand the role of landscape design with respect to macro scale of sustainability and ecology
2. Student will understand the micro scale of shaping of outdoor environments.
3. Student will gain Knowledge about the elements of landscape design and their scope.
4. Student will know about the Sensitivity towards evolution of different garden and landscape design across time and context.
5. Student will understand the historical method of landscape design
6. Student will understand the urban scale landscape design.
7. Student will be able to do landscape design with respect to site planning and different functional typologies of spaces

UNIT-I

INTRODUCTION

Introduction to landscape architecture; role of landscape design in architecture; Introduction to site planning, site analysis & landscape design. Site selection criteria for landscape projects.

UNIT-II

ELEMENTS IN LANDSCAPE DESIGN

Hard and soft landscape elements, Plant materials, classification, characteristics, use and application in landscape design; Water and Landform.

UNIT-III

GARDEN DESIGN IN HISTORY

Landscape and garden design in history - French, English, Japanese, Renaissance and Moghul . Study of notable examples.

UNIT-IV

URBAN LANDSCAPE

Significance of landscape in urban areas; road landscaping; waterfront development, landscaping of residential areas , Industrial landscaping .

UNIT-V

LANDSCAPE DESIGN

Basic principles of planting design; Spatial development in landscape design; Detailed landscape design of any small project including paving and street furniture design

SUGGESTED READINGS :

1. Michael Laurie , An Introduction to Landscape Architecture, Elsevier, 1986.
2. Geoffrey And Susan Jellicoe, The Landscape of Man, Thames And Hudson, 1987.

16ARES631B	PRODUCT DESIGN									SEMESTER-VI	
Marks	**Internal**	**40**	**External**			**60**	**Total**	**100**	**Exam Hours**		**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4		**Credits**		**2**

COURSE OBJECTIVE:

- To gain Knowledge about the various styles of furniture
- To gain knowledge about the manufacturing of various materials/ product
- To learn about visual codes & Symbols
- To understand the importance of Artefacts, murals and Artwork
- To learn about various products for the Physically challenged
- Understanding the methods and techniques involved in furniture and product design.

COURSE OUTCOME:

1. Student will gain knowledge about the various furniture and products
2. Student will understand the needs of the industry demand and product value
3. Student will gain knowledge in Composite materials and Products
4. Student will gain knowledge about Packaging design
5. Student will gain knowledge about the House hold items / products
6. Student will be able to do a Product design for the client

UNIT-I

INTRODUCTION

An brief introduction to Product Designing – Various elements – History of Product Design – Definition of Product Design, understanding of Product Design - Purpose of Product Design – Role of Product Designers.

UNIT-II

HUMAN FACTORS

Definition of human factors, Application of human factors data. Human activities, their nature and effects. Man-machine system and physical environment. Human performance and system reliability.Information input and processing. Human control systems. Applied anthropometry – Human response toclimate.

UNIT-III

ASPECTS OF PRODUCT DESIGN

Visual, Auditory, Tactual, Olfactory human mechanisms, Physical space and arrangement. Visual display, process of seeing, visual discrimination, quantitative and qualitative visual display, Alphanumeric and related displays , Visual codes and symbols.

UNIT-IV

PRODUCT DESIGN

Form, Colour, Symbols, User specific criteria, Material, Technology and recyclability, Packaging. Multiple Utility oriented approach to Product Design.

UNIT-V

DESIGN EXERCISES

Design of Household elements, tools and devices – Spoon/Cutlery.Design of furniture – Chairs/Computer table, Kitchen racks, Cabinets etc.Design of Industrial Product – Watch Dial, Gear Wheels, Automobile Headlights etc. Element design for the physically and mentally different people.

SUGGESTED READINGS :

1. Time Saver Standards for Interior Design
2. Andrew Alpern, Handbook of Speciality Elements in Architecture, McGrawhill Co., USA, 1982.
3. Francis D.K.Ching, Interior Design Illustrated, VNR Publications, New York, 1987.
4. An invitation to Design, Helen Marie Evans.

16ARP631C	INTERIOR DESIGN									SEMESTER-VI
Marks	**Internal**	**40**	**External**			**60**	**Total**	**100**	**Exam Hours**	**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4		**Credits**	**2**

COURSE OBJECTIVE:

- To provide familiarity with the characteristics of interior spaces
- To gain knowledge in all type's furniture across history.
- To introduce the profession of interior design and bring out its role.
- To inform about the various components of interior space and give an understanding of the design aspects involved in each
- To provide knowledge in Interior services
- To provide knowledge in interior specification & costing

COURSE OUTCOME:

1. Student will gain knowledge and understanding in Interior design
2. Student will understand the various elements in Interior Design
3. Student will gain knowledge in terms of Interior design lighting and accessories
4. Student will gain an overall exposure to the ways in which interior spaces can be enriched through the design of specific interior components.
5. Student will be able to do specification for an Interior Design layout
6. Student will be able to design a Interior project wih all working drawings

.

UNIT-I

INTRODUCTION TO INTERIOR DESIGN

Definition of interior design - design of interior spaces as related to typologies and functions, themes and concepts - Study of the history of interior design through the ages relating to historical context, design movements and ideas etc.

UNIT-II

ELEMENTS OF INTERIOR DESIGN

Introduction to various elements in interiors like floors, ceilings, walls, staircases, openings, interior service elements, incidental elements etc. and various methods of their treatment involving use of materials and methods of construction in order to obtain certain specific functional, aesthetic and psychological effects - design projects.

UNIT-III

INTERIOR DESIGN SERVICES - LIGHTING, ACCESSORIES, LANDSCAPE

Study of interior lighting - different types of lighting, their effects, types of lighting fixtures. Other elements of interiors like accessories used for enhancement of interiors - paintings, objects de art,Interior landscaping - elements like rocks, plants, water, flowers, fountains, paving, artefacts, etc. their physical properties, effects on spaces and design values.

UNIT-IV

FURNITURE DESIGN

Study of relationship of furniture to spaces and human movements furniture design as related to human comfort, function, materials and methods of construction, changing trends and lifestyles, innovations and design ideas - study on furniture for specific types of interiors like office furniture, children's furniture, residential furnitures, display systems, etc. - projects on furniture design.

UNIT-V

CASE STUDIES AND PROJECT

Study of Contemporary design in India and abroad with reference to interior design and decoration. Study of projects related to Residential Interiors, Commercial Interiors, Hospital Interiors etc. as regards to design scheme, functionalism, aesthetics, services integration, interior materials and details. Small scale interior projects such as Interior of an Office, Restaurant, Kids bedroom etc.

SUGGESTED READINGS :

1. Francis D.K.Ching, Interior Design Illustrated, V.N.R. Pub. NY 1987.
2. An Invitation to design, Helen Marie Evans.
3. Steport- De - Van Kness, Logan and Szebely, Introduction to Interior Design Macmillan Publishing Co., NY 1980.
4. Inca/Interior Design Register, Inca Publications, Chennai 1989.
5. Kathryn B.Hiesinger and George H.Marcus, Landmarks of twentieth Century Design; Abbey Ville Press, 1993.
6. SyanneSlesin and Stafford Ceiff- Indian Style, Clarkson N.Potter, Newyork, 1990.
7. The Impulse to adorn - Studies in traditional Indian Architecture. - Editor Dr.Saranya Doshi, Marg Publications, 1982.

16ARE631D	ARCHITECTURAL CONSERVATION											SEMESTER-VI	
Marks	**Internal**	**40**	**External**				**60**	**Total**	**100**			**Exam Hours**	**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4					**Credits**	**2**

COURSE OBJECTIVE:

- To introduce the various issues and practices of Conservation
- To familiarize the students with the status of conservation in India
- To teach them about the various agencies involved in the field of conservation worldwide and their policies.
- To outline the status of conservation practice in the country
- To Know about the various guidelines for the preservation, conservation and restoration of buildings.
- To inform the students about the character and issues in our heritage towns through case studies.

COURSE OUTCOME:

1. Student will understand the importance of heritage, issues and practices of conservation through case studies.
2. Student will become familiar with historic materials and their properties, different technologies for investigating masonry, foundation and also traditional and modern repair methods
3. Student will gain knowledge about the government agencies involved in Conservation
4. Student will understand the methods of urban Conservation.
5. Student will gain knowledge about various methods of Conservation techniques and Design
6. Student will gain knowledge about various policies involved in Conservation and practice in India

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UNIT-I

INTRODUCTION TO CONSERVATION

e conservation- Need, Debate and purpose.
Defining Conservation, Preservation and Adaptive reuse. Distinction between Architectural and Urban Conservation. International agencies like ICCROM , UNESCO and their role in Conservation

UNIT-II

CONSERVATION IN INDIA

Museum conservation – monument conservation and the role of Archeological Survey of India – role of INTACH – Central and state government policies and legislations – inventories and
projects- select case studies of sites such as Hampi, Golconda, Mahabalipuram -craft Issues of conservation

UNIT-III

CONSERVATION PRACTICE

Listing of monuments- documentation of historic structures- assessing architectural character – historic structure report- guidelines for preservation, rehabilitation and adaptive re-use of historic structures- Case studies of Palaces in Rajasthan, Chettinad and Swamimalai dwellings, seismic retrofit and disabled access/ services additions to historic buildings-heritage site management

UNIT-IV

URBAN CONSERVATION

Over view of urban history of India and Tamil Nadu- understanding the character and issues of historic cities – select case studies of towns like Srirangaram, Kumbakonam and Kanchipuram -
historic districts and heritage precincts.

UNIT-V

CONSERVATION PLANNING

Conservation as a planning tool.- financial incentives and planning tools such as Transferable Development Right(TDR)-urban conservation and heritage tourism-case studies of sites like for Cochin, Pondichery French town.- conservation project management

SUGGESTED READINGS :

1. Donald Appleyard, The Conservation of European Cities, M.I.T. Press, Massachusetts
2. James M. Fitch, Historic Preservation: Curatorial Management of the Built World by University Press of Virginia; Reprint edition (April 1, 1990)
3. A Richer Heritage: Historic Preservation in the Twenty-First Century by Robert E. Stipe
4. Conservation Manual , Bernard Fielden; INTACH Publication
5. B.K. Singh, State and Culture, Oxford, New Delhi
6. A.G. K. Memon ed. Conservation of Immovable Sites, INTACH Publication, N.Delhi.
7. Seminar Issue on Urban Conservation.

16ARES631E	ARCHITECTURAL JOURNALISM										SEMESTER-VI	
Marks	**Internal**	**40**	**External**				**60**	**Total**	**100**		**Exam Hours**	**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4				**Credits**	**2**

COURSE OBJECTIVE:
- To introduce general skills necessary for the practice of professional journalism.
- To introduce the fundamentals of writing, explain different strategies and their criticism.
- To give good exposure to architectural journalism.
- To make them understand the importance of writing articles
- To introduce photojournalism, bring out importance/ contributions of photography
- To gain knowledge in modern photography techniques.

COURSE OUTCOME:
1. Student will gain the ability to critically think and analyse about the effects of architecture on society as well as the tools to enable recording of the same
2. Student will be able to express by means of effective communication, writing and video documentation
3. Student will learn about the composition of content in Architecture Journals
4. Student will learn about Photography and Photo Journalism
5. Student will be able to document, analyse and critic the work by means of interview and data collection
6. Student will develop the proficiency in Field program, interviews and Architectural Document witting

UNIT-I
PHOTOGRAPHY & TECHNIQUES
Concept of color; concepts of lighting, distance, visual angle, frames; media; Types of camera, properties and priorities; Exposure, Aperture, Speed; Photographic films. Techniques of photography relevant to architecture.

UNIT-II
JOURNALISM
Analysis of recent historical and contemporary examples of written and journalistic criticism of architecture, including selected writings by Indian and overseas critics; discursive techniques, analysis of major critical themes, thematic categories in architectural writing over the past three centuries.

UNIT-III
ANALYSIS OF WORKS
Works of Indian and international writers and critics will be presented and discussed. Seminars on Indian architectural writers, journalists and critics

UNIT-IV
FIELD PROGRAM
Exercise on integrating photography in architectural journalism.

UNIT-V
DOCUMENTING AND REPORTING
Preparation of documentaries and reports in any media such as Video, Still images, Reports, presentations etc., and present as a Seminar.

SUGGESTED READINGS :

1. Dave Sounders, Professional Advertising Photography, Merchurst, London 1988
2. Roger Hicks, Practical photography, Cassell, London 1996
3. Julian Calder and john Garrett, The 35mm Photographer's Handbook, Pan Books, London 1999
4. Julie Adair King, Digital Photography for Dummies, COMDEX, New Delhi 1998

<table>
<tr><td>16ARES631F</td><td colspan="8">ADVANCED STRUCTURES</td><td colspan="2">SEMESTER-VI</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="3">External</td><td>60</td><td>Total</td><td>100</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>0</td><td>T</td><td>0</td><td>P/S</td><td>4</td><td colspan="2">Credits</td><td>2</td></tr>
</table>

COURSE OBJECTIVE:

- To get introduced to basic structural members in masonry & steel
- To give knowledge to design different slab & column components in a building.
- To enable an understanding of the types, efficiency and strength, advantages and disadvantages of rivet and welded joints in steel.
- To enable the design of tension (beams) and compression (columns) steel members in a building under different conditions.
- To gain understanding in pre stressed concrete
- To Understand the concept of Structural system of Steel sections

COURSE OUTCOME:

1. Student will understand about various masonry sections
2. Student will understand about the design of circular columns by applying the code provisions.
3. Student will understand about the Flat slabs and its usage.
4. Student will be able to design steel joints for maximum efficiency and strength.
5. Student will be able to design tension and compression members for different conditions by applying the
6. code provisions.
7. Student will be able to design different types of laterally unsupported & supported beams for different conditions.

UNIT-I

MASONRY

Analysis and Design of masonry walls – use of Nomograms - code requirements

UNIT-II

CIRCULAR SLABS

Design of RCC Circular slabs - simply supported and fixed slabs with uniformly distributed loads .

UNIT-III

FLAT SLABS

Design principles for flat slabs- coffer slabs - code provisions.

UNIT-IV

DESIGN OF FOOTINGS

Types of footings – Design of wall footings – Design of Axially loaded rectangular footing (Pad and sloped footing). Design of Combined Rectangular footings.

UNIT-V

PRESTRESSED CONCRETE

Principle of pre-stressing, methods of pre-stressing, advantages and disadvantages - applications to simple problems.

SUGGESTED READINGS :

1. P. Dayarathnam, 'Design of Reinforced Concrete Structures' second edition, Oxford and IBH publishing Co., New Delhi 1984.

2. Ashok K. Jain, Reinforced Concrete Limit State Design Nemchand and Bros., Roorkee, 1983.

3. N.L. Shinha and S.K. Roy, Fundamental of Reinforced Confrete, S.Chand and Company, New Delhi, 1983.

16ARES631G	DISASTER MANAGEMENT									SEMESTER-VI	
Marks	Internal	40	External			60	Total	100	Exam Hours		6
Instruction Hours /week		L	0	T	0	P/S	4		Credits		2

COURSE OBJECTIVE:

- To create awareness about natural disasters-factors
- To be aware of the disaster cause them-and to foster knowledge about strategies
- To learn about the methods of disaster prevention and management-
- To understand the fragile Eco-systems and factors that cause global climatic changes.
- Overview of major natural disasters-design & planning solutions for disaster mitigation-organizational
- To understand about the Disaster management aspects.

COURSE OUTCOME:

1. Student will be able to understand the cause and effects of natural disasters
2. Student will understand about climate change & disaster influences due to natural calamities
3. Student will learn to understand the prevention and design resistant structures
4. Student will understand the strategies to be implemented for disaster Mitigation.
5. Student will leran about Disaster management & recovery
6. Student will gain knowledge in design and Planning solutions of disaster proof structures

UNIT-I

INTRODUCTION TO NATURAL HAZARDS

Understanding the effects of natural calamities such as floods, tropical cyclones, earthquakes, landslides, heat waves , droughts &Tsunami.Climate changes, global sea rise, coastal erosion, environmental degradation, large dams & earth tremors, roads buildings & landslides, urbanization & desertification, cyclone effects on coastal towns.

UNIT-II

CASE STUDIES OF NATURAL DISASTERS IN INDIA

Earthquakes at Bhuj, Lattur, etc., Cyclones in coastal Andhra pradesh& Orissa, Landslides in Nilgiris, Himachal etc, Floods in Bangladesh, and Droughts in Rajasthan & Tsunami in Tamil Nadu.

UNIT-III

STRATEGIES FOR DISASTER PREVENTION & MITIGATION

Pre disaster, emergency, transition, and recovery. Disaster management plan, Natural crisis management committee [NCMC], State crisis management group [SCMG].

UNIT-4& 5

DESIGN & PLANNING SOLUTIONS

Design guidelines for disaster proof construction at appropriate situations.-Engineering, architectural, landscape & planning solutions for different types of calamities.- Norms, standards and practice procedures for shelter & settlement. Seismic repairs & retrofitting of damaged and undamaged buildings.

SUGGESTED READINGS :

1. Earthquake Resistant Design for Built Environment. Compiled notes by Department of Architecture and Planning, IIT-Roorkee.December 2003.
2. Das P.K, A.R.Ramanathan, An Introduction to Seismic Safety in Architecture, 2007
3. Paul D.K. Singh, Yogendra, Short Term Training Course on Earthquake Resistant Design of Buildings, ADPC, IIT Roorkhe& DMMC, Dehradun, 2002
4. S.Rajagopal - *Problems of housing in cyclone prone areas* - SERC, Vol.2, Chennai, 1980 5.Office of the UN Disaster Relief Co-ordinator - *Disaster prevention and mitigation*, Vol 12, Social and Sociological aspects - UNO, NY, 1986
5.F.C.Cony et.al - *Issue and problems in the prevention of disaster and housing* - A review of experiences from recent disasters - Appropriate reconstruction and training information centre, 1978
6.S.Ramani, *Disaster management - Advanced course on modern trends in housing* - SERC, Vol 2, Chennai, 198

SEMESTER 7

16ARP711	PRACTICAL TRAINING -I										SEMESTER-VII	
Marks	Internal	400	External			600	Total	1000			Exam Hours	6
Instruction Hours /week		L	0	T	0	P/S	0				Credits	14

COURSE OBJECTIVE:

- To introduce the challenges of architectural practice.
- To enable overall understanding of different stages in real life architectural projects in practice.
- To create involvement in these stages as much as possible within the scope of a specific architectural practice
- To work from initiation of project, development of concepts into schematic drawings, approval process, presentations and release of working drawings
- To get involvement in office discussions and client meetings, integrating structural and service concerns, estimation and tendering processes, site supervision and coordination in the construction process
- To coordinate with the various levels of workman/contractors etc for execution of the Project

COURSE OUTCOME:

1. Student will get and overall idea of the nuances of architectural practice.
2. Student will understand about the total process that takes place in an Architectural firm
3. Student will understand the Specifications of a project, time involved and the execution process
4. Student will gain knowledge in architectural working drawings
5. Student will gain experience of client meetings & site Execution
6. Student will gain the maturity of Architectural design, and the experience gained from internship will be helpful in the thesis project

TOPICS

The choice of the place of training shall be Architectural Firms, Organizations, Development Authorities, etc. which are headed by eminent architects. The choice of the office shall be approved by the Training Committee of the Faculty of Architecture. The practical training, primarily involves learning in the office and on the site. The progress of training shall be assessed periodically by reports from the employers of trainees and by the Training Committee of the Faculty of Architecture.

The evaluation of the practical training will be based on the following features.

- Client meeting and interaction
- Site visits, verification and measurements
- Concept and scheme development
- Construction documents / drawings
- Training portfolio

SEMESTER 8

16ARP811	PRACTICAL TRAINING -II										SEMESTER-VIII	
Marks	**Internal**	**400**	**External**			**600**	**Total**	**1000**	**Exam Hours**			**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	0				**Credits**	**14**

COURSE OBJECTIVE:

- To introduce the challenges of architectural practice.
- To enable overall understanding of different stages in real life architectural projects in practice.
- To create involvement in these stages as much as possible within the scope of a specific architectural practice
- To work from initiation of project, development of concepts into schematic drawings, approval process, presentations and release of working drawings
- To get involvement in office discussions and client meetings, integrating structural and service concerns, estimation and tendering processes, site supervision and coordination in the construction process
- To coordinate with the various levels of workman/contractors etc for execution of the Project

COURSE OUTCOME:

1. Student will get and overall idea of the nuances of architectural practice.
2. Student will understand about the total process that takes place in an Architectural firm
3. Student will understand the Specifications of a project, time involved and the execution process
4. Student will gain knowledge in architectural working drawings
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TOPICS

The choice of the place of training shall be Architectural Firms, Organizations, Development Authorities, etc. which are headed by eminent architects. The choice of the office shall be approved by the Training Committee of the Faculty of Architecture. The practical training, primarily involves learning in the office and on the site. The progress of training shall be assessed periodically by reports from the employers of trainees and by the Training Committee of the Faculty of Architecture.

The evaluation of the practical training will be based on the following features.

- Client meeting and interaction
- Site visits, verification and measurements
- Concept and scheme development
- Construction documents / drawings
- Training portfolio

<table>
<tr><td>16ARP821</td><td colspan="10">DISSERTATION</td><td colspan="2">SEMESTER-VIII</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="3">External</td><td>60</td><td>Total</td><td>100</td><td colspan="2">Exam Hours</td><td colspan="2">6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>0</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="3">Credits</td><td colspan="2">2</td></tr>
</table>

COURSE OBJECTIVE:

- To inculcate the spirit of research in architecture.
- To enable the acquisition of in-depth knowledge in a specific aspect/ issue in the discipline of architecture
- To develop perspectives on the same through reading, study, analysis and thought.
- To develop the skill of experimentation by their own course of study
- To facilitate the development of a coherent line of thinking and express it through clear writing.
- To serve as prelude to Thesis.

COURSE OUTCOME:

1. Student will learn to research on a specific interested topic and collect appropriate data
2. Student will develop the skill of analytical approach towards the related topic
3. Student will be able to develop a coherent line of thought based on point of view,
4. Student will be able to do observation, analysis and study
5. Student will be able to prepare a dissertation report which is based on accepted norms of technical writing.
6. Student will become prepared for the larger thesis project.

Unit I to Unit V

Identification of Dissertation Topic and Area, Hypothesis Formulation, Objectives and Methodology. Importance, Purpose and Scope of the Dissertation in architecture in terms of design, technology, environment, economic and behavioral areas.

Related Research, Literature and Field Studies. Submission of the above in report form.

SUGGESTED READINGS:

1.Knight, A. and Ruddock,L., "Advanced Research Methods in Built Environment", John Wiley & Sons. 2008.
2.Groat, L. and Wang D., "Architectural Research Methods", John Wiley & Sons. 2002.
3.Kothari, C.R., "Research Methodology- Methods and Techniques", New Age International. 2004.
4.All relevant Local, National and International Codes related to the Dissertation topic.
5. All relevant Books and Publications related to the Dissertation topic.

SEMESTER 9

16ART901	**PROFESSIONAL PRACTICE**						**SEMESTER-IX**	
Marks	**Internal**	**40**	**External**	**60**	**Total**	**100**	**Exam Hours**	**3**
Instruction Hours /week	**L**	3	**T**	0	**P/S**	0	**Credits**	**3**

COURSE OBJECTIVE:

- To give an introduction to easements and its types
- To know about the role of tenders and the processes involved within
- To give familiarity with a contract and the conditions therein
- To give exposure to the Arbitration in disputes
- To inform about legal aspects like Environmental acts and laws
- To know about the consumer protection act and their relevant provisions

COURSE OUTCOME:

1. Student will gain knowledge of the easements and its types
2. Student will become familiar with the tenders and the processes involved within
3. Student will gain knowledge about a contract and the conditions therein
4. Student will understand the Arbitration in disputes
5. Student will understand about the legal aspects like Environmental acts and laws
6. Student will understand about the consumer protection act and their relevant provisions

UNIT-I

ARCHITECT AND PROFESSION

Role of architect in society - relationship with client and contractor - code of conduct – management of an architect's office - elementary accountancy

UNIT-II

ARCHITECT'S SERVICES AND SCALE OF FEES

Conditions of engagement of an architect - normal additional, special and partial services – scale of fees for various services - claiming of fees

UNIT-III

ARCHITECTURAL COMPETITIONS

Open and closed competitions - appointment of assessors - duties of assessors - instructions to participants - rejection of entries - award of premium - guidelines prescribed by COA AND IIA for promotion and conduct of competitions

UNIT-IV

TENDER & CONTRACT

Calling for tenders - tender documents - open and closed tenders - item rate, lumpsum, labor and demolition tender - conditions of tender - submission of tender - scrutiny and recommendations

Conditions of contract - Form of contract articles of agreement - Contractor's bill certification

UNIT-V

ARBITRATION & EASEMENTS

Arbitration in disputes - arbitration agreement - sole arbitration - umpire - excepted matters - award .

Definition - types of easement – acquisition extinction and protection of easements

SUGGESTED READINGS :

1. J.J. Scott, Architect's Practice, Butterworth, London 1985
2. Publications of COA IIA Hand book on Professional Practice, The Architects publishing Corporation of India, Bombay 1987
3. Derek Sharp, The Business of Architectural Practice William Collins Sons & Co. Ltd, 8 Erafton St., London W1 1986
4. RoshanNamavathi, Professional Practice, Lakhsmi Book Depot, Mumbai 1984
5. Publication of IIA
6. Environmental Laws of India - by Kishore Vanguri, C.P.R. Environmental Education Centre, Chennai
7. The Tamil Nadu Hill Areas Special Building Rules - 19
8. Heritage Act
9. Consumer Protection Act
10. Indian Easements Act

16ART902	**URBAN DESIGN**						**SEMESTER-IX**	
Marks	**Internal**	**40**	**External**	**60**	**Total**	**100**	**Exam Hours**	**3**
Instruction Hours /week	**L**	3	**T**	0	**P/S**	0	**Credits**	**3**

COURSE OBJECTIVE:

- To provide knowledge of design of urban spaces including renewal and development.
- To provide knowledge ofpublic spaces
- To provide knowledge oforganizing and articulation of spaces for residential, commercial, industrial and recreational areas
- To provide knowledge of Causes and consequences of urban blight and obsolescence
- To provide knowledge of methods of conducting surveys and analysis
- To provide knowledge of programs for urban redevelopment

COURSE OUTCOME:

- Ability to gain knowledge in urban space planning
- Ability to handle large scale urban renewal projects
- Understanding of organizing and articulation of spaces for residential, commercial, industrial and recreational areas
- Ability to analyse the Causes and consequences of urban blight and obsolescence
- Ability to conduct surveys and analysis
- Understanding of programs for urban redevelopment

UNIT-I

INTRODUCTION

Relationship between Architecture, Urban Design and Town Planning - Perception of city form and pattern – Townscape elements

UNIT-II

ROLE OF PUBLIC SPACE IN URBAN AREAS

Introduction to public spaces. Evolution of public spaces. Comparative analysis of public spaces, their organization and articulation.

UNIT-III

ORGANIZATION OF SPACE

Understanding, organizing and articulation of spaces for residential, commercial, industrial and recreational areas.

UNIT-IV

URBAN RENEWAL

Causes and consequences of urban blight and obsolescence – slums and shanties – methods of conducting surveys, analysis and presentation of data, prevention of formation of slumsand squatter settlements. Environmental and management issues.

UNIT-V

URBAN REDEVELOPMENT

Objectives, surveys programs of urban redevelopment and public involvement and participation.

SUGGESTED READINGS :

1. Gordon Cullen - The concise TOWNSCAPE - The Architectural Press - 1978
2. Lawrence Halprin- CITIES - Reinhold Publishing Corporation N.Y. 1964.
3. Gosling and Maitland - URBAN DESIGN -St.Martin's Press, 1984.
4. Jonathan Barnett - An Introduction to Urban Design - Harper & Row, Publishers, N.Y.,1982

16ARS921	ARCHITECTURAL DESIGN - VII										SEMESTER-IX	
Marks	**Internal**	**200**	**External**				**400**	**Total**	**1000**		**Exam Hours**	**6**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	12				**Credits**	**8**

COURSE OBJECTIVE:

- Understanding Complex Design Programme and the Components of the Design Problem.
- Investigate and Acquire the Knowledge to address the various aspects of the Design Problem and Process
- Develop Ability to Communicate Design Ideas throughout the Design Stages with multiple media.
- Ability to conceptualize a design idea by Sketching and other techniques
- Ability to do a frame work of Design methodology
- Ability to understand the process of Design and deliver the Architectural Design with Technical Drawings

COURSE OUTCOME:

1. Student shall understand the basic functional aspect of designing complex building type and its relevant spatial organization.
2. Student will be learning to reciprocate and sensitize the design/concept to the environment and the design skill of the project
3. Student will be able to transform the theoretical ideas to the tangible output of design.
4. Student will be able to understand the space organization, space- volume design approach in large scale projects
5. Student will be able to research, Analyse and Deliver a Urban Design proposal
6. Student will be able to Communicate effectively through the design ideas.

TOPICS

Design of advanced and complex problems - comprising group multi storeyed structures and infrastructure - with regard to climatic conditions, orientation, services, circulation problems relating to large developments Design and detailing for movement and use by handicapped persons within and around building and campuses to be addressed – examples: campus design, urban centers, Housing for Senior citizens- Urban and regional planning

SUGGESTED READINGS :

1. Edward D Mills, planning, 4 volumes, newness Butterworths, London 1976
2. E and OE Planning London, Books Ltd 1973
3. National Building Code IS
4. De Chira a
5. d Callendar- Time saver standards for Building Types - Mc Graw Hill Co., 1973.

16ARS922	ESTMATION AND COSTING											SEMESTER-IX	
Marks	**Internal**	**80**	**External**				**120**	**Total**	**200**	**Exam Hours**			**6**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	4			**Credits**			**4**

COURSE OBJECTIVE:

- To provide the student adequate knowledge to write the specifications for a given item of work
- To gain knowledge in specification
- To gain Knowledge in Estimation of Civil Work
- To gain knowledge in estimation of Carpentry work
- To gain Knowledge in the estimation of Plumbing work
- To understand to work out the unit cost of individual items based on their specifications and arrive at the overall cost of the project.

COURSE OUTCOME:

1. Student will be able to understand and write specification for the given item of work
2. Student will gain knowledge & Understanding of Estimation of civil work
3. Student will gain knowledge about estimation of Carpentry work
4. Student will gain knowledge about estimation of plumbing work
5. Student will be able to do calculate the quantities on site with Field measurement book
6. Student will learn about various calculation of bill of quantities for Interiors

UNIT-I

SPECIFICATION

Necessity of specification, importance of specification, - How to write specification, - Types of Specification, -Principles of Specification writing, - Important aspects of the design of specification – sources of information – Classification of Specification.

UNIT-II

SPECIFICATION WRITING

Brief Specification for 1st class, 2nd class , 3rd class building. Detailed specification for earthwork excavation, plain cement concrete, Reinforced concrete, first class and second class brickwork, Damp proof course, ceramic tiles/marble flooring and dadoing, woodwork for doors, windows frames and shutters, cement plastering, painting & weathering course in terrace.

UNIT-III

ESTIMATION

Types & purpose, Approximate estimate of buildings – Bill of quality, - Requirement for preparing estimation, factors to be considered, - principles of measurement and billing, contingencies, Elementary billing and measurement of basic materials like brick, wood, concrete and unit of measurement for various items of work – abstract of an estimate.

UNIT-IV

DETAILED ESTIMATE

Deriving detailed quantity estimates for various items of work of a building. Like earthwork excavation, brick work, plain cement concrete, Reinforced cement concrete works, wood work, iron works, plastering, painting, flooring, weathering course for a single storied building using cerntre line method and long and short wall method.

UNIT-V

COST ESTIMATING & COST BUDGETTING

Function of Cost planner – liason with consultant, operation cost Exercise in variation, Cost adjustment and Cost analysis. Role of various financial agencies for building & land development. Economic feasibility reports – valuation, depreciation and its implications.

SUGGESTED READINGS :

1. Dutta, Estimating and Costing, S.Dutta and Co., Lucknow
2. S.C.Rangwala, Elements of Estimating and Costing, Charoter Publishing House, India.
3. W.H.King and D.M.R.Esson, Specification and Quantities for Civil Engineers, The English University Press Ltd.
4. T.N.Building Practice, Vol.1, Civil, Govt. Publication.P.W.D. Standard specifications, Govt. Publication

<table>
<tr><td>16ARES931A</td><td colspan="10">DEVELOPMENTAL RULES AND REGULATIONS</td><td colspan="2">SEMESTER-IX</td></tr>
<tr><td>Marks</td><td>Internal</td><td>60</td><td colspan="4">External</td><td>90</td><td>Total</td><td>150</td><td colspan="2">Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>1</td><td>T</td><td>0</td><td>P/S</td><td>4</td><td colspan="4">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:
- To develop understanding of the duties and liabilities of an architect
- To gain knowledge of bye-laws that relate to the building
- To understand about the environment in the Indian context.
- To Understand about legislation of corporation areas
- To understand about the Legislation of panchayat
- To understand about legislation of Industries

COURSE OUTCOME:
1. Student will be able to read and understand government related documents and incorporate it in practice
2. Student will be able to understand the building regulations and follow accordingly
3. Student will understand about the legislation of corporation ares
4. Student will understand about the legislation of panchayat
5. Studen will understand about the legislation of Industries
6. Student will be able to design buildings as per the recent norms and standards

UNIT-I

LEGISLATION - CORPORATION AREAS

Chennai Corporation Building Rules 1972, Development control Rules for Chennai Metropolitan Area 1990

UNIT-II

LEGISLATION - PANCHAYATS

The Panchayat Building Rules 1942

UNIT-III

LEGISLATION - INDUSTRIES AND FACTORIES

The Tamil Nadu Factory Rules 1950

UNIT-IV

EMERGING AREAS OF IMPORTANCE

Role of urban Arts Commissions - need for special rules on architectural control and development

UNIT-V

SPECIAL LEGISLATION

Environmental Acts and Laws - Special Rules governing Hill Area Development - coastal area development and management - Heritage Act of India - Consumer protection act and their relevant provisions

SUGGESTED READINGS :

1. Publications of COA, IIA Hand book on Professional Practice, The Architects publishing Corporation of India, Bombay 1987
2. D.C. Rules for Chennai Metropolitan Area 1990
3. T.N.D.M. Building Rules, 1972
4. T.N.P. Building Rules 1942
5. Chennai City Corporation Building Rules 1972
6. Environmental Laws of India - by Kishore Vanguri, C.P.R. Environmental Education Centre, Chennai
7. The Tamil Nadu Hill Areas Special Building Rules - 19
8. Heritage Act
9. Consumer Protection Act
10. Indian Easements Act

16ARES931B	CONSTRUCTION TECHNOLOGY									SEMESTER-IX	
Marks	Internal	60	External			90	Total	150	Exam Hours		6
Instruction Hours /week		L	1	T	0	P/S	4			Credits	3

COURSE OBJECTIVE:

- To study the advancements in construction with concrete for large span structures.
- To familiarize the students with the various classifications in buildings
- To familiarize the students with the manufacture, storage and transportation of concrete.
- To inform the various equipment used in the construction industry
- To learn about the criteria for choice of equipment.
- To familiarize the students with an overview of construction management, planning and scheduling

COURSE OUTCOME:

1. Ability to understand the practice of construction technology
2. Ability to understand the construction systems for high rise buildings
3. Ability to understand the process of manufacture, storage and transportation of concrete
4. Ability to understand thevarious equipment used in the construction industry
5. Ability to understand thecriteria for choice of equipment
6. Students will gain an overview of construction management, planning and scheduling

UNIT-I

GENERAL BUILDING REQUIREMENTS

Classification of buildings - Sites and Services - Requirements of parts of buildings.

UNIT-II

CONSTRUCTION SYSTEMS

Planning - Cast in situ construction (ready mixed pumped etc.) Reinforced concrete and prestressed concrete constructions precast concrete and pre- fabrication system - Modular coordination – Structural schemes.

UNIT-III

CONSTRUCTION PRACTICE

Manufacture, storage, transportation and erection of precast component forms, moulds and scaffoldings in construction - safety in erection and dismantling of constructions.

UNIT-IV

CONSTRUCTION EQUIPMENT

Uses of the following: Tractors, bulldozers, shovels draglings, cableways and belt conveyors, batching plants - Transit mixers and agitator trucks used for ready mix concrete pumps Gunitingequipments - Air compressors - welding equipment - cranes and other lifting devices Choice of construction equipment for different types of works.

UNIT-V

CONSTRUCTION MANAGEMENT

Overview of construction management topics including estimating, cost control, quality control, safety, productivity, value engineering, claims, and legal issues - planning and scheduling

SUGGESTED READINGS :

1. R. Chudley, Construction Technology, Longman Group Limited, England, 1985
2. R. Barry, The Construction of Buildings, The English Language Book Society and Crosby Lockwood, Staples, London, 1976
1. National Building Code of India, 1983
2. Frank R. Dagostino, Materials of Construction – Details given Reston Publishing
Company, nc.Virginia, 1976.
3.M. Mohsin, Project Planning and Control, Vikas Publishers, New Delhi, 1983

16ARES931C	**INTEGRATED BUILDING MANAGEMENT SYSTEM**									**SEMESTER-IX**	
Marks	**Internal**	**60**	**External**			**90**	**Total**	**150**		**Exam Hours**	**6**
Instruction Hours /week		**L**	1	**T**	0	**P/S**	4			**Credits**	**3**

COURSE OBJECTIVE:

- To impart advanced technical and practical knowledge in building services& Safety
- To gain knowledge of special services through preparation of service drawing and details.
- To understand about the fire alarm systems
- To gain understanding about the fire alarm system technologies for various buildings
- To gain knowledge about the Fire suppression systems
- To gain knowledge about Automation systems

COURSE OUTCOME:

1. Student will be able to understand the building services & Safety
2. Student will develop the skill of fire alarm service drawings
3. Student will understand about Safety standards for special buildings
4. Student will gain knowledge about Fire safety service standards for all types of buildings
5. Student will gain knowledge in Building management systems
6. Student will gain Knowledge about the integration of IBMS for Multi storied structures

UNIT-I

SAFETY REQUIREMENTS

Minimum safety requirements for a building, particularly for a high rise building as per the National Building Code.

UNIT-II

FIRE ALARM SYSTEMS

Objectives of a Fire Alarm System, Essential components of a Fire Alarm System, Technology of detection, Type of Statutory Standards followed in direction, Explaination on the essential clauses, various types of technologies employed in the Fire Alarm System, basic knowledge on how a Fire Alarm System is designed and installed

UNIT-III

FIRE SUPPRESSION SYSTEMS:

Objectives of a Fire Suppression System, Explanation on fire triangle,Essential components of a Fire Suppression System, different types of Fire Suppression Systems, Type of Statutory Standards followed in Suppression, Explanation on the essential clauses and basic knowledge on how a Fire Suppression System is designed and installed.

UNIT-IV

SECURITY SYSTEMS

Introduction to different types of Security Systems and why they are required. Introduction to Access Control, CCTV, Intruder Alarm and Perimeter protection Systems, Essential components of each system, various types of technologies employed in these Systems, basic knowledge on how they are designed and installed.

UNIT-V

AUTOMATION SYSTEMS

The objectives of the Building Automation system (BAS), the list of utility, safety and security systems that are generally monitored and controlled through IBMS, the various components of IBMS, types of integration with the utility, safety and security systems and the basic knowledge on how they are designed and installed.

SUGGESTED READINGS :

1. Building Automation Systems – A Practical Guide to selection and implementation – Author : Maurice Eyke
2. National Building Code of India 1983 (SP 7:1983 Part IV) – Published by Bureau of Indian Standards
3. IS 2189 – Selection, Installation and Maintenance of Automatic fire Detection and Alarm System – Code of Practice (3rd Revision) – Published by Bureau of Indian Standards.

SUGGESTED READINGS :

1. The Principles and Practice of Closed Circuit Television – Author: Mike Constant and Peter Turnbull
2. Rules of Automatic Sprinkler Installation – 2nd Edition – Published by Tariff Advisory Committee.
3. Fire Suppression Detection System – Author : John L. Bryan
4. Design and Application of Security/Fire Alarm system – Author: John E. Traister.
5. CCTV Surveillance – Author: Herman Kruegle
6. Security Systems and Intruder Alarm Systems – Author: Vivian Capel

16ARES931D	EARTH QUAKE RESISTANCE ARCHITECTURE										SEMESTER-IX	
Marks	**Internal**	**60**	**External**				**90**	**Total**	**150**	**Exam Hours**	**6**	
Instruction Hours /week		**L**	1	**T**	0	**P/S**	4			**Credits**	**3**	

COURSE OBJECTIVE:

- To understand the fundamentals of Earthquake and the basic terminology
- To familiarize the students with design codes and building configuration
- To understand the site planning and performance of ground & Buildings
- To understand the seismic design codes & configurations
- To understand the impacts in urban level due to earth quake and solution for mitigation
- To understand the various types of construction details to be adopted in a seismic prone area.

COURSE OUTCOME:

1. Student will be able to understand the formation and causes of earthquakes
2. Student will gain understanding of the factors to be considered in the design of buildings
3. Student will understand the services to resist earthquakes.
4. Student will become familiar with the Seismic Design Codes & configurations
5. Student will understand about designing earth quake resistant structures
6. Student will learn about urban level planning strategies for earth quake resistance

UNIT-I

Fundamentals of earthquakes
a) Earths structure, seismic waves, plate tectonics theory, origin of continents, seismic zones in India.
b) Predictability, intensity and measurement of earthquake
c) Basic terms- fault line, focus, epicentre, focal depth etc.

UNIT-II

Site planning, performance of ground and buildings
a) Historical experience, site selection and development
b) Earthquake effects on ground, soil rupture, liquefaction, landslides.
c) Behaviour of various types of building structures, equipments, lifelines, collapse patterns
d) Behaviour of non-structural elements like services, fixtures in earthquake-prone zones

UNIT-III

I. Seismic design codes and building configuration
a) Seismic design code provisions – Introduction to Indian codes
b) Building configuration- scale of building, size and horizontal and vertical plane, building proportions, symmetry of building- torsion, re-entrant corners, irregularities in buildingslike short stories, short columns etc.

UNIT-IV

II. Various types of construction details
a) Seismic design and detailing of non-engineered construction- masonry structures, wood structures, earthen structures.
b) Seismic design and detailing of RC and steel buildings
c) Design of non-structural elements- Architectural elements, water supply, drainage, electrical and mechanical components

UNIT-V

III. Urban planning and design
a) Vulnerability of existing buildings, facilities planning, fires after earthquake, socioeconomic impact after earthquakes.
b) Architectural design assignment- Institutional masonry building with horizontal spread and height restriction, multi-storeyed RC framed apartment or commercial building .

SUGGESTED READINGS :

1. Guidelines for earthquake resistant non-engineered construction, National Information centre of earthquake engineering (NICEE, IIT Kanpur, India)
2. C.V.R Murthy, Andrew Charlson. “Earthquake design concepts”, NICEE, IIT Kanpur India.
3. Ian Davis (1987) Safe shelter within unsafe cities” Disaster vulnerability and rapid urbanisation, Open House International, UK
4. Socio-economic developmental record- Vol.12, No.1, Jan-Feb 2005
5. Learning from Practice- A review of Architectural design and construction experience after recent earthquakes- Joint USA-Italy workshop, Oct.18-23, 1992, Orvieto, Italy.

16ARES931E	**DIGITAL ARCHITECTURE**							**SEMESTER-IX**
Marks	**Internal**	**60**	**External**	**90**	**Total**	**150**	**Exam Hours**	**6**
Instruction Hours /week	**L**	1	**T**	0	**P/S**	4	**Credits**	**3**

COURSE OBJECTIVE:

- To develop the advanced knowledge and skills in Digital application
- To develop knowledge in building visualization
- To develop knowledge in digital rendering
- To develop knowledge in walk through Animations
- To get familiarized & create simple multimedia presentations & brochures
- To learn about the videos & Presentations as required in architectural practice.

COURSE OUTCOME:

1. Student will learn about the Latest digital applications used in the architectural practice
2. Student will gain knowledge about parametric applications in design
3. Student will learn about the building visualization & Simulation
4. Student will learn about Advanced rendering techniques
5. Student will learn about animation and visualization techniques used in the architecture industry
6. Student will learn about the video presentations and realistic animations of buildings

TOPICS

1. Advanced techniques in rendering with differential lighting for realistic rendering

2. Advanced techniques in building information modeling

3. Animations and Walkthroughs

4. Simulating gravity, wind and other effects in the scene, distributed rendering

5. Performance Analysis on Building Model using softwares.

Recommended Software:Auto desk Revit, 3ds Max, rhino, lumion, vector works, BIM, Ecotect, v-ray rendering techniques

SUGGESTED READINGS :

1. Rendering Techniques for mixed reality, Thomas Girlinger, Daniel Dauch, Andre Stork, Springer, Berlin, October 2009
2. 3D Computer Animated Walk Throughs, Clark Cory, Scott Meador, William Rosi, McGraw Hill 2009.
3. The Animation Book: A complete guide to animation and film making, Kit Laybourne, Three Rivers Press, December 1998
4. Creating a website, Matthew McDonald, Pogue Press, January 2009s

16ARES931F	ADVANCED CONCRETE TECHNOLOGY										SEMESTER-IX
Marks	Internal	60	External			90	Total	150		Exam Hours	6
Instruction Hours /week		L	1	T	0	P/S	4			Credits	3

COURSE OBJECTIVE:

- To learn about the classification and specifications in concrete
- To learn about the Chemical composition and Testing of concrete
- To learn about the properties and durability of concrete
- To learn about the Principles and Methods of concrete mix design
- To learn about the Statistical quality control- sampling and acceptance criteria
- To learn the advanced level concrete technological applications.

COURSE OUTCOME:

1. An understanding of the classification and specifications in concrete
2. An understanding of special types of concrete and concreting methods
3. An understanding of the Chemical composition and Testing of concrete
4. An understanding of properties and durability of concrete
5. An understanding ofStatistical quality control- sampling and acceptance criteria
6. An understanding ofthe advanced level concrete technological applications

UNIT-I

CONCRETE MAKING MATERIALS

Aggregates classification, IS Specifications, Properties, Grading, Methods of combining aggregates, specified gradings, Testing of aggregates. Cement, Grade of cement, Chemical composition, Testing of concrete, Hydration of cement, Structure of hydrated cement, special cements. Water Chemical admixtures, Mineral admixture.

UNIT-II

CONCRETE

Properties of fresh concrete, Hardened concrete, Strength, Elastic properties, Creep and shrinkage, Variability of concrete strength, durability of concrete.

UNIT-III

MIX DESIGN

Principles of concrete mix design, Methods of concrete mix design, Testing of Concrete. Statistical quality control- sampling and acceptance criteria.

UNIT-IV

SPECIAL CONCRETE

Light weight concrete, Fly ash concrete, Fibre reinforced concrete, Sulphur impregnated concrete, Polymer Concrete, Super plasticisedconcrete,Hyper plasticized concrete, Epoxy resins and screeds for rehabilitation - properties and applications - high performance concrete. High performance fiber reinforced concrete, self-compacting-concrete.

UNIT-V

CONCRETING METHODS

Process of manufacturing of concrete, methods of transportation, placing and curing. Extreme weather concreting, special concreting methods. Vacuum dewatering - underwater concrete, special form work.

SUGGESTED READINGS :

1. Neville, A.M., Properties of Concrete, Prentice Hall, 1995, London.
2. Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi, 2003.
3. A.R.Santhakumar ;"Concrete Technology",Oxford University Press,2007.
4. Rudhani G. Light Weight Concrete Academic Kiado,Publishing Home of Hungarian Academy of Sciences, 1963

16ARES931G	REAL ESTATE MANAGEMENT									SEMESTER-IX	
Marks	**Internal**	**60**	**External**				**90**	**Total**	**150**	**Exam Hours**	**6**
Instruction Hours /week		**L**	1	**T**	0	**P/S**	4			**Credits**	**3**

COURSE OBJECTIVE:

- To give an overview of real estate development
- To understand about the market potential in the current scenario
- Stimulating an awareness of the issues involved in international real estate
- To learn about urban level policy & Decisions
- To learn about various differences in Real Estate market conditions all over the world
- To gain knowledge about the leverage that the real estate could provide in the overall development

COURSE OUTCOME:

1. Student will gain knowledge in the concepts of Real estate development
2. Student will understand about Property development
3. Student will learn about urban level policies in Real estate management
4. Student will learn about the corporate Real estate management
5. Student will gain knowledge in Project financing and development
6. Student will understand the Current scenario through case studies

UNIT-I

REAL ESTATE DEVELOPMENT

Fundamentals of real estate development – concepts – techniques – recognizing institutional elements – issues encountered in various phases of development like the site evaluation and land procurement – lease hold and free hold property – development team assembly –market potential – demand estimation study – development scheme –constructionand project management – Project marketing

UNIT-II

DEVLOPMENT ANF PROJECT FINANCING

Project feasibility – options – development financing – asset disposal and redevelopment options – analysis of development sites and case studies – integrated case study on specific development project – reviewing and analysis – problems and strategic issues

UNIT-III

URBAN POLICY AND REAL ESTATE MARKET

Impact of government regulations and public policies on real estate markets – urban land rate and location theories – Land us e structures – community and neighborhood dynamics – degeneration and renewal in urban dynamics – private public participation-government policies – public and private housing and fiscal policy – Property taxation – local government finance

UNIT-IV

CORPORATE REAL ESTAT EMANAGEMENT

Strategic plans to align real estate needs with corporate business plans – performance measurement techniques – identify assets acquisition or disposal – methods for enhancing values through alternative – efficientsource utilization or improving user satisfaction

SEMESTER 10

16ARS1021	ARCHITECTURAL THESIS									SEMESTER-X	
Marks	Internal	400	External			600	Total	1000		Exam Hours	6
Instruction Hours /week		L	4	T	0	P/S	27			Credits	18

COURSE OBJECTIVE:

- To ensure consolidation and application of the knowledge gained in preceding years of the programme
- To develop the skill of Design in the context of a project of the student's choice.
- To enable addressing of specific projects through key, identified issues inherent in the project
- To enable development of thought processes in specific areas/aspects into a project.
- To facilitate development of ability to complete and handle projects independently
- To develop the career of Architecture by exhibiting the skill in thesis

COURSE OUTCOME:

1. Student will gain an overall understanding of an Architectural project
2. Student will be able to research, Analyse, synthesise and present his ideas
3. Student will apply his skills developed in the previous years in this Project
4. Student will gain the ability to handle major architectural project of a larger scale
5. Student will be able to design with all Socio, economic and Environmental aspects.
6. Student will become an expertise in his domain of architectural design

UNITS I to UNIT V

The main areas of study and analysis shall be Architecture, Urban design, Urban renewal and Human settlements, Environmental Design, Conservation, Landscape Design, Housing etc.. However, the specific thrust should be architectural design of built environment.

Research Methods as applicable to architectural studies is to be taught as part of Thesis.

METHOD OF SUBMISSION

The Thesis Project shall be submitted in the form of drawings, project report, physical/ digital models, presentations and walkthroughs.

SUGGESTED READINGS :

1. E and OE Planning London Books Ltd 1973
2. National Building Code ISI
3. De Chiasa and Callendar- Time saver standards for Building Types - Mc Graw Hill Co., 1973.
4. Edward D Mills, planning, 4 volumes, newness Butterworths, London 1976

16ARES1031A		INDUSTRIAL ARCHITECTURE								SEMESTER-X	
Marks	Internal	80	External			120	Total	200	Exam Hours		6
Instruction Hours /week		L	0	T	0	P/S	4			Credits	2

COURSE OBJECTIVE:
- To introduce about Industrial design building and architecture
- To understand about the types of industrial space
- To understand about precast building types & practice
- To gain knowledge in on site & off-site prefabrication systems
- To gain deep understanding about the Modular - technologies
- To understand about the overall structural system of Industrial buildings

COURSE OUTCOME:
- Student will understand the application of Industrial buildings
- Student will gain understanding about the pre fabrication systems
- Student will gain Knowledge in Industrial construction
- Student will understand about the modular components & coordination of Industrial Buildings
- Student will understand about the overall structural system of Industrial buildings
- Student will be able to design large scale Industrial buildings

UNIT-I
INTRODUCTION
Five year plans and thrust in housing – Issues in Urban Housing – use of modern building materials – application of modern technology – meaning of industrial building system.
UNIT-II
APPLICATION OF INDUSTRIAL BUILDING SYSTEM
Feasibility of using industrial building system in Residential and Non-Residential buildings – manufacturing of building components – Technology requirements for industrial building system – use of Industrial building system as an option for disaster mitigation.
UNIT-III
MODULAR CO-ORDINATION AND INDUSTRIALISED SYSYEM
Concept and definition of Modular dimensional discipline – Advantages and Limitations of modular principle – Components of residential buildings – precast elements.
UNIT-IV
PRE-FABRICATION SYSTEM
Objective and necessity – Off site on site prefabrication elements and construction joints – architectural and technical limitations.
UNIT-V
PROCEDURES AND ORGANISATION
Equipments used – manufacturing processes – transportation of components – assembly and finishing – Structural, social and economic issues related to industrial building system.
SUGGESTED READINGS :
1. Industrial Building and Modular Design HenrikMissen – C & CK, UK 1972.
2. Albert G.H.Dietz, Laurence Secotter – “Industrialized Building Systems for Housing” – MIT, special summer session, 1970 USA.
3. “Industrialized Building Construction” – Proceedings of National Seminar, Nov-17-18, 2000, Indian Concrete Institute, Mumbai.
4. “Innovative Construction Materials” – Proceedings of Seminar, Jan 20-21,2001, Veermata Jeejabai Technical Institute, Mumbai.

<table>
<tr><td>16ARES1031B</td><td colspan="10">GREEN BUILDING</td><td colspan="2">SEMESTER-X</td></tr>
<tr><td>Marks</td><td>Internal</td><td>80</td><td colspan="4">External</td><td>120</td><td>Total</td><td>200</td><td colspan="2">Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>0</td><td>T</td><td>0</td><td>P/S</td><td>4</td><td colspan="4">Credits</td><td>2</td></tr>
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COURSE OBJECTIVE:

- To develop and acquire knowledge about environment and ecosystems
- To understand about Energy usage &energy efficient technologies
- To learn about the use of natural materials and water conservation technique.
- To Understand about Water Efficiency & regeneration
- To understand about the Rating of current buildings
- To understand the Bio degradability materials & recycling

COURSE OUTCOME:

1. Student will understand the basic concept of sustainability in Architecture
2. Student will gain knowledge in passive and Hybrid design strategies for designing a green building
3. Student will understand the energy usage of various types of buildings
4. Student will learn about energy efficiency and ways to minimize the energy.
5. Student will learn about the environmental impacts and assessment
6. Student will gain knowledge about the green rating systems and codes in India

UNIT - I

SUSTAINABILTY AND GREEN BUILDING

Understanding of food and energy cycle – Principals of sustainability – Naturalecosystem – Elements of green development – Introduction to green architecture – green building design – benefits – rating systems – LEED, GRIHA, BREAM, ECBC

UNIT II

SUSTAINABLE STRATEGIES AND DEVELOPMENT

Sustainable design concepts – strategies – Design principles – Active and passive techniques – land use patterns – site development – site selection – adaptive reuse – existing buildings up gradation

UNIT III

ENERGY – USAGE AND REGENERATION

Water – consumption – domestic usage – efficiency in usage – low flow plumbing fixtures – water appliances – rain water harvesting – reuse of gray water –energy efficiency – optimizing building envelopes configuration – renewable power- Towards net zero energy building - use of photovoltaic- automation for efficient usage – smart buildings

UNIT IV

BIO DEGRADABLE MATERIALS AND RECYCLING

Concept of embodied energy – performance and life cycles – building materials – selection of sustainable materials – recycling waste – collection and disposal – appropriate technologies – use in landscape.

UNIT V

ENVIRONMENTAL IMPACT ASSESMENT.

Envirnmental Impact Assesment – Internal frame works & Assessment Tools.

SUGGESTED READINGS :

1.Anna ray – Jone – Sustainable architecture in japan – The green buildings of Nikken seiki, Wiley – acdemy 2000
2.Architecture and th e environment – bio climatic building design – David Lloyd (Laurence king publishers, London 1998)
3.Sustainable Architecture low tech houses – Charles Broto& Arian Mostedi Pub : joseph Ma Minguet 2002.
4.Energy effiecient buildings in India – Millimajundar. TER publication and ministry of non conventional energy sources,2001
5.Ecology of the sky – Ivor Richards , The Image publishing groups ,2009

16ARES1031C	RESEARCH METHODS									SEMESTER-X	
Marks	**Internal**	**80**	**External**			**120**	**Total**	**200**	**Exam Hours**		**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4			**Credits**	**2**

COURSE OBJECTIVE:

- To learn the importance of and undertake research and field studies
- To understand the research applications in architectural design.
- To understand the different methods and the techniques as relevant to the design profession
- To understand the experimental research methods
- To apply research in evaluation and appraisal of architectural design projects.
- To understand about different survey methods

COURSE OUTCOME:

1. Student will understand the research methodology and research methods
2. Student will understand the various analytical methods
3. Student will understand the experimental methods of Research
4. Student will learn about the survey methods and documentation
5. Student will know to collect relevant data, compile and document
6. Student will be able to critically analyse the data and present it as a document

UNIT-I

Importance. Purpose and scope of research and field studies. Application in architecture in terms of design , technology, environment, economic and behavioral areas.

UNIT-II

Sequence and methods of research, Identification of problem, Hypothesis formulation objectives and methodology.

UNIT-III

Understanding and applying qualitative analytical interpretative correlation, quasi experimental, experimental, simulation and modeling techniques in Architectural design.

UNIT-IV

Pilot studies field surveys and collection of samples – physical, Architectural, Environmental organizational, preparation and Analysis of Data sheets and Questionnaires.

UNIT-V

Preparation and analysis of data sheets and questionnaires. Arriving at conclusions from the research at fiels studies. Report writing and publications.

SUGGESTED READINGS :

1.Knight. A and Ruddock L., “Advanced Research Methods in build Environment”, John Wiley & Sons 2008.
2.Groat L, and Wang D, “Architectural Research Methods”. John Wiley & Sons, 2002.
3.Gibbs J P “ Urban Research Methods”, (rev.ed) Von Nostrand 1988.
4.Kothari C R, Research Methodology – Methods and Techniques”, New Age Interntional 2004.
5.Khanzode V V, “ Research Methodology – Techniques and Trends”, APH Publishing, 1995.

16ARES1031D	**MEDICAL ARCHITECTURE**									**SEMESTER-X**
Marks	**Internal**	**80**	**External**			**120**	**Total**	**200**	**Exam Hours**	**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4		**Credits**	**2**

COURSE OBJECTIVE:

- To learn about the introduction of the health industry and relation to architecture
- To learn about the level of circulation in Hospital buildings
- To learn about the level of services in hospital buildings
- To learn about the planning aspects of the Hospital Architecture
- To learn about thequality control and delivery
- To learn the advanced level Hospital management

COURSE OUTCOME:

1. An understanding of the health industry & relation to Architecture
2. An understanding of special types of circulation in hospital buildings
3. An understanding of the major & minor services in hospital buildings
4. An understanding of planning aspects of hospital buildings
5. An understanding of quality control & delivery of Hospital architecture
6. An understanding ofthe advanced level of Hospital management

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UNIT-I

Introduction to health care industry, demand of the health care industry.

UNIT-II

Health care Industry - United Nations International Standard Industrial Classification (ISIC) - Hospital activities, Medical and dental practice activities and other human health activities.

UNIT-III

Health care Industry – Global Industry Classification Standard and the Industry Classification - Health care equipment & services and Pharmaceuticals, biotechnology & related life sciences.

UNIT-IV

Health care Industry – Delivery System – Primary, Secondary, Tertiary and Quaternary, Community Health

UNIT-V

Modern concepts in planning, designing, equipping and commissioning of all such built environments which are associated with the health care industry. Future aspects of planning heath care facilities and service

SUGGESTED READINGS :

1.Kunders .G.D, Hospitals – Facilities planning and Management, Tata Mcgraw Hill Publication, 2008
2.Joseph DeChiara, Julius Panero. Time-Saver Standards for Interior Design and Space Planning, McGraw-Hill Education, 2001
3.Peter Stone, British hospital and health-care buildings: designs and appraisals, Architectural Press, 1980
4.Joint Commission International Accreditation Standards for Hospitals, 2002
5.Carles Broto, New Health Care Facilities, Links International, 2009

16ARES1031E	EXHIBITION										SEMESTER-X	
Marks	**Internal**	**80**	**External**				**120**	**Total**	**200**		**Exam Hours**	**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4				**Credits**	**2**

COURSE OBJECTIVE:
- To learn about the introduction of the Exhibition design
- To learn about the introduction of the retail architecture
- To learn about the level of services in Exhibition & retail architecture
- To learn about the planning aspects of the Exhibition design
- To learn about the Marketing theories & retail branding
- To learn the advanced levelof exhibition structures

COURSE OUTCOME:
1. An understanding of the Exhibition design
2. An understanding of the retail Architecture
3. An understanding of the major services in exhibition design
4. An understanding of planning aspects of the Exhibition Design
5. An understanding of the marketing theories & retail branding techniques
6. An understanding ofthe advanced level of Exhibition Structures

UNIT-I

Introduction **Discussion: The terms 'exhibition' and 'retail' and 'Space & Form- Space Layout'**

UNIT-II

Elements of environmental design: from flat graphics to 3D

UNIT-III

Ergonomics& Accessibility

UNIT-IV

Exhibition Design: Form, Feel & Function, Introduction to aesthetic, form and functional aspects of basic exhibition design , Identification of critical issues through research , Execution of the design processes

Application of visualization skills

UNIT-V

Introduction to marketing theory / retail branding Marketing theory. Display of case studies.

SUGGESTED READINGS :

1. Pam Locker, BASICS INTERIOR DESIGN 02 – EXHIBITION DESIGN, Published by AVA Publishing.
2. Lynne Mesher, BASICS INTERIOR DESIGN 01 – RETAIL DESIGN, Published by AVA Publishing.

16ARES1031F	PROGRESSIVE ARCHITECTURE										SEMESTER X	
Marks	**Internal**	**80**	**External**				**120**	**Total**	**200**		**Exam Hours**	**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4				**Credits**	**2**

COURSE OBJECTIVE:

- To understand and acquire knowledge in advanced architectural concepts and ideologies.
- To gain Knowledge about the future concepts of eminent architects
- To understand about the material usage in the current trend of architecture
- To gain knowledge about the Concept of biomimicry
- To understand about the adaptive reuse
- To gain understanding about energy integration and zero energy developments

COURSE OUTCOME:

1. Student will be able to understand and evolve futuristic design ideas and concepts
2. Student will be able to integrate various aspects of design thinking of future
3. Student will understand about the parametric design concepts and applications
4. Student will understand about the concept of Biomimicry
5. Student will gain knowledge about the Adaptive reuse
6. Student will gain knowledge about energy integration and zero energy development.

Futuristic Vision

Future concepts as envisioned by Antonio Saint Elia, Frank Lloyd Wright, Corbusier.

UNIT-II

Futuristic Trends

Future trends being evolved by Marcos Novak, Neil Denari, Greg Lynn, Toyo Ito and others.

UNIT-III

Architectural Concepts and Ideas

Evolution of contemporary architectural concepts such as biomimcry, adaptive reuse, low cost development and urban regeneration.

UNIT-IV

Materials, Technology and Systems

Futuristic building materials, building tectonics and systems of the future.

UNIT-V

Energy Integration

"Zero energy" and "Energy +" buildings with emphasis on an integrated approach.

SUGGESTED READINGS :

1. Bell, J., "21st Century House", Laurence King Publishing, 2006
2. Jodidio, P., "Building a New Milleneum", Vol.1 Taschen, 2003
3. Jodidio, P., "Architecture Now", Vol. 2, Taschen, 2004

16ARES1031G	HGH RISE BUILDINGS									SEMESTER-X	
Marks	**Internal**	**80**	**External**			**120**	**Total**	**200**		**Exam Hours**	**6**
Instruction Hours /week		**L**	0	**T**	0	**P/S**	4			**Credits**	**2**

COURSE OBJECTIVE:

- To understand the various types of multistoried buildings
- To understand the structural systems of High -rise buildings
- To understand deeply about the building service systems of high- rise buildings
- To deeply understand about the Structural Systems in High Rise Buildings
- To understand about the Safety Systems in high Rise buildings
- To understand about the Bye – laws & codes of design of high -rise buildings

COURSE OUTCOME:

1. Student will learn about the Design and planning aspects of High-rise structures
2. Student will gain knowledge about the National building Codes of high-rise structures
3. Student will understand about the various development control regulations all over India
4. Student will gain knowledge about the Structural aspects of High-Rise buildings
5. Student will gain knowledge about various technical services involved in High rise buildings
6. Student will gain knowledge about functionality of the high-rise structures

UNIT-I

Introduction to High rise structures

Urban environment and physical planning considerations – architectural design considerations – space planning – palnning building services – advanced service systems – antomation – Bye laws and codes applicable – for every structure and service section

UNIT-II

Tall building types and floor systems

Classification of tall buildings – types – shear frames ,interacting systems – Tubular systems.

Composite steel floor systems , pre stressed and post tensioned concrete floor systems – examples

UNIT-III

Lateral load resisting systems

Braced frames – moment resisting frame systems – core and out trigger systems – benefits and drawbacks – tubular system – Hybrid systems – examples

UNIT-IV

Services for Tall buildings

Express evators- Sky lobbies – service floor etc – Water supply system- skip stage plumbing – energy conservation methods – location and sizing of water tanks – wet risers, sumps , smoke detectors , alarms ,sprinkler systwms – fire escpae stairs – fire resistant doors – Fire resistant materials – fire fightingequipments.

SUGGESTED READINGS : :

1.Bennetts , Ian etal – tall building structural systems

2.Proceedings of the council for tall buildings – Vol 1 to 10

3.NBC

SEMESTER - I

16IDT101	COMMUNICATIVE ENGLISH							SEMESTER-I
Marks	Internal	40	External	60	Total	100	Exam Hours	3
Instruction Hours/Week	L	2	T	0	P/S	0	Credits	2

UNIT-1: LANGUAGE FOCUS

Technical vocabulary – formal phrases and idioms – homophones, homonyms, often mis-spelt words – conjunctions – formation of new words – irregular verbs – plurals, gender sounds, words ending with phobia, logy etc. Grammar: Finite and infinite verbs – transformation of sentences – simple, complex and compound – phrases and clauses – question forms – question tags – expression of cause and effect, purpose and function.

UNIT-2: READING & LISTENING

Extensive and Intensive reading – active and passive reading – eye reading and visual perception – reading for a purpose – speed reading – reading with expression – story telling – critical and analytical reading – Listening to debates and discussions for making suitable responses.

UNIT-3: WRITING & SPEAKING

Cohesion and coherence in sentences and paragraphs – business letters of different kinds – report writing – writing strategies – writing comments, procedures, inferences, instructions and recommendations – writing articles.

Applied English Communication – Welcome address, vote of thanks, compeering, debates, role plays, demonstration of advertisements – group discussions – mock interviews and dialogues – checklist of making oral presentations – vocal communication techniques – voice, quality, volume, pitch, rate of delivery.

UNIT-4: HARD AND SOFT SKILLS

Personal attributes – verbal and non verbal communication – interpersonal abilities/ skills – empathy, leadership, good manners and sociability – problem solving – reasoning and flexibility – intrapersonal abilities – self communication – self control and self esteem.

UNIT-5: SOCIAL SKILLS

Facilitating interactions, understanding social roles – making a team – leading a team – dealing with different kinds of people and situations – emotional quotient and intelligent quotient – personality development – communication and body language, social etiquette –goal setting – determination, discipline and direction.

References

1. Sasikumar.V. and P.V.Damija, " Spoken English", Tata Mc Graw Hill Publishing Corporation Ltd, New Delhi, 1997
2. Ashraf Rizvi M, Effective Technical Communication, Tata McGraw Hill, Delhi 2008
3. Stanton Nicky, " Mastering Communication", Mc Millan Master Series, London,1996
4. Robert M Sherfield "Developing softskills", Dorling Kindersley (India)

<table>
<tr><td>16IDT102</td><td colspan="8">HISTORY OF INTERIORS</td><td colspan="3">SEMESTER-I</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="4">External</td><td>60</td><td>Total</td><td>100</td><td>Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="3">Credits</td><td>2</td></tr>
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COURSE OBJECTIVE:

- To help the student understand the designs from Prehistoric Period to the Middle Ages.
- To know more on the Modern Movements in Interior design from the beginnings of 20^{th}century.
- To allow students to learn from the rich heritage the elements of aesthetic design.
- To understand the construction techniques of the ancient times.
- To understand the skilled labor and the presence of the same in the olden days.
- To understand the same scene in the contemporary era and its challenges to execute the same finesse.

COURSE OUTCOME:

1. An understanding about the spatial and stylistic qualities associated with architecture.
2. An Understanding of architecture as an outcome of various social, political and economic upheavals, and as a response to the cultural and context.
3. The individual will be exposed to the present to the ancient day's comparison in techniques..
4. To use the techniques of the ancient times and to overcome the challenges faced by the same.
5. To respect the wide heritage that can be offered with respect to the various Architecture eras.
6. An understanding of the influences of lifestyle and culture of the respective times.

<u>Unit I</u>

Origin and scope of Interior Design - Evolution of Interior Design as an independent profession

<u>Unit II</u>

Origin and scope of Interior Design - Evolution of Interior Design as an independent profession through the ages - Definition of Interior Design - Overview of Interior Design in India

<u>Unit III</u>

Ancient Egyptian Period - Roman and Greek Styles - Medieval Period - Gothic and Renaissance

<u>Unit IV</u>

Baroque - European Rococo - Neo-Classicism - Art Deco Style - Art Nouveau - Minimalist - Industrial Bauhaus

<u>Unit V</u>

Traditional Styles - Islamic Period in India - Oriental Period - Vernacular Indian Styles

<u>References:</u>

1. Francis D.K.Ching, Interior Design Illustrated, V.N.R. Pub. NY 1987.
2. Steport - De - Van Kness, Logan and Szebely, Introduction to Interior Design Macmillan Publishing Co., NY 1980.
3. Kathryn B.Hiesinger and George H.Marcus, Landmarks of twentieth Century Design; Abbey Ville Press, 1993.
4. Syanne Slesin and Stafford Ceiff - Indian Style, Clarkson N.Potter, Newyork, 1990.
5. The Impulse to adorn - Studies in traditional Indian Architecture. - Editor Dr.Saranya Doshi, Marg Publications, 1982.

16IDP111	COMPUTER APPLICATIONS I										SEMESTER-I	
Marks	Internal	60	External				90	Total	150	Exam Hours		3
Instruction Hours/Week		L	1	T	0	P/S	4	Credits				3

COURSE OBJECTIVE:

- To make them digitally strong in the design related software.
- To make them understand and realize beautiful presentations.
- Understand #D nuances related to this subject.
- To represent ideas using technology and to be update in the use of softwares.
- To introduce to basic features of Artificial intelligence
- To Use software that are related to to BIM

COURSE OUTCOME:

1. Ability to express using digital tools in the realm of visual composition, drafting.
2. Ability to express using digital tools 3D visualization and rendering
3. To be able to represent ideas digitally for client understanding.
4. To understand the design in 3d to ensure the elimination of design flaws when translated from 2 d
5. To understand BIM and its overall structure.
6. To induce digital drawing reading and performing capacity.

Unit I

Definition and basics of internet, Electronic mail, File Transfer protocol, The World wide Web, WWW Browsers, Uses of Internet and Blogging

Unit II

Use in creating technical documents and reports, Cost Estimates, Paper Presentations and Assignments. Suggested Software – MS Office, Open Office

Unit III

A complete hands-on drawing ,sketching and two dimensional art course with exercises related to Basic Design and Visual Arts. Suggested Software – Photoshop, Illustrator.

Unit IV

Exercises in photographic image enhancement and Artistic Applications. Suggested Software – Photoshop, Illustrator.

Unit V

Command windows – toolbars and menus – tool palettes. Create and modify objects: 2d commands to draw, edit and modify. Suggested Software - AutoCAD

References:

1. Office 2007 All-in-One Desk Reference For Dummies (For Dummies (Computer/Tech)) by Peter Weverka
2. Special Edition Using Microsoft Office Word 2007 by Faithe Wempen (Paperback - Jan 6, 2007)
3. Photoshop Elements 6 For Dummies (For Dummies (Computer/Tech)) by Barbara Obermeier and Ted Padova
4. Adobe Photoshop CS4 Classroom in a Book by Adobe Creative Team (Paperback - Nov 20, 2008)
5. Illustrator CS for Dummies by Ted Alspach (Paperback - Oct 13, 2003)
6. AutoCAD 2006 – The Official Reference Guide by AutoDesk

16IDP112	ART AND CRAFT I						SEMESTER-I	
Marks	**Internal**	**40**	**External**	**60**	**Total**	**100**	**Exam Hours**	**3**
Instruction Hours/Week	**L**	**1**	**T**	**0**	**P/S**	**4**	**Credits**	**3**

COURSE OBJECTIVE:

- To encourage a critical orientation to design thinking and action.
- To understand the word critical meaning that everything must be open to enquiry and alternative view point.
- By design thinking and action it means that the process if observation and study of natural and manmade objects and systems,
- Ideation, free exploration , and development of personal skills and attitudes.
- To bring a creative interactive movement of students that will mould the respective skill.
- Skill based learning with adept technology support for the same.

COURSE OUTCOME:

1. The students are exposed to various mediums, techniques and tools.
2. The students gain mastery in sketching, visualizing and expression through manual drawing.
3. Sensitized to culture, craft and context.
4. Skill Development in Handling Materials and in Making Products
5. To be updated to the art world and to hone a skill that precedes the student in an overall development.
6. To imbibe qualities of confidence and orator ship

Unit I to V

Exploration in mixed media & collage to convey specific theme and meaning. Analytical Studies will be undertaken in two and three dimensions using various media.

Use of hand tools and materials: working with wood, metals, plaster, plastic, foam boards etc; techniques, safety & practice. Suggestive exercises are:

Type 1: Making mount board mobiles employing cubes cuboids, pyramid, cylinder and cones.

Type 2: Space frame models using match sticks straw, steel wires, bamboo splits.

Type 3: Texture applicability to murals and interior decoration.

Making craft objects and sculpture using different materials such as clay, metal, etc.

References:

1. Design Methods (Architecture) (Paperback), by John Chris Jones (Author).
2. Basics Design Ideas (Paperback) by Bert Bielefeld (Author), Sebastian El khouli (Author).
3. Design Drawing, Francis D. K. Ching.
4. The Nature of Design, Peg Faimon & John Weigand.
5. Foundations of Art and Design (Paperback) by Alan Pipes (Author)
6. John W.Mills - The Technique of Sculpture, B.T.Batsford Limited, New York - Reinhold Publishing Corporation, London, 1966.
7. C.Lawrence Bunchy - Acrylic for Sculpture and Design, 450, West 33rd Street, New York, N.Y.10001, 1972.
8. The Elements of Graphic Design: Space, Unity, Page Architecture, and Type (Paperback) by Alexander W. White (Author)
9. Geometry of Design: Studies in Proportion and Composition, Kimberly Elam.David Gibson

16IDS121	INTERIOR DESIGN I									SEMESTER-I	
Marks	Internal	160	External			240	Total	400	Exam Hours		6
Instruction Hours/Week		L	2	T	0	P/S	10	Credits			7

COURSE OBJECTIVE:

- To develop an understanding of various degrees of enclosures and various types of relationship between spaces.
- Understanding of the various effects that could be created by manipulating the enclosing elements such as walls, roof etc.
- To understand the design proximity and relation of spaces.
- To understand the translation of the drawing from board to reality and unification of the spaces.
- To understand the basic concepts for the size of the project.
- Develop an eye for design thinking that will encourage students to explore their creative capacities.

COURSE OUTCOME:

1. An understanding of the qualities of different elements as well as their composite fusions.
2. An ability to engage and combine the elements of design in spontaneous as well as intentional ways in order to create desired qualities and effects.
3. Development of required skills – observation / analysis / abstractions / interpretation / representations / expressions through models and drawings.
4. To analyze the pre data of the concepts and to introduce design solutions using a creative approach.
5. To be able to describe an understanding that is both in representation and verbally present the same.
6. To update and to introduce various other methodologies to enhance the skill set.

<u>Unit I to V</u>

Design Thinking: What is Design? Changing Role of the Designer; Route map of the Design Process; Components of Design Problems; Measurement, Criteria & Judgment in Design; Types and Styles of Thinking – Creative thinking, Guiding Principles.

Introduction to Elements of design.

Properties, qualities, and characteristics of (i) line, (ii) direction, (iii) shape, (iv) size, (v) texture, (vi) space (vii) time and motion (viii) value and (vii) colour. Exercises involving the same

Exploration in mixed media & collage to convey a specific theme and meaning.

Analytical Studies to be undertaken in two and three dimensions using various materials and tools.

The principles of design relationships/ Composition – Unity & Harmony, Balance, Scale & Proportion, Contrast and Emphasis, and Rhythm. Exercises involving the same.

Lecture introduction into the discipline of interior design and the transformation from basic design to interior design - Placing Interiors (Building, Site, Orientation, Climate, City and Landscape); History & Precedent; Materials & Construction; Representation and Realization.

References:

1. The Fundamentals of Architecture (Fundamentals (Ava)) (Paperback) by Lorraine Farrelly (Author)
2. Francis D.K.Ching - Architecture - Form Space and Order Van Nostrand Reinhold Co.,
3. Design Methods (Architecture) (Paperback), by John Chris Jones (Author).
4. How Designers Think, Fourth Edition: The Design Process Demystified (Paperback) by Bryan Lawson.
5. Basics Design Ideas (Paperback) by Bert Bielefeld (Author), Sebastian El khouli (Author).
6. Graphic Thinking for Architects, Paul Laseau.
7. Design Drawing, Francis D. K. Ching.
8. The Nature of Design, Peg Faimon & John Weigand.
9. Foundations of Art and Design (Paperback) by Alan Pipes (Author)
10. John W.Mills - The Technique of Sculpture, B.T.Batsford Limited, New York - Reinhold Publishing Corporation, London, 1966.
11. C.Lawrence Bunchy - Acrylic for Sculpture and Design, 450, West 33rd Street, New York, N.Y.10001, 1972.
12. The Elements of Graphic Design: Space, Unity, Page Architecture, and Type (Paperback) by Alexander W. White (Author)
13. Geometry of Design: Studies in Proportion and Composition, Kimberly Elam.David Gibson

16IDS122	INTERIOR MATERIALS AND CONSTRUCTION I									SEMESTER-I
Marks	Internal	80	External				120	Total	200	Exam Hours	6
Instruction Hours/Week		L	2	T	0	P/S	5	Credits			4

COURSE OBJECTIVE:

- Understanding the basic components of the buildings that envelope a small buildings
- Understanding the different types in each element and different treatments for the same.
- Understanding function of each component of a building like foundation, walls, beams, column, and roofs.
- Understanding simple roof & floor finishes.
- To understand the primary basics of the loading in a structure and the distribution of the load
- To understand the composition and properties of the materials.

COURSE OUTCOME:

1. Students learn Interior construction details using naturally occurring building materials.
2. Student are taught to judge the structure before making any structural changes required in renovation.
3. Working format with for materials such as stone, bamboo, mud and lime through drawing as well as doing a literature or live case study.
4. Students are to submit drawing plates comprising of technical plan, elevation and section along with sketches and details showing method of construction.
5. Students will be honing the skills of technical drawings and their representations.
6. Students will be able to use this material knowledge during construction and can find best materials suited for apt activities.

Unit I

Overview of all building materials – Application of Materials in Construction – Traditional Materials – Modern Materials – Recent Developments in the Building Material Industry – Sample collection of building materials/brochures

Unit II

Stone: Classification of rocks - Building stones - their uses –physical properties - brief study of tests for stone – deterioration - preservation of stone - various stone finishes - cutting and polishing of granites.

Unit III

Mud as a building material - Soil stabilization, soil blocks - Cast- in-situ walls - flooring - roofing - plastering.

Bamboo, Casuarina, Coconut, palm, Hay, Coir, Jute – properties and uses.

Types of foundations - walls - simple roof trusses floors for rural structures

Lime – types - properties and uses – Manufacturing process – Mortar: functions – requirements - mixes.

Unit IV

Bricks - brief study on manufacture of bricks – properties and uses - suitability - types of bricks - uses in buildings, structural tiles, ceramics, terracotta – properties and uses.

Unit V

Functional requirements of a building and its components - Drawings of foundations, plinth, superstructure, roofing. Openings: Doors, Windows and Ventilators.

References:

1. Parker , Harry, 1957, Materials and Methods of Architectural Construction, John Wiley & Sons, London
2. S.C.Rangwala, Engineering Materials, Charotar Publishing House, Anand, 1997.
3. Understanding Buildings: A Multidisciplinary Approach (Paperback) by Esmond Reid
4. R.J.S.Spencke and D.J.Cook, Building Materials in Developing Countries, John Wiley and Sons, 1983.
5. HUDCO - All you want to know about soil stabilized mud blocks, HUDCO Pub., New Delhi, 1989.
6. UNO - Use of bamboo and reeds in construction - UNO Publications.
7. Rural Construction - NBO, New Delhi

16IDS123	**INTERIOR GRAPHICS I**							**SEMESTER-I**
Marks	**Internal**	**60**	**External**	**90**	**Total**	**150**	**Exam Hours**	**6**
Instruction Hours/Week	**L**	**1**	**T**	**0**	**P/S**	**5**	**Credits**	**3**

COURSE OBJECTIVE:

- To help students to learn &understand the techniques of various methods of drawing
- To make them understand the use of colors & their effects in drawings.
- To understand various geometrical shapes.
- To be able to scale geometry and understand the sizes.
- To understand sciography and its representation.
- To be able to improve different lettering.

COURSE OUTCOME:

1. Ability to construct the 3d views and perspective drawings of the Interiors
2. Understanding of advanced documentation and measured drawing techniques.
3. Ability to express design in all dimensions
4. Ability to improve drawing skills.
5. To be able to understand the various measurements of the drawings.
6. To be able to express and exhibit drawings to the best understanding for professional practice.

Unit I

Freehand drawing: Study of form and proportion - study of light and shade - Drawing of simple and natural elements

Unit II

Freehand drawing: Parts of building environment - exterior and interior views- landscape

Unit III

Measured Drawing: Simple objects to scale such as furniture, entrances, building elements and details of interior components

Unit IV

Orthographic Projection: Scales - construction of planes, curves, circles, tangents, regular polygons - projection of points, lines and planes

Unit V

Orthographic Projection: Projection of Solids, Frustums - Section of Solids - Interpenetration of solids and true shape of sections

References:

1. Paul Laseau, Freehand Sketching: An Introduction.
2. Robert S. Oliver,, The Complete Sketch, Van Nostrand Reinhold, New York, 1989.
3. Tokyo Musashino Academy of Art - Introduction to Pencil Drawing, Graphic - Shaw Publishing Co. Ltd., Japan, 1991.
4. Freehand Drawing for Architects and Interior Designers (Paperback) by Magali Delgado Yanes (Author), Ernest Redondo Dominguez (Author)
5. Alwyn Cranshaw, Learn to paint with Water colours, Acrylic colours, Boats and Harbours, Sketch, Still life, landscapes, William Collins Sons and Co. Ltd., London, 1981.
6. IH. Morris, Geometrical Drawing for Art Students - Orient Longman, Madras, 1982.
7. Francis D. K. Ching, Architectural Graphics, Van Nostrand Rein Hold Company, New York, 1964.
8. C. Leslie Martin, Architectural Graphics, The Macmillan Company, New York, 1964.
9. Architectural Drawing: A Visual Compendium of Types and Methods (3rd edition) by Rendow Yee

16IDT201	CONTEMPORARY INTERIORS							SEMESTER-II
Marks	Internal	40	External	60	Total	100	Exam Hours	3
Instruction Hours/Week	L	3	T	0	P/S	0	Credits	3

COURSE OBJECTIVE:

- To help the student understand the designs from the industrial age to the present information age.
- To know more on the Modern Movements in Interior design from the beginnings of 20^{th}century.
- To help students acquire knowledge of the current happenings and the classification of the importanceof a particular information.
- To be undertsnad and execute various styleslike modernism, post modernism, contemporary, etc,
- To be able to understand the concepts of minimalism, and international design style.
- To be able to design a particular style of the interiors based on these understandings.

COURSE OUTCOME:

1. An awareness of the spread and varied later directions of modern interiors across the world.
2. An understanding of interior production from the 2060s as driven by large scale changes across the world.
3. Familiarity with contemporary forces and directions in interiors across the world.
4. To be fore thought and to be able to design for the future with an understanding of the recent history.
5. To be able to appreciate and be a critic to all works of famous architects under each movement.
6. To understand different regions and its interior design style to be able to regain global cultures understanding.

Unit I EVOLUTION OF MODERN INTERIORS

Reasons for the evolution of Modern Interiors, origins-Neo Classicism. Industrial revolution and its impact – Emergence of new building typologies, New Materials and Technologies- steel, glass and concrete.

Unit II REVIEWING INDUSTRIALISATION

Arts & Crafts movement in Europe and America; Art nouveau, and the works of Horta, Guimard, Gaudi and Macintosh; Organic Architecture -Early works of F.L.Wright. Chicago school; Art deco.

Unit III EVOLUTION OF MODERNISM, POST MODERNISM AND CRITIQUE

Viennese secession, Adolph Loos and debates on ornamentation; Futurism, Expressionism works of Mendelssohn &Taut, Cubism, Constructivism, De stijl and their influence on Architecture. Bauhaus school & Walter gropius, Modernism and the International style, Brutalism, Deconstructivist.

Unit IV WESTERN INTERIOR ARCHITECTURE

Ideas and works of Richard Meier (Smith House, Connecticut and Getty Centre, Brent Wood, LosAngeles), Charles Moore (Architect's Own House at Orinda and Piazza d'Italia, New Orleans), Bernard Tschumi (Kyoto Railway Station Project and Parc de la Villete, Paris), Frank Gehry (AeroSpace Museum, Santa Monica and Guggenheim Museum, Bilbao), Norman Foster (Hong Kong Shanghai Bank and Renault Distribution Centre, Swindon, England).

Unit V WESTERN INTERIOR ARCHITECTURE

Zaha Hadid (The Peak Club, HongKong and IBA Housing Block 2, West Berlin), Daniel Leibskind(Jewish Museum, Berlin and World Trade Centre, New York), Rem Koolhas(Dance Theatre, The Hague and Netherlands Sports Museum), Santiago Calatrava (Lyon- Satolas Railway Station and Olympic Stadium at Athens), Renzo Piano (Pompidou Centre, Paris).

References:

1. Morgan, Ann Lee & Taylor Colin, 1987, Contemporary Architecture, 2nd Edition, St.James Press
2. Sarabjit Bahga. S, Modern Architecture in India,
3. Ar.Pramod Beri, 2009, Form follows feeling, Anjali Prakashan, New Delhi

<table>
<tr><td>16IDT202</td><td colspan="8">HUMAN VALUES</td><td colspan="3">SEMESTER-II</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="4">External</td><td>60</td><td>Total</td><td>100</td><td>Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="3">Credits</td><td>2</td></tr>
</table>

Unit I HUMAN VALUES

Self discipline, Concern for others, Empathy, Kindness, Valuing time, Self Esteem, Dignity, Caring and Sharing, Honesty, Cooperation and Commitment, Responsible citizenship,.

Unit II CHARACTER BUILDING

Self-awareness, Self-confidence, Courage, Team work, Adjustments, Accepting differences, Conflict resolution, Assertiveness, Critical thinking, Decision making, Emotional coping skills.

Unit III DILEMMA OF THE YOUTH

Peer pressure, Mobile Usage, Influence of media, Alcoholism, Smoking & Substance abuse, Road accidents, Suicidal tendency.

Unit IV HEALTH AND WELLNESS

Personal hygiene, Fitness and health: Components and benefits of fitness, Importance of yoga and meditation, Balanced nutritional diet.

Sex education: Infatuation, Healthy life style choices, Sexually Transmitted Diseases, HIV/AIDS awareness.

Unit V PSYCHO – SOCIAL INTERVENTION

Psychotherapy: Supportive therapy, re-educative and re-constructive

References:

1. Standard study material / as prescribed by the concerned course teacher

16IDP211	COMPUTER APPLICATIONS II						SEMESTER-II	
Marks	Internal	60	External	90	Total	150	Exam Hours	3
Instruction Hours/Week	L	1	T	0	P/S	4	Credits	3

COURSE OBJECTIVE:

- To make them digitally strong in the design related software.
- To make them understand and realize beautiful presentations.
- Understand #D nuances related to this subject.
- To represent ideas using technology and to be update in the use of softwares.
- To introduce to basic features of Artificial intelligence
- To Use software that are related to to BIM

COURSE OUTCOME:

1. Ability to express using digital tools in the realm of visual composition, drafting.
2. Ability to express using digital tools 3D visualization and rendering
3. To be able to represent ideas digitally for client understanding.
4. To understand the design in 3d to ensure the elimination of design flaws when translated from 2 d
5. To understand BIM and its overall structure.
6. To induce digital drawing reading and performing capacity.

Unit I

Command programming – modifying commands, selection sets, Zoom, accurate inputs.

Introduction to Layers, Texts and Scale. Suggested Software - AutoCAD

Unit II

Command programming - transparent overlays, hatching utilities, assigned color and line types.

Unit III

Use of multiline, style, block, symbols and libraries.

Unit IV

Advance exercise in 2D drafting of various complex building drawings, incorporating Linetypes and Linetypes Styles.

Unit V

XREFS, Tables, Modifying and creating Dimensions and customizing AutoCAD; Understanding concepts of Vport, concept of object linking, and editing session.

Suggested Software - AutoCAD

References

1. MS Office 2010 Product Guide by Microsoft
2. First Look Microsoft Office 2010, Katherine Murray, Microsoft
3. Sketchup 7 User Self help Tutorials and Video Tutorials
4. Cherly R. Shrock Beginning AUTOCAD. New Age International Publishers. New Delhi. 2006.
5. AutoCAD architectural users guide - Autodesk Inc., 1998.
6. AutoCAD 2011 User Manual, Autodesk 2011.

<table>
<tr><td>16IDP212</td><td colspan="9">ART AND CRAFT II</td><td colspan="2">SEMESTER-II</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="4">External</td><td>60</td><td>Total</td><td>100</td><td>Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>1</td><td>T</td><td>0</td><td>P/S</td><td>4</td><td colspan="3">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:

- To encourage a critical orientation to design thinking and action.
- To understand the word critical meaning that everything must be open to enquiry and alternative view point.
- By design thinking and action it means that the process if observation and study of natural and manmade objects and systems,
- Ideation, free exploration , and development of personal skills and attitudes.
- To bring a creative interactive movement of students that will mould the respective skill.
- Skill based learning with adept technology support for the same.

COURSE OUTCOME:

1. The students are exposed to various mediums, techniques and tools.
2. The students gain mastery in sketching, visualizing and expression through manual drawing.
3. Sensitized to culture, craft and context.
4. Skill Development in Handling Materials and in Making Products
5. To be updated to the art world and to hone a skill that precedes the student in an overall development.
6. To imbibe qualities of confidence and orator ship.

<u>Unit I to V</u>

Exploration in digital and physical media to convey specific theme and meaning. Analytical Studies of the built forms will be undertaken in three dimensions using various media.

Use of digital and hand tools and materials: working with wood, metals, plaster, plastic, foam boards etc; techniques, safety & practice. Suggestive exercises are:

Type 1: Making complex 3D models

Type 2: Applying advanced rendering techniques to the 3D models.

Type 3: Rendering techniques

References:

1. Design Methods (Architecture) (Paperback), by John Chris Jones (Author).
2. Basics Design Ideas (Paperback) by Bert Bielefeld (Author), Sebastian El khouli (Author).
3. Design Drawing, Francis D. K. Ching.
4. The Nature of Design, Peg Faimon & John Weigand.
5. Foundations of Art and Design (Paperback) by Alan Pipes (Author)
6. John W.Mills - The Technique of Sculpture, B.T.Batsford Limited, New York - Reinhold Publishing Corporation, London, 1966.
7. C.Lawrence Bunchy - Acrylic for Sculpture and Design, 450, West 33rd Street, New York, N.Y.10001, 1972.
8. The Elements of Graphic Design: Space, Unity, Page Architecture, and Type (Paperback) by Alexander W. White (Author)
9. Geometry of Design: Studies in Proportion and Composition, Kimberly Elam.David Gibson

16IDS221	INTERIOR DESIGN II										SEMESTER-II	
Marks	Internal	160	External				240	Total	400		Exam Hours	6
Instruction Hours/Week		L	2	T	0	P/S	10	Credits				7

COURSE OBJECTIVE:

- To develop an understanding of various degrees of enclosures and various types of relationship between spaces.
- Understanding of the various effects that could be created by manipulating the enclosing elements such as walls, roof etc.
- To understand the design proximity and relation of spaces.
- To understand the basic concepts for the size of the project.
- To develop understanding of the scale, function and options existing when• designing small-scale spaces in residences such as toilets, kitchens, living, bedrooms etc.
- Development of ideas with regard to false ceiling, wall paneling, flooring,• floor coverings, curtains, windows, doors and other elements of residential interiors.

COURSE OUTCOME:

1. An understanding of the qualities of different elements as well as their composite fusions.
2. An ability to engage and combine the elements of design in spontaneous as well as intentional ways in order to create desired qualities and effects.
3. Development of required skills – observation / analysis / abstractions / interpretation / representations / expressions through models and drawings.
4. To analyze the pre data of the concepts and to introduce design solutions using a creative approach.
5. To be able to describe an understanding that is both in representation and verbally present the same.
6. To update and to introduce various other methodologies to enhance the skill set.
7. The students shall understand the basic functional aspect of designing simple building type and its relevant spatial organization.
8. The students shall be learn to reciprocate and sensitize the design/concept to the environment and the design skill of the project

Unit I to V

Design Process: Evolution from Program and Conditions to Concept & Design - Graphical Representation of the Process. Design Strategies and Methods. Designing in Context; Design & Function; Constituents of Design; Working with materials and Structures; Arriving at Ideas.

Horizontal movement - single bay - passive energy type spaces. Design Exercises shall be simple functional units with universal access compliance such as: Toilet for a physically handicapped person. Hostel room, bed room, kitchen, Shop, Workshop, pavilions, snack bar.

Design problems involving simple space organization. Design Exercises shall be multiple spaces and understanding their inter-relationships, such as: Residence, petrol bunk, fire station, police station, Cottage for an elderly couple

The study of space standards and anthropometrics related to each problem. Anthropometry as related to physically handicapped and elderly persons is required to be studied. Different Techniques shall be used for presentation.

<u>*References:*</u>

1. The Fundamentals of Architecture (Fundamentals (Ava)) (Paperback) by Lorraine Farrelly (Author)
2. Francis D.K.Ching - Architecture - Form Space and Order Van Nostrand Reinhold Co.,
3. Design Methods (Architecture) (Paperback), by John Chris Jones (Author).
4. How Designers Think, Fourth Edition: The Design Process Demystified (Paperback) by Bryan Lawson.
5. Basics Design Ideas (Paperback) by Bert Bielefeld (Author), Sebastian El khouli (Author).
6. Graphic Thinking for Architects, Paul Laseau.
7. Design Drawing, Francis D. K. Ching.
8. The Nature of Design, Peg Faimon & John Weigand.
9. Foundations of Art and Design (Paperback) by Alan Pipes (Author)
10. John W.Mills - The Technique of Sculpture, B.T.Batsford Limited, New York - Reinhold Publishing Corporation, London, 1966.
11. C.Lawrence Bunchy - Acrylic for Sculpture and Design, 450, West 33rd Street, New York, N.Y.10001, 1972.
12. The Elements of Graphic Design: Space, Unity, Page Architecture, and Type (Paperback) by Alexander W. White (Author)
13. Geometry of Design: Studies in Proportion and Composition, Kimberly Elam.David Gibson

16IDS222	**INTERIOR MATERIALS AND CONSTRUCTION II**						**SEMESTER-II**	
Marks	**Internal**	**80**	**External**	**120**	**Total**	**200**	**Exam Hours**	**6**
Instruction Hours/Week	**L**	**1**	**T**	**0**	**P/S**	**6**	**Credits**	**4**

COURSE OBJECTIVE:

- Understanding the basic components of the buildings that envelope a small buildings
- Understanding the different types in each element and different treatments for the same.
- Understanding function of each component of a building like foundation, walls, beams, column, and roofs.
- Understanding simple roof & floor finishes.
- To understand the primary basics of the loading in a structure and the distribution of the load
- To understand the composition and properties of the materials.

COURSE OUTCOME:

1. Students learn Interior construction details using naturally occurring building materials.
2. Student are taught to judge the structure before making any structural changes required in renovation.
3. Working format with for materials such as stone, bamboo, mud and lime through drawing as well as doing a literature or live case study.
4. Students are to submit drawing plates comprising of technical plan, elevation and section along with sketches and details showing method of construction.
5. Students will be honing the skills of technical drawings and their representations.
6. Students will be able to use this material knowledge during construction and can find best materials suited for apt activitie

Unit I BRICKS AND CLAY PRODUCTS - CONSTRUCTION

Structural members in brickwork – Brick piers, footings, load bearing walls.

Reinforced brick masonry - Arches - Lintels – Corbels - copings.

Unit II BRICKS AND CLAY PRODUCTS - CONSTRUCTION

Hollow clay blocks - for walls - partitions - roofs.

Roofing - Flat Roofs - Terrace roofs - Sloping roofs.

Unit III TIMBER AND ALLIED PRODUCTS

Softwood and hardwood - Secondary timber - Physical properties and uses - Defects, Conversion, Seasoning, decay and preservation of timber - Fire retardent treatment, anti-termite treatment.

Industrial timbers - plywood, block board, particle board, fiber boards.

Manufacture and uses - current developments.

Unit IV TIMBER CONSTRUCTION – DOOR, WINDOWS AND PANELLING

Drawings of timber joinery for Windows, doors, ventilators. Timber partitions, paneling, false ceiling, fixed partitions, sliding, folding, top hung bottom rested false ceiling - wall paneling.

Unit V TIMBER CONSTRUCTION – STAIRCASE AND TRUSSES

Timber staircases - Designed staircase - timber trusses - Lean to - close couple - Kingpost - Queen post - Trusses. Timber floors - timber built-in furniture.

References:

1. Parker , Harry, 1957, Materials and Methods of Architectural Construction, John Wiley & Sons, London
2. S.C.Rangwala, Engineering Materials, Charotar Publishing House, Anand, 1997.
3. Understanding Buildings: A Multidisciplinary Approach (Paperback) by Esmond Reid
4. R.J.S.Spencke and D.J.Cook, Building Materials in Developing Countries, John Wiley and Sons, 1983. Don A.Watson, Construction Materials and Processes, McGraw Hill Co., 1972.
5. W.B.Mckay, 'Building Construction', Vol.1, 2, 3 Longmans, U.K. 1981.
6. Alanwerth, Materials, The Mitchell Pub. Co. Ltd., London, 1986.
7. R.Chudleu, 'Building Construction Handbook', British Library Cataloguing in Publication Data, London, 1990.

16IDS223	**INTERIOR GRAPHICS II**						**SEMESTER-II**	
Marks	**Internal**	**60**	**External**	**90**	**Total**	**150**	**Exam Hours**	**6**
Instruction Hours/Week	**L**	**1**	**T**	**0**	**P/S**	**4**	**Credits**	**3**

COURSE OBJECTIVE:

- To help students to learn &understand the techniques of various methods of drawing
- To make them understand the use of colors & their effects in drawings.
- To understand various geometrical shapes.
- To be able to scale geometry and understand the sizes.
- To understand sciography and its representation.
- To be able to improve different lettering.

COURSE OUTCOME:

1. Ability to construct the 3d views and perspective drawings of the Interiors
2. Understanding of advanced documentation and measured drawing techniques.
3. Ability to express design in all dimensions
4. Ability to improve drawing skills.
5. To be able to understand the various measurements of the drawings.
6. To be able to express and exhibit drawings to the best understanding for professional practice

Unit I MEASURED DRAWING

Measured drawing of simple objects (like furniture, entrance gates, etc.) and building components (like columns, cornice, door, window, etc.). Detailed measured drawing/documentation of simple monument or building.

Unit II PERSPECTIVE

Perspective projection concepts, Types of Perspective views, Picture plane, vanishing points , station point, horizon , cone of vision, line of vision ,etc. Perspective Projection of simple & complex geometrical forms. Two point perspective of simple objects, outdoor and indoor view of a building, etc. One point and three point perspective of interiors, Human Figures, Landscape elements and Vehicles in Perspective

Unit III SCIOGRAPHY

Principles of shades and shadows - Shadows of basic shapes and solids; Shadows of architectural elements, etc; Shadows of circular solids; Shadows of buildings, etc.

Unit IV RENDERING TECHNIQUES

Colour Pencils Rendering, Water Colour Rendering, Pen & Ink Rendering, Marker Rendering Techniques, Using Digital & Mixed Media Rendering Techniques, Free hand drawings

Unit V GRAPHICAL PRESENTATION

Visual representation of the design scheme – interior and exterior perspective views – shades and shadows – use of various rendering techniques.

References:

1. Francis Ching, Architectural Graphics, Van Nostrand and Reinhold Company, New York, 1975.
2. Edward J.Muller,Jemes G. Fauselt, Philip A. Graw Architecture Drawing and Light Construction Prentice hall Publishers Columbus. 1999.
3. Ernest Norling, Perspective drawing, Walter Fostor Art Books, California, 1986.
4. Bernard Alkins - 147, Architectural Rendering, Walter Foster Art Books, 1986.
5. Learn to paint with Water Colours, Acrylic colours, Boats and Harbours, Sketch, Still life, landscapes. Author: Alwyn Cranshaw, Publisher: William Collins Sons & Co. Ltd., London, 1981.
6. Architectural Rendering, A Technique of Contemporary Presentation, Author: Albert O. Halse, Publisher, Mc Graw Hill Book Company, New York, 1972.
7. Elisabetta Drudi, Figure Drawing for Fashion Design, The Pepin Press Singapore. 2001.
8. K.Venugopal, Engineering Drawing and Graphics + AutoCAD, New Age International Publishers, New Delhi,2007.
9. Kendra Schank Smith, Architects' Drawings, Architectural Press- An imprint Elservier Burlington 2006.

SEMESTER-3

<table>
<tr><td>16IDT301</td><td colspan="7">HISTORY OF INTERIOR DESIGN</td><td colspan="3">SEMESTER-III</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="4">External</td><td>60</td><td>Total</td><td>100</td><td>Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>3</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="3">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:

- To help the student understand the designs from Prehistoric Period to the Middle Ages.
- To know more on the Modern Movements in Interior design from the beginnings of 20^{th}century.
- To allow students to learn from the rich heritage the elements of aesthetic design.
- To understand the construction techniques of the ancient times.
- To understand the skilled labor and the presence of the same in the olden days.
- To understand the same scene in the contemporary era and its challenges to execute the same finesse.

COURSE OUTCOME:

1. An understanding about the spatial and stylistic qualities associated with architecture.
2. An Understanding of architecture as an outcome of various social, political and economic upheavals, and as a response to the cultural and context.
3. The individual will be exposed to the present to the ancient day's comparison in techniques..
4. To use the techniques of the ancient times and to overcome the challenges faced by the same.
5. To respect the wide heritage that can be offered with respect to the various Architecture eras.
6. An understanding of the influences of lifestyle and culture of the respective times.

Unit – I:

Elements of style and determinants of Interior environments in Egypt, Mesopotamia, Babylonia, Chinese, Japan, Greece, Rome and Europe in Early Christian, Romanesque, Gothic, Byzantine, Renaissance, Baroque and Rococo periods.

Unit – II:

An overview of Victorian, Elizabethan, art Nouveau arts and crafts, Cubism, surrealism, Romanticism etc. Forces of industrialization in Europe, changes in social structure, production systems, changes in technology and its impact on the life styles, arts and crafts and interior environments.

Unit – III:

Elements of style, interior environment, furniture etc in Jammu and Kashmir, Southern India, Gujarat, Rajasthan, Himachal Pradesh , states of North eastern India, Maharastra, Uttar Pradesh, Orissa etc.

Unit – IV:

History of modern movement in interior Design and architecture – developments of modern movements – various fields of design affecting interior ambiences directly – international modernism, regionalism and concerns with vernacular etc.

Unit – V:

Designers and their works with respect to interior architecture and interior elements of design. Contemporary expressions of styles and art forms.

References

John F. Pile, A history of interior design, 2nd edition, Laurence King Publishing, 2005.
Jeannie Ireland, History of Interior Design, air child publications, illustrated ed., 2009.
Elaine, Michael Dywer, Christopher Mackinnon, Norman A. J. Berisford Denby , A History of Interior Design, Rhodec International, 1983.
Giedion Sigfried, Space, Time and Architecture: The growth of a new tradition, 4th ed. Harvard University Press, Cambridge, 1962.
Tadgell Cristopher, The History of Architecture in India: From the dawn of civilization to the End of the Raj , Om Book Service, New Delhi, 1990.
Rowl Bejamin. Art and Architecture of India.

<table>
<tr><td>16IDT302</td><td colspan="8">SPACE PLANNING</td><td colspan="2">SEMESTER-III</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="3">External</td><td>60</td><td>Total</td><td>100</td><td>Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="2">Credits</td><td>2</td></tr>
</table>

COURSE OBJECTIVE:

- To develop an understanding of various degrees of enclosure, various types of relationship between spaces.
- Understanding of the various effects that could be created by manipulating the enclosing elements such as walls, roof etc.
- To understand design with relation to a human being with respect to size, shape, and color.
- To understand a human bodies and its various movements and to accommodate the same into design standards.
- To understand spatial parameters with respect to the function and implications inflicted regarding the same.
- To introduce a self to design methodology..

COURSE OUTCOME:

1. The students understand the relationship of human being with its environment and implement the study into design.
2. The students are taught to be able to design spaces based on patterns of circulation, proximity and levels of privacy zones.
3. The students understand the different postures and positions with dimensions of the human body and will be able to recognize activities and relate the need of human measurements in the design principles.
4. To bring a relation with design principles and the human being using the design principle.
5. To be able to create a project in direct relation to this subject and hence be able to apply theoretical knowledge into practical construction
6. To introduce the student to visual analyses and hence be practically well equipped.

<u>Unit –I</u>

Basic anthropometrics – average measurements of human body in different postures – its proportion and graphic representation, application in the design of simple household and furniture.

UNIT-II

Role of mannequins in defining spatial parameter of design. Basic human functions and their implications for spatial planning. Minimum and optimum areas for various functions. Preparing user profile, bubble and circulation diagrams.

<u>Unit –III</u>

Introduction to design methodology. Detailed study of spaces such as living, dining, bedrooms, kitchen, toilet etc. including the furniture layout, circulation, clearances, lighting and ventilation, etc. Case study of existing house and analysis of the spaces.

<u>Unit – IV</u>

Visual analysis of designed spaces noted for comfort and spatial quality; analysis of solid and void relations, positive and negative spaces.

UNIT-V

Integration of spaces and function in the design of bus shelter, milk booth, watchman's cabin, traffic police kiosk, flower stall, ATM center, etc.

Note: In the end exam, which is a viva-voce, the students have to present the entire semester's work for assessment.

References:

Karlen Mark, Space planning Basics, Van Nostrand Reinhold, New York, 1992.

Joseph D Chiara, Julius Panero, & Martin Zelnick, Time Saver standards for Interior Design & space planning, 2nd edition, Mc-Graw Hill professional, 2001.

Francis.D. Ching & Corky Bingelli, Interior Design Illustrared, 2nd edition, Wiley publishers, 2004.

Julius Panero & Martin Zelnick, Human Dimension & Interior Space : A source book of Design Reference standards, Watson – Guptill, 1979.

Karlen Mark, Kate Ruggeri & Peter Hahn, Space Planning Basics, Wiley publishers, 2003.

16IDT303	FUNDAMENTALS OF STRUCTURES									SEMESTER-III	
Marks	**Internal**	**40**	**External**				**60**	**Total**	**100**	**Exam Hours**	**3**
Instruction Hours/Week		**L**	**3**	**T**	**0**	**P/S**	**0**	**Credits**			**3**

COURSE OBJECTIVE:

- To get introduced to basic structural members in timber and steel.
- To give knowledge to design different timber components in a building.
- To enable an understanding of the types, efficiency and strength, advantages and disadvantages of rivet joints
- To enable an understanding of the types, efficiency and strength, advantages and disadvantages of welded joints
- To enable the design of tension (beams) and compression (columns) steel members in a building under different conditions.
- To Understand the concept of Structural system of Steel & Timber

COURSE OUTCOME:

1. Student will understand about Various Timber sections
2. Student will understand about the design timber beams and columns by applying the code provisions.
3. Student will understand about the Steel Sections and its usage.
4. Student will be able to design steel joints for maximum efficiency and strength.
5. Student will be able to design tension and compression members for different conditions by applying the
   code provisions.
6. Student will be able to design different types of laterally unsupported & supported beams for different conditions.

Unit – I:

Introduction to built elements – study of built elements in the interiors with respect to materials used. Basic construction methods and general specifications. General types and classification of different types of buildings: overview of different functional, structural and architectural elements.

Unit – II:

Introduction to basic structural systems, elements of structure, their functions and behavior, beams, slabs, columns, walls, foundations, bearing wall systems, trusses, rigid frames, linear and curved elements, : simply supported, cantilever and overhanging beams for various loads, : effect of simple geometric forms in the overall structural behavior.

Unit – III:

Primary and secondary forces acting on the structures – gravitational force, live load, wind, temperature variation, distribution of loads through the elements of the structural system.

Unit – IV:

Primary and secondary forces acting on the structures – gravitational force, live load, wind, temperature variation, distribution of loads through the elements of the structural system.

Unit – V:
Characteristic requirements of structural design – stress and strains, strength, stiffness and stability. Discussion on factors affecting them and the ways of satisfying these requirements. Study of behavior of structures through models and testing them for given loads.

Unit – VI:
Structural properties of basic materials like masonry, timber, concrete and steel etc. Light weight space structure, small and large scale surface structure, integrated display system and structural elements.

Unit – VII:
Structural systems and their layout for a small building. Structural systems for elements of interior spaces – false ceilings etc. Structural system for urban interior spaces – malls, fair grounds, exhibition spaces, etc.

References
Rowland J. Mainstone : Development of Structural Form
Rangwala : Engineering Materials
S.P.Bindra, S.P.Arora, Building Construction
B.C. Punmia : Strength of Materials vol - I

16IDP311	FURNITURE DESIGN										SEMESTER-III
Marks	**Internal**	**40**	**External**				**60**	**Total**	**100**	**Exam Hours**	**3**
Instruction Hours/Week		**L**	**0**	**T**	**0**	**P/S**	**6**	**Credits**			**3**

COURSE OBJECTIVE:

- To help the student understand day lighting and technology of artificial lighting.
- To equip the student to understand and successfully apply lighting techniques with color effects.
- To understand the various types of furniture's from history to the current date.
- To produce designs that will suit the function, location and the ergonomics.
- To understand different types of lighting ad to use apt luminaries and fixture.
- To make different styles of furniture both in modular and in customized.

COURSE OUTCOME:

1. Awareness of the role of light and color in design with respect to macro scale of sustainability and ecology as well as in the micro scale of shaping of outdoor environments.
2. Knowledge about the elements of light and color
3. Sensitivity towards evolution of different color combination and realization of color in different lighting.
4. To have to ability to understand the furniture in plans sections and elevation and to have ergonomic detail compliance in every format
5. To be able to make electrical drawings with apt representation and accommodating different types of lighting details.

To introduce the idea of detailing in a micro concept of furniture design and to be able to produce products suitable for comfort, function and aesthetics

<u>Unit – I</u>

Furniture categories, exploration of the idea of furniture, role of furniture in interior design, Design approaches in furniture design.

Assignment: Measured drawing of a piece of furniture – plan, elevation and drawings on full scale

<u>Unit – II</u>

Brief overview of the evolution of furniture from Ancient to present: Various stylistic transformations. Furniture designers and movements. Analysis of furniture in terms of human values, social conditions, technology and design criteria.

<u>Unit - III</u>

Functional and formal issues in design: study and evaluation of popular dictums such as "Form follows function", Form and function are one", "God is in Details" etc.

Evaluation of visual design: study of Gestalt theory of design – law of enclosure, law of proximity, law of continuity etc.

Human factors, engineering and ergonomic considerations: principles of universal design and their application in furniture design.

Unit – IV
An introduction of various manufacturing processes most frequently adopted in furniture design such as Injection Molding, investment casting, sheet metal work, die casting, blow- molding, vacuum - forming etc.

Unit – V
Seating Design: Different types of seating with a focus on the following –

- Functionality
- Aesthetics
- Style
- Human factors and ergonomics

The other component to be considered is the cost of the designed furniture piece.
Assignment: Design with wood, metal and combination of materials. Drawings, details and prototype making. Market survey of available products and economics of products.

Unit – VI
Storage systems: Functional analysis of storage systems and thereby deriving types of cabinets needed for interior spaces – kitchen cabinets, wardrobes closets, book cases, show cases , display systems etc.

Assignment: Exercise to design kitchen cabinets for a given kitchen.
Unit –VII
Modular approach to furniture design – various materials, combination of materials and its application – design parameters, ergonomics etc. Drawings and prototype. Survey of several modular systems available for different functions in the market. Exploration of wood, metal, glass, plastics, FRP as materials for system design. Cost criteria of furniture design.
Assignments : Typology of furniture with respect to the different states in India.
Design for middle and lower middle income groups- elements of living units, education institutes, health facilities, street elements etc.

References :

Joseph Aronson, The Encyclopedia of Furniture: Third Edition ,1961

Bradley Quinn, Mid-Century Modern: Interiors, Furniture, Design Details, Conran Octopus Interiors, 2006.

Jim Postell, Furniture Design, Wiley publishers, 2007.

Edward Lucie-Smith , Furniture: A Concise History (World of Art) , Thames and Hudson, 1985

Robbie. G. Blakemore, History of Interior Design and Furniture: From Ancient Egypt to Nineteenth-Century Europe, Wiley publishers, 2005.

John.F. Pile, Interior Design, 2nd edition, illustrated, H.N.Abrams, 1995.

<table>
<tr><td>16IDP312</td><td colspan="7">WORKSHOP (WOOD, CANE & BAMBOO)</td><td colspan="4">SEMESTER-III</td></tr>
<tr><td>Marks</td><td>Internal</td><td>60</td><td colspan="4">External</td><td>90</td><td>Total</td><td>150</td><td>Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>0</td><td>T</td><td>0</td><td>P/S</td><td>6</td><td colspan="3">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:

- To understand the basic methods of furniture making with focus on hands
- on methods regarding workshop practices in wood, metal, plastic, textiles etc.to understand the usage of various materials as required with its properties.
- To understand the usage of engineered wood against the solid wood.
- To understand the fixing details of multiple materials and its interaction with each other.
- To be introduced to alternate materials
- To relate the various capacities into creative pursuits of design.
- To understand and acquire knowledge in interior workshops for hands on experience in build and construct design processes.

COURSE OUTCOME:

1. Understanding the scale of drawing to life size
2. To use tools related to wood glass and alternative substitution to wood.
3. To understand properties and usage of materials henceforth.
4. To understand modular furniture through engineered wood.
5. To understand the various capacities of hardware for the various materials.
6. To understand wood joints and its usage in various circumstances.
7. To develop a keen eye for compositions through workshops.
8. To use all materials in coordination with other materials and create an understanding of multi material compositions.

Unit – I:

Types of wood –natural and artificial and its properties
Working with wood and wood products to understand material parameters. Wooden joinery and its strength. Wood polishes and other finishes – color and surface quality.

Unit – II:

Making of elements of various scales in the built form such as interior space making elements, furniture forms, various products, Art & Artifacts by using wood.

Unit – III:

Introduction to cane, bamboo, working with bamboo/cane and their products to understand material parameters. Bamboo and cane joinery and its strength. Polishes and other finishes

Unit – IV:

Understanding the material and tools by making objects which allow students to explore the forms, surfaces, textures and patterns. Explore different joinery, support conditions, and woven surfaces.

References

Carol Stangler, The crafts and art of Bamboo, Rev. updated edition, Lark books, 2009.
Dr Angelika Taschen, Bamboo style: Exteriors, Interiors, Details, illustrated edition, 2006.
Albert Jackson & David Day, The complete manual of wood working, knopf publishers, 1996.
Lonnie Bird, Jeff Jewitt, Thomas lie- Nielsen, Taunton's Complete Illustrated Guide to Woodworking, Taunton, 2005.
Peter Korn, Wood working Basics : Mastering the essentials of craftsmanship, Taunton , 2003.

16IDS321	INTERIOR DESIGN IV						SEMESTER-III	
Marks	**Internal**	**160**	**External**	**240**	**Total**	**400**	**Exam Hours**	**6**
Instruction Hours/Week	**L**	**2**	**T**	**0**	**P/S**	**10**	**Credits**	**7**

COURSE OBJECTIVE:

- To develop an understanding of various degrees of enclosures and various types of relationship between spaces.
- Understanding of the various effects that could be created by manipulating the enclosing elements such as walls, roof etc.
- To understand the design proximity and relation of spaces.
- To understand the basic concepts for the size of the project.
- To develop understanding of the scale, function and options existing when• designing small-scale spaces in residences such as toilets, kitchens, living, bedrooms etc.
- Development of ideas with regard to false ceiling, wall paneling, flooring,• floor coverings, curtains, windows, doors and other elements of residential interiors.

COURSE OUTCOME:

1. An understanding of the qualities of different elements as well as their composite fusions.
2. An ability to engage and combine the elements of design in spontaneous as well as intentional ways in order to create desired qualities and effects.
3. Development of required skills – observation / analysis / abstractions / interpretation / representations / expressions through models and drawings.
4. To analyze the pre data of the concepts and to introduce design solutions using a creative approach.
5. To be able to describe an understanding that is both in representation and verbally present the same.
6. To update and to introduce various other methodologies to enhance the skill set.
7. The students shall understand the basic functional aspect of designing simple building type and its relevant spatial organization.
8. The students shall be learn to reciprocate and sensitize the design/concept to the environment and the design skill of the project

The primary focus should be on –

Anthropometry

Design methodology

Conceptual exploration and representation.

Creativity

Scale/proportion

Documenting space

Graphic design (page layout and composition)

Concepts sketching

Application of design principles and elements

Portfolio development

The list of suggested topics to be covered as design problems:
Single room residence, Doctor"s clinic, kindergarten school, Architect"s studio, Small cafeteria, Bank extension counter, Departmental store, local police station, local post office, products used by architects in the studio, products for children in kindergarten etc.

Note: At least two major exercises and two minor design/time problems should be given.

In the end exam, which is a viva-voce the students have to present the entire semester work for assessment.

References

Karlen Mark, Space planning Basics, Van Nostrand Reinhold, New York, 1992.
Joseph D Chiara, Julius Panero, & Martin Zelnick, Time Saver standards for Interior Design & space planning, 2nd edition, Mc-Graw Hill professional, 2001.
Francis.D. Ching & Corky Bingelli, Interior Design Illustrared, 2nd edition, Wiley publishers, 2004.
Julius Panero & Martin Zelnick, Human Dimension & Interior Space : A source book of Design Reference standards, Watson – Guptill, 1979.
Maureen Mitton, Interior Design Visual Presentation: A Guide to Graphics, Models, and Presentation Techniques. John Wiley and Sons, 2003
Mark.W. Lin, Drawing and Designing with Confidence: A step-by-step guide, Wiley and Sons, 1993.
Robert Rengel, Shaping Interior Space, Fairchild Books & Visuals ,2002

16IDS322	ADVANCED MATERIALS AND APPLICATIONS										SEMESTER-III	
Marks	**Internal**	**80**	**External**				**120**	**Total**	**200**		**Exam Hours**	**6**
Instruction Hours/Week		**L**	**1**	**T**	**0**	**P/S**	**6**	**Credits**				**4**

COURSE OBJECTIVE:

- Understanding the basic components of the buildings that envelope a small buildings
- Understanding the different types in each element and different treatments for the same.
- Understanding function of each component of a building like foundation, walls, beams, column, and roofs.
- Understanding simple roof & floor finishes.
- To understand the primary basics of the loading in a structure and the distribution of the load
- To understand the composition and properties of the materials.
- To understand the various components of interior space as doors, windows, staircases.

COURSE OUTCOME:

1. Students learn Interior construction details using naturally occurring building materials.
2. Student are taught to judge the structure before making any structural changes required in renovation.
3. Working format with for materials such as stone, bamboo, mud and lime through drawing as well as doing a literature or live case study.
4. Students are to submit drawing plates comprising of technical plan, elevation and section along with sketches and details showing method of construction.
5. Students will be honing the skills of technical drawings and their representations.
6. Students will be able to use this material knowledge during construction and can find best materials suited for apt activities.
7. To inculcate in students and understanding of ideas in 3d and physical models

<u>Unit – I</u>

Roofing and Flooring – Roofing tiles and asbestos cement products, sheets and fiber boards – properties, uses and application. Various natural as well as artificial flooring materials like vitrified tiles, ceramic tiles, Shahabad stones, Mosaic, Rubber, Linoleum, PVC and PVA flooring. Properties, other uses and applications in the interiors.

<u>Unit -II</u>

Metals – Steel, iron, aluminum, bronze, brass, copper – alloys, characteristics, form and uses, properties, definition of terms, methods of working with metals, fixing and joinery in metals, finishing and treatment to metals. Application of metals to built form and interiors - special doors and windows, ventilators – sliding, sliding and folding, revolving, pivoted, rolling, collapsible, dormer, skylights, clerestory etc.

<u>Unit –III</u>

Fabrics and other furnishing materials – fibers, textiles, fabric treatments, carpets, durries, tapestries, Drapery, upholstery, wall coverings, etc. –properties, uses and application in the interiors.

<u>Unit – IV</u>

Miscellaneous materials such as cork, leather, paper, Rexene etc. – their properties, uses and applications in the interiors. A brief overview of Green materials.

References

Bindra, S.P. and Arora, S.P. Building Construction: Planning Techniques and methods of Construction, 19th ed. Dhanpat Rai Pub., New Delhi, 2000.

Moxley, R. Mitchell"s Elementary Building Construction, Technical Press Ltd. Rangwala, S.C. Building Construction 22nd ed. Charota Pub. House Anand, 2004.

Sushil Kumar. T.B. of Building Construction 19th ed. Standard Pub. Delhi, 2003.

Chowdary, K.P. Engineering Materials used in India, 7th ed. Oxford and IBH, New Delhi,1990.

Rangwala, S.C. Building Construction: Materials and types of Construction, 3rd ed. John Wiley and Sons, Inc., New York, 1963.

Francis D. Ching, Building Construction Illustrated, Wiley publishers, 2008.
S.K.Duggal, Building Materials, Illustrated, A.A.Balkema,1998.

SEMESTER-4

<table>
<tr><td>16IDT401</td><td colspan="10">ENVIRONMENTAL CONTROL - I</td><td colspan="2">SEMESTER-IV</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="4">External</td><td>60</td><td>Total</td><td>100</td><td colspan="2">Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>3</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="4">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To be introduced to a sustainable approach in the dwelling formats.
- To create an ardent respect for the depleting resources of the world.
- To understand the biodiversity and the impact of introducing building environments in the various bio diverse surroundings.

COURSE OUTCOME:

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. To apply sustainable approach that could be environmental friendly to reduce the carbon footprint.
5. To understand the changes in the ecosystems due to the intervention of the human race.
6. To understand and help in the global green revolution that is initiated to produce green environments for the future to come

Unit – I

Need to study acoustics, methods used for good acoustics. Basic theory: Generation, propagation, transmission, reception of sound: Frequency, wave length and velocity of sound, sound intensity, inverse square law, Decibel scale.

Unit –II

Human ear, Loudness perception, subjective effects, characteristics of sound in speech and music. Speech privacy and annoyance, background noise. Communication in open plans, electronic sound systems, loud speaker‟s layout.

Unit – III

Room acoustics: Behavior of sound in enclosed spaces. Ray-diagrams, sound paths, effect of geometry and shapes, sound absorption, sound absorption coefficients, Sabine‟s formula, reverberation and resonant panels.

Unit – IV

Acoustic Design process and different types of buildings – auditoriums, concert halls, cinema halls, seminar rooms, lecture halls, classroom and open offices.

Unit – V

Noise reduction, sound isolation, transmission loss. TL for walls, sound leaks in doors, noise reduction between rooms, construction details for noise reduction. Noise reduction and built form. Noise reduction from mechanical equipment. Rubber mounts, vibration isolation guidelines, characteristics of duct system, noise in AC ducts, vibration isolation of pumps and generators.

Unit- VI

Introduction – Lighting and vision, basic units, photometry and measurement. Effects of good lighting, considerations for good lighting, brightness, glare, contrast and diffusion. Economic issues of lighting.

Unit VII

Quality and quantity of different sources of light – daylight, incandescent, fluorescent, halogen, electric gas discharge high discharge, neon, cold cathode, mercury, sodium vapor etc. lighting levels, visual field. Survey of lamps available in the market with cost and technical specifications.

Unit VIII

Day light – advantages, admitting daylight, controlling daylight – multiple glazing, orientation, window treatments, potentials of day lighting as an energy resource.
Artificial lighting - color characteristics of artificial lighting, integration of day lighting with artificial lighting, lighting controls, intelligent building systems for lighting, switches, dimmers.

Unit IX

Planning lighting – general aims, lighting needs, calculation of lighting levels, intensity levels, energy and installation costs and other factors, selection of fixtures, location and placing of fixtures.

Unit X

Lamps and lighting fixtures – Floor, table and desk, wall mounted, ceiling units, built in lighting, miscellaneous types, decorative lighting, spot lighting, task lighting, underwater lighting etc.

Note: Detailed acoustic design and lighting should be done for any one type of building.

References

Poella . L. Leslie, Environmental Acoustics.

Moore J.E. , Design of good acoustics, The architectural press, London, 1961.

Burris, Harold, Acoustics for Architect.

Lord, Peter and Tempelton, Duncan, The Architecture of sound,. ; Designing places of Assembly , Architectural press ltd, London, 1986.

Egan David, Architectural acoustics, Mc-Graw Hill Book company, New york, 1988.

John.F. Pile, Interior Design, 2nd edition, illustrated, H.N.Abrams, 1995.

Wanda jankowski, Lighting : In Architecture and Interior Design, pbc intl, 1995.

Moore Fuller, Concepts and practice of Architectural Day lighting, Van Nostrand Reinhold co., New York, 1985.

David Egan. M. Concepts in Architectural lighting Mcgraw Hill Book company, New York, 1983.

16IDP411	ADVANCED COMPUTER APPLICATIONS							SEMESTER-IV
Marks	Internal	60	External	90	Total	150	Exam Hours	3
Instruction Hours/Week	L	1	T	0	P/S	4	Credits	3

COURSE OBJECTIVE:

- To make them digitally strong in the design related software.
- To make them understand and realize beautiful presentations.
- Understand #D nuances related to this subject.
- To represent ideas using technology and to be update in the use of softwares.
- To introduce to basic features of Artificial intelligence
- To Use software that are related to to BIM
- To help the student understand the technology of computer and its terminology.
- To enable the student to understand the applications of the software and graphic system.

COURSE OUTCOME:

1. Ability to express using digital tools in the realm of visual composition, drafting.
2. Ability to express using digital tools 3D visualization and rendering
3. To be able to represent ideas digitally for client understanding.
4. To understand the design in 3d to ensure the elimination of design flaws when translated from 2 d
5. To understand BIM and its overall structure.
6. To induce digital drawing reading and performing capacity.
7. Ability to express using digital tools in the realm of visual composition, drafting, 3D visualization and rendering

Unit – I

Starting AutoCAD: Introduction to the menu, starting drawings from scratch. Creating and using templates- starting drawings with setup wizards. Saving and closing a file.

Unit – II

Using co-ordinate systems – The UCS. Working with Cartesian and polar coordinate systems. Using displays with shortcuts.

Unit – III

Setting up the drawing environment – setting the paper size, setting units, grid limits, drawing limits, snap controls. Use of paper space and model space.

Unit – IV

Basic commands dealing with drawing properties: Layer control, change properties, line weight control, etc.

Unit – V

Inquiry methods: Using data base information for objects, calculating distance, angle, areas etc.

Unit – VI

Dimensioning commands and blocks: Dimensioning the objects in linear, angular fashions along with quick time dimensioning etc. Creating and working with blocks, creating symbols, use of blocks in creating a layout, of a residential area- one exercise to be done as lab assignment.

Unit – VII
Orientation towards 3D : 2D to 3D conversion, perspective view, walk through the layout.

Unit – VIII

3D-Max : Understanding 3D, theory behind 3D modeling. Preparing for construction of 3D models. Construction of 3D surface models- extrusion, wire frame, creation of a shell, elaborate surfaces.

Unit –IX
Solid modeling : concepts behind solid modeling, composite solids creation and modification, solids display and inquiry.

Unit – X
Rendering and presentation. Printing and plotting.

References
Teyapoovan. T., Engineering Drawing with Auto CAD 2000. Vikas Pub House Pvt Ltd, New Delhi, 2000.
Parker, Daniel and Rice, Habert. Inside Auto CAD Daniel, 1987.
Georgeomura, Auto CAD, Release 2000.
Oscar Riera Ojed , Lucast Guerre, Hyper realistic Computer Generated Architectural Renderings .
Giuliano Zampi Conway Lloyd Morgan, Virtual Architecture.

16IDP412	LIFESTYLE ACCESSORIES DESIGN									SEMESTER-IV	
Marks	**Internal**	**60**	**External**				**90**	**Total**	**150**	**Exam Hours**	**3**
Instruction Hours/Week		**L**	**1**	**T**	**0**	**P/S**	**4**	**Credits**			**3**

COURSE OBJECTIVE:

- To introduce students to all accessories that could be used in each and every space in design.
- To make students understand the need for aesthetics in design
- To use all above said materials in the most creative fashion that they could use.
- To help the student understand day lighting and technology of artificial lighting.
- To equip the student to understand and successfully apply lighting techniques with color effects.
- To be able to experiment new materials and to understand the properties of the materials.

COURSE OUTCOME:

1. Ability to decide the other factors of design which has no limitations and understand the importance of appropriate accessories to fill in the space as per design requirements.
2. Understanding the luxury element in interior design which leads to a picture perfect assimilation of items in design principles.
3. To understand the development and technology of the product and the procedure of manufacturing.
4. To be able to approach the design with the utmost importance to the function and the aesthetics to be incorporated.
5. To be able to physically make a product that faces all challenges laid for the execution and design of the same.
6. To be able to assess the working of the project and to be able to redesign with the errors o be minimized as much as possible.

Unit –I

Insight of various products and lifestyle accessories in the interiors. Role of accessories in interiors. Integration of accessories in interior design. Design approaches in product and lifestyle accessories design with a focus on functionality, ergonomics, aesthetics, multiple usages etc.

Unit – II

Stylistic development of decorative accessories from the past to present with insight into technological advances and the influences of social, economic and political factors on their design. Brief study of period room settings with the context of decorative accessories complementing the architecture and interior design.

Unit – III

Study of materials and processes adopted in accessories design. Basic understanding of construction principles, anthropometrics, principles of sizes and proportions, modeling, rapid prototyping, color, texture etc. with broad orientation to socio-cultural and historical context of the sector. Orientation to Indian as well as global context of interiors, trends and market.

Unit – IV

Design approach with limited constraints inherent in accessory products. Evolving the strategy of design with integration of technical complexities and lifestyle influences. Development of the design of products and accessories to specific interiors and prevailing trends. Broad based approach towards innovative design and application to multi products and multi materials in manufacturing interior products and lifestyle accessories.

Unit – V

A detailed study involving all the design aspects of any of the following lifestyle accessories: luminaire design, glassware, lighting, textiles, mirrors, clocks, wall coverings etc.

References

Laura Slack, What is product Design? Roto Vision publishers, 2006

Treena Crochet and David Vleck, Designer‟s Guide to Decorative Accessories, Prentice Hall, Ist edition, 2008.

Michael Ashby, Kara Johnson, Materials and Design: The Art and Science of material selection in product design, Butter Worth Heinemann, 1st edition, 2002.

International Design Yearbook, 1995: Furniture, Lighting, Tableware, Textiles and Products, Books Nippan, 1996.

Karl. T. Ulrich, Steven D. Eppinger, Product Design and Development, McGraw-Hill Education Singapore; 4th edition, 2007

William Lidwell, Kritina Holden, Jill Butler ,Universal principles of Design, Rockport publishers, 2003.

16IDP413	ESTIMATION AND COSTING							SEMESTER-IV
Marks	Internal	40	External	60	Total	100	Exam Hours	3
Instruction Hours/Week	L 0	T 0	P/S	6	Credits			3

COURSE OBJECTIVE:

- To equip the students to prepare the Estimate in order to fore see the cost of the work
- To implement an interior design project & also to monitor / control project cost.
- To be able to make specification of the materials used and hence regulate the cost to keep it in the budget specified by the client.
- To understand various finishes and its rates to be executed as per the budget and the designers choice.
- To be able to provide a rough estimate and a detailed estimate as in need of the project.
- To be able to learn to control the cost and time with respect to the project.

COURSE OUTCOME:

1. Ability to understand and write specification for the construction projects
2. Ability to do estimate of building interiors with various quantities
3. To be update about the latest materials available in the market ad to be able to substitute materials to attain cost goals.
4. To understand the various methods of estimation that can be made and to be able to use the same during the execution of the project.
5. To have the knowledge of the budget limits of the client and hence will be able to make suitable suggestions to the client.
6. To be able to alter the specification and to adjust the final cost though the changes

1. INTRODUCTION TO ESTIMATION

Types and purpose, approximate estimate, detail estimate of building, Bill of quantity format.

Quantity survey - Principle of measurement and billing, elementary billing and measurement of basic materials like brickwood, concrete, etc. Advance billing and measurement of structural and service item of work.

2. COST ESTIMATING

Function of cost planner, liaisons with consultant construction planning technique for efficienjt cost control or cost budgeting of a project.

Exercise in variation, cost adjustment and cost analysis norms and standard for building project. Relationship between specification with B.O.Q. on grounds of cost economics.

3. COST BUDGETTING

The business environment and its structure in practice details and information on taxation, depreciation, operation cost, economics of building plant and material handling.

4. FINANCE AND BUDGETTING

Financial control and management for building construction and maintenance investment - role of various financial agencies for building and land development. Financing of projects, economic feasibility report, valuation depreciation and its implication, and assessment of completed project.

5. SPECIFICATION

Detailed Specifications for all Civil & Architectural works for a Typical two-storeyed Residential Building

References

1. Dutta, Estimating and Costing, S.Dutta and Co., Lucknow
2. S.C.Rangwala, Elements of Estimating and Costing, Charoter Publishing House, India.
3. W.H.King and D.M.R.Esson, Specification and Quantities for Civil Engineers, The English University Press Ltd.
4. T.N.Building Practice, Vol.1, Civil, Govt. Publication.
5. P.W.D. Standard specifications, Govt. Publication.

<table>
<tr><td>16IDP421</td><td colspan="8">INTERIOR DESIGN IV</td><td colspan="3">SEMESTER-IV</td></tr>
<tr><td>Marks</td><td>Internal</td><td>160</td><td colspan="4">External</td><td>240</td><td>Total</td><td>400</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>10</td><td colspan="3">Credits</td><td>7</td></tr>
</table>

COURSE OBJECTIVE:S

COURSE OUTCOME:

1. Ability to collect, assimilate and integrate knowledge in a holistic manner.
2. Sensitivity towards the nature and values of unselfconscious and collective design as well as the interconnectedness of human society and environment
3. Ability to observe and analyze changes in the above.
4. Development of required skills – observation / analysis / abstractions / interpretation / representations / expressions through models and drawings.
5. To analyze the pre data of the concepts and to introduce design solutions using a creative approach.
6. To be able to describe an understanding that is both in representation and verbally present the same.
7. To update and to introduce various other methodologies to enhance the skill set.
8. The students shall understand the basic functional aspect of designing simple building type and its relevant spatial organization.
9. The students shall be learn to reciprocate and sensitize the design/concept to the environment and the design skill of the project

The primary focus should be on –

- space planning process (block diagram, concept statement)
- Furniture
- Historic style
- Structural integration
- Material selection
- Color
- Rendering
- Design Process/methodology
- Creativity /originality
- Documenting space (sketch and photo documentation)
- Anthropometry and ergonomics
- Graphic design (page layout and composition)
- Concepts sketching
- Application of design principles and elements
- Portfolio development

The list of suggested topics to be covered as design problems:

- Thematic space making with Art and craft forms of our own culture in India – East, West, North, Central and so on.
- Design of living units of various geographical locations and culture by involving historical periods, styles and use of craft in its inherent quality and form – craft and living environment.
- Applications of art / craft at public level spaces- lounge (hotel), restaurant of specific ethnic characteristics.
- Response to today‟s situation of urban society – For a given building create contemporary homes of modern society – needs, realities, value system etc.

Note: At least two major exercises and two minor design/time problems should be given.
In the end exam, which is a viva-voce the students have to present the entire semester work for assessment.

Reference Books:

Karlen Mark, Space planning Basics, Van Nostrand Reinhold, New York, 1992.

Joseph D Chiara, Julius Panero, & Martin Zelnick, Time Saver standards for Interior Design & space planning, 2nd edition, Mc-Graw Hill professional, 2001.

Francis.D. Ching & Corky Bingelli, Interior Design Illustrared, 2nd edition, Wiley publishers, 2004.

Julius Panero & Martin Zelnick, Human Dimension & Interior Space : A source book of Design Reference standards, Watson – Guptill, 1979.

Maureen Mitton, Interior Design Visual Presentation: A Guide to Graphics, Models, and Presentation Techniques. John Wiley and Sons, 2003

Mark.W. Lin, Drawing and Designing with Confidence: A step-by-step guide, Wiley and Sons, 1993.

Robert Rengel, Shaping Interior Space, Fairchild Books & Visuals ,2002

Neufert Ernest, Architect‟s Data, Granada pub. Ltd. London, 2000.

John F. Pile, A history of interior design, Laurence King Publishing, 2005.

Robin D. Jones, Interiors of Empire: Objects, Space and Identity within the Indian Subcontinent, Manchester University Press; illustrated edition, 2008

<table>
<tr><td>16IDP422</td><td colspan="6">INTEGRATED PROJECT WORK - I</td><td colspan="4">SEMESTER-IV</td></tr>
<tr><td>Marks</td><td>Internal</td><td>60</td><td colspan="3">External</td><td>90</td><td>Total</td><td>150</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>0</td><td>T</td><td>0</td><td>P/S</td><td>6</td><td colspan="2">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:

-
- The student has to exhibit the capacities of an interior design in full ideology and should be ready for the professional challenges in future.
- The project understanding in totality will be expected from each student.
- It will help understand the importance of each subject in the previous years and its applications

henceforth

- To understand the environmental impact assessment and to analyze the feasibility of the project in any given site.
- To check the feasibility of the project in the services.

COURSE OUTCOME:

1. Ability to integrate all the knowledge acquired so far and to exhibit the same through drawings and renderings.
2. Ability to integrate all aspects of the project to give a final report.
3. To be ready for large scale projects before the thesis.
4. To conduct research and to present the research with analysis of the feasibility of the project.
5. To understand the socio economic implication of the project in the given location.
6. To check the technical feasibility of eth project with parameters such as soil, water and other natural elements.
7. To assess the building for seismic zone and hence design according to the reading and understanding.

The student has to submit a project feasibility report on the project done in the design studio by integrating the knowledge and skills acquired from all the subjects studied till date.
The report may consist of the following –

- Environmental impact assessment of the project following the standards and specifications
- Socio-economic appraisal of the project and the design considering factors such as behavioral aspects, security considerations, costs for different user groups, aesthetic preferences etc.
- Technical feasibility – through execution and detailing of different spaces and elements of design, checking the feasibility of layout for service systems and specifications
- Costing of the project – bill of quantities, schedule of rates, specifications etc. economic viability and financial viability
- Space planning aspects/ issues – user activity spaces, access to physically challenged, fire safety, other services, green rating etc.

Note : The report has to presented for internal assessment

References

M.P. Birkett, An appraisal of project work as an educational tool within interior design education at tertiary level and its relation to professional practice, Royal College of Art, 1985.

Griff Boyle, Design Project Management, Ashgate Publishing; illustrated edition, 2003.

16IDES431A	ELECTIVE – I WORKSHOP (METAL)									SEMESTER-IV
Marks	Internal	60	External			90	Total	150	Exam Hours	6
Instruction Hours/Week		L	1	T	0	P/S	4	Credits		3

COURSE OBJECTIVE:

- To understand the basic methods of furniture making with focus on hands
- on methods regarding workshop practices in wood, metal, plastic, textiles etc.to understand the usage of various materials as required with its properties.
- To understand the usage of engineered wood against the solid wood.
- To understand the fixing details of multiple materials and its interaction with each other.
- To be introduced to alternate materials
- To relate the various capacities into creative pursuits of design. To understand the basic methods of furniture making with focus on hands on methods regarding workshop practices in metal
- To understand the joineries and also understand the properties in these materials. This will help them add new elements into their design which could be their own personal ideas.

COURSE OUTCOME:

1. Ability to understand and construct furniture to live size
2. understanding the scale of drawing to life size
3. To use tools related to wood glass and alternative substitution to wood.
4. To understand properties and usage of materials henceforth.
5. To understand modular furniture through engineered wood.
6. To understand the various capacities of hardware for the various materials.
7. To understand wood joints and its usage in various circumstances.
8. Ability to understand and construct furniture to live size understanding the scale of drawing to life size
9. To use tools related to metal and alternative substitution to metal and combination of wood, glass and metal.

Unit –I TO 5

Types of metals, properties of metals, definitions of terms with reference to properties and uses of metals, various methods of working with metals, fixing and joinery in metals, finishing and treatment of metals., finishes on metals. Standard specifications.

Metals in built form activity – horizontal, vertical and inclined surfaces – in interior environment elements- products and furniture forms- doors, windows, jalies, railing, stair etc. Metals and other materials – form and joinery.

Note: Learning should be by feel and working with metals to explore design.

References
John .F. Pile, Interior Design, Harry. N Abrams, Inc. New York . 1995.
Ron Fournier, Metal Fabricator‟s Handbook, Rev. Illustrated edition, HP Books, 1990.
Stanford Hohauser, Architectural and Interior models, Van Nostrand Reinhold, 1970.

16IDES431B	ELECTIVE – I WORKSHOP (WEAVING)	SEMESTER-IV

Marks	Internal	60	External			90	Total	150	Exam Hours	6
Instruction Hours/Week		L	1	T	0	P/S	4	Credits		3

COURSE OBJECTIVE:

- To understand the basic methods of furniture making with focus on hands
- on methods regarding workshop practices in wood, metal, plastic, textiles etc.to understand the usage of various materials as required with its properties.
- To understand the usage of engineered wood against the solid wood.
- To understand the fixing details of multiple materials and its interaction with each other.
- To be introduced to alternate materials
- To relate the various capacities into creative pursuits of design. To understand the basic methods of furniture making with focus on hands on methods regarding workshop practices in metal
- To understand the joineries and also understand the properties in these materials. This will help them add new elements into their design which could be their own personal ideas.

COURSE OUTCOME:

10. Ability to understand and construct furniture to live size
11. understanding the scale of drawing to life size
12. To use tools related to wood glass and alternative substitution to wood.
13. To understand properties and usage of materials henceforth.
14. To understand modular furniture through engineered wood.
15. To understand the various capacities of hardware for the various materials.
16. To understand wood joints and its usage in various circumstances.
17. Ability to understand and construct furniture to live size understanding the scale of drawing to life size
18. To use tools related to metal and alternative substitution to metal and combination of wood, glass and metal.

<u>Unit –I To 5</u>

Introduction to fibers and yarns, table loom and floor loom, preparing warp, setting up loom for weaving. Basic weaves and their variations.

Variation weaves and design quality, weaves as light controlling device, weaves and its quality for upholstery, curtains and floor coverings.

Rugs and durries – motifs design, patterns and color variations.

Note: Extensive market survey of available fabrics for interior spaces – product specifications and manufacturers

References
Liz Gibson, Weaving Made Easy: 17 Projects Using a Simple Loom (Paperback), Interweave press, 2008
Deoborah Chandler, Learning to weave, Revised edition, Interweave press, 2009.
Kirsten Glasbrook, Tapestry Weaving, Search Press, 2002.

SEMESTER-5

16IDT501	ENVIRONMENTAL CONTROL - II	SEMESTER-V

Marks	Internal	40	External			60	Total	100	Exam Hours	3
Instruction Hours/Week		L	3	T	0	P/S	0	Credits		3

COURSE OBJECTIVE:

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To be introduced to a sustainable approach in the dwelling formats.
- To create an ardent respect for the depleting resources of the world.
- To understand the biodiversity and the impact of introducing building environments in the various bio diverse surroundings.

COURSE OUTCOME:

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. To apply sustainable approach that could be environmental friendly to reduce the carbon footprint.
5. To understand the changes in the ecosystems due to the intervention of the human race.
6. To understand and help in the global green revolution that is initiated to produce green environments for the future to come

Unit – I

Introduction – Climate and built form interaction. Global climatic factors, elements of climate, impact and issues of climatic balance in traditional and contemporary built environments, issues of ecological balance, implications of climatic forces in nature of spaces and forms. Patterns of organization and elements of built form at individual building.

Unit – II

Thermal comfort and heat flow: Thermal comfort factors, physiological aspects. Body heat balance. Building climatological site analysis, application of comfort diagrams.

Unit-III

Introduction to basic thermal units, theory of heat flow, heat transmission, thermal properties of materials, human heat balance. Physiological comfort, outdoors and indoors, heat flow within buildings, steady state conditions and periodic flow, thermal performance of building elements.

Unit –IV

Sun and Design process – Solar charts, sun angles and shadow angles, orientation for sun, sun control, design of shading devices, radiation, glare.

Unit-V
Solar energy and its technical applications. Climate and material choices, color and texture choices for interior spaces.

References

Koeinsberger, O.H. and others, Manual of Tropical Housing and Building. Orient Longman, Chennai, 2003.
Konya Allan, Design for Hot Climates.
Kukreja. C.P. Tropical Architecture. Tata McGraw Hill Pub. Co. Ltd. New Delhi, 1978.
Markus, T.A and Morris. E.N. Buildings. Climate and Energy, Pitman Pub Ltd., London, 1980.
Olgay and Olgay, Solar Control and Shading Devices.

16IDT502	PROJECT MANAGEMENT											SEMESTER-V	
Marks	**Internal**	**40**	**External**				**60**	**Total**	**100**			**Exam Hours**	**3**
Instruction Hours/Week		**L**	**3**	**T**	**0**	**P/S**	**0**	**Credits**					**3**

COURSE OBJECTIVE:

- To introduce different management techniques suitable for planning and construction projects.
- To enable understanding of management systems for accomplishing the task efficiently in terms of quality, time and cost.
- To understand the elements of network and be able to take the project completion analysis.
- To understand various methods for the analysis and hence arrive at the management procedures.
- To handle and calculate risk in delays and hence suggesting corrections to beat time lag in projects.
- To update project in the process and be able to control manpower management.

COURSE OUTCOME:

1. Ability to understand a project from concept to commissioning, feasibility study & facility programme, design, construction to commissioning.
2. Ability to apply project management techniques in achieving objectives of a project like client needs, quality, time & cost.
3. An understanding of principles of management, construction scheduling, scope definition and team roles
4. To differentiate the management into time, labor, ad materials mainly apart from other contingencies.
5. To allocate various job works to different vendors and vendor management
6. To enable the smooth functioning of the project and to move towards completion in time.

1. INTRODUCTION TO PROJECT MANAGEMENT

Introduction to project Management concepts - background of management, purpose, goal and objectives, characteristics of projects and different aspects of management.

Traditional management system, Gantt's approach load chart, progress chart, bar chart merits and limitation. Schedule time, estimates units

2. PROJECT PROGRAMMING

Project programming, resources balancing, phasing of activities, programs, scheduling, project control, reviewing, updating and monitoring. Exposure to relevant software such as MS Project, Primavera, Introduction to modern management, concepts, uni-dimensional management techniques - Introduction to PERT and CPM introduction to network concepts, network elements and inter-relationships.

3. NETWORK TECHNIQUES

Network techniques, network logic - interrelationships, activity information, data sheets, development of network. CPM for management, CPM network analysis, identification of critical path float computation result sheets.

4. PERT NETWORK

PERT Network, introduction to the theory of probability and statistics, probabilistic time estimation for the activities of PERT network

5. PROJECT COST

Introduction to two dimensional network analysis, activity cost information. Cost time relationship, crashed estimates for the activities, compression potential, cost slope, utility, data sheet, project direct cost and indirect cost. Crashed programmes, network compression least cost solution least time solution, optimum time solution. Network techniques, PERT/CPM, generating alternative strategies using computers

References

1. Project management for design professionals By William Ramroth
2. Jerome D. Wiest and Ferdinand K. Levy, A Management Guide to PERT/CPM, Prentice Hall of Indian Pub.Ltd. New Delhi, 1982.

<table>
<tr><td>16IDS521</td><td colspan="9">INTERIOR DESIGN V</td><td colspan="2">SEMESTER-V</td></tr>
<tr><td>Marks</td><td>Internal</td><td>160</td><td colspan="4">External</td><td>240</td><td>Total</td><td>400</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>10</td><td colspan="3">Credits</td><td>7</td></tr>
</table>

- **COURSE OBJECTIVE:**S
  - To create understanding of human built environment as a holistic, living entity from macro to micro scales,
  - shaped by geographic and socio-cultural forces as well as by historic, political and economic factors, through study of and design within the context of rural settlements.
- To enable a comprehensive study of rural settlement and Interior design in order to understand them as exemplar of collective design that evolved through various parameters.
- To observe changes in the above, analyze their nature and causes for them

COURSE OUTCOME:

1. Ability to collect, assimilate and integrate knowledge in a holistic manner.
2. Sensitivity towards the nature and values of unselfconscious and collective design aswellas the interconnectedness of human society and environment
3. Ability to observe and analyze changes in the above.
4. Ability to project future transformations and give possible/ appropriate ways to address issues, if any
5. Ability to collect, assimilate and integrate knowledge in a holistic manner.
6. Sensitivity towards the nature and values of unselfconscious and collective design as well as the interconnectedness of human society and environment
7. Ability to observe and analyze changes in the above.
8. Development of required skills – observation / analysis / abstractions / interpretation / representations / expressions through models and drawings.
9. To analyze the pre data of the concepts and to introduce design solutions using a creative approach.
10. To be able to describe an understanding that is both in representation and verbally present the same.
11. To update and to introduce various other methodologies to enhance the skill set.
12. The students shall understand the basic functional aspect of designing simple building type and its relevant spatial organization.
13. The students shall be learn to reciprocate and sensitize the design/concept to the environment and the design skill of the project

The primary focus should be on –

- Introduction to building codes
- Way finding, Signage and graphics
- Universal Design
- Accessible design
- Design Disabled
- Materials, furniture and finish selections
- Introduction to construction detailing

- Ergonomics and Human Factors
- Digital representation (3 D modeling)
- Space planning process
- Color
- Interior environmental control issues
- Rendering

The list of suggested topics to be covered as design problems:

- Institutional spaces in urban, semi-urban and rural contexts with an aim to explore and understand transformation and adaptive re-use.
- Historic and abandoned sites provide scope for rejuvenation through multi dimensional programs covering functions like museums, cultural and resource centers, libraries, convention centers, exhibitions etc. that also aim in making a social contribution.
- Recreational spaces such as auditoriums, halls, cinema houses, stage design etc. Knowledge of audio visual communication, color and light interaction, sound control system, design of interior elements, products and furniture forms.

Design issues in addition to the primary focus for the above are statement of institution character through interior environment responses to site and context, integration of interior architectural elements to other interior elements, dialogue between the existing and the newly added insert, interpretation of institutional activities and their spatial correlation.

Note: At least two major exercises and two minor design/time problems should be given.
In the end exam, which is a viva-voce the students have to present the entire semester work for assessment.

References

Karlen Mark, Space planning Basics, Van Nostrand Reinhold, New York, 1992.

Joseph D Chiara, Julius Panero, & Martin Zelnick, Time Saver standards for Interior Design & space planning, 2nd edition, Mc-Graw Hill professional, 2001.

Francis.D. Ching & Corky Bingelli, Interior Design Illustrared, 2nd edition, Wiley publishers, 2004.

Julius Panero & Martin Zelnick, Human Dimension & Interior Space : A source book of Design Reference standards, Watson – Guptill, 1979.

Maureen Mitton, Interior Design Visual Presentation: A Guide to Graphics, Models, and Presentation Techniques. John Wiley and Sons, 2003

Mark.W. Lin, Drawing and Designing with Confidence: A step-by-step guide, Wiley and Sons, 1993.

Robert Rengel, Shaping Interior Space, Fairchild Books & Visuals, 2002

Neufert Ernest, Architect"s Data, Granada pub. Ltd. London, 2000.

Maryrose McGowan & Kelsey Kruse, Interior Graphic Standards, Wiley and sons, 2004.

Robert F. Erlandson, Universal and Accessible Design for Products, Services, and Processes, CRC; 1st edition, 2007.

Oliver Herwig & L. Bruce, Universal Design: Solutions for Barrier-free, Birkhäuser Basel; 1st edition, 2008

16IDS522	INTEGRATED PROJECT WORK - II									SEMESTER-V	
Marks	Internal	60	External				90	Total	150	Exam Hours	6
Instruction Hours/Week		L	0	T	0	P/S	6	Credits			3

COURSE OBJECTIVE:

-
- The student has to exhibit the capacities of an interior design in full ideology and should be ready for the professional challenges in future.
- The project understanding in totality will be expected from each student.
- It will help understand the importance of each subject in the previous years and its applications henceforth
- To understand the environmental impact assessment and to analyze the feasibility of the project in any given site.
- To check the feasibility of the project in the services.

COURSE OUTCOME:

1. Ability to integrate all the knowledge acquired so far and to exhibit the same through drawings and renderings.
2. Ability to integrate all aspects of the project to give a final report.
3. To be ready for large scale projects before the thesis.
4. To conduct research and to present the research with analysis of the feasibility of the project.
5. To understand the socio economic implication of the project in the given location.
6. To check the technical feasibility of eth project with parameters such as soil, water and other natural elements.

To assess the building for seismic zone and hence design according to the reading and understanding
The student has to submit a project feasibility report on the project done in the design studio by integrating the knowledge and skills acquired from all the subjects studied till date.
The report may consist of the following –

- Environmental impact assessment of the project following the standards and specifications
- Socio-economic appraisal of the project and the design considering factors such as behavioral aspects, security considerations, costs for different user groups, aesthetic preferences etc.
- Technical feasibility – through execution and detailing of different spaces and elements of design, checking the feasibility of layout for service systems and specifications
- Costing of the project – bill of quantities, schedule of rates, specifications etc. economic viability and financial viability
- Space planning aspects/ issues – user activity spaces, access to physically challenged, fire safety, other services, green rating etc.

Note: The report has to be presented for internal assessment

References

M.P. Birkett, An appraisal of project work as an educational tool within interior design education at tertiary level and its relation to professional practice, Royal College of Art, 1985.

Griff Boyle, Design Project Management, Ashgate Publishing; illustrated edition, 2003.

<table>
<tr><td colspan="2">16IDS523</td><td colspan="10">WORKING DRAWINGS AND DETAILS</td><td colspan="2">SEMESTER-V</td></tr>
<tr><td>Marks</td><td>Internal</td><td>80</td><td colspan="4">External</td><td>120</td><td>Total</td><td>200</td><td colspan="2">Exam Hours</td><td colspan="2">6</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>1</td><td>T</td><td>0</td><td>P/S</td><td>6</td><td colspan="4">Credits</td><td colspan="2">4</td></tr>
</table>

COURSE OBJECTIVE:

- Reading of working drawing, their co-relation and cross-referencing in various technical projections.
- To produce detailed measured drawings in plans, elevations, sections, detailing etc.
- To understand the various parameters involved in the detail drawing and to be able to produce the same.
- To incorporate all service drawings with respect to fire and safety, water supply and plumbing, electrical, acoustics and any such that will be accounted for.
- To be able to detail out each part into sub parts and to be able to provide construction execution details of the same.
- To be able to produce circulation patterns in the plan and to able to detail out the standards that are used in the design.

COURSE OUTCOME:

1. An understanding of all the aspects that go into the making of interiors through study of drawings related to construction.
2. Ability to resolve spatial concerns with technical aspects of a the interiors
3. Ability to design and detail components within a building interiors.
4. Ability to understand the structural components of the buildings and to be able to make changes only if necessary and hence impact studies to be carried out.
5. To understand designs in all parameters such as plans sections elevations and detailed drawings.
6. Joinery details to be detailed and produced as fit for construction.

<u>Unit – I</u>
Preparation of working drawings – Suitable scales of drawings, methods of giving dimensions and standards on plans, sections, elevations, details etc.

<u>Unit – II</u>
Preparation of plans – Architectural plans, furniture layout floor plans with clearances, different level floor plans, detailed floor plans of each room.

<u>Unit – III</u>
Elevations and Sections – Detailed sectional elevations of all the walls in the interior with al the required dimensions and specifications.

<u>Unit - IV</u>
Details of all services – layouts for flooring, ceiling, electrical, plumbing, lighting, fire fighting etc., toilet details, kitchen details, staircase details, furniture details, Interior finishing details, material, color and texture details,
Fixture and fixing and joinery details.

Unit – V

Specifications writing: Writing detailed clause by clause specifications for materials pre and post execution, tests, mode of measurements, manufacturers details and specifications etc.

Unit – VI

Manufacturer's specifications – Database of manufacturers specifications for the following materials based on surveys –
Glass, plywood and laminates, hardware, electrical, wiring, accessories, plumbing fitting and fixtures, flooring, cladding etc.,

Note : Students shall prepare at least two working drawing sets, one for a small residence and one for a large building.

References

Leibing. W. Ralph, Architectural Working Drawings, 4th edition, John wiley and sons, New York, 1999.

Macey. W. Frank, Specification in detail, 5th edition, Technical press ltd, London, 1955.

Shah, M.G.; and others, Building Drawing : An integrated approach to build environment, 3rd ed, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 1996.

Fredd Stitt, Working Drawing Manual, McGraw-Hill Professional; 1st edition, 1998.

Kilmer, Workind Drawings and Details for Interiors, John Wiley and Sons

<table>
<tr><td>16IDS524</td><td colspan="10">INTERIOR SERVICES</td><td colspan="2">SEMESTER-V</td></tr>
<tr><td>Marks</td><td>Internal</td><td>60</td><td colspan="4">External</td><td>90</td><td>Total</td><td>150</td><td colspan="2">Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>1</td><td>T</td><td>0</td><td>P/S</td><td>4</td><td colspan="4">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVE:

- To understand the need and application so fair conditioning, acoustics, electrification and mechanical services in buildings with exposure to various systems, methods and fixtures.
- To understand human comfort and to be able to produce environments for human comfort.
- To be able to understand various seasons and climatic zones in the world.
- To be able to produce sustainable interiors to ensure the conservation of natural resources.
- To be able to use natural sources of energy in design and to produce the effects desired both climatically and aesthetically.
- To understand the solar energy and its various uses.

COURSE OUTCOME:

1. An understanding of heat balance in human beings.
2. An understanding of the effect of sun and wind in the inside of buildings.
3. An understanding of material effects inside the buildings.
4. Ability to design buildings with interiors with respect to climate.
5. To be able to modify small building elements to improve the condition of a particular climate.
6. To appreciate various methods suited for natural heating and cooling in building systems

<u>Unit - I</u>

General idea of sources of water supply. Standards for quality of water. Domestic water systems, suction and storage tanks and their capacity. Pipes and their sizes and jointing. Consumption of water. Down take supply to various fittings. Types of fittings like taps, ball valves, hot water supply systems, bathtubs, showers, jets, cocks, valves etc. Faucets for kitchens, bathrooms and toilets. Check valves, foot valves, sump pump check valves etc.

<u>Unit – II</u>

Basic principles of sanitations and disposal of waste materials from buildings. Connection to outdoor drainage system, size requirements calculations, types of pipes available in the market. Water carriage systems, standard sanitary fittings, traps, pipes and their jointing. Flushing systems. Bathroom interior layouts, extensive market survey of products available, economies of products available, fixing of the products with other finishing materials.

<u>Unit – III</u>

Refuse, different forms of refuse garbage, house refuse – its collection, storage and transport, refuse chutes etc.

<u>Unit – IV</u>

Building wiring system. Service wires, metering distribution boards, circuits, MCB cutouts. Conductors, wiring methods, switch boards, electrical devices in the buildings, light and power circuits. Indian electricity rules, relevant provisions of NBC. Preparation of electrical layout scheme for a interior using standard electrical symbols.

<u>Unit – V</u>

Air conditioning, Mechanical ventilation – mechanical inlet and extraction systems. Functions of air conditioning. Principles of AC, capacity of AC, calculation of AC loads. Types of AC systems –

window AC, split, ductable, central AC and their details. Air distribution systems – ducts, air inlets. Noise control of AC.

Unit - VI

Fire – causes and spread of fire. Design considerations for fire safety, Devices for firefighting – portable, built in wet riser system, sprinkler system, fire hydrant. Class of fire and occupancy, study of fire regulations as per NBC. Services for multi storied buildings – lifts, escalators etc. – definition, location and arrangement.

Unit – VII

Vertical transportation systems – Introduction – lifts, escalators, definition, location, arrangement, structure, drives, traffic analysis, supervisory control, remote monitoring.

Unit – VIII

Security and safety systems – introduction, designing a security system – burglar alarm, CCTV, central alarm systems, intrusion sensors and space sensors. Other services – cable TV, PABX, computer labs – access flooring, server rooms.

Unit – IX

Intelligent buildings – introduction, definition, cost analysis, building environment, architecture and people, Information technology, communications & artificial intelligence in intelligent buildings. Design in computer age, engineering intelligence through nature.

Unit – X

Building automation and energy management – Introduction, History of development of BAS, typical BAS, criteria for choosing the right BAS, open system architecture.

References

Hussain S.K, T.B of water supply and sanitary engineering, 3rd ed, Oxford and IBH pub. Ltd., New Delhi, 1994

Kshirsagar, S. R, Water supply engineering, 6th ed, Roorkee publications, 1980.

Rangwala, S.C. water supply and Sanitary Engineering : Environmental Engineering, 19th ed, Charotar pub house, Anand, 2004.

Electrical wiring and contracting (vol. 1 to vol.4), London. The New era Publishing Company.

Dr Frith Abnwos and others, Electrical Engineering hand book.

William . J. Guinness, Mechanical and Electrical Systems for Buildings, New York : Mc Graw Hill.

Faber, Oscar and Kell, J.R. Heating and Air conditioning of Building. Architectural Press, surrey, 1945.

Prasad Manohar, Refrigeration and air-conditioning. 5th ed, New Age Intl. pub, New Delhi, 1996.

Derek Clements-Croome, Derek J. Croome, Intelligent buildings: Design, Management and Operation, Thomas Telford Books, London, 2004.

Albert Ting-pat So, Wai Lok Chan, Intelligent Building Systems, Kluwer Academic Publishers, 1999.

16IDES531A	ELECTIVE –II SIGNAGE AND GRAPHICS								SEMESTER-V
Marks	Internal	40	External			60	Total	100	Exam Hours	6
Instruction Hours/Week		L	0	T	0	P/S	4	Credits	2

COURSE OBJECTIVE:

- Knowledge about the various styles of signage manufactured in various materials is vital to an designer.
- Understanding the methods and techniques involved in signage and graphics.
- Understanding the signage location and using apt design and material is important.
- To understand the visibility factor and the importance of the signage.
- To be able to differentiate the various types of signage and to se it aptly in strategic locations.
- As a designer it is important to come up with unique and legible ideas for signage.

COURSE OUTCOME:

1. Ability to design products in signage using graphics.
2. Ability to understand the needs of the industry and give better products in design
3. Ability to experiment with different materials
4. Ability to provide proper lighting for the signage to be legible.
5. Ability to produce signage for large spaces and to be unique in design
6. To be able to understand the hardware system and to be integrated to the project in total

Unit – I

Introduction – environmental graphic Design, wayfinding, Need, importance etc.

Unit – II

Information content system – kinds of sign information, hierarchy of content, developing the sign information content, Navigation – message hierarchy and proximity, Other factors affecting sign information content, pictorial information content, signage master plans.

Unit – III

The Graphic system - Typography overview, choosing a typeface, typographic treatment, typographic considerations in signage for nonsighted and low sighted people, symbols and arrows, other graphic elements, color, layout, overview of signage graphic process.

Unit – IV

The hardware system – shape, connotations of form, sign mounting considerations, sign size considerations, sign lighting overview, sign materials overview, basic sign materials, electronic message displays, stock sign hardware systems, sign materials and codes, overview of coatings and finishes applied to signs.

Unit – V

Signage Design – Eyelevel, light, Fonts, typographical systems and type area, pictograms, arrows, color – contrast, language, systems, tones, Coding, privacy and protection, Room identification.

Unit – VI

Signage Planning – contract, obtaining information, preliminary design, design, construction, work plan and prototypes, tenders, specifications, on-site management, completion.

References

Joseph DeChiara, Julius Panero, and Martin Zelnik Time-Saver Standards for Interior Design and Space Planning, 2nd edition, Mc-Graw Hill Professional,2001.
Andreas Uebele, Signage Systems and Information Graphics , Thames and Hudson, 2007
Craig Berger, Wayfinding: Designing and Implementing Graphic Navigational Systems, Rotovision, 2009.
Chris Calori, Signage and Wayfinding Design: A Complete Guide to Creating Environmental Graphic Design Systems, Wiley and sons, 2007.
David Gibson, The Wayfinding Handbook: Information Design for Public Places, Princeton Architectural Press; 1st edition, 2009.
Rayan Abdullah and Roger Hubner, Pictograms, Icons and Signs, Thames and Hudson, illustrated edition, 2006.

16IDES531B	ELECTIVE –II PRODUCT DESIGN									SEMESTER-V	
Marks	Internal	40	External				60	Total	100	Exam Hours	6
Instruction Hours/Week		L	0	T	0	P/S	4	Credits			2

COURSE OBJECTIVE:

- Knowledge about the various styles of furniture manufactured in various materials is vital to a Designer.
- Understanding the methods and techniques involved in furniture and product design.
- To understand the importance of a digital product and then to create a digital product.
- The process involved in the design of a product to be understaood.
- To undertand the detilaing of the furniture and its feasibility for production
- To understand mass production techniques and the production line formation of the same.

COURSE OUTCOME:

1. Ability to design products
2. Ability to understand the needs of the industry and give better product design.
3. To understand the need and to be able to justify the product to be designed.
4. To follow design procedure and to understand the process to make a product.
5. To understand various materials and to execute the best possible material for a particular design.
6. To create a digital product and to be able to display the product details of the same

1. INTRODUCTION

An brief introduction to Product Designing – Various elements – History of Product Design – Definition of Product Design, understanding of Product Design - Purpose of Product Design – Role of Product Designers.

2. HUMAN FACTORS

Definition of human factors, Application of human factors data. Human activities, their nature and effects. Man-machine system and physical environment. Human performance and system reliability.

Information input and processing. Human control systems. Applied anthropometry – Human response to climate.

3. ASPECTS OF PRODUCT DESIGN

Visual, Auditory, Tactual, Olfactory human mechanisms, Physical space and arrangement. Visual display, process of seeing, visual discrimination, quantitative and qualitative visual display, Alphanumeric and related displays , Visual codes and symbols.

4. PRODUCT DESIGN

Form, Colour, Symbols, User specific criteria, Material, Technology and recyclability, Packaging. Multiple Utility oriented approach to Product Design.

5. DESIGN EXERCISES

Design of Household elements, tools and devices – Spoon/Cutlery.
Design of furniture – Chairs/Computer table, Kitchen racks, Cabinets etc.
Design of Industrial Product – Watch Dial, Gear Wheels, Automobile Headlights etc.
Element design for the physically and mentally different people.

References:
1. Time Saver Standards for Interior Design
2. Andrew Alpern, Handbook of Speciality Elements in Architecture, McGrawhill Co., USA, 1982.
3. Francis D.K.Ching, Interior Design Illustrated, VNR Publications, New York, 1987.
4. An invitation to Design, Helen Marie Evans.

16IDES531C	ELECTIVE –II SET DESIGN										SEMESTER-V	
Marks	Internal	40	External				60	Total	100	Exam Hours		6
Instruction Hours/Week		L	0	T	0	P/S	4	Credits				2

COURSE OBJECTIVE:

- Knowledge about the various styles of sets manufactured in various materials is vital to an designer for a foray into the film industry.
- Understanding the methods and techniques involved in set designs.
- To understand the defiance of temporary structures.
- To acquire knowledge of materials and construction techniques used in temporary structures.
- To understand the area and field specific for the film industry.
- To be able to design and imagine various backgrounds for the set design

COURSE OUTCOME:

1. Ability to design products and sets suitable to situations in concern
2. Ability to understand the needs of the industry and give better product in design
3. The student will be able to enter into the film industry in the foray of Design
4. The student will acquire knowledge various temporary structural methods.
5. To understand to set up stage and platforms for future
6. To understand history and security in the film industry and to be able to use the techniques already introduced
7. To understand theater sit up and the rolling screen design.

UNIT-1 FILM AND SOCIETY

Examination of the twentieth-century culture and society through film. Critical analysis of cultural and social conflicts are portrayed and worked out in popular films, and examination of how motion pictures create a window into modern society. Film as cultural texts to better understand history and culture manifestations.

UNIT-2 HISTORY AND THEATER FILM SET DESIGN

Investigation the production methods, dramatic theory and conventions, and scene design of various performance media since the popularization of the motion picture, and how it has influenced all entertainment design in the 20th and 21st centuries.

UNIT-3 GRAPHIC DESIGN AND TYPOGRAPHY FOR EXHIBIT DESIGN

Principles of layout for creating effective visual signage and explore the unique problems, technique, theory, and approaches of signage in film, theatre, and other forms of mediated exhibition. Introduction to the design applications for building signage.

UNIT-4 SET DESIGN AND CONCEPT WRAP

Introduction to the basic concepts, through theory and practice, of scene design in theatre, film, and other fine arts and entertainment media. Students will learn how to analyze scripts for proper scenery, how to conceptualize designs that will translate into actual sets, and develop visual thinking within the creative process.

UNIT-5 STAGE DESIGN

Stage design process from inception to performance, script analysis, visual arts analysis, research skills, and the application of principles and elements of design. Understanding stage setting through language, color, and architectural analysis.

References

1. Time saver standards for building types,DeChiara and Callender, Mc Graw hill company
2. Neufert Architect's data, Bousmaha Baiche & Nicholas Walliman, Blackwell science ltd

SEMESTER-6

<table>
<tr><td>16IDT601</td><td colspan="10">PROFESSIONAL PRACTICE</td><td colspan="2">SEMESTER-VI</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="4">External</td><td>60</td><td>Total</td><td>100</td><td colspan="2">Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>3</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="4">Credits</td><td>3</td></tr>
</table>

COURSE OBJECTIVES:

- To develop understanding of the duties and liabilities of an Interior designer
- To obtain knowledge of bye-laws that relate to the building & the environment in the Indian context.
- To learn and understand the Professional ethics and practice.
- To understand the code of conduct for interior Designers.
- To understand and undertake duties of an interior designer.
- To enable students to be ready for the professional world as practicing interior designers.

COURSE OUTCOME:

1. Ability to understand the professional standards
2. Ability to understand the tender documents and contract
3. Ability to understand and abide the duties of an interior designer.
4. Ability to understand and execute the code of conduct for an interior designer.
5. Ability to tender for Government projects and be able to estimate the cost of the same.

Ability to conduct various valuation for interior projects

Unit – I

Role of Interior Designer in society: Interior Design Profession as compared to other professions. Difference between profession and business. IIID and other organizations related to interior design profession.

Interior Designers approach to works, ways of getting works: types of works, works partly executed by other Interior Designers. : various precautions to be taken before taking up the work, conditions of engagement between interior Designer and client: commencement of work.

Unit – II

Issues of professional practice: Professional behavior, Ethics, Types of clients, Contracts, Tenders, Arbitration etc. as defined in terms of Interior Design field and current day context. Career opportunities, styles of interior design practice, relationship between client and professional, type of fees, process of fees negotiations, billing methods, tax liabilities, contracts – types of contracts – item rate, labour, lumpsum, cost plus percentage etc.

Unit – III

Interior Designer‟s duties : drawings to be prepared : Interior Designer‟s relation with other parties connected with works such as client, contractor, sub contractors, consultants and authorities.

UNIT IV

IIID Code of professional conduct: scale of charges: units and mode of measurements, clerk of work and his duties, inspection of work, certificate of payment to contractor, bill of quantities, schedule of rates, tenders, public, limited and negotiated tender documents and allied formalities.

Preliminary knowledge of Consumer protection Act and other related acts on Interior Designers.

Unit – V

Types of offices for interior design practice: staff structure, filing of records, correspondence and drawings, maintenance of accounts, presentations in meetings, recording minutes of meeting.
Note : a report to be prepared by each student after visiting an interior designer"s office.
Knowledge of role of consultants and coordination between different consultants on a big project.

References

Indian Institute of Architects. H.B. Professional Practice , The Architects pub. Bombay.
Namavati. H. Roshan. Professional Practice. 8th ed, Lakshani Book Depot, Bombay, 2001.
Christine .M. Piotrowski , Professional practice for Interior Designers, 3rd edition, Wiley and sons, 2001.
Cindy Coleman,Interior Design Handbook practice, Mc Graw Hill professional, ist ed, 2001
Ronald Veitch, Professional practice for Interior Designers, Peguis Publishers, Limited, 1987.

16IDT602	INTERIOR LANDSCAPE										SEMESTER-VI	
Marks	Internal	40	External				60	Total	100	Exam Hours		3
Instruction Hours/Week		L	3	T	0	P/S	0	Credits				3

COURSE OBJECTIVE:

- To develop an understanding about the design of interior landscape
- To give special emphasis on the choice and care of plant materials used in the interior spaces.
- To study about the various landscaping elements and their application in interior spaces.
- To develop and understanding between outdoor and indoor landscape areas.]
- To have apt knowledge of the regional or vernacular plantation to use in particular regions and climates.
- To understand the various features using natural and manmade elements in landscape detailing.

COURSE OUTCOME:

1. Awareness of the role of landscape design with respect to macro scale of sustainability and ecology as well as in the micro scale of shaping of outdoor environments.
2. Knowledge about the elements of landscape design and their scope.
3. Sensitivity towards evolution of different garden and landscape design across time and context.
4. An understanding of landscape design with respect to site planning and different functional typologies of spaces
5. To use landscape according to the region, climate location and other detail.
6. To understand and provide physical requirements for plants to keep it in the living condition and maintenance of the same.

<u>Unit – I</u>

Introduction to landscape architecture. And role of landscaping design in the built environment. Types of natural elements – stones, rocks, pebbles, water forms, plants and vegetation. Elements of interior landscape.

<u>Unit – II</u>

Introduction to study of plants in relation to landscape design and interiors. Types of indoor plants, plant characteristics: i.e., biology, soil, moisture, light nutrient, atmospheric conditions, growing medium, pests & diseases. Botanical nomenclature, anatomy and physiology of plant growth. Indoor plants in Indian context. Market survey and costs.

<u>Unit – III</u>

Design with plants – Basic principles of designs. The physical attribute of plants and relation to design. Appearance, functional and visual effects of plants in landscape design and built environment. Selection and management of plant material in relation to the built environment. Design concepts related to use of sculpture , lightings, garden furniture , architectural feature and grouping them into meaningful composition s for visual and functional effects.

<u>Unit – IV</u>

Landscaping design parameters for various types of built forms- indoor and outdoor linkage to spaces. Landscaping of courtyards- residential and commercial forms. Indoor plants and their visual characteristics- color, texture, foliage.

Unit-V

Science of maintaining and growing greenery. Flowers- its colors, texture and its visual perception in various indoor spaces and science of flower arrangement. Automatic irrigation costing and installation of micro irrigation systems.

References

Laurie, Michael, An Introduction to Landscape. 2nd edition, Prentice Hall, New Jersey, 1986.
Trivedi. P.Prathiba. Beautiful Shrubs. Indian council of Agricultural Research. New Delhi, 1990.
Hacheat, Blan. Plant Design.
Gerald Robert Vizenor , A Guide to Interior Landscapes, Univ of Minnesota Press, 1990.
Nelson Hammer and Mel Green, Interior Landscape Design, Mc Graw Hill, 1991.

16IDP611	PSYCHOLOGY OF SPACE AND BEHAVIORAL SCIENCE									SEMESTER-VI
Marks	Internal	60	External			90	Total	150	Exam Hours	3
Instruction Hours/Week		L	1	T	0	P/S	4	Credits		3

COURSE OBJECTIVE:

- To Explain the role Wilhelm Wundt played in the development of psychology.
- To Understand the lack of ethnic and gender diversity in early psychology.
- To Explain the steps in the scientific method
- To Explore how the left and right hemisphere influence brain functioning.
- To Explain the difference between a psychiatrist and psychologist.
- To Examine the legal and ethical issues posed in the treatment of psychological disorders.

COURSE OUTCOME

1. Demonstrate an understanding of psychological theory regarding the relationship between physiology, cognition, and emotion.
2. Identify the lobes of the cortex and their major functions.
3. Differentiate between several measures of brain activity used in biopsychological research.
4. Identify the underlying causes of neurological and mental disorders.
5. Describe the action potential.
6. Describe how communication takes place between neurons.

Unit – I

Perception of space through understanding associative aspects relating to space. Understanding cognitive theories and Gestalt principles of psychology related in the field of space making to develop an understanding of place making.

Unit – II

Relationship of spatial elements like floor, column, wall, window, door, stair, roof, light, color, textures to the psychology and perception of space.

Unit – III

Kinesthetic – Understanding perception while in movement and space organization around such a phenomena.

Unit – IV

Analysis of human mind and his/her image of the world - social behavior patterns, traditional thinking and behavior and reflection of social world into physical environment.

Unit – V

Human being and his behavior in various public and private areas – change of patterns in various cultures. Human behavior in a group. Activities and its relationship with grouping of people
Assignment : Space planning for public areas- restaurant, café, theatre lounge, waiting rooms, hotel foyer etc based on analysis of human behavior and perception of space.

References
Bryan Lawson, Language of Space, Architectural Press, 2001.
Yi- Fu Tuan, Steven Hoelscher, Space and Place : The perspective of experience, University of Minnesota Press, 2001.
Setha . M. Low, Denise Lawrence – Zunigias, Anthropology of Space and place : Locating Culture, Wiley – Blackwell publishers, 2003.
Irwin Altman & Erwin . H. Zube, Public spaces and places, (Human Behavior and environment), Springer link, 1989.
Roger Downs, David Stea, Kenneth . E. Boulding, Image and environment, Transaction Publishers, 2005.

<table>
<tr><td colspan="2">16IDP612</td><td colspan="8">WORKSHOP (PRINTING AND TEXTILES)</td><td colspan="3">SEMESTER-VI</td></tr>
<tr><td>Marks</td><td>Internal</td><td>80</td><td colspan="4">External</td><td>120</td><td>Total</td><td>200</td><td colspan="2">Exam Hours</td><td>3</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>1</td><td>T</td><td>0</td><td>P/S</td><td>6</td><td colspan="4">Credits</td><td>4</td></tr>
</table>

COURSE OBJECTIVE:

- To understand the basic methods of furniture making with focus on hands
- on methods regarding workshop practices in wood, metal, plastic, textiles etc.to understand the usage of various materials as required with its properties.
- To understand the usage of engineered wood against the solid wood.
- To understand the fixing details of multiple materials and its interaction with each other.
- To be introduced to alternate materials
- To relate the various capacities into creative pursuits of design.
- To understand and acquire knowledge in interior workshops for hands on experience in build and construct design processes.

COURSE OUTCOME:

1. Understanding the scale of drawing to life size
2. To use tools related to wood glass and alternative substitution to wood.
3. To understand properties and usage of materials henceforth.
4. To understand modular furniture through engineered wood.
5. To understand the various capacities of hardware for the various materials.
6. To understand wood joints and its usage in various circumstances.
7. To develop a keen eye for compositions through workshops.
8. To use all materials in coordination with other materials and create an understanding of multi material compositions.

Unit – I

Development of textile design in different cultures from primitive art to contemporary designs. Criteria of design of the elements and principles of textile design. Analysis of a motif, developing repeat as a basic unit of design in textile printing.

Unit – II

Block printing – developing block, understanding the material used, colors, types and their mixing process, various color printing.

Unit – III

Screen printing – design evolution for wall hangings, preparing screen and understanding the technique, printing on paper and printing on fabric.

References

June Fish, Designing and printing textiles, Crowood press, 2005
R.W.Lee, Printing on Textiles by Direct and Transfer Techniques, Noyes Data Corporation, 1981
Fabrics: A guide for architects and Interior Designers, Marypaul Yates, Norton publishers, 2002.
Materials for Interior Environments, Corky Bingelli, John wiley and sons, 2007

16IDP613	SEMINAR										SEMESTER-VI
Marks	Internal	40	External				60	Total	100	Exam Hours	3
Instruction Hours/Week		L	0	T	0	P/S	4	Credits			2

Some of the possible topics are –

- History of Interior design
- Theory of Interior space
- Interior Design language of various cultures
- Art and craft form and its relevance in interior spaces.
- Mass production of various interior elements
- Material techniques search to evolve alternatives
- Graphics and space transformation
- Color and light interaction to change space
- Eco friendly furniture
- User participation in Design
- Relation of an interior designer with other consultants.

Note: Each student is required to select one of the above topics and present a written paper and a seminar. This should be based on literature reviews, case studies, interviews, market surveys, if applicable.

16IDS621	**INTERIOR DESIGN VI**							**SEMESTER-VI**
Marks	**Internal**	**160**	**External**	**240**	**Total**	**400**	**Exam Hours**	**6**
Instruction Hours/Week	**L**	**2**	**T**	**0**	**P/S**	**10**	**Credits**	**7**

- **COURSE OBJECTIVE:**To create understanding of human built environment as a holistic, living entity from macro to micro scales,
- shaped by geographic and socio-cultural forces as well as by historic, political and economic factors, through study of and design within the context of rural settlements.
- To enable a comprehensive study of rural settlement and Interior design in order to understand them as exemplar of collective design that evolved through various parameters.
- To observe changes in the above, analyze their nature and causes for them
- Understanding a Design Programme and the Components of the Design Problem.
- To introduce buildings as consumers of resources for human needs and to enable responsible, creative addressing of this fact through design choices.
- To enable an understanding of interior design as integrating diverse functional concerns in a building through analysis and innovation.

COURSE OUTCOME:

1. Ability to collect, assimilate and integrate knowledge in a holistic manner.
2. Sensitivity towards the nature and values of unselfconscious and collective design aswellas the interconnectedness of human society and environment
3. Ability to observe and analyze changes in the above.
4. Ability to project future transformations and give possible/ appropriate ways to address issues, if any
5. Ability to collect, assimilate and integrate knowledge in a holistic manner.
6. Sensitivity towards the nature and values of unselfconscious and collective design as well as the interconnectedness of human society and environment.
7. Understanding a Design Programme and the Components of the Design Problem.
8. To introduce buildings as consumers of resources for human needs and to enable responsible, creative addressing of this fact through design choices.
9. To enable an understanding of interior design as integrating diverse functional concerns in a building through analysis and innovation.
10. Ability to critically understand and address issue of resources.
11. Ability to balance diverse aspects/concerns of buildings by making informed choices and innovative design in the context of buildings with intense or complex programmes.
12. Ability to apply knowledge intensively in realms such as sustainable built environment, services

The primary focus should be on –

- Interior Construction Detailing
- Way finding/signage and graphic identification
- Decorative Accessories
- Building Codes.
- Rendering (hand and computer generated).
- Custom designed furniture and cabinetry

- Specification Writing
- Cost estimating
- Selection of sustainable/green materials

The list of suggested topics to be covered as design problems:

- Hospitality Design, Retail Design, Healthcare Design and Office systems
- Urban Interiors – Shopping malls, streets, Town squares, Fair grounds
- Interior Ports – air ports, Bus stops, Railway stations, boats/ports
- Exhibition displays – urban level and National level.
- Mobile units – buses, cars, railway coaches etc.

Note: One major design in detail and two minor design/time problems should be given.

References

Karlen Mark, Space planning Basics, Van Nostrand Reinhold, New York, 1992.

Joseph D Chiara, Julius Panero, & Martin Zelnick, Time Saver standards for Interior Design & space planning, 2nd edition, Mc-Graw Hill professional, 2001.

Francis.D. Ching & Corky Bingelli, Interior Design Illustrared, 2nd edition, Wiley publishers, 2004.

Julius Panero & Martin Zelnick, Human Dimension & Interior Space : A source book of Design Reference standards, Watson – Guptill, 1979.

Maureen Mitton, Interior Design Visual Presentation: A Guide to Graphics, Models, and Presentation Techniques. John Wiley and Sons, 2003

Mark.W. Lin, Drawing and Designing with Confidence: A step-by-step guide, Wiley and Sons, 1993.

Robert Rengel, Shaping Interior Space, Fairchild Books & Visuals, 2002

Neufert Ernest, Architect"s Data, Granada pub. Ltd. London, 2000.

Maryrose McGowan & Kelsey Kruse, Interior Graphic Standards, Wiley and sons, 2004.

Mary Jo Peterson, Universal Kitchen and Bathroom Planning: Design That Adapts to People, McGraw-Hill Professional Publishing, 1998.

David Kent Ballast, Interior Construction & Detailing for Designers and Architects, Professional Publications, Inc.; Fourth Edition, 2007.

16IDS622	INTEGRATED PROJECT WORK - III						SEMESTER-VI	
Marks	Internal	60	External	90	Total	150	Exam Hours	6
Instruction Hours/Week	L	0	T	0	P/S	6	Credits	3

COURSE OBJECTIVE:

-
- The student has to exhibit the capacities of an interior design in full ideology and should be ready for the professional challenges in future.
- The project understanding in totality will be expected from each student.
- It will help understand the importance of each subject in the previous years and its applications henceforth
- To understand the environmental impact assessment and to analyze the feasibility of the project in any given site.
- To check the feasibility of the project in the services.

COURSE OUTCOME:

1. Ability to integrate all the knowledge acquired so far and to exhibit the same through drawings and renderings.
2. Ability to integrate all aspects of the project to give a final report.
3. To be ready for large scale projects before the thesis.
4. To conduct research and to present the research with analysis of the feasibility of the project.
5. To understand the socio economic implication of the project in the given location.
6. To check the technical feasibility of eth project with parameters such as soil, water and other natural elements.
7. To assess the building for seismic zone and hence design according to the reading and understanding.

The student has to submit a project feasibility report on the project done in the design studio by integrating the knowledge and skills acquired from all the subjects studied till date.

The report may consist of the following -

- Environmental impact assessment of the project following the standards and specifications
- Socio-economic appraisal of the project and the design considering factors such as behavioral aspects, security considerations, costs for different user groups, aesthetic preferences etc.
- Technical feasibility – through execution and detailing of different spaces and elements of design, checking the feasibility of layout for service systems and specifications
- Costing of the project – bill of quantities, schedule of rates, specifications etc. economic viability and financial viability
- Space planning aspects/ issues – user activity spaces, access to physically challenged, fire safety, other services, green rating etc.

Note : The report has to presented for internal assessment

References

M.P. Birkett, An appraisal of project work as an educational tool within interior design education at tertiary level and its relation to professional practice, Royal College of Art, 1985.
Griff Boyle, Design Project Management, Ashgate Publishing; illustrated edition, 2003.

SEMESTER-7

<table>
<tr><td>16IDP711</td><td colspan="8">PRACTICAL TRAINING</td><td colspan="3">SEMESTER-VII</td></tr>
<tr><td>Marks</td><td>Internal</td><td>400</td><td colspan="4">External</td><td>600</td><td>Total</td><td>1000</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>0</td><td>T</td><td>0</td><td>P/S</td><td>0</td><td colspan="3">Credits</td><td>15</td></tr>
</table>

COURSE OBJECTIVE:

- To introduce the challenges of interior design practice.
- To enable overall understanding of different stages in real life interior design projects in practice.
- To create involvement in these stages as much as possible within the scope of a specific interior design practice –
- initiation of project,
- development of concepts into schematic drawings,
- approval process,
- presentations and working drawings,
- involvement in office discussions and client meetings,
- integrating structural and service concerns,
- estimation and tendering processes,
- site supervision and coordination in the construction process

COURSE OUTCOME:

1. An overall idea of the nuances of interior design practice.
2. An understanding about the total process that goes into the making of an interior in a building.
3. Maturity in using the experience gained from internship in the thesis project.
4. To have the ability to handle clients and translate the design requirements in to design projects.
5. To be able to experience hands on experience in the site during site visits and gain practical knowledge.
6. To be able to do professional detailing and to be able to produce drawings that are good for construction.

Every student must work in an interior designer's office as a full time trainee for a period of 20 calendar weeks (excluding viva – voce) from the date of commencement of training. The chief Interior Designer in the firm should have a minimum of 5 years of practical/ professional experience after his /her graduation.

The student should involve herself /himself in various aspects of work in an office like working drawings, presentation drawings, quantity estimation, site supervision etc. Students should understand professional practice methods of various interior designers, design process from client contacts to production documents, tender documents, production drawings for various works, site supervision etc. for various works. They should also know the Coordination of various agencies – client, members of design team, consultants, contractors, craftsmen and construction supervisors.

Detailed instructions regarding the training, the frequency of reporting to the department etc will be issued at the end of Seventh semester, which the student must strictly follow.

After completion of training, every student will have to submit a detailed report with a set of drawings on at least two projects in which he / she has worked during the twenty calendar weeks of the practical training period. This report will be evaluated at viva – voce by a jury consisting of one external, one internal and head of the department or his nominee. After submission of the report the department at its convenience will arrange for the conduct of the viva – voce examination.

<table>
<tr><td>16IDS721</td><td colspan="9">FIELD STUDY & DOCUMENTATION</td><td colspan="2">SEMESTER-VII</td></tr>
<tr><td>Marks</td><td>Internal</td><td>200</td><td colspan="4">External</td><td>0</td><td>Total</td><td>200</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours/Week</td><td>L</td><td>0</td><td>T</td><td>0</td><td>P/S</td><td>6</td><td colspan="3">Credits</td><td>3</td></tr>
</table>

The choice of the building shall be Contemporary, Heritage, Vernacular or even a settlement/small area in the city of training. This field study and documentation shall be submitted in the form of an architectural report with sketches, pictures and drawings and presented in the form of videos, presentation, slideshow etc covering the following aspects:

- History and Cultural Impact
- Style and Function
- Form and Spatial Studies
- Key Elements and Features
- Materials and Technology

SEMESTER-8

16IDS821	**DESIGN THESIS**									**SEMESTER-VIII**	
Marks	**Internal**	**400**	**External**				**600**	**Total**	**1000**	**Exam Hours**	**6**
Instruction Hours/Week		**L**	**2**	**T**	**0**	**P/S**	**28**	**Credits**			**16**

COURSE OBJECTIVE:

- To ensure consolidation and application of the knowledge gained in preceding years of the programme in the context of a design project of the student's choice.
- To enable addressing of specific projects through key, identified issues inherent in the project or to enable development of thought processes in specific areas/aspects into a project.
- To facilitate development of ability to complete and handle projects independently as a precursor to professional life.
- To encompass the capacities to handle large scale projects and to be able to choose the scale of the project based on the knowledge acquired.
- To be given a chance to research the area that is of the students choice and to analyze the data and to be able to produce sensible design parameters based on the analysis.
- To be introduced to the professional practice nuances with respect to the design field.

COURSE OUTCOME:

1. Skill, knowledge and expertise in the domain of interior design.
2. Ability to handle a major interior design project independently through all stages
3. To be able to scale project size based on the parameters asserted by the futuristic clients.
4. To be able to design in relationship to the surroundings and also have a pragmatic and vernacular approach to the design chosen.
5. To be able to handle complex design problems
6. To introduce them into the professional world of design and detailing

Each student is expected to prepare a design thesis based on the preliminary work undertaken in the Interior design studio under an approved guide.
Thesis should reflect the knowledge gained from all the courses undertaken by the student in all the previous semesters.

The particulars of the schedule, content, presentation, format etc is to be decided by the department from time to time and shall be strictly followed.

At the end of the semester each student is expected to submit all original drawings prepared as per the department specifications. Three copies of the report in the specified format should be submitted to the department after the approval of the respective guides.

The department shall schedule the viva voce at its convenience only after the receipt of the thesis by the student. The performance sheet submitted by the guide and thesis committee should be the basis for allowing the student to appear for the final viva voce.

The end exam is to be conducted by a jury comprising of an external examiner. One internal examiner and head of the department or his nominee.

16IDS822	**REVITALIZATION OF ARTS & CRAFTS**						**SEMESTER-VIII**	
Marks	**Internal**	**80**	**External**	**120**	**Total**	**200**	**Exam Hours**	**6**
Instruction Hours/Week	**L**	**1**	**T**	**0**	**P/S**	**6**	**Credits**	**4**

Identification of private and public craft activity around the nation – various crafts and its perception in the society - design issues in transforming old craft forms into modern context by keeping its original spirits.

Assignment: Select one of the art/ craft form with the consultation of the faculty. Visit to the craft pockets. Document people, life , culture and craft and understand the materials, tools, technology, processes and forms. Suggest suitable changes in technology to improve the products so as to make it acceptable in today's context.

Note: The work will be periodically reviewed. The study has to be presented in the form of a report with illustrations and as a seminar for final assessment, along with the final product.

DETAILED SYLLABUS

M.ARCH (ADVANCE DESIGN)

2016-2017 BATCH

16MARS111	RESEARCH AND FIELD STUDIES -1						SEMESTER-I	
Marks	Internal	40	External	60	Total	100	Exam Hours	6
Instruction Hours /week	L	1	T	0	P/S	2	Credits	2

COURSE OBJECTIVE:

- To learn the importance of research & field Studies
- To understand the Research application in architectural design.
- To understand the different methods and techniques as relevant to the design profession
- To apply the research concepts in evaluation and appraisal of architectural design projects.
- To Analyse the Various methodologies of Field Survey
- To Develop the skill of preparation of report and Documentation

COURSE OUTCOME:

1. Student will understand the methods of research
2. Student will be able to develop the Skill of field study and experimentation
3. Student will understand the research application in the field of Architectural Design
4. Student will understand about the collection of data and Analyse the data
5. Student will develop the skill of documentation of various Survey and Research
6. Student will be able to prepare documents, report writing and publish in journals

UNIT-I INTRODUCTION TO RESEARCH

Importance, Purpose and Scope of Research and Field Studies. Application in architecture in terms of design, technology, environment, economic and behavioral areas.

UNIT-II RESEACRH OBJECTIVES AND METHODOLOGY

Sequence and Methods of Research. Identification of the Problem, Hypothesis Formulation, Objectives and Methodology.

UNIT-III APPLICATION OF RESEARCH

Understanding and Applying Qualitative, Analytical, Interpretative, Correlational, Quasi- Experimental, Experimental, Simulation and Modelling techniques in Architectural Design.

UNIT-IV FIELD STUDIES

Pilot Studies, Field Surveys and Collection of Samples - Physical, Architectural, Environmental, Organizational. Preparation and Analysis of Data Sheets and Questionnaires.

UNIT-V ANALYSIS, PREPARATION AND DOCUMENTATION

Preparation and Analysis of Data Sheets and Questionnaires. Arriving at conclusions from the Research at Field Studies. Report Writing and Publications.

SUGGESTED READINGS:

1.Knight, A. and Ruddock., "Advanced Research Methods in Built Environment", John Wiley & Sons. 2008.
2.Groat, L. and Wang D., "Architectural Research Methods", John Wiley & Sons. 2002.
3.Gibbs, J.P., " Urban Research Methods", (rev) Von Nostrand. 1988.
4 Kothari, C. R., and Gaurav Garg. *Research Methodology: Methods and Techniques*. New Delhi: New Age International (P) Limited, Publishers,

<table>
<tr><td>16MARS112</td><td colspan="8">DESIGN SYSTEMS</td><td colspan="2">SEMESTER-I</td></tr>
<tr><td>Marks</td><td>Internal</td><td>80</td><td colspan="3">External</td><td>120</td><td>Total</td><td>200</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>4</td><td colspan="2">Credits</td><td>4</td></tr>
</table>

COURSE OBJECTIVE:

- To understand various design systems
- To Understand the different civilizations in different parts of the world through study of their source,
- To Understand the origin, context, grammar, intent and application in architectural design.
- To Understand the Contemporary design process and relevant case studies
- To Understand & develop the skill of Design thinking as per the Current change in Architectural Style
- To understand the Concept of design Systems by various literature/case studies.

COURSE OUTCOME:

1. Student will be able to understand the various design systems in the Architecture era
2. Student will be able to understand the vernacular architecture and its importance
3. Student will Understand the contemporary design process
4. Student will develop the skill of Design thinking as per the Current situation
5. Student will develop the skill of presentation of his ides by Seminar and presentation
6. Student will be able to envision the futuristic architecture

UNIT-I HISTORIC DESIGN SYSTEMS

Pragmatic, Iconic, Analogic and Canonic systems. Relationship between mathematics and architecture and hierarchies of geometry in design. Design systems through the middle ages to the renaissance period.

UNIT-II VERNACULAR DESIGN SYSTEMS

Vernacular architecture of the world and relevance of the climate in which they have evolved. Enduring nature of the vernacular in contemporary times, De-coding vernacular narratives regarding the cultures they represent.

UNIT-III CONTEMPORARY DESIGN SYSTEMS

Evolution of design systems since the modern period following industrial revolution to the advent of the digital age and representation of design.

UNIT-IV FUTURISTIC DESIGN SYSTEMS

Evolution of futuristic ideas since the 1960s in the field of design. Emerging areas of programming, expert systems and 3-D printing in design. New materials, technologies and bio mimicry- oriented design evolutions of future.

UNIT – V SEMINAR

Seminar on all the design systems -vernacular architecture – futuristic ideas and discussions

SUGGESTED READINGS:

1. Paul Oliver, Encyclopedia of Vernacular Architecture of the World, Cambridge University Press, 1997
2. Bernard Rudofsky, 'Architecture without Architects', MoMA, 1964.
3.Geoffrey Broadbent - Design in Architecture - Architecture and the human sciences - John Wiley & Sons, New York, 1981
4.Francis D.K. Ching et al; A global history of Architecture; John Wiley's sons, 2nd edition 2010
5.Weber.W & Yannas.S, 'Lessons from Vernacular Architecture', Routledge, 2014.
6. Vernacular Architecture – contemporary traditions – Aishwarya Tipnis – TERI

16MARS113	**EXHIBITION AND SEMINAR -1**						**SEMESTER-I**	
Marks	**Internal**	**100**	**External**	**-**	**Total**	**100**	**Exam Hours**	**6**
Instruction Hours /week	**L**	0	**T**	0	**P/S**	3	**Credits**	**2**

COURSE OBJECTIVE:

- To comprehend the importance of Seminars
- To understand the methods of Exhibition
- To Understand the method of presentations in International Seminars
- To Understand the method of presentations in National Seminars
- To Undertake responsibilities to conduct a conference & Seminar
- To refer reputed journals/magazines and gain the skill & Importance of good presentation methods.

COURSE OUTCOME:

1. Student will be able to know the method of Seminar events
2. Student will understand the methods of Presentation in International Seminar
3. Student will understand the methods of Presentation in National Seminar
4. Student will be able to prepare and publish journal Articles
5. Student will be able to develop the skill of writing & Presentation in Seminars
6. Student will develop the Skill of Report Writing & Presentation in Exhibitions

UNIT-I to UNIT V
CONTENT

Organizing and participating in Technical Seminars, Exhibitions, Workshops, Conferences related to architecture and allied fields. Publishing papers and articles in reputed magazines and journals. Preparing, editing and publishing reports, dossiers, documents, magazines and portfolios of master's course work.

SUGGESTED READINGS:

1. Knight, A. and Ruddock,L., "Advanced Research Methods in Built Environment", John Wiley & Sons. 2008.
2. Groat, L. and Wang D., "Architectural Research Methods" second edition, John Wiley & Sons. 2013.
3. Gibbs, J. P., "Urban Research Methods", (rev.ed.) Von Nostrand. 1988.
4. Booth, Wayne C., Gregroy G. Colomb, and Joseph M. Williams. 2008. The Craft of Research, 3rd edition. Chicago: University of Chicago Press.
5. Zeisel, J., "Inquiry by Design", Revised edition. New York: Norton, 2006.
6. Joo-Hwa Bay and Boon- Lay ong.,"Tropical Sustainable Architecture", Elsevier Ltd,2006

<table>
<tr><td>16MARS114</td><td colspan="9">ADVANCED DESIGN STUDIO I</td><td colspan="2">SEMESTER-I</td></tr>
<tr><td>Marks</td><td>Internal</td><td>160</td><td colspan="4">External</td><td>240</td><td>Total</td><td>400</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>3</td><td>T</td><td>0</td><td>P/S</td><td>9</td><td colspan="3">Credits</td><td>8</td></tr>
</table>

COURSE OBJECTIVE:

- To learn the importance of and undertake the design process at advanced level t
- To learn the design aspects and considerations in large scale projects
- To understand the Urban Reformation and Renewal systems through Design
- To Categorize the Physiological and Psychological aspects in advanced level of Design
- To understand the various design systems, guidelines and considerations as undertaken in the research and field studies and apply them in architectural design.
- To understand the future need for the city & design accordingly

COURSE OUTCOME:

1. Student will be able to design complex structures with advanced level planning principles
2. Student will be able to understand the Urban Renewal and urban level design
3. Student will be able to Design large scale projects
4. Student will understand the Physiological and Psychological aspects in advanced level of Design
5. Student will be able to give a wholesome product of design in all aspects
6. Student can give futuristic proposals for the urban Architecture.

UNIT-I to UNIT - V

CONTENT:
Design of advanced and complex built environments having strong linkages with the urban scale and focusing on architectural, spatial, landscape, environmental, structure, services and technology features.
Examples: Campus Design, Urban Centers, Mixed Use Development etc.

SUGGESTED READINGS:

1.Agkathidis, A., Hudert, M. and Schillig, G.,"Form Defining strategies: Experimenting Architectural Design", Wasmuth International. 2007.
2. Ching, F.D.K., "Architecture: Form, Space and Order", 3rd ed., John Wiley & Sons. 2007.
3. Morgan, C.L., "Jean Nouvel - The Elements of Architecture", Thames and Hudson. 1998.Neufert, P., "Architects' Data", 3rd ed., Blackwell Science. 2000.

<table>
<tr><td>16MARS211</td><td colspan="8">RESEARCH AND FIELD STUDIES - II</td><td colspan="3">SEMESTER-II</td></tr>
<tr><td>Marks</td><td>Internal</td><td>40</td><td colspan="4">External</td><td>60</td><td>Total</td><td>100</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>1</td><td>T</td><td>0</td><td>P/S</td><td>2</td><td colspan="3">Credits</td><td>2</td></tr>
</table>

COURSE OBJECTIVE:

- To learn the importance of Research & Field Studies in advanced level
- To understand the Research application in architectural design.
- To understand the different methods and techniques as relevant to the design profession
- To apply the research concepts in evaluation and appraisal of architectural design projects.
- To Analyse the Various methodologies of Field Survey in focus area such as Sustainability, housing etc
- To Develop the skill of preparation of report and Documentation in the focus area

COURSE OUTCOME:

1. Student will understand the methods of research
2. Student will be able to develop the Skill of field study and experimentation
3. Student will understand the research application in the field of Architectural Design
4. Student will understand about the collection of data and Analyse the data
5. Student will develop the skill of documentation of various Survey and Research
6. Student will be able to prepare documents, report writing and publish in journals

UNIT-I RESEARCH METHODS – PART -1

Importance, Purpose and Scope of Research methodology & field studies specific to the focus area. Understanding and Applying Qualitative, Analytical, Interpretative research in Architectural Design

UNIT-II RESEARCH METHODS – PART -2

Importance, Purpose and Scope of Research methodology & Filed studies specific to the focus area. Understanding and Applying
Quasi- Experimental, Experimental, Simulation and Modelling techniques in the focus area of Architectural Design.

UNIT-III FIELD STUDIES AND EXPERIMENT

Focus area and specialization specific Pilot Studies, Field Surveys and Collection of Samples - Physical, Architectural, Environmental, and Organizational

UNIT-IV FIELD STUDY ANLAYSIS

Preparation and Analysis of Data Sheets and Questionnaires. Preparation and Analysis of Data Sheets and Questionnaires. Arriving at conclusions from the Research at Field Studies.

UNIT-V PROJECT REPORT

Arriving at conclusions from the Research at Field Studies. Report Writing and Publications.

SUGGESTED READINGS:

1.Knight, A. and Ruddock,L., "Advanced Research Methods in Built Environment", John Wiley & Sons. 2008.
2.Groat, L. and Wang D., "Architectural Research Methods", John Wiley & Sons. 2002.
3.Gibbs, J.P., " Urban Research Methods", (rev.ed.) Von Nostrand. 1988.
4.Kothari, C.R., "Research Methodology- Methods and Techniques", New Age International. 2004.
5.Khanzode, V.V., "Research Methodology -Techniques and Trends", APH Publishing. 1995.
Books and Magazines/Journals specific to the focus area.

16MARS212	**EXHIBITION AND SEMINAR - II**						**SEMESTER-II**	
Marks	**Internal**	**100**	**External**	**-**	**Total**	**100**	**Exam Hours**	**6**
Instruction Hours /week	**L**	0	**T**	0	**P/S**	3	**Credits**	**2**

COURSE OBJECTIVE:

- To comprehend the importance of Seminars
- To understand the methods of Exhibition
- To Understand the method of presentations in International Seminars
- To Understand the method of presentations in National Seminars
- To Undertake responsibilities to conduct a conference & Seminar
- To refer reputed journals/magazines and gain the skill & Importance of good presentation methods.

COURSE OUTCOME:

1. Student will be able to know the method of Seminar events
2. Student will understand the methods of Presentation in International Seminar
3. Student will understand the methods of Presentation in National Seminar
4. Student will be able to prepare and publish journal Articles
5. Student will be able to develop the skill of writing & Presentation in Seminars
6. Student will develop the Skill of Report Writing & Presentation in Exhibitions

UNIT-I to UNIT V
CONTENT

Organizing and participating in Technical Seminars, Exhibitions, Workshops, Conferences related to architecture and allied fields. Publishing papers and articles in reputed magazines and journals. Preparing, editing and publishing reports, dossiers, documents, magazines and portfolios of master's course work.

SUGGESTED READINGS:

1. Knight, A. and Ruddock,L., "Advanced Research Methods in Built Environment", John Wiley & Sons. 2008.
2. Groat, L. and Wang D., "Architectural Research Methods" second edition, John Wiley & Sons. 2013.
3. Gibbs, J. P., "Urban Research Methods", (rev.ed.) Von Nostrand. 1988.
4. Booth, Wayne C., Gregroy G. Colomb, and Joseph M. Williams. 2008. The Craft of Research, 3rd edition. Chicago: University of Chicago Press.
5. Zeisel, J., "Inquiry by Design", Revised edition. New York: Norton, 2006.
6. Joo-Hwa Bay and Boon- Lay ong.,"Tropical Sustainable Architecture", Elsevier Ltd,2006

16MARS213	ADVANCED DESIGN STUDIO – II									SEMESTER-II	
Marks	Internal	160	External				240	Total	400	Exam Hours	6
Instruction Hours /week		L	3	T	0	P/S	9			Credits	7

COURSE OBJECTIVE:

- To learn the importance of and undertake the design process at advanced level t
- To learn the design aspects and considerations in large scale projects
- To understand the Urban Reformation and Renewal systems through Design
- To Categorize the Physiological and Psychological aspects in advanced level of Design
- To understand the various design systems, guidelines and considerations as undertaken in the research and field studies and apply them in architectural design.
- To understand the future need for the city & design accordingly

COURSE OUTCOME:

1. Student will be able to design complex structures with advanced level planning principles
2. Student will be able to understand & design as per the Sustainability aspects
3. Student will be able to Design large scale projects
4. Student will understand the Physiological and Psychological aspects in advanced level of Design
5. Student will be able to give a wholesome product of design in all aspects
6. Student can give futuristic proposals for the urban Architecture.

UNIT-I to UNIT - V

CONTENT:

Design of advanced and complex built environments having strong linkages with the urban scale and focusing on architectural, spatial, landscape, environmental, structure, services and technology features.
Examples: Campus Design, Urban Centers, Mixed Use Development etc.

SUGGESTED READINGS:

1. Agkathidis, A., Hudert, M. and Schillig, G., "Form Defining Strategies: Experimenting Architectural Design", Wasmuth International. 2007.
2. Ching, F.D.K., "Architecture: Form, Space and Order", 3rd ed., John Wiley & Sons. 2007.
3. Morgan, C.L., "Jean Nouvel - The Elements of Architecture", Thames and Hudson. 1998.
4. Neufert, P., "Architects' Data", 3rd ed., Blackwell Science. 2000.

Any other books, documents and standards relevant to the focus area

<table>
<tr><td>16MARS311</td><td colspan="9">DISSERTATION -1</td><td colspan="2">SEMESTER-III</td></tr>
<tr><td>Marks</td><td>Internal</td><td>160</td><td colspan="4">External</td><td>240</td><td>Total</td><td>400</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>10</td><td colspan="3">Credits</td><td>7</td></tr>
</table>

COURSE OBJECTIVE:

- To Learn and show advanced understanding and application of the knowledge of Architectural design
- To Understand the Sustainability & housing in general or to any specific focus area through the culmination in a dissertation.
- To develop the skill of Unique research-based application through various Literature study
- To develop knowledge by own experimentation as per the chosen topic
- To do an in- depth study and analysis for a chosen topic of interest
- To present a Wholesome Technical Study report based on Experimentation and Research

COURSE OUTCOME:

1. Student will be able to identify the thrust area of research
2. Student will understand and develop his own dissertation topic with research -oriented study
3. Student will know the basis of experimentation, methods and applications
4. Student will understand the core ideas of Application design through the experimental research
5. Student will be able to analyse and synthesize a defined context with in-depth study and scientific approach
6. Student will be able to provide innovative and practical solutions for the future architecture.

UNIT-I to UNIT - V

CONTENT:

Identification of Dissertation Topic and Area, Hypothesis Formulation, Objectives and Methodology. Importance, Purpose and Scope of the Dissertation in architecture in terms of design, technology, environment, economic and behavioral areas.

Related Research, Literature and Field Studies. Submission of the above in report form.

SUGGESTED READINGS:

1. Knight, A. and Ruddock,L., "Advanced Research Methods in Built Environment", John Wiley & Sons. 2008.
2. Groat, L. and Wang D., "Architectural Research Methods", John Wiley & Sons. 2002.
3. Kothari, C.R., "Research Methodology- Methods and Techniques", New Age International. 2004.
4. Wayne C Booth, Joseph M Williams, Gregory G. Colomb, 'The Craft of Research', 2nd Edition, University of Chicago Press, 2008.
5. Ranjith Kumar, 'Research Methodology- A Step by Step Guide for Beginners', Sage Publications, 2005.
6. John W Creswell, 'Research Design: Qualitative, Quantitative and Mixed Methods Approaches', Sage Publications, 2002.

<table>
<tr><td>16MARS411</td><td colspan="9">DISSERTATION -1I</td><td colspan="2">SEMESTER-IV</td></tr>
<tr><td>Marks</td><td>Internal</td><td>320</td><td colspan="3">External</td><td>480</td><td>Total</td><td>400</td><td colspan="2">Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>16</td><td>T</td><td>0</td><td>P/S</td><td>20</td><td colspan="3">Credits</td><td>16</td></tr>
</table>

COURSE OBJECTIVE:

- To Learn and show advanced understanding and application of the knowledge of Architectural design
- To Understand the Sustainability & housing in general or to any specific focus area through the culmination in a dissertation.
- To develop the skill of Unique research-based application through various Literature study
- To develop knowledge by own experimentation as per the chosen topic
- To do an in- depth study and analysis for a chosen topic of interest
- To present a Design report based on previous Experimentation and Research

COURSE OUTCOME:

1. Student will be able to identify the thrust area of research
2. Student will understand and develop his own dissertation topic with research -oriented study
3. Student will know the basis of experimentation, methods and applications
4. Student will understand the core ideas of Application design through the experimental research
5. Student will be able to analyse and synthesize a defined context with in-depth study and scientific approach
6. Student will be able to provide innovative and practical solutions for the future architecture by Design

UNIT-I to UNIT - V

CONTENT:

Identification of Dissertation Topic and Area, Hypothesis Formulation, Objectives and Methodology. Importance, Purpose and Scope of the Dissertation in architecture in terms of design, technology, environment, economic and behavioral areas.

Related Research, Literature and Field Studies. Submission of the above in report form.

SUGGESTED READINGS:

1. Knight, A. and Ruddock,L., "Advanced Research Methods in Built Environment", John Wiley & Sons. 2008.
2. Groat, L. and Wang D., "Architectural Research Methods", John Wiley & Sons. 2002.
3. Kothari, C.R., "Research Methodology- Methods and Techniques", New Age International. 2004.
4. Wayne C Booth, Joseph M Williams, Gregory G. Colomb, 'The Craft of Research', 2nd Edition, University of Chicago Press, 2008.
5. Ranjith Kumar, 'Research Methodology- A Step by Step Guide for Beginners', Sage Publications, 2005.
6. John W Creswell, 'Research Design: Qualitative, Quantitative and Mixed Methods Approaches', Sage Publications, 2002

LIST OF ELECTIVES		
FOCUS AREA: SUSTAINABLE ARCHITECTURE		
Elective 1	Introduction to Sustainable Architecture	16MARESS1
Elective2	Building Performance Analysis	16MARESS2
Elective 3	Sustainable Design Strategies	16MARESS3
Elective 4	Sustainable Building Systems	16MARESS4
Elective 5	Sustainable Trends and Theories	16MARESS5
FOCUS AREA: HOUSING DESIGN		
Elective 1	Introduction to Housing Design	16MARESH1
Elective2	Housing Policies and Schemes	16MARESH2
Elective 3	Sustainable Housing	16MARESH3
Elective 4	Community Participation in Housing	16MARESH4
Elective 5	Special Types of Housing	16MARESH5
FOCUS AREA: LANDSCAPE DESIGN		
Elective 1	Introduction to Landscape Design	16MARESL1
Elective2	Plants and Application	16MARESL2
Elective 3	Site Engineering	16MARESL3
Elective 4	Planting Design	16MARESL4
Elective 5	Advanced Landscape Theories	16MARESL5
FOCUS AREA: MEDICAL ARCHITECTURE		
Elective 1	Introduction to Medical Architecture	16MARESM1
Elective2	Medical Systems and Typologies	16MARESM2
Elective 3	Hospital Standards	16MARESM3
Elective 4	Management of Healthcare Facilities	16MARESM4
Elective 5	Special Types of Healthcare	16MARESM5
FOCUS AREA: STRUCTURES IN ARCHITECTURE		
Elective 1	Advanced Concrete Technology	16MARESA1
Elective2	Advanced Structural Analysis I	16MARESA2
Elective 3	Advanced Structural Analysis II	16MARESA3
Elective 4	Design of Concrete Structures	16MARESA4
Elective 5	Steel Structures	16MARESA5
FOCUS AREA: RETAIL AND EXHIBITION DESIGN		
Elective 1	Introduction to Retail and Exhibition Design	16MARESR1
Elective2	Visual Merchandising	16MARESR2
Elective 3	Animation for Design	16MARESR3
Elective 4	Exhibition Construction and Detailing	16MARESR4
Elective 5	Interactive Experience Design	16MARESR5

16MARESS1	INTRODUCTION TO SUSTAINABLE ARCHITECTURE									SEMESTER-I	
Marks	Internal	80	External				120	Total	200	Exam Hours	6
Instruction Hours /week		L	2	T	0	P/S	4			Credits	4

COURSE OBJECTIVE:

- To orient towards the United nations Sustainable Development goals
- To Understand the environmental impact of building as well as to safeguard the environment
- To Understand the Sustainable Design principles in Architecture
- To Understand the Climatic impacts due to urbanization and ways for mitigation.
- To Understand & work for the health & well- being of the building and its occupants.
- To Understand the broad guideline of various green Building Systems

COURSE OUTCOME:

1. Student will understand the fundamentals of sustainable concepts and applications
2. Student will understand the Site planning principles and its applications
3. Student will understand the climate and its impacts in indoor thermal comfort
4. Student will understand the energy usage ratio and the effective steps of conservation and utilization of energy.
5. Student will understand the Green building Rating Systems in a Broader context
6. Student will understand the Effective methods to propose green buildings through Case Studies

UNIT-I INTRODUCTION TO SUSTAINABILITY

Sustainable Design Concepts and Strategies - Energy and Environment in Architecture, Green building systems, Energy efficiency. Relevant Literature/Case studies.

UNIT-II SUSTAINABLE DESIGN PRINCIPLES

Sustainable Design Principles - Site planning, Resources, Built form, Climate responsiveness, Energy usage, Occupant behaviour and comfort. Relevant Literature/Case studies.

UNIT-III CLIMATE AND BULT ENVIRONMENT

Climate and Built Form - Overview of Passive techniques for Day lighting, Ventilation, Solar Control and Thermal Comfort. Modelling methods and simulation for assessing building performance. Relevant Literature/Case studies.

UNIT-IV ENERGY AND ITS IMPACTS

Zero Energy and Zero Waste - Methods to achieve zero energy and zero waste in buildings, life cycle assessments and energy audits, renewable energy technologies, integrated energy design. Relevant Literature/Case studies and codes such as ECBC.

UNIT-V GREEN BUILDING SYSTEMS

Green buildings systems - GRIHA, LEED, BREEAM, GREEN STAR. Comparative Studies and analysis, relevance to India.

SUGGESTED READINGS:

1.Mili Majunder, Teri - Energy - Efficient Bldg in India - Thomson Press, New Delhi. 2001.
2.Arvind Krishnan & Others - Climate Responsive Architecture, Tata Mcgraw -Hill New Delhi. 2001.
3.Ralph M. Lebens - Passive Solar Architecture in Europe - 2, Architecture Press, London. 1983.
4.Charles. J. Kibert, 'Sustainable Construction' John Wiley and sons Inc, USA. 2004.
5.N.D. Kaushika, Energy, Ecology and Environment, Capital Publishing Company, New Delhi. 2006
6.GRIHA manuals, TERI press
7.Norbert Lechner, "Heating, Cooling, Lighting", John wiley and sons
8. Mark Dekay and G.Z. Brown, "Sun, Wind and Light- Architectural Design Strategies",,John Wiley and Sons
9. Szokolay, Koenigsberger," Manual of Tropical Housing and building" 2014

16MARESS2	BUILDING PERFORMANCE ANALYSIS										SEMESTER-II	
Marks	Internal	80	External				120	Total	200		Exam Hours	6
Instruction Hours /week		L	2	T	0	P/S	4				Credits	4

COURSE OBJECTIVE:

- To Understand the principles of Sustainable building through Simulation process
- To learn the simulation techniques with digital applications, and to get quantifiable results by usage of various building simulation analysis software.
- To Understand the Effective methods of Daylighting through Simulation
- To Understand the Effective methods of Reduction of Solar Radiation through Simulation
- To Understand the effects of Indoor thermal comfort through Simulation.
- To Understand the Energy performance Index of a Building

COURSE OUTCOME:

1. Student will understand the effects of indoor comfort through software simulation and analysis
2. Student will be able to achieve a quantitative result of thermal analysis by software simulations
3. Student will be able to effectively use the modelling tools and techniques
4. Student will be able to design a building with good thermal comfort with optimum design solutions
5. Student will be able to give quantitative results of Daylighting and Ventilation of a building
6. Student will be able to give an energy performance index of a building.

UNIT-I BUILDING PERFORMANCE-DATA FILES

Building Performance Analysis - Design Optimization and Visualization using Building Information Modelling. - use of Epw file – TMY data extraction – IMD files

UNIT-II DAYLIGHTING, IRRADIATION AND WIND ANALYSIS

Building Performance Analysis - Daylighting, Shading and Ventilation.

UNIT-III ENERGY ANALYSIS

Building Performance Analysis - Whole building energy analysis.

UNIT-IV MODELLING TOOLS

Building Performance Analysis - Modelling Tools and Techniques.

UNIT-V SIMULATION TOOLS

Building Performance Analysis - Simulation Tools and Techniques.

Suggested software: CLIMATE CONSULTANT, HEED, SBEED, OPAQUE, ECOTECT, SKETCHUP – OPEN STUDIO, OPTIVENT, ENERGY PLUS, DAYSIM -RADIANCE, COOLVENT, RHINO-GRASSHOPPER-LADY BUG, DIVA, DRAGONFLY, SEFAIRA, IES-VE,VELUX and recent software.

SUGGESTED READINGS:

1. Autodesk Manuals for BIM tools such as CAD, REVIT, ECOTECT
2. Rhino tutorials
3. Sefaira tutorials
4. Climate consultant Tutorials
5. IES tutorials
6. Computational fluid Dynamics – Tutorials
7. Open Studio – Tutorials

16MARESS3	SUSTAINABLE DESIGN STRATEGIES									SEMESTER-II	
Marks	**Internal**	**80**	**External**			**120**	**Total**	**200**		**Exam Hours**	**6**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	4			**Credits**	**4**

COURSE OBJECTIVE:

- To understand the sustainable strategies and its principles in the design.
- To focus on passive means, reduction of active methods in building Function
- To gain a broad understanding of hybrid strategies and Mixed mode building
- To Understand in depth the green building Rating Systems all over India & Abroad
- To Understand the Design Aspects of Daylighting techniques for large scale projects
- To Understand the Design Aspects of heating & Ventilation techniques for large scale projects

COURSE OUTCOME:

1. Student will be able to apply the Sustainable design strategies in architecture, Design and environment
2. Student will be able to give design solutions of Thermal comfort for various climatic locations
3. Student will understand the application of Passive, Active and Hybrid Deign strategies.
4. Student will become expertise in terms of green building aspects and applications.
5. Student will understand the in – depth Analysis of Daylighting
6. Student will understand the In- depth analysis of Ventilation technique.

UNIT-I DAYLIGHTING AND VENTILATION STRATEGIES

Sustainable Strategies - Day lighting -WWR – Daylight Factor, Daylight levels – ERC, SC, IRC, Visible light Transmittance – Code compliance – Indian Standards – Lighting Standards. Ventilation – Fenestrations- Methods and calculations – Orientation strategies- Wing walls – Permeable buildings – Stack- Chimney – Cross ventilation etc

UNIT-II SOLAR CONTROL AND SHADING STRATEGIES

Sustainable Strategies - Solar Control -Sun Path – Shading concepts – radiation control – Heat balance – thermal properties of materials- Heat Dissipation – Albedo effect etc. Thermal Comfort – ASHRAE standards, Adaptive comfort model, Operative temperature, Tropical Summer Index, Comfort indices – Shading methods for Indoor thermal Comfort etc

UNIT-III STRATEGIES ASSESMENT BY SIMULATION

Sustainable Strategies - Modelling methods and simulation for assessing building performance – Simulation software – Daylight, Irradiation, Mean radiant temperature calculations etc

UNIT-IV GREEN BUILDING SYSTEM AND RATING- APPLICATIONS

Sustainable Strategies - Green buildings systems such as GRIHA, LEED, ECBC, BREEAM, and GREEN STAR. - Rating systems and applications in Residential, Commercial and Industrial buildings etc

UNIT-V CASE STUDY AND COMPARITIVE STUDIES

Sustainable Strategies - Comparative Studies of the different Case studies of buildings with rating systems and their analysis with relevance to India.

SUGGESTED READINGS:

1. GRIHA, LEED, BREEAM and GREEN STAR manuals.
2. Mark dekay and G. Z. Brown, “Sun Wind and light – Architectural Design Strategies “, John wiley and sons, New York.2013
3. Norbert Lechner, ‘Heating, cooling and Lighting ‘,2011
4. Edward Allen, “How Buildings Work-The Natural Order of Architecture”, Oxford University Press
5. Mili Majunder, Teri - Energy - Efficient Bldg in India - Thomson Press, New Delhi. 2001.
6. Arvind Krishnan & Others - Climate Responsive Architecture, Tata Mcgraw -Hill New Delhi. 2001.

Ralph M. Lebens - Passive Solar Architecture in Europe - 2, Architecture Press, London. 1983.

<table>
<tr><td>16MARESS4</td><td colspan="9">SUSTAINABLE BUILDING SYSTEMS</td><td colspan="2">SEMESTER-III</td></tr>
<tr><td>Marks</td><td>Internal</td><td>80</td><td colspan="4">External</td><td>120</td><td>Total</td><td>200</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>4</td><td colspan="3">Credits</td><td>4</td></tr>
</table>

COURSE OBJECTIVE:

- To Understand the low Energy Building Concepts with case studies
- To Understand the Indoor Environmental Quality aspects through survey & Case studies
- To Gain understanding & knowledge about the green Materials
- To learn & provide a comfortable, healthy, and productive environment and landscape with minimal energy and better environmental impact.
- To Gain Understanding about the Smart technologies for the Energy management
- To Gain Understanding & Knowledge about the Energy & Cost Audit

COURSE OUTCOME:

1. Student will be able to gain knowledge and application of low energy building design
2. Student will understand the thermal quality standards and its importance in various countries
3. Student will understand the use of green materials and products for a sustainable future.
4. Student will be able to calculate the energy consumption features and the cost audits.
5. Student will be able to understand the integrated building management systems for a controlled environment.
6. Student will be able to understand the energy and cost audits

UNIT-I LOW ENERGY BUILDING

Sustainable Building - Low energy building design and operation. -types of energy – consumption-renewable/ non-renewable-Hybrid design strategies-

UNIT-II INDOOR ENVIRONMENTAL QUALITY

Indoor Environment - Quality and Standards, Indoor Air Quality-indoor thermal comfort- levels – activity analysis- carbon emissions etc

UNIT-III GREEN MATERIALS

Building Systems - Green Materials and green Products- Manufacture- reuse- reduce-recycled materilas

UNIT-IV SMART TECHNOLOGIES

Building Systems – Smart Materials and systems- Integrated buildings- Energy saving – Automations

UNIT-V ENERGY AND COST AUDITS

Building Services - Energy and Cost audits.

SUGGESTED READINGS:

1. Mili Majunder, Teri - Energy - Efficient Bldg in India - Thomson Press, New Delhi. 2001.
2. Charles. J. Kibert, 'Sustainable Construction' John Wiley and sons Inc, USA. 2004.

N.D. Kaushika, Energy, Ecology and Environment, Capital Publishing Company, New Delhi. 2006

<table>
<tr><td>16MARESS5</td><td colspan="6">SUSTAINABLE TRENDS AND THEORIES</td><td colspan="4">SEMESTER-III</td></tr>
<tr><td>Marks</td><td>Internal</td><td colspan="2">80</td><td colspan="3">External</td><td>120</td><td>Total</td><td>200</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>4</td><td colspan="3">Credits</td><td>4</td></tr>
</table>

COURSE OBJECTIVE:

- To Understand the various Sustainable Policies & mechanisms
- To Gain in-depth knowledge about vernacular & traditional practices
- To Gain knowledge about biomimicry and applications in building design
- To Gain Knowledge about Adaptive reuse & Urban regeneration
- To Understand about Resource Optimisation – Water Efficiency- Operational procedure
- To familiarize with the historic, contemporary and futuristic tends of sustainable building.

COURSE OUTCOME:

1. Student will be able to understand the policy level mechanisms and design process and product accordingly.
2. Student will understand the vernacular / traditional building types and its applications to the modern context by its systems and materials.
3. Student will understand to use the site in an optimum manner and know about the operational and maintenance practices.
4. Student will gain knowledge about biomimicry and its importance in sustainable design
5. Student will gain knowledge about futuristic design systems and new material applications.
6. Student will Understand about the Adaptive Reuse & urban Generation

UNIT-I POLICY AND REGULATORY MECHANISMS
Sustainable Design: Policies and regulatory mechanisms, Design practices
UNIT-II VERNACULAR AND TRADITIONAL PRACTICES
Sustainable Trends: Vernacular ways of sustainable building, Preservation of the regional and cultural identity, documentation and continuity of vernacular/traditional ways of building and detailing
UNIT-III RESOURSE OPTIMISATION
Sustainable Trends: Contemporary ideas and trends, Optimization Of site potential, Minimization of energy consumption, Protection and conservation of water resources, Use of environmentally friendly materials and products, Provision of a healthy and convenient indoor climate, Optimization of operational and maintenance practices
UNIT-IV DIGITAL APPLICATIONS AND FUTURISTC APPROACH
Sustainable Trends: Futuristic thoughts and approaches, New materials and technologies, Application of digital technologies
UNIT-V ADAPTIVE REUSE AND URBAN REGENERATION
Sustainable Theories: Biomimicry, Adaptive Reuse, Urban regeneration

SUGGESTED READINGS:

1. Eco-Tech: Sustainable Architecture and High Technology by Slessor© - Thames and Hudson 1997
2. Sustainable Architecture: Low tech houses by Mostaedi (A) – Carles Broto 2002
3. Eco-design: A manual for Ecological Design by Yeang(K) – Wiley Academy 2006
4. O.H. Koenigsberger and others (2014), Manual of Tropical Housing and Building –Part I - Climate design, Orient Longman, Madras, India,
5. “Sun wind and light”- Mark Dekay, G. Z. Brown, Feb 2014

16MARESH1	INTRODUCTION TO HOUSING DESIGN										SEMESTER-I	
Marks	Internal	80	External				120	Total	200		Exam Hours	6
Instruction Hours /week		L	2	T	0	P/S	4				Credits	4

COURSE OBJECTIVE:

- To Gain Knowledge about the Housing Typologies all over the world
- To Understand the principles of Community living & Neighbourhood
- To Understand the social, economic, environmental, and psychological implications of housing process and products.
- The goal is to familiarize with housing as a process and a product in the context of the individual, the family, and the community.
- To introduce various stakeholders involved in the housing scenario.
- To Understand about the Housing Finance

COURSE OUTCOME:

1. Student will be able to gain knowledge about housing typologies
2. Student will understand about the theories and concepts of community and Neighbourhood
3. Student will understand about the emerging trends in housing
4. Student will understand about the housing finance schemes and management
5. Student will understand the relation of housing and real estate management in the global and local scenario.
6. Student will Understand the Basis of Housing Demand all over the world

UNIT-I HOUSING TYPOLGY

Housing typologies - Identification of stakeholders, roles responsibilities of various stakeholders, classification of various typologies.

UNIT-II COMMUNITY AND NEIGHBOURHOOD

Community and neighborhood - Theories and concepts, Understanding the scale of housing.

UNIT-III CONTEMPORARY HOUSING

Architectural styles and preferences - Trends in contemporary housing types, greater role for the architect in housing.

UNIT-IV HOUSING FINANCE

Housing finance - Economic consideration and feasibility studies. Various housing financial institutions

UNIT-V HOUSING AND REAL ESTATE

Housing markets - Real estate scenario, Land availability & Acquisition, suburban and rural trends.

SUGGESTED READINGS:

1. Merrill, J.L. (Ed.). Introduction to Housing. Upper Saddle River, NJ:Pearson Prentice Hall. 2006
2. Joseph DeChiara, Julius Panero. Time-Saver Standards for Interior Design and Space Planning, McGraw-Hill Education, 2001
3. Robert E. Stevens, Philip K. Sherwood. How to prepare a feasibility study Prentice-Hall, 1982
4. Susan S. Fainstein, Scott Campbell, Readings in Planning Theory, Wiley, 2011
5. Doris Kohn, J. D. von Pischke, "Housing Finance in Emerging Markets: Connecting Low-Income Groups to Markets"Springer

16MARESH2	**HOUSING POLICIES AND SCHEMES**						**SEMESTER-II**	
Marks	**Internal**	**80**	**External**	**120**	**Total**	**200**	**Exam Hours**	**6**
Instruction Hours /week	**L**	2	**T**	0	**P/S**	4	**Credits**	**4**

COURSE OBJECTIVE:

- To learn about the housing schemes and policies
- To learn about the Urban housing scenario
- To learn about the Rural housing scenario
- To explore about the stakeholders in the housing
- To gain knowledge about the Central government schemes
- To gain Knowledge about the State Government Schemes

COURSE OUTCOME:

1. Student will learn and gain knowledge the housing schemes and policies
2. Student will gain knowledge about the urban housing scenario
3. Student will gain knowledge about the rural housing scenario
4. Student will gain knowledge about the stakeholders in the housing
5. Student will gain knowledge about the systematic approach for the future housing demand.
6. Student will gain knowledge about the Schemes of Central & State government

UNIT-I HOUSING POLICY IN INDIA

Housing Policy in the India - Government policies on housing, Government Agencies in housing sector, Classification of housing Stock

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UNIT-II CENTRAL GOVERNMENT SCHEMES

Central Government Schemes - Identification and review of schemes with housing component.

UNIT-III STATE GOVERNMENT SCHEMES

State government Schemes - Identification and review of schemes with housing component.

UNIT-IV URBAN HOUSING

Urban housing Scenario - Housing scenario, Housing typology, Housing Stock & shortage, Demand and supply, emerging trends.

UNIT-V RURAL HOUSING

Rural Housing Scenario - Housing scenario, Housing typology, Housing Stock & shortage, Demand and supply, emerging trends.

SUGGESTED READINGS:

1.National Urban Housing and habitat policy, 2007
2.http://www.tnhb.gov.in/dept.aspx
3.http://mhupa.gov.in/policies/
4.http://nhb.org.in/Urban_Housing/HousingjDolicies.php

<table>
<tr><td>16MARESH3</td><td colspan="7">SUSTAINABLE HOUSING</td><td colspan="3">SEMESTER-II</td></tr>
<tr><td>Marks</td><td>Internal</td><td>80</td><td colspan="3">External</td><td>120</td><td>Total</td><td>200</td><td>Exam Hours</td><td>6</td></tr>
<tr><td colspan="2">Instruction Hours /week</td><td>L</td><td>2</td><td>T</td><td>0</td><td>P/S</td><td>4</td><td colspan="2">Credits</td><td>4</td></tr>
</table>

COURSE OBJECTIVE:

- To Understand about the Site Analysis
- To gain Knowledge about Affordable housing
- To gain Knowledge about Resource Mapping
- To gain Knowledge about advanced level of Building services for housing
- To learn and understand the current interventions in housing sector and propose a sustainable approach towards the housing.
- To learn about High Performance Housing

COURSE OUTCOME:

1. Student will be able to understand the sustainable site planning with site inventory and analysis
2. Student will understand about Affordable housing techniques
3. Student will learn about cost effective techniques in housing.
4. Student will be able to understand the resource mapping
5. Student will be able to understand the advance level building services
6. Student will be able to understand & design high performance houses

UNIT-I SITE ANALYSIS

How Site and climate related issues affect the design parameters and decisions. -Site Inventory and Analysis- Location, Access- Circulation, Traffic, Climate, Sensory – Analysis

UNIT-II AFFORDABLE HOUSING

Exploring the social and economic choices, options and decision of housing, various technologies available.

UNIT-III RESOURCE MAPPING

Identifying the resources (construct techniques & technology, Manpower & Material) predominant in that area. Understanding the Availability and Cost implication of the resources.

UNIT-IV BUILDING SERVICES

An in depth understanding of building system, how houses work as a system.

UNIT- V HIGH PERFORMANCE HOUSING

Exploring the science and technology required to build high performance houses.

SUGGESTED READINGS:

1.Thomas Russ, Site Planning and Design Handbook, Second Edition, McGraw-Hill Education, 2009

2.Joseph De Chiara, Julius Panero Time-Saver Standards for Interior Design and Space Planning, McGraw-Hill Education, 2001.

3.Clayton Bennett Greening Your Home: Sustainable options for every system in your house McGraw-Hill Professional 2008

4.Global Green USA, "Blueprint for Greening Affordable Housing" Island Press. 2007

5.Jessica Kellner Housing Reclaimed: Sustainable Homes for Next to Nothing New Society Publishers 2011

16MARESH4	COMMUNITY PARTICIPATION IN HOUSING									SEMESTER-III	
Marks	Internal	80	External				120	Total	200	Exam Hours	6
Instruction Hours /week		L	2	T	0	P/S	4			Credits	4

COURSE OBJECTIVE:

- To gain knowledge about the Community participation in Housing
- To gain deep understanding about the Planning Aspects in Housing
- To gain knowledge about the planning process
- To Learn and determine the involvement end users in various stage of housing process across.
- To learn about the community participation for various typologies
- To learn about various best practices in community Housing Through Case studies

COURSE OUTCOME:

1. Student will be able to develop a model for both the end user and the service provider
2. Student will be able to involve in planning in design stages
3. Student will be able to understand the intricacies of Community participation in Housing
4. Student will be able to give design solution for the future community housing
5. Student will gain Knowledge about the best practices in Community housing

UNIT-I COMMUNITY PARTICIPATION PLANNING

Awareness and importance of Community participation, Planning and design stages - Zoning studies, spatial analysis, customs & cultural practices and user -based studies

UNIT-II PLANNING ASPECTS

People-based planning - Identifying & incorporating Aspiration, Needs & Affordability, incorporating special needs of the elderly and children, concept of better living. Degrees of customizations

UNIT-III PLANNING PROCESS

Familiarization with development and planning process of various agencies (Public, Private (Multifamily), Private (single family), Co-operative, NGO), view on community participation, organizational structure, Project and product brief, Identification of beneficiaries.

UNIT-IV COMMUNITY PARTICIPATION MODELS AND CASE STUDIES

Existing models of community participation across various typologies, best practices, Case studies.

UNIT-V TYPOLOGY

Developing models for community participation for various typologies and stages.

SUGGESTED READINGS:

1.Sylvia J.T. Jansen, Henny C.C.H. Coolen and Roland W. Goetgeluk, "The Measurement and Analysis of Housing Preference and Choice" Springer 2011

2.Andrew Beer, Debbie Faulkner, Chris Paris, Terry Clower - Housing transitions through the life course: Aspirations, needs and policy 2011

3.Groat, L. and Wang D., "Architectural Research Methods", John Wiley & Sons. 2002.

4.Merrill, J.L. (Ed.). Introduction to Housing. Upper Saddle River, NJ:Pearson Prentice Hall. 2006

5.Juilenne Hanson, Decoding Homes and Houses Cambridge University Press 2003

16MARESH5	**SPECIAL TYPES OF HOUSING**									**SEMESTER-III**	
Marks	**Internal**	**80**	**External**			**120**	**Total**	**200**		**Exam Hours**	**6**
Instruction Hours /week		**L**	2	**T**	0	**P/S**	4			**Credits**	**4**

COURSE OBJECTIVE:

- To gain Knowledge about the Vernacular housing in Chettinad Region
- To Gain knowledge about the Vernacular housing in Hill region
- To understand the Various techniques involved in the vernacular construction
- To understand about Disaster prone areas an methodologies for housing in those regions
- To learn about the influences of social, economic and environmental factors in housing
- Exploring housing typologies which tends to lean more on a aspect more than the rest.

COURSE OUTCOME:

1. Student will learn and understand the Vernacular Architecture of various regions of world
2. Student will learn and understand the Vernacular Architecture of various regions of India
3. Student will learn and understand the Vernacular Architecture of various regions of Tamilnadu
4. Student will learn about design aspects and historical methods of construction which can be adopted for a particular context
5. Student will learn and understand the types of housing in disaster prone areas
6. Student will be able to Propose the housing trend for the Future.

UNIT-I VERNACULAR- CHETTINAD REGION

Vernacular Architecture - Typology 1 - Chettinad region - Social factor influencing Architectural features, Location characteristics, Climatic consideration.

UNIT-II VERNACULAR-HILL REGION

Vernacular Architecture - Typology 2 - Hill region - Social factor influencing Architectural features, Location characteristics, Climatic consideration.

UNIT-III VERNACULAR – DESERT REGION

Vernacular Architecture - Typology 3 - Desert region - Social factor influencing Architectural features, Location characteristics, Climatic consideration.

UNIT-IV HOUSING – DISASTER PRONE AREAS

Housing in Disaster prone areas - Classification of Disaster, Disaster Management Cycle, Housing interventions.

UNIT-V HOUSING – FUTURE CONCEPTS

Future concepts - Development trends, Product categories, material trends, People preferences

SUGGESTED READINGS:

1. Richard Hyde, Bioclimatic Housing: Innovative Designs for Warmer Climates, Earthscan
2. Willie Webber, Simos Yannas (ed.) Lessons from vernacular Architecture, Earthscan
3. Ilay Cooper, Traditional Buildings of India, Thames and Hudson, 1998
4. Monisha Bharadwaj, India Style, Bay Soma Publishing -2003

FACULTY OF PHARMACY

16PYU101 **SEMESTER-I**

ANATOMY & PHYSIOLOGY-I **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body.
- It also helps in understanding both homeostatic mechanisms.
- It also helps in understanding homeostatic imbalances of various systems of the body.
- Since a medicament, which is produced by the pharmacist, is used in various disease conditions to correct the abnormal functioning of the body systems.
- The basic knowledge of this subject is must for a student to understand how drugs act on various systems/organs in correcting the disease state of organs/systems.
- Thus it becomes a prerequisite subject for the pharmacy course.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the gross morphology, structure and functions of various organs of the human body.
2. Understand the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of the human body.
4. Perform the haematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time, etc and also record blood pressure, ECG, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system.
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of the human body.

Course Content

UNIT I

Definition - scope of anatomy and physiology, description of body and basic Terminologies - General anatomy and physiology –**Cell** - cell junctions - transport mechanisms – homeostasis - ion channels - cell communication and signaling pathways – Definition - classification of tissues - their location - characteristics and Functions - **Human skeleton**–Structure – composition - classification and function of bones - Identification and few - salient features of important bones of axial and appendicular skeleton - Classification of joints, types of movements.

UNIT II

Body fluids and blood - Body fluids - composition and functions of blood – haemopoiesis - mechanism of coagulation -bleeding and clotting disorders - blood grouping and its significance - blood transfusion - lymphatic system and reticuloendothelial system - Definitions of Anemia – Hemophilia - leukemia and lymphoma.

UNIT III

Cardio Vascular system - Anatomy and physiology of heart - blood circulation - cardiac output - cardiac cycle - heart rate - blood pressure – electrocardiogram - heart sounds - Definitions of hypertension –hypotension – atherosclerosis – arteriosclerosis – angina - myocardial infarction - congestive heart failure - cardiac arrhythmia.

UNIT IV

Digestive system - Gross anatomy of G.I. Tract and its physiology with special reference to liver - pancreas and stomach – digestion – absorption - movements of intestine - Definitions of peptic ulcer - colorectal cancer - hepatitis.

UNIT V

Respiratory system - Anatomy of respiratory tract - mechanism of respiration - regulation of respiration lung volumes and capacities - transport of oxygen and carbondioxide - artificial respiration - resuscitation methods - Definitions of hypoxia – asphysia - bronchial asthma - COPD.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Anne Waugh and Allison Grant	Ross and Wilson Anatomy and Physiology in Health and illness	Churchill Livingstone Elsevier-UK	2013

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.C.Chattterjee	Human Physiology - Vol.–I &I I	Medical Allied Agency-Calcutta	1997
2	Gerard J Tortora- Bryan Derrickson	Principles of Anatomy and Physiology	Wiley-USA	2014
3	Cinnamon Van Putte	Seeley’s Fundamentals of Human Anatomy and Physiology	Tata Mc GrawHill-New Delhi	2009

WEBSITES:

- **www.khanacademy.org**
- **www.biologycorner.com**
- **www.gwc.maricopa.edu**

16PYU111 **SEMESTER-I**

ANATOMY & PHYSIOLOGY LABORATORY – I 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body.
- It also helps in understanding both homeostatic mechanisms.
- It also helps in understanding homeostatic imbalances of various systems of the body.
- Since a medicament, which is produced by the pharmacist, is used in various disease conditions to correct the abnormal functioning of the body systems
- The basic knowledge of this subject is must for a student to understand how drugs act on various systems/organs in correcting the disease state of organs/systems.
- Thus it becomes a prerequisite subject for the pharmacy course.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the gross morphology, structure and functions of various organs of the human body.
2. Understand the various homeostatic mechanisms and their imbalances
3. Identify the various tissues and organs of different systems of the human body.
4. Perform the hematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time, etc and also record blood pressure, ECG, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of the human body.

Course content:

1. Guidelines in laboratory discipline.
2. Introduction to microscope.
3. The study of common objects.
4. Microscopic study of different tissues.
5. Identification of bones.
6. Hemoctometry.
7. Estimation of Bleeding time.
8. Estimation of Clotting Time.
9. Determination of RBC.
10. Determination of WBC.

11. Determination of haemoglobin content (2 Experiments).

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Godkar P.B and Godkar D.P	Textbook of Medical Laboratory Technology	Bhalani Publishing House, Mumbai	2007

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mukherjee, K.L	Medical Laboratory Technology	Tata McGraw Hill Publishing Company Ltd. New Delhi	2010

WEBSITES:

- **www.khanacademy.org**
- **www.biologycorner.com**
- **www.gwc.maricopa.edu**

16PYU102 **SEMESTER-I**

PHARMACEUTICAL INORGANIC CHEMISTRY –I 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- Study about various role of inorganic compounds which having medicinal use.
- This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs.
- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- This subject deals with general methods of preparation and reactions of some organic compounds.
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.
2. Understand the medicinal and pharmaceutical importance of the inorganic compounds.
3. Write the molecular formula and balance chemical equations and understand the development of periodic table.
4. Understand the importance of quality control.
5. Discuss the nuclear reactions and radioactivity.
6. Elaborate the importance of topical agents.

Course Content:

UNIT – I
Learning symbols and valency of elements. Writing molecular formula- balancing the equation Pharmacopoeia and monograph - Development of periodic table of the modern concept of atomic structure and its importance.

UNIT – II
Importance of quality control- sources and types of impurities in pharmaceutical substances - Test for purity – Swelling power in bentonite- acid is replacing capacity of antacid- presence of iodates and ferric ion. Limit test – Definition- importance- general procedure for limit test for chloride – sulphate- iron- arsenic- heavy metals and lead - Modified limit test for chloride and sulphate in

potassium permanganate- sodium bicarbonate and sodium salicylate - Modified limit test for chlorinated compounds in sodium benzoate.

UNIT – III

Nuclear reactions- radioactivity- nomenclature- units- detection and measurement of radioactivity- clinical applications and dosage- hazards- precautions and storage- biological effects of radiation. Radio pharmaceutical preparations and standards of radioactive material such as $_{131}$Iodine, $_{58}$Cobalt. Radio opaque contrast medium-barium sulfates.

Method of preparation- assay- identification test-test for purity- storage conditions- official preparations and uses of inorganic compounds in the following categories:

UNIT – IV

Gastrointestinal agents and related compounds - Acidifiers - Dilute hydrochloric acid-Sodium phosphate- Ammonium chloride. Antacids - Classification- qualities of ideal antacid- side effects- advantages- combination therapy-acid neutralizing capacity-sodium bicarbonate-potassium citrate- aluminium hydroxide gel- dried aluminium hydroxide gel-aluminium phosphate- magnesium hydroxide-light and heavy magnesium trisilicate -light and heavy magnesium carbonate- calcium carbonate- magaldrate and bismuth carbonate. Adsorbents and protectives - Light kaolin- heavy kaolin and bismuth sub-carbonate. Saline cathartics – Magnesium hydroxide-magnesium sulphate- magnesium carbonate and Sodium phosphate.

UNIT – V

Topical Agents -Protective – Talc-zinc oxide – calamine-zinc stearate-titanium dioxide – kaolin- silicon polymers and Dimethicone - Astringents - Alum- zinc sulfate and zinc chloride. Antimicrobials – Hydrogen peroxide - potassium permanganate - chlorinated lime-iodine- boric acid- silver nitrate- sodium stilbo gluconate- povidone-iodine- selenium sulfide and zinc undecenoate.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	V.N Rajasekaran	Text Book of pharmaceutical Inorganic Chemistry	Sun Publications	2005

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dr.B.G.Nagavi	Pharmaceutical Inorganic chemistry	S.Chand	2007
2	Surendra N. Pandeya	A text book Inorganic medicinal chemistry	Sg Publisher	2011

3	Anand & Chatwal	Inorganic Pharmaceutical Chemistry	Himalaya Pub. House	2010
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	1996

WEBSITES:

- **www.slideshare.com**
- **www.ucdavis.com**
- **www.chem.tamu.edu**

16PYU112 **SEMESTER-I**

PHARMACEUTICAL INORGANIC CHEMISTRY LABORATORY–I 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- Study about various role of inorganic compounds which having medicinal use.
- This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs.
- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- This subject deals with general methods of preparation and reactions of some organic compounds.
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.
2. Understand the medicinal and pharmaceutical importance of the inorganic compounds.
3. Write the molecular formula and balance chemical equations and understand the development of periodic table.
4. Understand the importance of quality control.
5. Discuss the nuclear reactions and radioactivity.
6. Elaborate the importance of topical agents.

Course Content:

1. Limit test for Chloride.
2. Limit test for Sulphate.
3. Modified limit test for chloride in $KMnO_4$.
4. Modified limit test for Sulphate in $KMnO_4$.
5. Preparation of Barium sulphate.
6. Preparation of Magnesium sulphate.
7. Preparation of Boric acid.
8. Test for adsorption power in heavy kaolin.
9. Systematic qualitative analysis for unknown inorganic mixture (Four experiments).

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	V.N Rajasekaran	Text Book of pharmaceutical Inorganic Chemistry	Sun Publications	2005

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	1996

WEBSITES:

- **www.slideshare.com**
- **www.ucdavis.com**
- **www.chem.tamu.edu**

16PYU103 **SEMESTER-I**

PHARMACEUTICAL ORGANIC CHEMISTRY –I 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry.
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds.
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes (CO's):

On successful completion of the course the student will Explain molecular orbital theory.

1. Understand the strain theories.
2. Describe effect of substituents on the reaction.
3. Elaborate the different mechanisms of reaction.
4. Account for the structure, stability, orientation, reaction and its mechanism of Benzene.
5. Explain different Reaction Intermediates & their application in reaction mechanism.
6. How to name the organic compounds?
7. Explain different reaction involve in the formation of aromatic compounds.

Course Content:

UNIT I

Classification /Nomenclature/ Isomerism: Classification of organic Compounds - Common and IUPAC systems of Nomenclature of organic compounds - Structural Isomerism in organic compounds.

UNIT II

Alkanes -General preparation and reactions including sp3 hybridization of alkanes and halogenation of alkanes -**Cyclo alkanes -**General preparation and reactions including its Stability – Baeyer's strain theory and its limitation and Sachse Mohr's theory (Theory of strainless rings).

UNIT III

Alkenes -General preparation and reactions including Stabilities of alkenes - sp2 hybridization - Saytzeff's rule - Markownikoff's rule - Anti Markownikoff's rule – Ozonolysis - electrophilic addition reactions of alkenes -**Conjugated dienes -** General preparation and reactions including

Diel's-Alder - electrophilic addition - freeradical addition reactions of conjugated dienes and allylic rearrangement - Stability of conjugated dienes.

UNIT IV

Alkyl halides - General preparation and reactions including**S_N^1**and **S_N^2** reactions-kinetics, order of reactivity of alkyl halides - stereochemistry and rearrangement of carbocations -**S_N^1** versus **S_N^2** reactions.**E_1** and **E_2** reactions – kinetics - order of reactivity of alkyl halides - stereochemistry and rearrangement of carbocations - Nucleophilic substitution versus elimination reactions – **Alcohols -** General preparation and reactions including various test to distinguish primary secondary and tertiary alcohols.

UNIT V

Carbonyl compounds (Aldehydes and ketones) -Electromeric effect - aldol condensation - crossed aldol condensation - cannizaro reaction - crossed cannizaro reaction - benzoin condensation - perkin condensation - Knoevenagel reaction - reformatsky reaction -**Carboxylic acids -**Acidity of carboxylic acids - effect of substituents on acidity - inductive effect

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Arun Bahl and B.S Bhal	Advanced Organic Chemistry	S. Chand	2012

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	E.I. Elliel.	Stereo Chemistry of Organic Compounds	Wiley Eds	1988
2	Cramand Hammered	Organic chemistry	Pine Hendrickson	2005
3	Jerry March	Advanced Organic Chemistry: Reactions, Mechanisms, and Structure	Wiley: New York, NY	1992

WEBSITES:

- **www.pdfbit.com**
- **www.chem.ucla.edu**
- **www.chemistrylectures.com**

16PYU113 **SEMESTER-I**

PHARMACEUTICAL ORGANIC CHEMISTRY LABORATORY–I 3H 3C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Explain molecular orbital theory.
2. Understand the strain theories.
3. Describe effect of substituents on the reaction.
4. Elaborate the different mechanisms of reaction.
5. Account for the structure, stability, orientation, reaction and its mechanism of Benzene.
6. Explain different Reaction Intermediates & their application in reaction mechanism.
7. How to name the organic compounds.
8. Explain different reaction involve in the formation of aromatic compounds.

Course Content:

1. Preparation of Salicyclic acid
2. Preparation of Benzamide
3. Preparation of Iodoform
4. Preparation of Phenyl Benzoate
5. Preparation of Dibenzilidine acetone
6. Assay of organic compounds involving acidimetry, alkalimetry (at least 02).
7. Melting point of any synthesized compound
8. Stereo models
9. Systematic qualitative analysis of organic compounds including preparation of derivative (not less than 4 compounds with different functional groups).

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Arthur I Vogel	Practical Organic Chemistry by vogel	Dorling Kindersley	2008

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Brian Furniss, Antony Hannaford, Peter Smith, Austrin	Vogel's Text Book of Practical Organic Chemistry	ELBS Publication, Singapore	1997

WEBSITES:

- **www.pdfbit.com**
- **www.chem.ucla.edu**
- **www.chemistrylectures.com**

16PYU104 **SEMESTER-I**

BIOCHEMISTRY– I **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells.
- The scope of the subject is providing biochemical facts and the principles
- To understand metabolism of nutrient molecules in physiological and pathological conditions.
- It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.
- Will be able to know bioenergetics and energy rich compounds.
- To know the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Explain the types and importance of biomolecules.
2. Explain the bioenergetics and energy rich compounds.
3. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
4. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
5. Understand the genetic organization of mammalian genome, functions of DNA and RNA in protein synthesis.
6. Understand the principles of organ functions tests and their clinical significances.

Course Content:

UNIT I
Introduction to biochemistry–Types of aminoacids and their structures - Cell organelles and its biochemical functions - Transport process across the cell membranes –Types of solutions.

UNIT II
Bioenergetics - Concept of free energy - determination of free energy from equilibrium constant - Redox potential - **Energy rich compounds** – Definition - classification and Production and biological significance of ATP and cyclic AMP.

UNIT III
Enzymes - Definition – Nomenclature - IUB classification - Properties of enzymes - Factor affecting enzyme activity - Enzyme kinetics (Michaelis plot, Line Weaver Burke plot) - Enzyme inhibitors

with examples - Mechanism of enzyme action and theories of enzyme action eg. Allosteric enzymes - Enzyme induction and repression - Isoenzymes and their diagnostic applications - Therapeutic and diagnostic applications of enzymes - Coenzymes – Structure and biochemical role.

UNIT IV

Biological oxidation - Enzymes and co-enzymes involved in Biological oxidation - Electron transport chain (its mechanism and role) - Oxidative phosphorylation (its mechanism) and substrate level phosphorylation - Inhibitors ETC and Uncouplers or inhibition of oxidative phosphorylation.

UNIT V

Carbohydrate metabolism – Definition – classification - chemistry and biological role of carbohydrates - Glycolysis – energetics and significance - Citric acid cycle – energetic - amphibolic nature - anaplerosis and significance - HMP shunt and its significance - Glycogen metabolism (Glycogenolysis and glycogenesis) and its regulation - Gluconeogenesis and its significance - Various shuttle systems and its significance - glycerol – phosphate & malate – aspertate - Uronic acid pathway and its significance - Hormonal regulation of carbohydrate metabolism - Disorders of Carbohydrate metabolism - Diabetes mellitus - glycogen storage.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vasudevan	Textbook of Biochemistry	Jaypee	2009
2	D. Satyanarayan and U.Chakrapani	Biochemistry	Elsevier Health Sciences	2013

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Robert K. Murry, Daryl K. Granner and Victor W. Rodwell	Harper's Biochemistry	McGraw-Hill Medical	2006
2	Stryer	Biochemistry	Pine Hendrickson	2005
3	Deb	Textbook of Biochemistry	Wiley: New York, NY	1992

WEBSITES:

- **biochemistryquestions.wordpress.com**
- **www.mbmb.siu.edu**
- **www.medicalbiochemistry.org**

16PYU114 **SEMESTER-I**

BIOCHEMISTRY LABORATORY– I 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells.
- The scope of the subject is providing biochemical facts and the principles
- To understand metabolism of nutrient molecules in physiological and pathological conditions.
- It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.
- Will be able to know bioenergetics and energy rich compounds.
- To know the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Explain the types and importance of biomolecules.
2. Explain the bioenergetics and energy rich compounds.
3. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
4. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
5. Understand the genetic organization of mammalian genome, functions of DNA and RNA in protein synthesis.
6. Understand the principles of organ functions tests and their clinical significances.

Course Content:

1. Qualitative analysis of carbohydrates.
2. Qualitative analysis of Proteins.
3. Determination of Serum Glutamate Oxoloacetate Transaminase.
4. Determination of Serum Glutamate Pyrvuate Transaminase.
5. Determination of blood and urine sugar to asses metabolic function.
6. Determination of serum calcium.
7. Qualitative analysis of urine for normal constituents.
8. Qualitative analysis of urine for abnormal constituents.
9. Determination of serum total proteins.
10. Determination of blood creatine.
11. Determination of urine creatinine.

12. Determination of blood urea.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	R.C. Gupta and S. Bhargavan	Practical Biochemistry	CBS Publishers & Distributors Pvt. Ltd	2010

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Pattabiraman and Sitaram Acharya	Laboratory manual of Biochemistry	AITBS Publishers	1994

WEBSITES:

- **biochemistryquestions.wordpress.com**
- **www.mbmb.siu.edu**
- **www.medicalbiochemistry.org**

16PYU105 **SEMESTER-I**

BIOSTATISTICS & COMPUTER APPLICATIONS-I 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- To learn and understand the computer basics.
- To learn the statistical method of analysis that can apply in the development and use of therapeutic drug.
- This subject deals with the introduction Database, Database Management system.
- This subject deals with the Computer application in clinical studies and use of databases.
- To switch the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.
- To organize, summarize, and display quantitative data.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Able to organize, summarize, and display quantitative data.
2. Comfortable with statistical methods for calculating summary estimates, measures of variability, and confidence intervals
3. Know the various types of application of computers in pharmacy.
4. Know the various types of data bases.
5. Know the various applications of data bases in pharmacy.
6. Swith the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.

Course Content:

UNIT – I

Application of biostatics in medicine and pharmacy - collection of data - classification and tabulation of statistical data- diagrammatic and graphical representation - measure of central tendancy - Mean – Median- mode – geometric Mean.

UNIT – II

Purpose of sampling- methods of sampling- test significance-Null hypothesis and alternative hypothesis- standard errors-one tailed test and two tailed test-T test.

UNIT – III

Correlation analysis- application of correlation analysis- types of correlation-Scatter diagram- karl pearson's correlation coefficient- spearman's rank correlation coefficient.

UNIT – IV

Computer application - Basic computer components of organization- classification of computers- binary number system conversion- types of memory device - network topology - types of computer networks- internet search engine- computer input and output device – multimedia- MS office package- advantages and application.

UNIT – V

Types of computer software and application - types of operating systems - statistical software tools- DBMS and RDDMS- data abstraction- E- R diagram concept- Client server process- network layers- HTML web pages.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Popst and Perrum	Computer aided drug design	Academic Press, New York	2007

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hunt N and Shelly J	Computers and commonsense	Prentice – Hall of India, New Delhi.	1998
2	Writh	Systematic programming an introduction	Prentice hall Englewood Cliff's NewJersey	2006
3	S.C Gupta	Fudamentals of statistics	Pushpa banarje	2000
4	Tanen Baum	Computer networks	Pearson education pte.limited	1993
5	D.N Elhance and Veen Elhance	Practical Problems in statistics	Century printers	1955

WEBSITES:

- **www.biostat.jhsph.edu**
- **www.stat.ufl.edu**
- **www.uwf.edu**

16PYU115 **SEMESTER-I**

BIOSTATISTICS & COMPUTER APPLICATIONS LABORATORY–I 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- To learn and understand the computer basics.
- To learn the statistical method of analysis that can apply in the development and use of therapeutic drug.
- This subject deals with the introduction Database, Database Management system.
- This subject deals with the Computer application in clinical studies and use of databases.
- To switch the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.
- To organize, summarize, and display quantitative data.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Able to organize, summarize, and display quantitative data.
2. Comfortable with statistical methods for calculating summary estimates, measures of variability, and confidence intervals
3. Know the various types of application of computers in pharmacy.
4. Know the various types of data bases.
5. Know the various applications of data bases in pharmacy.
6. Swith the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.

Course Content:

1. Computer operating systems like MS DOS etc
2. Simple program in C
3. MS office (MS-Word, MS-Excel, M S- power point).

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Johnathan Lightfoot, chris Beckett	Microsoft office 2010 In simple steps	Kogent learning solutions	2011

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Margret Levine Young	Complete reference internet	Osborne/ McGraw-Hill	2007

WEBSITES:

- **www.biostat.jhsph.edu**
- **www.stat.ufl.edu**
- **www.uwf.edu**

16PYU201 **SEMESTER-II**

HUMAN ANATOMY & PHYSIOLOGY II **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body.
- It also helps in understanding both homeostatic mechanisms.
- It also helps in understanding homeostatic imbalances of various systems of the body.
- Since a medicament, which is produced by the pharmacist, is used in various disease conditions to correct the abnormal functioning of the body systems
- The basic knowledge of this subject is must for a student to understand how drugs act on various systems/organs in correcting the disease state of organs/systems.
- Thus it becomes a prerequisite subject for the pharmacy course.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the gross morphology, structure and functions of various organs of the human body.
2. Understand the various homeostatic mechanisms and their imbalances
3. Identify the various tissues and organs of different systems of the human body.
4. Perform the haematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time, etc and also record blood pressure, ECG, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of the human body.

Course Content:

UNIT I

Urinary system - Structure and functions of kidney and urinary tract- physiology of urine formation- micturition reflex and acid base balance - Definitions of renal calculi- urinary tract infection- nephrotic syndrome- renal failure- nephritis.

UNIT II

Reproductive system - Structure and function of male and female reproductive system- sex hormones- physiology and menstruation- coitus- fertilization- spermatogenesis- oogenesis-pregnancy and parturition.

UNIT III

Endocrinology–Introduction- chemistry and action of hormones- basic anatomy and physiology of pituitary – thyroid – parathyroid- adrenal and pancreas - local hormones - Definitions of disorders of these glands.

UNIT IV

Nervous system - Definition and classification nervous system - Neurons and properties of nerve fibers- neuroglia - Synapses- neurotransmitters its receptors and neurohumoral transmission - Meninges- ventricles of the brain and CSF - Anatomy and functions of cerebrum- cerebellum- brain stem (pons- medulla and mid brain)- hypothalamus- thalamus- basal ganglia - Spinal cord- structure and reflexes - Cranial nerves- names and their functions - Definitions of stroke- Alzheimer’s disease- brain tumor- epilepsy- Parkinson’s disease- psychosis- anxiety- depression - Autonomic nervous system-Anatomy and functions of sympathetic and parasympathetic nervous system.

UNIT V

Sense organs - Introduction to special senses - Anatomy and physiology of eye - ear- skin- nose and tongue - Disorders related to sense organs - Definitions of cataract – glaucoma- sight disorder – deafness- Otitis media- vertigo.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Anne Waugh and Allison Grant	Ross and Wilson Anatomy and Physiology in Health and illness	Churchill Livingstone Elsevier-UK	2013

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.C.Chattterjee	Human Physiology - Vol.–I &I I	Medical Allied Agency-Calcutta	1997
2	Gerard J Tortora- Bryan Derrickson	Principles of Anatomy and Physiology	Wiley-USA	2014
3	Cinnamon Van Putte	Seeley’s Fundamentals of Human Anatomy and Physiology	Tata Mc GrawHill-New Delhi	2009

WEBSITES:

- **www.khanacademy.org**
- **www.biologycorner.com**
- **www.gwc.maricopa.edu**

16PYU211 **SEMESTER-II**

HUMAN ANATOMY & PHYSIOLOGY LABORATORY – II 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body.
- It also helps in understanding both homeostatic mechanisms.
- It also helps in understanding homeostatic imbalances of various systems of the body.
- Since a medicament, which is produced by the pharmacist, is used in various disease conditions to correct the abnormal functioning of the body systems
- The basic knowledge of this subject is must for a student to understand how drugs act on various systems/organs in correcting the disease state of organs/systems.
- Thus it becomes a prerequisite subject for the pharmacy course.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the gross morphology, structure and functions of various organs of the human body.
2. Understand the various homeostatic mechanisms and their imbalances
3. Identify the various tissues and organs of different systems of the human body.
4. Perform the haematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time, etc and also record blood pressure, ECG, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of the human body.

Course content

1. Identification of Blood Groups.
2. Recording of human body temperature and Body Mass Index (BMI) (2 experiments).
3. Recording of systematic arterial blood pressure.
4. Recording of human heart rate and pulse rate.
5. Recording of human pulse rate.
6. Study of nervous- digestive- respiratory- cardiovascular- urinary- reproductive systems.
7. Study of special senses with the help of models- charts and specimens.
8. Health education (2 experiments)

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Godkar P.B and Godkar D.P	Textbook of Medical Laboratory Technology	Bhalani Publishing House, Mumbai	2007

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mukherjee, K.L	Medical Laboratory Technology	Tata McGraw Hill Publishing Company Ltd. New Delhi	2010

WEBSITES:

- **www.khanacademy.org**
- **www.biologycorner.com**
- **www.gwc.maricopa.edu**

16PYU202 **SEMESTER-II**

PHARMACEUTICAL INORGANIC CHEMISTRY –II 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- Study about various role of inorganic compounds which having medicinal use.
- This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs.
- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- This subject deals with general methods of preparation and reactions of some organic compounds.
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
2. Understand the medicinal and pharmaceutical importance of the inorganic compounds
3. Write the molecular formula and balance chemical equations and understand the development of periodic table.
4. Understand the importance of quality control.
5. Discuss the nuclear reactions and radioactivity.
6. Elaborate the importance of topical agents.

Course Content

UNIT-I

Anti-caries Agents - Role of fluorides as anti-caries agents-sodium fluoride –**Dentifrices**-Calcium carbonate - dibasic calcium phosphate-strontium chloride- zincs chloride -**Medicinal Gases –** Oxygen- carbon dioxide – helium- nitrogen and nitrous oxide.

UNIT -II

Major Intra and extra cellular electrolytes- Physiological role of chloride – phosphate – bicarbonate –sodium– potassium-calcium and magnesium-Electrolytes used for replacement therapy - Sodium chloride-potassium chloride-calcium chloride- calcium gluconate- calcium lactate-di basic calcium phosphate- tri basic calcium phosphate -Physiological acid-base balance and its importance – Electrolytes used in the acid –base therapy –Sodium acetate-potassium acetate-sodium bicarbonate-potassium bicarbonate-sodium citrate-sodium lactate-ammonium chloride – Electrolyte combination therapy- compound sodium chloride solution- sodium chloride injection and oral rehydration salt.

UNIT – III

Essential and Trace ions – Definition - physiological role of iron - copper – zinc – chromium– manganese – molybdenum – selenium-sulphur and iodine – Ferrous fumarate- ferrous gluconate- ferrous sulphate- iron and ammonium citrate -**Official formulation** –Iron dextran injection- strong iodine solution.

UNIT – IV

Pharmaceutical Aids- Sodium bisulphate- sodium metabisulphite –sulphur dioxide –bentonite- magnesium stearate – zinc stearate- aluminium sulphate- sodium carboxymethyl cellulose-sodium formaldehyde sulphoxylate- purified water- water for injection and sterile water for injection.

UNIT – V

Miscellaneous- Sclerosing agents- Hypertonic saline- sodium tetra decyl sulphate– Expectorants – Potassium citrate and potassium iodide – Sedative – Potassium bromide –Antidotes –Sodium nitrite- sodium thiosulphate and charcoal - Respiratory stimulant - Ammonium carbonate.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	V.N Rajasekaran	Text Book of pharmaceutical Inorganic Chemistry	Sun Publications	2005

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dr. B. G. Nagavi	Pharmaceutical Inorganic chemistry	S. Chand	2007
2	Surendra N. Pandeya	A text book Inorganic medicinal chemistry	Sg Publisher	2011
3	Anand & Chatwal	Inorganic Pharmaceutical Chemistry	Himalaya Pub. House	2010

WEBSITES:

- **www.slideshare.com**
- **www.ucdavis.com**
- **www.chem.tamu.edu**

16PYU212 **SEMESTER-II**

PHARMACEUTICAL INORGANIC CHEMISTRY LABORATORY–II 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- Study about various role of inorganic compounds which having medicinal use.
- This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs.
- This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- This subject deals with general methods of preparation and reactions of some organic compounds.
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
2. Understand the medicinal and pharmaceutical importance of the inorganic compounds
3. Write the molecular formula and balance chemical equations and understand the development of periodic table.
4. Understand the importance of quality control.
5. Discuss the nuclear reactions and radioactivity.
6. Elaborate the importance of topical agents.

Course Content:

1. Limit test for Iron.
2. Limit test for Arsenic.
3. Modified limit test for chloride in $NaHCO_3$.
4. Modified limit test for Sulphate in $NaHCO_3$.
5. Preparation of Calcium Carbonate.
6. Preparation of Zinc Oxide.
7. Test for swelling power of Bentonite.
8. Test for Presence of iodate in potassium iodide.
9. Systematic qualitative salt analysis (4 mixture of compounds).

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	A. H. Beckett and J. B. Stenlake	Practical Pharmaceutical Chemistry Vol-I & II	Harcourt Brace College Publishers, London	1998

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	1996

WEBSITES:

- **www.slideshare.com**
- **www.ucdavis.com**
- **www.chem.tamu.edu**

16PYU203 **SEMESTER-II**

PHARMACEUTICAL ORGANIC CHEMISTRY –II **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry.
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds.
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes (CO's):

On successful completion of the course the student will Explain molecular orbital theory.

1. Understand the strain theories.
2. Describe effect of substituents on the reaction.
3. Elaborate the different mechanisms of reaction.
4. Account for the structure, stability, orientation, reaction and its mechanism of Benzene.
5. Explain different Reaction Intermediates & their application in reaction mechanism.
6. How to name the organic compounds?
7. Explain different reaction involve in the formation of aromatic compounds.

Course Content:

UNIT I

Benzene -Derivation of structure of benzene. Orbital picture- resonance in benzene- aromatic characters- Huckel's rule.Preaparation and Reactions of benzene – nitration- sulphonation- halogenation- reactivity- friedel crafts alkylation- friedel crafts acylation. Effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reactions.

UNIT II

Aryl halides -Nomenclature- General methods of preparation- General reactions of – Aryl halides- Nucleophilic aromatic substitution reactions (Bimolecular nucleophilic substitution and Benzyne- mechanisms)- effect of substituents on reactivity towards nucleophilic aromatic substitution reactions.

UNIT III

Phenols -Nomenclature- General methods of preparation- General reactions- Acidity of -phenols- effect of substituents on acidity – **Amines -**Nomenclature- General methods of preparation- General reactions- Basicity of - aromatic amines- effect of substituents on basicity- comparison with aliphatic saturated amines- synthetic uses of diazonium salts.

UNIT IV

Types of reaction and factors influencing the reaction including Inductive effect- electromeric effect- mesomeric effect- Resonance effect- resonance- tautomerism- hyper conjugation- Types of bond fission- electrophiles and nucleophiles.

UNIT V

Reactive intermediates - Carbocations- carbanions- carbenes- free radicals – generation- relative stability- fate and applications.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Arun Bahl and B.S Bhal	Advanced Organic Chemistry	S. Chand	2012

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	E.I. Elliel.	Stereo Chemistry of Organic Compounds	Wiley Eds	1988
2	Cramand Hammered	Organic chemistry	Pine Hendrickson	2005
3	Jerry March	Advanced Organic Chemistry: Reactions, Mechanisms, and Structure	Wiley: New York, NY	1992

WEBSITES:

- **www.pdfbit.com**
- **www.chem.ucla.edu**
- **www.chemistrylectures.com**

16PYU213 **SEMESTER-II**

PHARMACEUTICAL ORGANIC CHEMISTRY LABORATORY–II 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Explain molecular orbital theory.
2. Understand the strain theories.
3. Describe effect of substituents on the reaction.
4. Elaborate the different mechanisms of reaction.
5. Account for the structure, stability, orientation, reaction and its mechanism of Benzene.
6. Explain different Reaction Intermediates & their application in reaction mechanism.
7. How to name the organic compounds.
8. Explain different reaction involve in the formation of aromatic compounds.

Course Content:

1. Determination of melting point and boiling point of organic compounds including mixed melting point technology (3 compounds)
2. Preparation of organic compounds (5 compounds)
3. Systematic Qualitative Salt analysis (4 compounds)

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Arthur I Vogel	Practical Organic Chemistry by Vogel	Dorling Kindersley	2008

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Brian Furniss, Antony Hannaford, Peter Smith, Austrin	Vogel's Text Book of Practical Organic Chemistry	ELBS Publication, Singapore	1997

WEBSITES:

- **www.pdfbit.com**
- **www.chem.ucla.edu**
- **www.chemistrylectures.com**

16PYU204 **SEMESTER-II**

BIOCHEMISTRY– II **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells.
- The scope of the subject is providing biochemical facts and the principles
- To understand metabolism of nutrient molecules in physiological and pathological conditions.
- It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.
- Will be able to know bioenergetics and energy rich compounds.
- To know the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Explain the types and importance of biomolecules.
2. Explain the bioenergetics and energy rich compounds.
3. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
4. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
5. Understand the genetic organization of mammalian genome, functions of DNA and RNA in protein synthesis.
6. Understand the principles of organ functions tests and their clinical significances.

Course Content:

UNIT I
Lipid metabolism – Definition – classification - chemistry and biological role of lipids - β-Oxidation of saturated (Palmitic acid) and unsaturated fatty acids (linolinic acid) - Ketone bodies metabolism (Ketogenesis and ketolysis) ketosis and ketoacidosis d - *De novo* -Biosynthesis of fatty acids (Palmitic acid) - Metabolism of cholesterol (Biosynthesis and degradation) - Biosynthesis and significance of Phospholipids - Disorders of lipid metabolism – Hypercholesterolemia - atherosclerosis and fatty liver.

UNIT II
Amino acid metabolism – Definition - classification and biological role of amino acids - General reactions of amino acid metabolism - Transamination - deamination & decarboxylation - Urea cycle and its metabolic disorders - Metabolism of sulfur containing amino acids their metabolic

disorders - Catabolism of tyrosine – tryptophan - phenylalanine and their metabolic disorders - Synthesis and significance of biological substances – creatine – histamine - 5-hydroxy- Tryptophan (5-HT) – dopamine – noradrenaline – adrenaline - Metabolism of Heme and its disorders Porphyriaas - hyperbilirubinemia and jaundice.

UNIT III

Nucleic acid metabolism – Definition - chemistry and biological role of nucleosides - nucleotides - Biosynthesis of purine and pyrimidine nucleotides - Catabolism of purine and pyrimidine nucleotides -Disorders of nucleotide metabolism - Gout disease.

UNIT IV

Replication and Protein synthesis - Organization of mammalian genome **-** Structure of DNA and significance as genetic material – RNA – structure - types and significance in protein synthesis **-** DNA replication - types and details on semi conservative model **-** Mutation and consequences of mutation **-** DNA Damage and repair mechanism **-**Transcription or RNA synthesis - Genetic code **-** Translation or Protein synthesis and its regulation and inhibition.

UNIT V

Clinical biochemistry - Role of the kidney - routine performed Laboratory tests - serum creatinine-creatinine clearance - serum urea and serum uric acid - Liver functions – Metabolic – synthetic - excretion & detoxification - Tests to evaluate theliver function **-** Composition and significance of lipoproteins - Lipid profile tests.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	D. Satyanarayan and U.Chakrapani	Biochemistry	Elsevier Health Sciences	2013

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Robert K. Murry, Daryl K. Granner and Victor W. Rodwell	Harper's Biochemistry	McGraw-Hill Medical	2006
2	Stryer	Biochemistry	Pine Hendrickson	2005
3	Deb	Textbook of Biochemistry	Wiley: New York- NY	1992

WEBSITES:

- **biochemistryquestions.wordpress.com**
- **www.mbmb.siu.edu**
- **www.medicalbiochemistry.org**

16PYU214 **SEMESTER-II**

BIOCHEMISTRY LABORATORY– II **3H** **2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells.
- The scope of the subject is providing biochemical facts and the principles
- To understand metabolism of nutrient molecules in physiological and pathological conditions.
- It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.
- Will be able to know bioenergetics and energy rich compounds.
- To know the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Explain the types and importance of bio molecules.
2. Explain the bioenergetics and energy rich compounds.
3. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
4. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
5. Understand the genetic organization of mammalian genome, functions of DNA and RNA in protein synthesis.
6. Understand the principles of organ functions tests and their clinical significances.

Course Content:

1. Determination of serum cholesterol(2 experiments).
2. Determination of serum triglycerides(2 experiments).
3. Determination of Salivary amylase activity(2 experiments).
4. Study the effect of pH on salivary amylase activity. (2 experiments).
5. Study the effect of Temperature on Salivary amylase activity.
6. Study the effect of substrate concentration on salivary amylase activity.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	R.C. Gupta and S. Bhargavan	Practical Biochemistry	CBS Publishers & Distributors Pvt. Ltd	2010

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Pattabiraman and Sitaram Acharya	Laboratory manual of Biochemistry	AITBS Publishers	1994

WEBSITES:

- **biochemistryquestions.wordpress.com**
- **www.mbmb.siu.edu**
- **www.medicalbiochemistry.org**

16PYU205 **SEMESTER-II**

BIOSTATISTICS & COMPUTER APPLICATIONS-II 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- To learn and understand the computer basics.
- To learn the statistical method of analysis that can apply in the development and use of therapeutic drug.
- This subject deals with the introduction Database, Database Management system.
- This subject deals with the Computer application in clinical studies and use of databases.
- To switch the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.
- To organize, summarize, and display quantitative data.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Able to organize, summarize, and display quantitative data.
2. Comfortable with statistical methods for calculating summary estimates, measures of variability, and confidence intervals
3. Know the various types of application of computers in pharmacy.
4. Know the various types of data bases.
5. Know the various applications of data bases in pharmacy.
6. Swith the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.

Course Content:

UNIT – I

Bio-statistics – Dispersion -Theory of sampling - Statistical inference.

UNIT – II

Regression and correlation - Probabilities.

UNIT – III

Computer Packages- MS Office - MS Word-MS ExcelMSPowerPointAdvantages and use.

UNIT – IV

Introduction to Computer Networks –Definition – LAN – WAN – Advantages – Internet-Worldwide Web.

UNIT – V

Computer Graphics - Definition-displaydevices-graphicalinputandoutputdevices-multimedia–definition and application.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hunt N and Shelly J	Computers and common sense	Prentice – Hall of India, New Delhi.	1998

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Popst and Perrum	Computer aided drug design	Academic Press, New York	2007
2	Writh	Systematic programming an introduction	Prentice hall Englewood Cliff's New Jersey	2006
3	Tanen Baum	Computer networks	Pearson education pte.limited	1993
4	S.C Gupta	Fundamentals of statistics	Pushpa banarje	2000
5	D.N Elhance and Veen Elhance	Practical Problems in statistics	Century printers	1955

WEBSITES:

- **www.biostat.jhsph.edu**
- **www.stat.ufl.edu**
- **www.uwf.edu**

16PYU215 **SEMESTER-II**

BIOSTATISTICS & COMPUTER APPLICATIONS LABORATORY–II 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- To learn and understand the computer basics.
- To learn the statistical method of analysis that can apply in the development and use of therapeutic drug.
- This subject deals with the introduction Database, Database Management system.
- This subject deals with the Computer application in clinical studies and use of databases.
- To switch the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.
- To organize, summarize, and display quantitative data.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Able to organize, summarize, and display quantitative data.
2. Comfortable with statistical methods for calculating summary estimates, measures of variability, and confidence intervals
3. Know the various types of application of computers in pharmacy.
4. Know the various types of data bases.
5. Know the various applications of data bases in pharmacy.
6. Switch the introduction Database, Database Management system, Computer application in clinical studies and use of data bases.

Course Content:

1. Computer operating systems like MS DOS- etc (4 experiments).
2. Simple programin C (4 experiments).
3. MS Office (MS-Word- MS-Excel-MS-Access-MS-Powerpoint) (4 experiments).

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Johnathan Lightfoot, chris Beckett	Microsoft office 2010 In simple steps	Kogent learning solutions	2011

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Margret Levine Young	Complete reference internet	Osborne/ McGraw-Hill	2007

WEBSITES:

- **www.biostat.jhsph.edu**
- **www.stat.ufl.edu**
- **www.uwf.edu**

16PYU301 **SEMESTER-III**

PHYSICAL PHARMACEUTICS-I **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Physical pharmaceutics is a fundamental course that leads to proper understanding of subsequent courses in Pharmaceutics.
- It integrates knowledge of mathematics, physics and chemistry and applies them to the pharmaceutical dosage form development.
- It focuses on the theories behind the phenomena needed for dosage form design.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions, etc.
- The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations.
- Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Exploit the historical background of pharmacy industry.
2. Recognize about various Pharmacopoeias like IP, BP,USP
3. Acquire the basics of physical pharmaceutics.
4. Interpret about diffusion, dissolution and particle properties.
5. Demonstrate the applications of micromeritics in pharmaceutical industy.
6. Enable the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions.

Course Content:

UNIT-I
Historical back ground and development of profession of pharmacy industry and organization - Pharmacy as a career – Pharmacopoeias - Introduction to IP – BP - USP and extra pharmacopoeia - Salient features of Indian Pharmacopoeia.

UNIT-II
Diffusion – definition –Fick's law - steady state diffusion – principles of diffusion involved in biological systems - **Dissolution** – definition – rate of dissolution – theories of dissolution - factors

affecting rate of dissolution - Noyes Whitney equation.

UNIT-III

Colloids– definition – types of colloids – preparation of colloids – purification - dialysis – electrodialysis – ultrafiltration – stabilization of colloids – solubilization – optical properties – electrical properties –kinetic properties.

UNIT-IV

Coarse dispersion– definition - **Suspension** – definition – preparation – settling of suspension – physical stability – evaluation of suspension - **Emulsion** – definition – types of emulsion – theories involved –instabilities of emulsion – microemulsion – multiple emulsions.

UNIT-V

Micromeritics– definition – particle shape and size distribution – methods of determining particle size – microscopic method –sieve method – sedimentation technique – particle volume measurement – coulter counter method - shape - surface area and derived properties of powders.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Manavalan and Ramasamy	Physical Pharmaceutics	Pharmamed Press	2015
2.	S.P.Agarwal and Rajesh Khanna	Physical Pharmacy	CBS Publishers	2015

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	H.C. Ansel	Pharmaceutical Dosage form and Drug delivery system	New Delhi	2000
2	Lachmann	Theory and practice of Industrial pharmacy	Churchill Livingstone	2002
3	M.E. Aulton	Pharmaceutics- The Science & Dosage Form Design	Churchill Livingstone	2001
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
5	Remington	Science and Practice of Pharmacy	Philadelphia	2005

6	Carter S.J	Cooper and Gunn's-Dispensing for Pharmaceutical students	CBS publishers	2000

WEBSITES:

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU311 **SEMESTER-III**

PHYSICAL PHARMACEUTICS LABORATORY- I **3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Physical pharmaceutics is a fundamental course that leads to proper understanding of subsequent courses in Pharmaceutics.
- It integrates knowledge of mathematics, physics and chemistry and applies them to the pharmaceutical dosage form development.
- It focuses on the theories behind the phenomena needed for dosage form design.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions, etc.
- The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations.
- Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Understand the physicochemical parameters of a drug
2. Identify methods to enhance solubility of a new drug moiety
3. Discover the importance of stability in pharmaceutical preparations
4. Demonstrate the powder properties and effect of Glidants in powder flow
5. Interpret about diffusion, dissolution and particle properties.
6. Demonstrate the applications of micromeritics in pharmaceutical industry
7. Enable the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions

Course content:

1. Determination of particle size and particle size distribution using microscope.
2. Determination of particle size distribution using sieve method.
3. Determination of powder properties,
   a) Density
   b) Porosity
4. Determination of powder properties,
   a) Compressibility
   b) Angle of repose
5. Determination of effect of glidants or lubricants on angle of repose.

6. Preparation of emulsion.
7. Determination of globule size of emulsions.
8. Preparation of various types of suspensions.
9. Determination of suspension sedimentation parameters.
10. Experiment on preparation of colloids.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.V.S. Subramanyam - J. Thimmasettee	Laboratory manual of physical pharmaceutics	CVS	2001
2	C. Vijayaraghavan	A Practical Handbook Of Physical Pharmaceutics	New Century Book House	2008

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Eugene-Parott	Experimental pharmaceutics	New Delhi	2000
2	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

WEBSITES:

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU302 **SEMESTER-III**

PHARMACETICAL ANALYSIS AND PHYSICAL CHEMISTRY-I 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Titrimetric analysis deals with complete understanding of the various titration methods.
- The scope of the present course is to know the quality, quantity and purity of pharmaceutical products and chemicals.
- Know and understand the various apparatus used in pharmaceutical analysis and their calibrations.
- Know the quality control and their importance.
- Know the apparatus used in analysis.
- Know the calibration of volumetric apparatus.

Course Outcomes:

On successful completion of the course the student will

1. To know the quality control and their importance.
2. To know the apparatus used in analysis.
3. To know the calibration of volumetric apparatus.
4. To know the different types of titrations like neutralization, non- aqueous, complexometric, gravimetric, precipitation and reduction oxidation titrations.
5. To know the concept of titrations.
6. To know indicators used in various titration methods.

Course Content:

UNIT- I

Introduction - Importance of quality control - computation of analytical results - significant figure - concept of error – precision – accuracy - standard deviation - normal distribution curve - calibration of volumetric apparatus - titration - concepts and different types of titration.

UNIT- II

Acid-base titrations - Acid-base concepts, Henderson–Hasselbalch equation, theory of indicators, neutralization curves - **Non aqueous titration -** Introduction- Solvents for Non- Aqueous Titrations- Indicators for Non- Aqueous Titrations-Titrations of Weak Base.

UNIT- III

Precipitation titrations - Principles of precipitation titrations- factors affecting solubility of precipitate- Argentimetric titration including, Mohr's method, Volhard's method, Fajan's method and Gay Lussac method - **Complexometric titration -** principle of complexometric titration- types of titrations-endpoint determination-masking and demasking agents.

UNIT- IV

Solutions - Definition and types of solutions- Ideal and real solutions- colligative properties- partition coefficient- Debye- Huckel theory - **Thermodynamics -** Terminology of thermodynamics- **First law of thermodynamics**- internal energy- enthalpy of a system- relation between ΔH and ΔE- molar heat capacity- Joule – Thomson effect- Adiabatic expansion of an ideal gas and Zeroth law of thermodynamics.

UNIT-V

Second law of thermodynamics -Need for second law- spontaneous processes- concept ofentropy- statement of second law of thermodynamics and Carnot cycle - **Change in entropy for isothermal changes-** Entropy of vaporization- Trouton's rule- hydrogen bonding- need for Gibb's free energy and definition of free energy- predicting spontaneity of reaction- equilibrium constant and Vant-hoff equation - **Third law of thermodynamics:** Definition- Zero entropy.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Parimoo	Pharmaceutical Analysis	CBS Publisher & Distributors P Ltd;	2012

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	V. Alexysev	Quantitative analysis	University Press of the Pacific	2000
2	Skoog West and James Holler.	Fundamentals of Analytical Chemistry	Cengage Learning India	2013
3	G.H. Jeffery J, Bassett J. Mendham R.C. Denney	Vogel's Textbook of Quantitative Chemical Analysis	John Wiley & Sons Inc	1989

WEBSITES:

- **www.jpr.info.com**
- **www.sciencedomain.org**
- **www.pharmaresearchlibrary.com**

16PYU312 **SEMESTER-III**

PHARMACETICAL ANALYSIS AND PHYSICAL CHEMISTRY LABORATORY- I **3H** **2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Titrimetric analysis deals with complete understanding of the various titration methods.
- The scope of the present course is to know the quality, quantity and purity of pharmaceutical products and chemicals.
- Know and understand the various apparatus used in pharmaceutical analysis and their calibrations.
- Know the quality control and their importance.
- Know the apparatus used in analysis.
- Know the calibration of volumetric apparatus.

Course Outcomes:

On successful completion of the course the student will

1. To know the quality control and their importance.
2. To know the apparatus used in analysis.
3. To know the calibration of volumetric apparatus.
4. To know the different types of titrations like neutralization, non- aqueous, complexometric, gravimetric, precipitation and reduction oxidation titrations.
5. To know the concept of titrations.
6. To know indicators used in various titration methods.

Course Content:

1. Standardization of analytical weights and calibrating of volumetric apparatus.
2. Assay of citric acid by alkalimetry.
3. Assay of ammonium chloride by alkalimetry.
4. Assay of sodium hydroxide by acidimetry.
5. Assay of calcium gluconate by complexometry.
6. Assay of magnesium sulphate by complexometry.
7. Assay of silver nitrate by precipitation titration.
8. The liquid state physical properties – surface tension- parachor.
9. The liquid state physical properties viscosity- rheochor.
10. The liquid state physical properties refractive index.
11. The liquid state physical properties -optical rotation and chemical constitution.

12. Assay of silver nitrate by precipitation titration.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	A.H. Beckett and J.B. Stenlake	Practical Pharmaceutical Chemistry	Bloomsbury Academic	2001

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	1996

WEBSITES:

- **www.jpr.info.com**
- **www.sciencedomain.org**
- **www.pharmaresearchlibrary.com**

16PYU303 **SEMESTER-III**

ADVANCED PHARMACEUTICAL ORGANIC CHEMISTRY-I 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The subject deals with structure, stability and reactivity of organic compounds. It emphasizes on mechanisms and orientation of reactions.
- The syllabus includes physical properties of organic compounds and named reactions. This course also deals with stereo chemical aspects of organic compounds and stereo chemical reactions.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes:

On successful completion of the course the student will

1. Write the structure, name, type of isomerism of the organic compound.
2. Write the reaction, name the reaction and understand orientation of reactions.
3. Understand the stereo chemical aspects of organic compounds and reactions
4. Account for the stability/reactivity/orientation
5. Emphasize the synthesis, reactions and uses of Heterocyclic compounds
6. Know aspects of organic compounds and reactions.

Course Content:

UNIT I

Polynuclear hydrocarbons –Synthesis - reactions and medicinal uses of following derivatives Naphthalene – Phenanthrene - Anthracene - Diphenylmethane and Triphenylmethane.

UNIT II

Reactions of synthetic importance: Catalytic hydrogenation - metal hydride reduction - Clemmensen reduction – Meerwein Pondorff Verley reduction - Birch reduction - Wolff kishner reduction.

UNIT III

Study of name reaction with its mechanism: Beckmanns rearrangement, Claisen-Schmidt Condensation- Oppenauer-oxidation- Dakin reaction- cannizaro reaction- crossed cannizaro reaction- Aldol condensation.

UNIT IV

Detailed Study of Heterocyclic Compounds Including Its Synthesis and Medicinal Uses - Classification and nomenclature of Heterocyclic compounds- Pyrrole- Furan- Thiophene - Relative aromaticity, reactivity, Basicity of pyrrole- Pyrazole- Imidazole- Oxazole- Thiazole.

UNIT V

Detailed Study of Heterocyclic Compounds Including Its Synthesis and Medicinal Uses - Pyridine and its basicity- Quinoline- Isoquinoline- Acridine- Indole- phenothiazine- azepines and Diazepines- Pyrimidine- Purine.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Morrison and Boyd	Organic Chemistry	Prentice Hall	1992

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	I.L. Finar	Organic Chemistry by Vol. I & II	Pearson	1956
2	Cramand Hammered	Organic chemistry	Pine Hendrickson	2005
3	Jerry March	Advanced Organic Chemistry: Reactions- Mechanisms- and Structure	Wiley: New York- NY	1992

WEBSITES:

- **www.pdfbit.com**
- **www.chem.ucla.edu**
- **www.chemistrylectures.com**

16PYU313 **SEMESTER-III**

ADVANCED PHARMACEUTICAL ORGANIC CHEMISTRY LABORATORY- I **3H** **2C**

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Quantitatively analyze the organic compounds
2. Determine the qualitative parameters of oil.
3. Prepare homocyclic compounds using basic reactions.
4. Write the structure, name, type of isomerism of the organic compound.
5. Write the reaction, name the reaction and understand orientation of reactions.
6. Understand the stereo chemical aspects of organic compounds and reactions

Course Content:

I. Quantitative determination of following classes of organic compound

1. Alcohol by acetylation method.
2. Carbonyl compound by hydroxyl amine hydro chloride method.
3. Carboxylic acid by acid base method.
4. Ester by hydrolysis method.

II. Determination of following oil values

1. Acid value.
2. Saponification value.

III. Preparation of homocyclic compounds.

1. Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction. (any two)

   5- Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction. (any two)

IV. Preparation of heterocyclic compounds.

1. Benzimidazole from ortho phenylene diamine.
2. 2,3–diphenyl quinoxaline from benzil

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mann and Saunders	. Practical Organic Chemistry	Longman	1960

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Arthur I. Vogel	Vogel's text book of Practical Organic Chemistry	Pearson	1996

WEBSITES:

- **www.pdfbit.com**
- **www.chem.ucla.edu**
- **www.chemistrylectures.com**

16PYU304 **SEMESTER-III**

PHARMACY PRACTICE AND PATHOPHYSIOLOGY-I 3H 3C

Instruction hours/ week: L: 3 T: 0 P:0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This course is designed to impart basic knowledge and skills that are required for the practice of pharmacy in both hospital and community settings.
- To develop practical clinical skills that will enable the student to enhance the quality of life of patients and advance pharmaceutical care in the community setting.
- To understand prescription handling, dispensing of dosage forms and calculation of dosage forms.
- Pathophysiology is the study of causes of diseases and reactions of the body tosuch disease producing causes.
- This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms.
- Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Course Outcomes:

On successful completion of the course the student will

1. Understand the various drug distribution system- BMI & BP
2. Handle the prescriptions.
3. Manage community pharmacies.
4. Understand the elements of pharmaceutical care and provide comprehensive patient care services
5. Understand the concept and practice of the quality use of medicines.
6. Summarize the therapeutic approach for management of various diseases including reference to the latest available evidence.

Course Content:

UNIT I

Prescription -Parts of prescription- handling of prescription- source of errors in prescription- care required in dispensing procedures including labeling of dispensed products.

UNIT II

Pharmaceutical calculations -Latin terms used in prescription – posology- factors determining doses of drug- calculation of doses for infants- adults and elderly patients - enlarging and reducing recipes- percentage solutions –allegation - alcohol dilution- proof spirit- isotonic solutions.

UNIT III

Dosage form -introduction - classifications of dosage forms - **Principles involved and procedures adopted in dispensing -**Typical prescription like mixtures – emulsions – powders – pastilles – lozenges – pills – lotions – liniments – inhalations – mouthwashes – gargles – douches – paints- sprays and tablet triturates.

UNIT IV

Basic principles of cell injury and adaptation -Causes of cellular injury- Pathogenesis and morphology of cell injury - Intercellular alterations in lipids- proteins and carbohydrates- cellular adaptation- atrophy and hypertrophy.

UNIT V

Basic mechanism involved in the process of inflammation and repair - alteration in vascular permeability and blood flow- migration of WBC's- acute and chronic inflammation and mediators of inflammation - Brief outline of the process of repair.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.J. Carter.	Cooper and Gunn's Dispensing for Pharmaceutical students	CBS publishers	2000

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	University of the Sciences in Philadelphia	Remington's Pharmaceutical Sciences	LWW	2005
2	H.C. Ansel	Pharmaceutical Dosage form and Drug delivery system	New Delhi	2000
3	William E. Hassan	Hospital Pharmacy	Lea & Febiger	1974
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family	2007

			Welfare, Govt. of India	
5	Goodman and Gilman	The Pharmacological basis of therapeutics	Mc Grill	2008

WEBSITES:

- **www.jpp.sagepub.com**
- **www.jrpp.net**
- **www.pharmacypractice.com**

16PYU314 **SEMESTER-III**

PHARMACY PRACTICE AND PATHOPHYSIOLOGY LABORATORY -I **3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This course is designed to impart basic knowledge and skills that are required for the practice of pharmacy in both hospital and community settings.
- To develop practical clinical skills that will enable the student to enhance the quality of life of patients and advance pharmaceutical care in the community setting.
- To understand prescription handling, dispensing of dosage forms and calculation of dosage forms.
- Pathophysiology is the study of causes of diseases and reactions of the body tosuch disease producing causes.
- This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms.
- Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Understand the various drug distribution system- BMI & BP
2. Handle the prescriptions.
3. Manage community pharmacies.
4. Understand the elements of pharmaceutical care and provide comprehensive patient care services
5. Understand the concept and practice of the quality use of medicines.
6. Summarize the therapeutic approach for management of various diseases including reference to the latest available evidence.

Course Content:

I. Dispensing of prescription falling under the following categories:

1. Preparation of strong ammonium acetate solution.
2. Preparation of diuretic mixtures.
3. Preparation of sodium bicarbonate.
4. Preparation of paracetamol elixir.
5. Preparation of ferric ammonium citrate emulsion

6. Preparation of castor oil emulsion.
7. Preparation of aspirin powder.
8. Preparation of electrolyte powder.
9. Preparation of crystal violet paint
10. Preparation of Mandl's paint.

II. Dispensing procedures involving pharmaceutical calculation, dosage calculation for paediatric.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Guyton A- Hall J.E.	Textbook of Medical Physiology- WB Saunders Company.	Saunders	2015

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Joseph DiPiro-Robert L. Talbert	Pharmacotherapy: A Pathophysiological Approach	McGraw-Hill Education	2014

WEBSITES:

- **www.jpp.sagepub.com**
- **www.jrpp.net**
- **www.pharmacypractice.com**

16PYU305 **SEMESTER-III**

PHARMACEUTICAL TECHNOLOGY-I **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This course is designed to impart a fundamental knowledge on the art and science of various machines and their handling in pharmaceutical industry.
- This course focuses on various topics like unit operations, material handling, pharma plant construction, corrosion, industrial pollution etc.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of pharmaceutical equipments.
- To carry out various test to prevent environmental pollution.
- To appreciate and comprehend significance of plant lay out design for optimum use of resources.
- To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

Course Outcomes (CO's):

On successful completion of the course the student will

1. To know various unit operations used in Pharmaceutical Industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various tests to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical Industries.

Course Content:

UNIT I

Materials of Pharmaceutical Plant Construction - General study of composition – corrosion – resistance - properties and applications of the materials of construction with special reference to stainless steel and glass.

UNIT II

Industrial Hazards and Safety Precautions –Mechanical – Chemical – Electrical - Fire and Dust hazards - Industrial dermatitis - Accident records - **Fluid Flow -**Types of flow - Reynold's number – Viscosity - Concepts of boundary layer - Basic equation of fluid flow – Valves – Pumps - Flow meters -

Manometers and Measurement of flow and pressure.

UNIT III

Filtration and Centrifugation -Theory of filtration - filter aids - filter media - industrial filters including filter press - rotary press - rotary filter - edge filter - Factors affecting filtration - mathematical problems on filtration – optimum- cleaning cycle in batch filters - Principles of centrifugation - industrial centrifugal filters & centrifugal sedimenters.

UNIT IV

Crystallization - Characters of crystals like purity - size - shape - geometry - habit, forms, size and factors affecting them - Solubility curves and calculation of yields - Material and heat balances around Swenson Walker crystalliser - Super saturation theory - its limitations - nucleation mechanism and crystal growth - Study of various types of crystallisers - Caking of crystals and its prevention and numerical problems on yields.

UNIT V

Dehumidification and Humidity Control -Basic concepts – definition - wet bulb and adiabatic saturation temperatures - psychometric chart and measurement of humidity - application of humidity measurement in pharmacy -Equipments for dehumidification operations.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.V.S.Subrahmanyam et al	Pharmaceutical Engineering principles and practices	Vallabh prakashan	2002

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Lachman	Theory and practice of Industrial Pharmacy	Lea & Febiger	1986
2	MaCabe WL and Smith J.C.	Unit operations of Chemical Engineering	McGraw-Hill Education	2004
3	Walter J. Badger.	Introduction to Chemical Engineering	McGraw-Hill Education	1955
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health &	2007

			Family Welfare, Govt. of India	
5	Remington	Science and Practice of Pharmacy	Philadelphia	2005

WEBSITES:

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU306 **SEMESTER-III**

SOCIAL PHARMACY AND BEHAVIORAL SCIENCE 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Social Pharmacy and Behavioural Science course will prepare the young pharmacy student to fit into the social role as Pharmacist.
- Interaction of pharmacist with doctors- nurses- dentists- physiotherapists and other health workers is to develop team spirit in pharmacist.
- Rational drug use and essential drugs concepts can be realized with meaningful interaction of pharmacists with other health care providers.
- At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.
- This course is designed to impart basic knowledge and skills that are required for the practice of pharmacy in both hospital and community settings.
- To develop practical clinical skills that will enable the student to enhance the quality of life of patients and advance pharmaceutical care in the community setting.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the behavioural needs for a Pharmacist to function effectively in the areas of
2. pharmaceutical Operation
3. Communicate effectively (Verbal and Non Verbal)
4. Effectively Manage the team as a team player
5. Manage the time effectively
6. Develop Leadership Qualities and Essentials

Course Content:

UNIT I

Social Pharmacy and Behavioral Science– Introduction to behavioural science- The Concept of social pharmacy – Theory and applications of social pharmacy and behavioural science.

UNIT II

Pharmacy Profession - Introduction to profession of Pharmacy - Pattern of entry and employment in pharmacy - Employment position and job responsibilities of a pharmacist - Role of pharmacist in health care - Pharmacy ethics.

UNIT III

Professionalization of community pharmacy- Introduction – professional status of community pharmacy **-** Patients medication records and pharmacist's extended role **-** Health screening services in community pharmacy.

UNIT IV

Role of hospital pharmacist in a hospital – Introduction – Manufacturing – purchasing- inventory management- distribution and promoting the rational view of medicine **-** Definition and concept of clinical pharmacy.

UNIT V

Time Management - Value of Time **-** How to Track the action items **-** Goal setting **-** Using SMART Objective concept **-** Goals- Tasks- Sub Tasks **-** Resource Management **-** Mile Stone- Mapping and Gantt chart application.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harding Jeoffrey	Social Pharmacy – Innovation & development	Pharmaceutical Press- London	1994

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	World Health Organization	Use of Essential Drugs	WHO expert committee	1997
2	Darrin Salle	Inspired- Organized & Effective	Darrin Salle	2012
3	Ken Blanchard	The One Minute Manager Meets: The Monkey	Quill	1991

WEBSITES:

- **www.publichealth.org**
- **www.web.arizona.org**
- **www.umass.org**

16PYU351 **SEMESTER-III**

COMMUNICATION SKILLS **1H** **1C**

Instruction hours/ week: L: 1 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This course will prepare the young pharmacy student to interact effectively withdoctors, nurses, dentists, physiotherapists and other health workers.
- At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.
- Students will develop interview skills
- Understand Leadership qualities and essentials
- They Develop presentation and group discussion skills

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and Non-Verbal)
3. Effectively manage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials
6. Develop presentation and group discussion skills

Course Content:

Unit I

Communication Skills – Introduction-Definition - The Importance of Communication - The Communication Process – Source – Message – Encoding – Channel – Decoding – Receiver – Feedback – Context - **Barriers to communication -** Physiological Barriers - Physical Barriers - Cultural Barriers - Language Barriers - Gender Barriers - Interpersonal Barriers - Psychological Barriers - Emotional barriers.

Unit II

Elements of Communication – Introduction - Face to Face Communication - Tone of Voice - Body Language (Non-verbal communication) - Verbal Communication - Physical Communication - **Communication Styles –** Introduction - The Communication Styles Matrix with example for each - Direct Communication Style - Spirited Communication Style - Systematic.

UNIT – III

Basic Listening Skills - Introduction – Self – Awareness - Active Listening - Becoming an Active Listener - Listening in Difficult Situations - **Effective Written Communication –** Introduction -

When and When Not to Use Written Communication - Complexity of the Topic - Amount of Discussion – Required - Shades of Meaning - Formal Communication.

UNIT – IV

Interview Skills - Purpose of an interview - Do's and Dont's of an interview - **Giving Presentations -** Dealing with Fears - Planning your Presentation - Structuring Your Presentation - Delivering Your Presentation - Techniques of Delivery.

UNIT – V

Group Discussion – Introduction - Communication skills in group discussion - Do's and Dont's of group discussion - knowledge development in group discussion.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Andreja. J. Ruther Ford	Basic communication skills for Technology	Pearson Education	2011

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Sanjay Kumar, Pushpalata	Communication skills	Oxford Press	2011
2	Stephen .P. Robbins	Organizational Behaviour	Pearson	2013
3	Gill Hasson	Brilliant- Communication skills	Pearson	2011

WEBSITES:

- **www.skillsyouneed.com**
- **www.minetools.com**
- **www.helpguide.org**

16PYU401 **SEMESTER-IV**

PHYSICAL PHARMACEUTICS - II **3H 3C**

Instruction hours/ week: L: 3 T:0 P:0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- Physical pharmaceutics is a fundamental course that leads to proper understanding of subsequent courses in Pharmaceutics.
- It integrates knowledge of mathematics, physics and chemistry and applies them to the pharmaceutical dosage form development.
- It focuses on the theories behind the phenomena needed for dosage form design.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions, etc.
- The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations.
- Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the physicochemical parameters of a drug
2. Identify methods to enhance solubility of a new drug moeity
3. Discover the importance of stability in pharmaceutical preparations
4. Demonstrate the powder properties and effect of Glidants in powder flow
5. Interpret about diffusion, dissolution and particle properties.
6. Demonstrate the applications of micromeritics in pharmaceutical industy
7. Enable the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions

Course Content:

UNIT-I

Kinetics – definition – rate and order of reaction – zero order reactions – first order reactions – second order reactions – determination of orders – factors influencing rate of reaction – decomposition and stabilization study of medicinal agents – accelerated stability studies.

UNIT-II

Interfacial phenomenon – definition – measurement of surface and interfacial tension - surface active agent – hydrophilic lipophilic balance – spreading coefficient – theory of micelle formation – factors influencing critical micelle concentration – electrical properties at interface.

UNIT-III

Rheology – definition – Newtonian and non Newtonian system - flow characteristics – thixotropy – determination of rheological properties – capillary viscometer – falling and rising body apparatus – rotational viscometers – application of rheology in pharmacy.

UNIT-IV

pH, buffer and isotonic solutions - definition – buffer action - pH determination – applications – buffer equation – buffer capacity – factors affecting buffer capacity – buffers in pharmaceutical - biological systems and buffered isotonic solutions.

UNIT-V

Complexation – definition – types of complexes – metal complexes – inorganic complexes – chelates – olefin complexes – aromatic complexes – organic molecular complexes - inclusion complexes – methods of analysis of complexes - Protein binding – definition – binding equilibria.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Manavalan and Ramasamy	Physical Pharmaceutics	Pharmamed Press	2015
2.	S.P.Agarwal and Rajesh Khanna	Physical Pharmacy	CBS Publishers	2015

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	H.C. Ansel	Pharmaceutical Dosage form and Drug delivery system	New Delhi	2000
2	Lachmann	Theory and practice of Industrial pharmacy	Churchill Livingstone	2002
3	M.E. Aulton	Pharmaceutics- The Science & Dosage Form Design	Churchill Livingstone	2001
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
5	Remington	Science and Practice of Pharmacy	Philadelphia	2005
6		Cooper and Gunn's-		

	Carter S.J	Dispensing for Pharmaceutical students	CBS publishers	2000

WEBSITES:

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU411 **SEMESTER-IV**

PHYSICAL PHARMACEUTICS LABORATORY-II 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Physical pharmaceutics is a fundamental course that leads to proper understanding of subsequent courses in Pharmaceutics.
- It integrates knowledge of mathematics, physics and chemistry and applies them to the pharmaceutical dosage form development.
- It focuses on the theories behind the phenomena needed for dosage form design.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions, etc.
- The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations.
- Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Understand the physicochemical parameters of a drug.
2. Identify methods to enhance solubility of a new drug moiety.
3. Discover the importance of stability in pharmaceutical preparations.
4. Demonstrate the powder properties and effect of Glidants in powder flow.
5. Interpret about diffusion, dissolution and particle properties.
6. Demonstrate the applications of micromeritics in pharmaceutical industry.
7. Enable the pharmacist to make rational decisions on scientific basis concerning the art and technology of solutions, suspensions, emulsions.

Course content:

1. Determination of half life of pseudo first order reaction.
2. Determination of rate constant and order of reaction.
3. Determination of surface tension.
4. Determination of CMC of surfactant.
5. Determination of HLB value
6. Study of rheological properties of various systems using viscometer.
7. Preparation of pharmaceutical buffers.

8. Determination of buffer capacity.
9. Determination of partition coefficient of benzoic acid in benzene and distilled water.
10. Accelerated stability studies.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.V.S.Subramanyam- J. Thimma settee	Laboratory manual of physical pharmaceutics	CVS	2001
2	C.Vijayaraghavan	A Practical Handbook of Physical Pharmaceutics	New Century Book House	2008

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Eugene- Parott	Experimental pharmaceutics	New Delhi	2000
2	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

WEBSITES:

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU402 **SEMESTER-IV**

PHARMACETICAL ANALYSIS AND PHYSICAL CHEMISTRY-II 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Titrimetric analysis deals with complete understanding of the various titration methods.
- The scope of the present course is to know the quality, quantity and purity of pharmaceutical products and chemicals.
- Know and understand the various apparatus used in pharmaceutical analysis and their calibrations.
- Know the quality control and their importance.
- Know the apparatus used in analysis.
- Know the calibration of volumetric apparatus.

Course Outcomes:

On successful completion of the course the student will

1. To know the quality control and their importance.
2. To know the apparatus used in analysis.
3. To know the calibration of volumetric apparatus.
4. To know the different types of titrations like neutralization, non- aqueous, complexometric, gravimetric, precipitation and reduction oxidation titrations.
5. To know the concept of titrations.
6. To know indicators used in various titration methods.

Course Content:

UNIT- I

Oxidation Reduction titrations - concept of oxidation reduction titrations - redox reactions-theory of redox titrations-Oxidation reduction curves- Iodometry and Iodimetry- Titrations involving cerric ammonium sulphate and potassium permanganate - **Diazotization titration-** principle-application.

UNIT-II

Gravimetric analysis - Basic concepts - precipitation techniques - various steps involved in gravimetric analysis - **Miscellaneous methods of analysis** - Kjeldahl methods - oxygen flask combustion method**-gasometry-** assay of oxygen, carbon dioxide, nitrous oxide.

UNIT – III

Adsorption: Definition- chemisorption- state of adsorbed molecule- factors influencing adsorption- types of adsorption isotherms- Freundlich- Langmuir's and Gibb's adsorption isotherms - **Catalyst -** Definition- characteristics- types- homogeneous & heterogeneous- theory and mechanism of catalysis- phase transfer catalysts- enzyme catalysts (biocatalysts)- mechanism of catalysis- pharmaceutical applications.

UNIT – IV

Thermochemistry: Enthalpy of combustion- neutralization- solution- formation- precipitation- Hess's law of constant heat of summation- Lavoiser – Laplace law- bond energies and its application in calorimetry- e.g. Bomb calorimeter.

UNIT – V

Polarimetry and Refractometry - Polarimetry- Principle- Polarized light- rotation of the plane of polarized light- Instrumentation and Applications - Refractometry- Refractometer – theory- refractive index- construction- principle of operation of refractometers and applications .

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Parimoo	Pharmaceutical Analysis	CBS Publisher & Distributors P Ltd;	2012

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	V. Alexysev	Quantitative analysis	University Press of the Pacific	2000
2	Skoog West and James Holler.	Fundamentals of Analytical Chemistry	Cengage Learning India	2013
3	G.H. Jeffery J, Bassett J. Mendham R.C. Denney	Vogel's Textbook of Quantitative Chemical Analysis	John Wiley & Sons Inc	1989

WEBSITES:

- **www.jpr.info.com**
- **www.sciencedomain.org**
- **www.pharmaresearchlibrary.com**

16PYU412 **SEMESTER-III**

PHARMACETICAL ANALYSIS AND PHYSICAL CHEMISTRY LABORATORY- II **3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Titrimetric analysis deals with complete understanding of the various titration methods.
- The scope of the present course is to know the quality, quantity and purity of pharmaceutical products and chemicals.
- Know and understand the various apparatus used in pharmaceutical analysis and their calibrations.
- Know the quality control and their importance.
- Know the apparatus used in analysis.
- Know the calibration of volumetric apparatus.

Course Outcomes:

On successful completion of the course the student will

1. To know the quality control and their importance.
2. To know the apparatus used in analysis.
3. To know the calibration of volumetric apparatus.
4. To know the different types of titrations like neutralization, non- aqueous, complexometric, gravimetric, precipitation and reduction oxidation titrations.
5. To know the concept of titrations.
6. To know indicators used in various titration methods.

Course Content:

1. Preparation and standardization of volumetric solutions and assay of official compounds Permanganometry
2. Assay of copper sulphate by iodometry
3. Assay of hydrogen peroxide by permanganometry
4. Assay of potassium iodide by potassium iodate titration
5. Assay of ferrous sulphate by ceriometry.
6. Determination of acidity constant.
7. Determination of equilibrium constant of a chemical reaction.
8. Determination of order of reaction.
9. Adsorption isotherm study.
10. Determination of heat of neutralization.

11. Preparation of any one buffer solution and verification of its pH.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	A.H. Beckett and J.B. Stenlake	Practical Pharmaceutical Chemistry	Bloomsbury Academic	2001

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	1996

WEBSITES:

- **www.jpr.info.com**
- **www.sciencedomain.org**
- **www.pharmaresearchlibrary.com**

16PYU403 **SEMESTER-IV**

ADVANCED PHARMACEUTICAL ORGANIC CHEMISTRY-II **3H** **3C**

Instruction hours/ week: L: 3 T: 1 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Study the isomerism of the organic compound
2. Understand the stereo chemical aspects of organic compounds and reactions
3. To study the three dimensional structural formulae of certain compounds.
4. Account for the stability/reactivity/orientation
5. Emphasize the synthesis, reactions and uses of Heterocyclic compounds
6. Know aspects of organic compounds and reactions.

Course Content:

UNIT I

Study about stereochemistry - Optical isomerism - Optical activity – enantiomerism – diastereoisomerism - meso compounds - Elements of symmetry – chiral – achiral- molecules - DL system of nomenclature of optical isomers - sequence rules - RS system of nomenclature of optical isomers.

UNIT II

Optical isomerism - Reactions of chiral molecules - Racemic modification - resolution of racemic mixture -Asymmetric synthesis – partial – absolute.

UNIT III

Geometrical isomerism - Nomenclature of geometrical isomers (Cis Trans- EZ- Syn Anti system)- Methods of determination of configuration of geometrical isomers- Conformational isomerism in alkanes Cyclopentane - Cyclohexane.

UNIT IV

Stereo isomerism in biphenyl compounds (Atropisomerism) - conditions for optical activity - Stereospecific and stereoselective reactions.

UNIT V

Fats and Oils - Fatty acids – Reactions – Hydrolysis – hydrogenation - saponification and rancidity- of oils - drying oils - **Analytical constants** – Acid value - saponification value - ester value - iodine value - acetyl value - Reichert Meissl (RM) value –significance and principle involved in the determination.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Morrison and Boyd	Organic Chemistry	Prentice Hall	1992

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	I.L. Finar.	Organic Chemistry by Vol. I & II	Pearson	1956
2	Cramand Hammered	Organic chemistry	Pine Hendrickson	2005
3	Jerry March	Advanced Organic Chemistry: Reactions- Mechanisms- and Structure	Wiley: New York- NY	1992

WEBSITES:

- **www.pdfbit.com**
- **www.chem.ucla.edu**
- **www.chemistrylectures.com**

16PYU413 **SEMESTER-IV**

ADVANCED PHARMACEUTICAL ORGANIC CHEMISTRY LABORATORY -II **3H** **2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- Illuminate relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
- Review and study fundamentals of Organic Chemistry in identifying and synthesizing organic compounds essentially employed as drugs and pharmaceuticals.
- Clarify basic principles concepts of organic chemistry
- Explain basic functional groups & IUPAC Nomenclature of Organic Compounds.
- Some important physical properties of organic compounds;
- Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Study the isomerism of the organic compound
2. Understand the stereo chemical aspects of organic compounds and reactions
3. To study the three dimensional structural formulae of certain compounds.
4. Account for the stability/reactivity/orientation
5. Emphasize the synthesis, reactions and uses of Heterocyclic compounds
6. Know aspects of organic compounds and reactions.

Course Content:

I. Quantitative determination of following classes of organic compounds (2 compounds)

II .Determination of following oil values (2 compounds)

III. Preparation of homocyclic compounds.(2 compounds)

IV. Preparation of heterocyclic compounds. (4 compounds)

V. Partition coefficient. (2 compounds)

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mann and Saunders	Practical Organic Chemistry	Longman	1960

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Arthur I. Vogel	Vogel's text book of Practical Organic Chemistry	Pearson	1996

WEBSITES:

- **www.pdfbit.com**
- **www.chem.ucla.edu**
- **www.chemistrylectures.com**

16PYU404 **SEMESTER-IV**

PHARMACY PRACTICE AND PATHOPHYSIOLOGY-II 3H 3C

Instruction hours/ week: L: 3 T: 0 P:0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This course is designed to impart basic knowledge and skills that are required for the practice of pharmacy in both hospital and community settings.
- To develop practical clinical skills that will enable the student to enhance the quality of life of patients and advance pharmaceutical care in the community setting.
- To understand prescription handling, dispensing of dosage forms and calculation of dosage forms.
- Pathophysiology is the study of causes of diseases and reactions of the body tosuch disease producing causes.
- This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms.
- Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Course Outcomes:

On successful completion of the course the student will

1. Understand the various drug distribution system- BMI & BP
2. Handle the prescriptions.
3. Manage community pharmacies.
4. Understand the elements of pharmaceutical care and provide comprehensive patient care services
5. Understand the concept and practice of the quality use of medicines.
6. Summarize the therapeutic approach for management of various diseases including reference to the latest available evidence.

Course Content:

Unit I

Incompatibilities -Physical- chemical and therapeutic incompatibilities – definition- reasons and correction of incompatibilities- role of pharmacist in overcoming such incompatibilities in prescription. Incompatibility of alkaloidal salts- barbiturates- salicylates- iodides salts- gas production (chemical types)- etc.

Unit II

Community pharmacy - Organization and structure of retail and wholesale drug store- types and design of drug store- legal requirements for establishment and maintenance of a drug store- dispensing of proprietary products- maintenance of records of retail and whole sale- rational drug therapy- OTC medication- code of ethics- health screening services- role of pharmacist in community health care and education.

Unit III

Surgical supplies -An account of surgical dressing like primary wound dressing- absorbents- bandage- adhesive tapes- protectives- sutures and suture materials (method of preparation are to be avoided).

Unit IV

Pathophysiology of common diseases - Rheumatoid arthritis- gout- epilepsy- hypertension- angina- Congestive Heart Failure (CHF)- atherosclerosis- myocardial infarction- diabetes- hepatitis- Parkinson's disease- thyroid diseases.

Unit V

Pathophysiology of common diseases -Osteoporosis- syphilis & gonorrhea- peptic ulcer- asthma- ulcerative colitis- acute and chronic renal failure- tuberculosis- urinary tract infections. Wherever applicable the molecular basis should be discussed.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.J. Carter.	Cooper and Gunn's Dispensing for Pharmaceutical students	CBS publishers	2000

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	University of the Sciences in Philadelphia	Remington's Pharmaceutical Sciences	LWW	2005
2	H.C. Ansel	Pharmaceutical Dosage form and Drug delivery system	New Delhi	2000
3	William E. Hassan	Hospital Pharmacy	Lea & Febiger	1974
4	The Indian Pharmacopoeia	Indian Pharmacopoeia	Press of IPC under	2007

	Commission		Ministry of Health & Family Welfare, Govt. of India	
5	Goodman and Gilman	The Pharmacological basis of therapeutics	Mc Grill	2008

WEBSITES:

- **www.jpp.sagepub.com**
- **www.jrpp.net**
- **www.pharmacypractice.com**

16PYU414 **SEMESTER-IV**

PHARMACY PRACTICE AND PATHOPHYSIOLOGY LABORATORY -II **3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This course is designed to impart basic knowledge and skills that are required for the practice of pharmacy in both hospital and community settings.
- To develop practical clinical skills that will enable the student to enhance the quality of life of patients and advance pharmaceutical care in the community setting.
- To understand prescription handling, dispensing of dosage forms and calculation of dosage forms.
- Pathophysiology is the study of causes of diseases and reactions of the body tosuch disease producing causes.
- This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms.
- Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the various drug distribution system- BMI & BP
2. Handle the prescriptions.
3. Manage community pharmacies.
4. Understand the elements of pharmaceutical care and provide comprehensive patient care services
5. Understand the concept and practice of the quality use of medicines.
6. Summarize the therapeutic approach for management of various diseases including reference to the latest available evidence.

Course Content:

Dispensing of prescription falling under the following categories:

III. Preparation of calamine lotion.
IV. Preparation of salicylic acid lotion.
V. Preparation of white liniment.
VI. Preparation of camphor liniment.
VII. Preparation of compound sodium chloride mouth wash.
VIII. Preparation of zinc sulphate and zinc chloride mouth wash.

IX. Preparation of potassium permanganate gargle.
X. Preparation of phenol glycerine gargle.
XI. Incompatibilities in sodium salicylate mixture.
XII. Incompatibilities in quinine sulphate mixture.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Guyton A- Hall J.E.	Textbook of Medical Physiology- WB Saunders Company.	Saunders	2015

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Joseph DiPiro- Robert L. Talbert	Pharmacotherapy: A Pathophysiological Approach	McGraw-Hill Education	2014

WEBSITES:

- **www.jpp.sagepub.com**
- **www.jrpp.net**
- **www.pharmacypractice.com**

16PYU405 **SEMESTER-IV**

PHARMACEUTICAL TECHNOLOGY-II **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This course is designed to impart a fundamental knowledge on the art and science of various machines and their handling in pharmaceutical industry.
- This course focuses on various topics like unit operations, material handling, pharma plant construction, corrosion, industrial pollution etc.
- Enables the pharmacist to make rational decisions on scientific basis concerning the art and technology of pharmaceutical equipments.
- To carry out various test to prevent environmental pollution.
- To appreciate and comprehend significance of plant lay out design for optimum use of resources.
- To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

Course Outcomes (CO's):

On successful completion of the course the student will

1. To know various unit operations used in Pharmaceutical Industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various tests to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical Industries.

Course Content:

UNIT I

Evaporation - basic concepts of phase equilibria – factors affecting evaporation – evaporators – film evaporators – single effect and multiple effect evaporators - **Heat transfer -** source of heat – mechanism of heat flow – steam as heating source.

UNIT II

Distillation - Raoult's law - phase diagrams - volatility - simple steam flash distillation - principles of rectification - method for calculation of number of theoretical plates - Azeotropic and extractive distillation.

UNIT III

Drying - Moisture content - mechanism of drying - rate of drying - time of drying - calculations - classification - types of dryers - dryers used in pharmaceutical industries - special drying methods - mathematical problems on drying.

UNIT IV

Size reduction and Size separation - Definition - objective of size reduction - factors affecting size reduction - laws governing energy and power requirement of mills - including ball mill - hammer mill - fluid energy mill.

UNIT V

Mixing - definition - solid-solid mixing – mixing process steps – classification of equipments for solid mixing - solid-liquid mixing - mechanism of liquid mixing – mixing vessels or tanks - liquid-liquid mixing – equipments used in mixing.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.V.S.Subrahmanyam et al	Pharmaceutical Engineering principles and practices	Vallabh prakashan	2002

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Lachman	Theory and practice of Industrial Pharmacy	Lea & Febiger	1986
2	MaCabe WL and Smith J.C.	Unit operations of Chemical Engineering	McGraw-Hill Education	2004
3	Walter J. Badger.	Introduction to Chemical Engineering	McGraw-Hill Education	1955
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
5	Remington	Science and Practice of Pharmacy	Philadelphia	2005

WEBSITES:

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU406 **SEMESTER-IV**

PHARMACEUTICAL JURISPRUDENCE **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The subject deals with several important legislations related to the profession of pharmacy in India. The Drugs and Cosmetics Act- along with its amendments is the core of this course.
- Other acts- which are covered- include the Pharmacy Act- dangerous drugs- medicinal and toilet preparation Act etc.
- Besides this the new drug policy- professional ethics- DPCO- patent and design Act will be discussed.
- To know and understand various Indian pharmaceutical acts and laws.
- To know about the process of drug discovery and developments.
- To know the regulatory authorities and agencies governing the manufacture and sale of Pharmaceuticals.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know and understand the Pharmaceutical legislations and their implications in the development and marketing.
2. Understand and follow the code of ethics during the pharmaceutical practice.
3. Know and understand various Indian pharmaceutical acts and laws.
4. Know about the process of drug discovery and developments.
5. Know the regulatory authorities and agencies governing the manufacture and sale of Pharmaceuticals.
6. Know the regulatory approval process and their registration in Indian and international markets.

Course Content:

FORENSIC PHARMACY

UNIT-I

Definition and scope of Forensic Pharmacy- Pharmacist's role in drug treatment- drug usage and pharmacist as a member of health care team. Pharmaceutical legislation in India: Historical development of Pharmaceutical education in India and its present status- Professional ethics in Pharmacy practice- legal and ethical responsibilities of Pharmacists.

UNIT-II

A detailed study and the understanding of the various act and rules (as last amended) governing the Pharmaceutical Profession in India - Pharmacy Act 1948. - Drugs and Cosmetics Act 1940 and Rules

1945- Narcotics and Psychotropic Substances Act - **Medicinal and Toilet Preparations (Excise duties) Act and Rules.** -Essential Commodities Act-Drugs (Price Control) order 1995-Pharmaceutical policy 2002.

UNIT-III

Medical Termination of Pregnancy Act - Prevention of Cruelty of Animal Act 1960 including study of CPCSEA guidelines - INSA and ICMR guidelines - **Indian Patent Act** with special reference to pharmaceutical products.

UNIT-IV

Drugs (Price Control) order 1995- Pharmaceutical policy 2002. -Medical Termination of Pregnancy Act.

UNIT V

Prevention of Cruelty of Animal Act 1960 including study of CPCSEA guidelines - INSA and ICMR guidelines -Indian Patent Act with special reference to pharmaceutical products -Drugs and Magic Remedies (Objectionable Advertisement) Act 1955.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	N.K. Jain	A text book of Forensic Pharmacy	Vallabh Prakashan, Delhi	2010

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	B.M. Mithal	Text book of Forensic Pharmacy	Vallabh Prakashan, Delhi	2010
2		Narcotic drugs and psychotropic substances act	Govt. of India publications	
3	M.L. Mehra	Hand book of drug law	Vallabh Prakashan, Delhi	2010

WEBSITES:

- **www.pvbooks.in**
- **www.pharmacy.nz**
- **www.schoolsoup.in**

16PYU451 **SEMESTER-IV**

ENVIRONMENTAL SCIENCES **1H** **1C**

Instruction hours/ week: L: 1 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms.
- It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.
- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

Course Content:

Unit-I

The Multidisciplinary nature of environmental studies - Natural Resources - Renewable and non-renewable resources - Natural resources and associated problems **-** Forest resources - Water resources - Mineral resource - Food resources - Energy resources - Land resources - Role of an individual in conservation of natural resources.

Unit-II

Ecosystems - Concept of an ecosystem – Introduction – types - characteristic features - structure and function of the ecosystems - Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (ponds – streams – lakes – rivers – oceans -estuaries).

Unit- III

Environmental Pollution - Air pollution - Water pollution - Soil pollution.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Y.K.Sing	Environmental Science	New Age	2011

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Agarwal.K.C	Environmental Biology	Nidi publications	2001
2	Environmental Biology	The Biodiversity of India	Mapin publishing	2013
3	Brunner R.C	Hazardous Waste Incineration	McGraw Hill Inc	2011

WEBSITES:

- **www.environmentalsciences.org.**
- **www.ensci.iastate.edu**
- **www.biodiversitya-z.org.**

16PYU501 **SEMESTER-V**

PHARMACOGNOSYAND PHYTOCHEMISTRY – I **3H** **3C**

Instruction hours/ week: L: 3 T:0 P:0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs and their use and application in eradicating ailments.
- The students are given sufficient knowledge to be able to describe the modern methods of extraction and purification of crude drugs.
- To learn and understand the techniques involved in the herbal drug-cosmetic preparation and their Standardization.
- The subject involves the fundamentals of Pharmacognosy like scope, classification ofcrude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.
- To know the techniques in the cultivation and production of crude drugs.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Explain the basic principles of extraction and various modern extraction techniques.
2. Understand the biogenesis of secondary metabolites.
3. Elaborate the plant based industries and institutions involved in work on medicinal and aromatic plants in India.
4. Demonstrate the Industrial production and estimation of Phytoconstituents.
5. Perform the Herbal formulation and standardization.
6. Explain the Nutraceuticals.

Course Content:
UNIT – I
Definition – History-Present status-Future scope-Development of Pharmacognosy - Alphabetical-Biological – Chemical – Pharmacological – Taxonomical- Chemotaxonomical and Serotaxonomical classification n of crude drugs.

UNIT – II
General principles of cultivation & collection of vegetable drugs of commercial Significance from wild & cultivated source-Advantage and disadvantages of cultivation- Soil and soil fertility-

Factors influencing cultivation of medicinal plants – Processing – storage- and preservation of crude drugs- Study of natural pesticides.

UNIT – III

Different methods of adulteration of crude drugs & their detection by evaluation methods – Introduction – morphological – Microscopical – physical – chemical- biological and spectral analysis of herbal drugs.

UNIT – IV

Detailed study of crude drugs with emphasis on source – cultivation – collection – preparation – storage- diagnostic characters (Macroscopic & Microscopic techniques applied) – constituents- chemical tests – substitutes- adulterants & uses of – **Carbohydrates** and their derived products - Agar- Gum Acacia- Gum tragacanth – Honey – Isapgol – pectin – Starch – Tannins – Gambier- Black Catechu – Gall – Myrobalan- Pale catechu and Tannic acid – **Lipids-**Castor oil- Shark liver oil- Wool fat – Beeswax- Neem oil- Cod liver oil and Bran oil – Proteins – Gelatin- Spirullina and soya.

UNIT – V

Detailed study of crude drugs with emphasis on source- cultivation- collection- preparation- storage- diagnostic characters (Macroscopic & Microscopic techniques applied)- constituents- chemical tests- substitutes- adulterants & uses of - **Volatile oils**-Mentha- Coriander-Cinnamon- Cassia- Caraway- Dill- Clove- Fennel- Nutmeg- Cardamom- Lemon grass oil- Eucalyptus- Sandalwood- Palmarosa and Citronellal-**Saponins-**Liquorice-Ginseng-Dioscorea. **Cardio active sterols -**Digitalis- Squill and Strophanthus- **Steroidal-**Kurchi- Solasodine. **Alkaloidal amines-** Ephedra and Colchicum- **Glycoalkaloids-**Solanum species.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kokate C.K- Purohit A.P- Gokhale S.B	Text book of Pharmacognosy	Nirali prakasan	2008

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Trease and Evans	Pharmacognosy	W.B Sauders	2002
2	James Robbers- Marilyn K. Speedice and	Pharmacognosy and Pharmacobiotechnology	Williams and Wilkins	1996

	Varro E.- Tyler			
3	TE Wallis	Textbook of Pharmacognosy	CBS publishers and Distributors- New Delhi	2005

WEBSITES:

- **www.authorstream.com**
- **www.epharmacognosy.com**
- **www.science20.com**

16PYU511 **SEMESTER-V**

PHARMACOGNOSY AND PHYTOCHEMISTRY LABORATORY – I 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs and their use and application in eradicating ailments.
- The students are given sufficient knowledge to be able to describe the modern methods of extraction and purification of crude drugs.
- To learn and understand the techniques involved in the herbal drug-cosmetic preparation and their Standardization.
- The subject involves the fundamentals of Pharmacognosy like scope, classification ofcrude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.
- To know the techniques in the cultivation and production of crude drugs.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Describe the isolation of the Phytoconstituents.
2. Prepare the hair care preparation.
3. Prepare the skin care the preparation.
4. Demonstrate the Amino acid by ascending chromatography.
5. Perform the Thin layer chromatography of Curcumin.
6. Understand the isolation and formulation procedure.

Course content:

1. Identification of crude drugs listed in theory (entire condition) by Morphological characters.
2. Microscopical studies of some selected drugs:
    - Cinnamon & Clove
    - Ephedra & Liquorice
    - Fennel & Coriander.
3. Microscopical studies of some selected powdered drugs of single component or mixture of two components:
    - Cinnamon & Clove
    - Ephedra & Liquorice
    - Fennel & Coriander.

4. Identification of unorganized drugs by Morphological characters and chemical tests.
    - Agar- Gum Acacia
    - Gum tragacanth- Honey
    - Castor oil- Shark liver oil
    - Wool fat- Beeswax
    - Neem oil- Tannic acid

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.B.Gokale and C.K kokate	Practical Pharmacognosy	Vallabh prakasan	2008

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Khandelwal KR	Practical pharmacognosy	Nirali prakashan	2005

WEBSITES:

- **www.authorstream.com**
- **www.epharmacognosy.com**
- **www.science20.com**

16PYU502 **SEMESTER-V**

MEDICINAL CHEMISTRY- I **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Course Outcomes:
On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Write the chemical synthesis of some drugs.

Course Content

UNIT I
Introduction to Medicinal Chemistry - History and development of medicinal chemistry- Physicochemical properties in relation to biological action- Ionization, Solubility, Partition Coefficient, hydrogen bonding, protein binding, chelation, Bioisosterism, optical and geometrical isomerism-**Drug metabolism-**General pathways of drug metabolism (different types of reaction in phase-I and phase-II with examples). Factors affecting drug metabolism including stereochemical aspects.

Study of classification, mechanism of action (biochemical and molecular basis), structure activity relationship including stereo chemical aspects, physiochemical properties and synthesis of selected drugs (only drugs marked with asterisk) on the following categories of drugs.

UNIT II

Drugs acting on Autonomic Nervous System - Adrenergic Neurotransmitters - Biosynthesis and catabolism of catecholamine-Adrenergic receptors system (Alpha & Beta) and their distribution**-Sympathomimetic agents-SAR of Sympathomimetic agents-Direct acting**-Nor-epinephrine-Epinephrine- Phenylephrine*- Dopamine- Methyldopa- Clonidine*- Dobutamine- Isoproterenol-Terbutaline- Salmeterol- Salbutamol*- Bitolterol- Albuterol- Ritodrine- Naphazoline-Tetrahydrozoline- Oxymetazoline and Xylometazoline**-Indirect acting agents**: Hydroxyamphetamine- Pseudoephedrine- Propylhexedrine

UNIT III

Drugs acting on Autonomic Nervous System - Adrenergic Antagonists - Alpha adrenergic blockers-Tolazoline*- Phentolamine*- Phenoxybenzamine- Prazosin- Tetrazosin- Doxazosin-Ergotamine- Methysergide-**Beta adrenergic blockers**: SAR of beta blockers- Propranolol*-Dichloroisoproterenol- Practolol- Metibranolol- Acebutolol- Atenolol- Betazolol- Bisoprolol-Esmolol- Metoprolol- Labetolol and Carvedilol-**Cholinergic neurotransmitters-**Biosynthesis and catabolism of acetylcholine-Cholinergic receptors system (muscaranic & nicotinic) and their distribution-**Parasympathomimetic agents-SAR of Parasympathomimetic agents**-**Direct acting agents:** Acetylcholine- Carbachol*- Bethanechol- Methacholine- Pilocarpine-**Indirect acting/Cholinesterase inhibitors (Reversible & Irreversible):** Physostigmine- Neostigmine-Pyridostigmine*- Edrophonium chloride- Tacrine hydrochloride- Ambenonium chloride-Isofluorphate- Echothiophate iodide- Parathione- Malathion-**Cholinesterase reactivators -** Pralidoxime chloride

UNIT IV

Drugs acting on Autonomic Nervous System - Cholinergic Blocking agentsn - SAR of cholinolytic agents-Solanaceous alkaloids and analogues- Atropine sulphate- Hyoscyamine sulphate- Scopolamine hydrogenbromide- Homatropine hydrogenbromide*- Ipratropium bromide*.**Synthetic cholinergic blocking agents:** Tropicamide- Cyclopentolate hydrochloride-Clidinium bromide- Dicyclomine hydrochloride*- Glycopyrrolate- Methantheline bromide-Propantheline bromide- Benztropine mesylate- Orphenadrine citrate- Biperidine hydrochloride-Procyclidine hydrochloride*- Tridihexethyl chloride- Isopropamide iodide- and Ethopropazine hydrochloride-**Ganglionic blocking agents-**Trimethaphan camsylate- mecamylamine-**Neuromuscular blocking agents**: Metocurine Iodide- pancuronium bromide

UNIT V

Drugs acting on Autonomic Nervous System - Local Anesthetics - SAR of Local anaesthetics**-Benzoic Acid derivatives**-Cocaine- Hexylcaine- Meprylcaine- Cyclomethycaine- Piperocaine**-Amino Benzoic acid derivatives** Benzocaine*- Butamben- Procaine*- Butacaine- Propoxycaine-Tetracaine- Benoxinate-**Lidocain/Anilide derivatives**- Lignocaine*- Mepivacaine- Prilocaine-Etidocaine- **Miscellaneous**- Phenacaine- Diperodon- Dibucaine* and Dyclonine

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William Foye	Foye's Principles of Medicinal Chemistry- 5th edition-	LWW	2002

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Wilson and Gisvold's	Wilson and Gisvold's Organic medicinal and Pharmaceutical Chemistry-	11th edition	2003
2	Burger	Burger's Medicinal Chemistry Vol I to IV	Wiley	2010
3	K-D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

WEBSITES:

- **www-rsc-org**
- **www-acs-org**
- **www-medicinalchemistry-org**

16PYU513 **SEMESTER-V**

MEDICINAL CHEMISTRY LABORATORY– I 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Course Outcomes:

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Write the chemical synthesis of some drugs.

Course Content:

I. Preparation of medicinally important compounds or intermediates required for synthesis of drugs (5 compounds)

II. Monograph analysis of selected drugs from course content. (2 compounds)

III. Assay of Selected drugs from course content prescribed as per I.P or B.P. (5 compounds)

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	A-I-Vogel	Text book of practical organic chemistry	Dorling Kindersely	2008

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ashutoshkar	Ashutoshkar's Medicinal Chemistry	New Age International	2007

WEBSITES:

- **www-rsc-org**
- **www-acs-org**
- **www-medicinalchemistry-org**

16PYU503 **SEMESTER-V**

PHARMACEUTICAL DOSAGE FORMS & COSMETIC TECHNOLOGY -I 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to provide detail knowledge about chemistry of medicinal compounds from natural origin and general methods of structural elucidation of such compounds.
- It also emphasizes on isolation, purification and characterization of medicinal compounds from natural origin.
- This gives a knowledge of preformulation studies and stability studies
- Different machinery used for various steps in manufacture of various dosage forms. Formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market.
- To know the various pharmaceutical dosage forms and their manufacturing techniques.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid- liquid and semisolid dosage forms.
4. Know the evaluation test of solid, liquid and semisolid dosage form.
5. Know the modern extraction techniques- characterization and identification of the herbal drugs.
6. Know the different types of natural compounds and their chemistry and medicinal importance

Course Content:

UNIT I

Liquid Dosage forms –Introduction- types of additives used in formulations – vehicles – stabilizers – preservatives- suspending agents- emulsifying agents – solubiliser – colours – flavours – manufacturing- packaging and evaluation of clear liquids- suspensions and emulsions official in pharmacopoeia.

UNIT II

Semisolid Dosage Forms –Definition – types- mechanisms of drug penetration- factors influencing penetration- semisolid bases and their selection - General formulation of semisolids- clear gels- manufacturing procedure- evaluation and packaging.

UNIT III

Pharmaceutical Aerosols – Definition – propellants- general formulation – manufacturing- packaging methods- pharmaceutical applications and evaluation.

UNIT IV

Packaging of pharmaceutical products -Types and tests assuring quality of glass - Types of plastics used – permeation – leaching – sorption- chemical reactions- biological tests- modification of plastics by drugs - Different types of closures and closure liners - film wrapper - blister packs- bubble packs - shrink handling - foil / plastic pouches- bottle seals- tape seals- breakable seals and sealed tubes - quality control of packaging material and filling equipment.

UNIT V

Suppositories –definition -Ideal requirements – advantages - disadvantages – bases- manufacturing procedure- packaging and evaluation.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.J. Carter.	Cooper and Gunn's Dispensing for Pharmaceutical students	CBS	2000

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	David B Troy	Remington's Pharmaceutical Sciences	Pharmaceutical Press	2006
2	Loyd V. allen	H.C. Ansel Introduction to Pharmaceutical dosage	Wolters kluwer	2013
3	Carter S.J.- Cooper and Gunn's	Tutorial Pharmacy	CBS Publishers- Delhi.	2000

WEBSITES:

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU513 **SEMESTER-V**

PHARMACEUTICAL DOSAGE FORMS & COSMETIC TECHNOLOGY LABORATORY-I
3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to provide detail knowledge about chemistry of medicinal compounds from natural origin and general methods of structural elucidation of such compounds.
- It also emphasizes on isolation, purification and characterization of medicinal compounds from natural origin.
- This gives a knowledge of preformulation studies and stability studies
- Different machinery used for various steps in manufacture of various dosage forms. Formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market.
- To know the various pharmaceutical dosage forms and their manufacturing techniques.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid- liquid and semisolid dosage forms.
4. Know the evaluation test of solid, liquid and semisolid dosage form.
5. Know the modern extraction techniques- characterization and identification of the herbal drugs.
6. Know the different types of natural compounds and their chemistry and medicinal importance

Course Content:

I. Preparation- evaluation and packaging of:

1. Simple Syrups IP.
2. Cough syrup.
3. Antipyretic syrup.
4. Simple ointment IP
5. Sulphur ointment IP
6. Emulsifying ointment

II. Formulation of various types of cosmetics for

7. Cold cream
8. Face powder
9. Shampoo.
10. Hair oil.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Thomsen S.G.	Modern Cosmetics- Universal Publishing Corporation- Bombay	Vargeese	1991

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Remington	Remington's The Science and Practice of Pharmacy- Easton.	Valtimore	2000

WEBSITES:

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU504 **SEMESTER-V**

PHARMACOLOGY - I 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics.
- The subject covers the complete information about the drugs like sources-physicochemical properties- mechanism of action-physiological and biochemical effects (pharmacodynamics) as well as absorption-distribution-metabolism and excretion (pharmacokinetics) along with the adverse effects-clinical uses-interactions-doses-contraindications and routes of administration of different classes of drugs.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Explain the pharmacological actions of different categories of drugs on various systems of the body.
2. Explain the mechanism of drug action at organ system/subcellular/macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Handle the animals and conduct the experiments to observe the effect of drugs from different therapeutic classes and to interpret the results using suitable statistical analysis.
5. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.
6. Comprehend the principles of toxicology and treatment of various poisonings.

Course Content:

UNIT I

General Pharmacology - Introduction to Pharmacology- Definition and various branches of pharmacology – **Pharmacodynamics**-Principles and mechanisms of drug action -Classification of receptors-Signa ltransduction mechanisms of ligand gated ion channels-G Protein–coupled receptors-

Kinase linked receptors and receptors that regulate transcription factors –Drug receptors interactions-combined effects of drugs and factors modifying drug action.

UNIT II

Pharmacokinetics- Detail study of various factors influencing drug absorption- distribution-metabolism and excretion - **Pharmacogenetics**-Adverse drug reactions – Discovery and development of new drugs-Preclinical and clinical studies.

UNIT III

Pharmacology of Peripheral Nervous System – Organization and function of ANS-Neurohumoral transmission – Parasympathomimetics –Parasympatholytics-Sympathomimetics and Sympatholytics.

UNIT IV

Pharmacology of Peripheral Nervous System-Neuromuscular blocking agents and skeletal muscle relaxants (peripheral)-Local anesthetic agents-Drugs used in Myasthenia Gravis.

UNIT V

Drugs acting on Urinary System-Diuretics and anti-diuretics.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	K.D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Satoskar R.S and Bhandarkar S.D.	Pharmacology and Pharmacotherpeutics	Popular Prakasan	2009
2	Mycek M.J-Gelnet S.B and Perper M.M.	Lippincott's illustrated Reviews-Pharmacology	Harvery	1992

3	Lawrence L brunton	Goodman and Gilman's- The Pharmacological basis of therapeutics	CBS Publishers- Delhi.	2011

WEBSITES:

- **www.libguides.utep.edu**
- **www.pharmacology2000.com**
- **www.pharmacologycorner.com**

16PYU514 **SEMESTER-V**

PHARMACOLOGY LABORATORY – I 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics.
- The subject covers the complete information about the drugs like sources-physicochemical properties- mechanism of action-physiological and biochemical effects (pharmacodynamics) as well as absorption-distribution-metabolism and excretion (pharmacokinetics) along with the adverse effects-clinical uses-interactions-doses-contraindications and routes of administration of different classes of drugs.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Explain the pharmacological actions of different categories of drugs on various systems of the body.
2. Explain the mechanism of drug action at organ system/subcellular/macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Handle the animals and conduct the experiments to observe the effect of drugs from different therapeutic classes and to interpret the results using suitable statistical analysis.
5. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.
6. Comprehend the principles of toxicology and treatment of various poisonings.

Course Content:

1. Commonly used Apparatus/instruments in experimental pharmacology.
2. Commonly used laboratory animals and their handling.
3. Maintenance of laboratory animals- regulations of animal use and Ethical requirements according to CPCSEA.
4. Some common laboratory techniques : Blood withdrawal –plasma and serum separation-

5. Anesthetics used for animal studies-procedures for rendering animal unconscious and chemical euthanasia.
6. Study of different routes of drugs administration in mice/rats.
7. To study the effect of hepatic microsomal enzyme inhibitors and inducers on the Phenobarbitone sleeping time in mice.
8. Experiments on Central nervous system : Recording of spontaneous motor activity- stereotype a c t i vity -anti-catatonic activity-analgesic activity-anti convulsant
9. Local anesthetic activity of drugs by suitable animal model.
10. Effect of autonomic drugs on rabbit's eye.
11. Diuretic activity of drugs in rats.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M. N. Ghosh. .	Fundamentals of Experimental Pharmacology	Hilton and company	2015

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kulkarni.S.K. Easton.	Handbook of Experimental Pharmacology	Elsevier	2006

WEBSITES:

- **www.libguides.utep.edu**
- **www.pharmacology2000.com**
- **www.pharmacologycorner.com**

16PYU505 **SEMESTER-V**

PHARMACEUTICAL MICROBIOLOGY 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- This paper has been designed to provide the advanced knowledge to the Pharmacy students in valuable areas of advanced Biotechnology.
- To play a crucial role in determining its future use and applications in medicine- drug discovery and in pharmaceutical industry**.**
- It also emphasize the study of microbiological and biotechnological processes.
- To know modern technology aspects to useful products and to correct the alternative ways to prevent the occurrence and the treatment of disease related to microorganisms and techniques.
- To understand methods of identification- cultivation and preservation of various microorganisms.
- To understand Genetic engineering applications in relation to production of pharmaceuticals.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the importance of immunological reactions and preparations of immunological products.
2. Do sterilization of various equipments/products and bacterial sensitivity testing against antibiotics and disinfectants.
3. Know the anatomy, identification, growth factors and sterilization of microorganisms;
4. Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
5. Do estimation of RNA and DNA and there by identifying the source;
6. Do cultivation and identification of the microorganisms in the laboratory;
7. Understand methods of identification- cultivation and preservation of various microorganisms
8. Understand Genetic engineering applications in relation to production of pharmaceuticals

Course Content:

UNIT I

Introduction to Microbiology- Scope of Microbiology- Microbes of Medicinal interest- study of mode of Transmission & treatment of Microbial diseases like Cholera – Typhoid – Tuberculosis – Diphtheria – Tetanus- Syphilis & AIDS –Classification- Morphology and fine structure Bacteria –

Fungi- Viruses -Methods of isolation and identification of bacteria - staining techniques and bio chemical reactions - Total & viable counting techniques of bacteria - Growth and cultivation- Their Nutritional requirements -Media-differential enriched selective - Maintenance of lab culture.

UNIT II

Total & viable counting techniques of bacteria - Growth and cultivation- Their Nutritional requirements - Media-differential- enriched- selective. Maintenance of lab culture.

UNIT III

Detail study of different methods of sterilization including their merits and Demerits-Detailed study of sterility testing of different pharmaceutical preparations – Disinfectant - study of disinfectant. Factors affecting their action and evaluation of bactericidal & Bacteriostatic -Principles and methods of different microbiological assays including sensitivity testing with references to ciprofloxacin-streptomycin & vitamin B -12.

UNIT IV

Genetic organization of Eukaryotes and Prokaryotes - Microbial genetics including transformation – transduction – conjugation- plasmids and transposons - Introduction to Microbial biotransformation- Biotransformation of steroids and production of single cell protein.

UNIT V

Introduction to Microbial biotransformation- Biotransformation of steroids and production of single cell protein - Microbiological assay of antibiotics and vitamins.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ananthanarayan and Paniker	Text Book of Microbiology	Orient black swam	2015

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Pelzer- Krieg and Chan	Microbiology	ABE books	1986
2	John A Wiley	Prescott's Microbiology	Prescott's	2011
3	R.Y. Stainer	General Microbiology	Mac mallion	1952

WEBSITES:

- **www.microbiology.org**
- **www.microworld.org**
- **www.neomed.edu**

16PYU515 **SEMESTER-V**

PHARMACEUTICAL MICROBIOLOGY LABORATORY 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This paper has been designed to provide the advanced knowledge to the Pharmacy students in valuable areas of advanced Biotechnology.
- To play a crucial role in determining its future use and applications in medicine- drug discovery and in pharmaceutical industry**.**
- It also emphasize the study of microbiological and biotechnological processes.
- To know modern technology aspects to useful products and to correct the alternative ways to prevent the occurrence and the treatment of disease related to microorganisms and techniques.
- To understand methods of identification- cultivation and preservation of various microorganisms.
- To understand Genetic engineering applications in relation to production of pharmaceuticals.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the importance of immunological reactions and preparations of immunological products.
2. Do sterilization of various equipments/products and bacterial sensitivity testing against antibiotics and disinfectants.
3. Know the anatomy, identification, growth factors and sterilization of microorganisms;
4. Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
5. Do estimation of RNA and DNA and there by identifying the source;
6. Do cultivation and identification of the microorganisms in the laboratory;
7. Do identification of diseases by performing the diagnostic tests; and
8. Appreciate the behavior of motility and behavioral characteristics of microorganisms.

Course Content:

Microbiology

1. Study of apparatus used in experimental microbiology.
2. Sterilization techniques – Glasswares- media- Room.
3. Preparation and sterilization of Media.
4. Isolation techniques– Streak plate- Pour plate
5. Staining techniques- Simple staining Gram's staining- Acid fast staining-
6. Spore staining- flagella staining - Capsule staining.

7. Total and viable count of Microorganisms.
8. Motility of the microorganism by Hanging drop method.
9. Sterility testing for Pharmaceutical products.
10. Microbiological assay of antibiotics.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	James G. Cappuchino	Microbiology – A laboratory manual	Pearson	2013

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mackie and McCartney	Practical Medical Microbiology	Elsevier	1996

WEBSITES:

- **www.microbiology.org**
- **www.microworld.org**
- **www.neomed.edu**

16PYU506 **SEMESTER-V**

HOSPITAL AND CLINICAL PHARMACY - I **3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- This course is designed to impart basic knowledge and skills that are required for the practice of pharmacy in both hospital and community settings.
- Conduct sufficiently thorough and accurate patient assessments
- Explain and properly dispense commonly used medications, formulations, and drug products.
- Identify and assess drug related problems relative to specific patient cases.
- The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.
- The purpose of this course is to introduce to students a number of health issues and their challenges.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the various drug distribution system
2. Handle the prescriptions and manage community pharmacies
3. Understand the elements of pharmaceutical care and provide comprehensive patient care services
4. Understand the concept and practice of the quality use of medicines
5. Summarize the therapeutic approach for management of various diseases including Reference to the latest available evidence.
6. Evaluate alternative ways of solving problems related to health and pharmaceutical issues.

Course Content:

UNIT-I

Organisation and structure -Organisation of a hospital- hospital pharmacy- Responsibilities of a hospital pharmacist- Pharmacy and Therapeutic committee- Budget preparation and Implementation.

UNIT-II

Hospital formulary – Contents- drug profile- preparation and revision of hospital formulary.

UNIT-III

Purchase-Distribution and inventory control of drugs in hospitals - Purchasing Procedures - Dispensing of drugs to outpatients and inpatients - Types of distribution of drugs and charging policies in Hospital- Dispensing of Controlled drugs.

UNIT-IV

Central sterile supply unit and their management -Types of materials for sterilization- packing of materials prior to sterilization- sterilization equipments and supply of sterile materials.

UNIT-V

Drug information services-Drug information centre- sources of information on drugs- disease treatment schedules- procurement of information- computerized services (e-g- MEDLINE)- retrieval of information.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S-H- Merchant and J-S- Qadry	A textbook of Hospital Pharmacy	Mc Graw hill New Delhi	2004

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Malcom	Clinical Pharmacokinetics concepts and Application	Lippincotts Williams and wilcoms	2007
2	G- Parthasarathy- Karin Nyfort- Hansen- Milap C- Nahara	A text book of clinical Pharmacy Practice- Essential concepts and skills	Orient Black swam	2004
3	Sartaray Hiage	Textbook of Biopharmaceutics and Clinical Pharmacokinetics	CRC Book House	2014

WEBSITES:

- **www-jpp.sagepub.com**
- **www.jrpp.net**
- **www.pharmacypractice.com**

16PYU601 **SEMESTER-VI**

PHARMACOGNOSYAND PHYTOCHEMISTRY – II **3H 3C**

Instruction hours/ week: L: 3 T:0 P:0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs and their use and application in eradicating ailments.
- The students are given sufficient knowledge to be able to describe the modern methods of extraction and purification of crude drugs.
- To learn and understand the cultivation of crude drugs
- To learn and understand the Production of crude drugs and their usefulness.
- To learn and understand traditional uses of plants, medicines derived from plants, animals, various types of organisms (bacteria, fungi ect.) and recently marine organisms

Course Outcomes (CO's):
On successful completion of the course the student will

1. Know the advances in the cultivation, production adulterants of drugs
2. Know the macroscopical study of crude drugs
3. Know the microscopical study of crude drugs
4. Know the constituents and chemical tests for crude drugs
5. Know the medicinal uses of individual drugs
6. Explain the Nutraceuticals.

Course Content:

UNIT – I
Detailed study of crude drugs with emphasis on source- cultivation- collection- preparation- storage- diagnostic characters (Macroscopic & Microscopic techniques applicable) - constituents- chemical tests- substitutes- adulterants & uses of- Anthraquinone cathartics: Aloes- Senna- Rhubarb and Cascara. **Pyridine and Piperidine alkaloids**: Areca and Lobelia.**Tropane alkaloids**: Belladona- Hyoscyamus- Datura- Cocoa. **Quinoline and Isoquinoline alkaloids:** Cinchona- Ipecac and Opium

UNIT – II
Purines : Tea-Coffee. **Resins**: Colophony- Cannabis- Capsicum- Balsam of Tolu- Benzoin-Balsam of Peru- Asafoetida- Turmeric and Ginger. **Others**: Gentian- Saffron- Ashwagandha

UNIT – III

Tumor inhibitors- Taxol- Vinca and Podophyllum, **Indole alkaloids**: Ergot- Rauwolfia- Nuxvomica- Physostigmine. **Imidazole**: Pilocarpus

UNIT – IV

Anti- hepatotoxic and oral hypoglycemic agents Phyllanthusniruri- Eclipta Alba- Gymnema sylvestre. **Quinazolidine alkaloids**: Adathoda, **Terpenes**: Neem- Artemesia

UNIT – V

Plant fibers used as surgical dressing- Cotton- Silk- Wool- Nylon- Rayon- Alginate dressing- Gelatin Sponge- Oxidized cellulose. Sutures and ligatures. **Pharmaceutical aid -** Talc- Kaolin- Bentonite and Natural colours.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kokate C.K- Purohit A.P- Gokhale S.B	Text book of Pharmacognosy	Nirali prakasan	2008

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Trease and Evans	Pharmacognosy	W.B Sauders	2002
2	James Robbers- Marilyn K. Speedice and Varro E.- Tyler	Pharmacognosy and Pharmacobiotechnology	Williams and Wilkins	1996
3	TE Wallis	Textbook of Pharmacognosy	CBS publishers and Distributors- New Delhi	2005

WEBSITES:

- **www.authorstream.com**
- **www.epharmacognosy.com**
- **www.science20.com**

16PYU611 **SEMESTER-VI**

PHARMACOGNOSY AND PHYTOCHEMISTRY LABORATORY – II 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs and their use and application in eradicating ailments.
- The students are given sufficient knowledge to be able to describe the modern methods of extraction and purification of crude drugs.
- To learn and understand the cultivation of crude drugs
- To learn and understand the Production of crude drugs and their usefulness.
- To learn and understand traditional uses of plants, medicines derived from plants, animals, various types of organisms (bacteria, fungi ect.) and recently marine organisms

Course Outcomes (CO's):
On successful completion of the course the student will

1. Know the advances in the cultivation, production adulterants of drugs
2. Know the macroscopical study of crude drugs
3. Know the microscopical study of crude drugs
4. Know the constituents and chemical tests for crude drugs
5. Know the medicinal uses of individual drugs
6. Explain the Nutraceuticals.

Course content:

1. Identification of crude drugs listed in theory (entire condition) by Morphological characters.
2. Microscopical and Powder studies:
   - Senna
   - Rauwolfia
   - Cinchona
   - Datura
   - Vinca
   - Ginger
   - Nuxvomica
   - Neem
3. To do simple chemical tests to identify the pharmaceutically important phytoconstituents.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.B. Gokale and C.K Kokate	Practical Pharmacognosy	Vallabh prakasan	2008

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Khandelwal KR	Practical pharmacognosy	Nirali prakashan	2005

WEBSITES:

- **www.authorstream.com**
- **www.epharmacognosy.com**
- **www.science20.com**

16PYU602 **SEMESTER-VI**

MEDICINAL CHEMISTRY- I **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Write the chemical synthesis of some drugs.

Course Content

Study of classification- mechanism of action (biochemical and molecular basis)- structure activity relationship including stereo chemical aspects- physiochemical properties and synthesis of selected drugs (only drugs marked with asterisk) on the following categories of drugs.

UNIT I

Drugs acting on Central Nervous Sysytem - General anesthetics - Inhalation anesthetics- Halothane*- Methoxyflurane*- Enflurane- Sevoflurane- Isoflurane- Desflurane-**Ultra short acting barbitutrates**: Methohexital sodium*- Thiamylal sodium*- Thiopental sodium-**Dissociative anesthetics**: Ketamine hydrochloride*-**Sedatives and Hypnotics-Benzodiazepines:** SAR of Benzodiazepines- Chlordiazepoxide*- Diazepam*- Oxazepam- Chlorazepate Dipotassium- Lorazepam- Alprazolam- Zolpidem-**Barbiturtes-**SAR of barbiturates- Barbital*- Phenobarbital- Mephobarbital-Amobarbital- Butabarbital- Pentobarbital- Secobarbital-**Miscelleneous-**Amides & imides : Glutethmide-Alcohol & their carbamate derivatives- Meprobomate- Ethchlorvynol- Aldehyde & their derivatives- Triclofos sodium*- Paraldehyde.

UNIT II

Drugs acting on Central Nervous Syytem - Skeletal Muscle relaxants -Methocarbamol- Chlorphenesin **- Antipsychotics- Phenothiazeines -** SAR of Phenothiazeines - Promazine hydrochloride- Chlorpromazine hydrochloride*- Triflupromazine- Thioridazine hydrochloride- Piperacetazine hydrochloride- Mesoridazine hydrochloride- Prochlorperazine maleate*- Trifluoperazine hydrochloride**- Chlorprothixene**- Thiothixene- Loxapine succinate- Clozapine**- Fluro buterophenones-** Haloperidol- Droperidol- Risperidone**-Beta amino ketones-** MolindoneHcl**- Benzamides**- Sulpieride

UNIT III

Drugs acting on Central Nervous System -Anticonvulsants- SAR of Anticonvulsants**-** mechanism of anticonvulsant action-**Hydentoins-** Phenytoin*- Mephenytoin- Ethotoin-**Oxazolidine diones-** Trimethadione*- Paramethadione-**Succinimides-** Phensuximide- Methsuximide- Ethosuximide*- **Urea and monoacylureas**- Phenacemide- Carbamazepine*-**Benzodiazepines**- Clonazepam **Miscellaneous-**Primidone- Valproic acid* - Gabapentin- Felbamate

CNS stimulants - Analeptics- Nikethamide*- Doxapram hydrochloride- Pentylenetetrazole- Caffeine- Theophylline- Theobromine-**Psycomotor stimulants-** Amphetamine- Dextroamphetamine sulphate*- Methamphetamine- Chorphentermine- Chlortermine- Phendimetrazine- Methylphenidate- Pemoline-**MAO inhibitors-** Phenelzine sulphate- Isocarboxazid- Tranylcypromine- Pargyline hydrochloride-**Tricyclic anti-depressants -** Amitriptyline hydrochloride*- Nortryptyline- Imipramine hydrochloride*- Desipramine hydrochloride- Trimipramine maleate- Doxepin hydrochloride- Amoxapine- Fluoxetine.

UNIT IV

Drugs acting on Cardiovascular System - Anti-anginal - **Vasodilators:** Amyl nitrite- Nitroglycerin*- Pentaerythritol tetranitrate- Isosorbide dinitrite*- Dipyridamole-**Calcium channel blockers:** Verapamil- Bepridil hydrochloride- Diltiazem hydrochloride- Nifedipine- Amlodipine- Felodipine- Nicardipine- Nimodipone-**Cardiotonics:** Digoxin- Digitoxin- Deslanoside -**Anti-arrythmic Drugs**- Quinidine sulphate- Procainamide hydrochloride- Disopyramide phosphate*- Phenytoin sodium- Lidocaine hydrochloride- Tocainide hydrochloride Mexiletine hydrochloride- Lorcainide hydrochloride- amiodarone and Sotalol-**Anti-hypertensive Agents**- timolol- Captopril- Lisinopril- Enalapril- Benazepril hydrochloride- Quinapril hydrochloride- Methyldopate hydrochloride-* Clonidine hydrochloride- Guanethidine monosulphate*- Guanabenz acetate- Sodium nitroprusside- Diazoxide- Minoxidil- Reserpine- Hydralazine hydrochloride

UNIT V

Diuretics - Carbonic anhydrase inhibitors- Acetazolamide*- Methazolamide- Dichlorphenamide. **Thiazides-** Chlorthiazide*- Hydrochlorothiazide*- Hydroflumethiazide- Cyclothiazide -**Loop diuretics-** Furosemide*- Bumetanide- Ethacrynic acid- **Potassium sparing Diuretics** Spironolactone- Triamterene- Amiloride*- **Miscelleneous-** Mannitol- and Theophylline-**Anti-hyperlipidemic agents**- Clofibrate- lovastatin- cholesteramine and cholestipol **Coagulant & Anticoagulants-** menodione- acetomenadione- Warferin*- phenindione **Oral hypoglycemic agents-** tolbutamide- metformin- glipizide- pioglitazone- acarabose-**Thyroid & Antithyroid-** L-Thyroxine-

L-Thyronine- Propylthiouracil- Methimazole-**Drugs acting on GIT-** Antacids- antiulcers- laxatives and anti-diarrhoeal agents- emetics & antiemetics

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William Foye	Foye's Principles of Medicinal Chemistry- 5th edition-	LWW	2002

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Wilson and Gisvold's	Wilson and Gisvold's Organic medicinal and Pharmaceutical Chemistry-	11th edition	2003
2	Burger	Burger's Medicinal Chemistry Vol I to IV	Wiley	2010
3	K-D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

WEBSITES:

- **www.rsc.org**
- **www.acs.org**
- **www.medicinalchemistry.org**

16PYU612 **SEMESTER-VI**

MEDICINAL CHEMISTRY LABORATORY– II 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Write the chemical synthesis of some drugs.

Course Content:

I. Preparation of medicinally important compounds or intermediates required for synthesis of drugs (5 compounds)

II. Monograph analysis of selected drugs from course content(2 compounds)

III. Assay of Selected drugs from course content prescribed as per I-P or B-P (2 compounds)

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	A-I-Vogel	Text book of practical organic chemistry	Dorling Kindersely	2008

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ashutoshkar	Ashutoshkar's Medicinal Chemistry	New Age International	2007

WEBSITES:

- **www.rsc.org**
- **www.acs.org**
- **www.medicinalchemistry.org**

16PYU603 **SEMESTER-VI**

PHARMACEUTICAL DOSAGE FORMS & COSMETIC TECHNOLOGY -II 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to provide detail knowledge about chemistry of medicinal compounds from natural origin and general methods of structural elucidation of such compounds.
- It also emphasizes on isolation, purification and characterization of medicinal compounds from natural origin.
- This gives a knowledge of preformulation studies and stability studies
- Course enables the student to understand and appreciate the influence of pharmaceutical cosmetics and various pharmaceutical dosage forms on the performance of the drug product.
- To understand the formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This also gives knowledge about packing of various dosage forms.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid- liquid and semisolid dosage forms.
4. Know the evaluation test of solid, liquid and semisolid dosage form.
5. Know the modern extraction techniques- characterization and identification of the herbal drugs.
6. Know the different types of natural compounds and their chemistry and medicinal importance.

Course Content:

UNIT I

Blood Products and Plasma Substitutes –Collection- processing and storage of whole human blood- concentrated human RBCs- dried human plasma- human fibrinogen- human thrombin- human normal immunoglobulin- human fibrin foam- plasma substitutes- ideal requirements of PVP - dextran- Control of blood products as per IP.

UNIT II

Sterile pharmaceutical products - Formulation – requirements- factors & related aspects- evaluation of injectable solutions- suspensions and sterile powders- containers and closures - Total parenteral nutrition (TPN) & IV additives.

UNIT III

Sterile pharmaceutical products - Production facilities and process control – layout- air control-design of aseptic area- LAF and maintenance - Ophthalmic preparations – Requirements – formulation- methods of preparation- containers and evaluation.

UNIT IV

Cosmeticology and cosmetic preparation -Fundamentals of cosmetic science - Structure and functions of skin and hair – Formulation – Evaluation- packaging of cosmetics for skin – hair-dentifrices and manicure preparations- nail polish – lipsticks- eye lashes- baby care products.

UNIT V

Good Manufacturing Practice (GMP) -Human behaviour – infestation- condition of equipments and utensils- condition of raw materials- the plant- waste disposal and storage conditions - **Quality Assurance (QA)** -Salient features of ISO 9000- Total quality management and productivity – process- product and equipment validation.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S.J. Carter.	Cooper and Gunn's Dispensing for Pharmaceutical students	CBS	2000

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	David B Troy	Remington's Pharmaceutical Sciences	Pharmaceutical Press	2006
2	Loyd V. allen	H.C. Ansel Introduction to Pharmaceutical dosage	Wolters kluwer	2013
3	Carter S.J.- Cooper and Gunn's	Tutorial Pharmacy	CBS Publishers- Delhi.	2000

WEBSITES:

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU613 **SEMESTER-VI**

PHARMACEUTICAL DOSAGE FORMS & COSMETIC TECHNOLOGY LABORATORY-II 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3

Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to provide detail knowledge about chemistry of medicinal compounds from natural origin and general methods of structural elucidation of such compounds.
- It also emphasizes on isolation, purification and characterization of medicinal compounds from natural origin.
- This gives a knowledge of preformulation studies and stability studies
- Course enables the student to understand and appreciate the influence of pharmaceutical cosmetics and various pharmaceutical dosage forms on the performance of the drug product.
- To understand the formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This also gives knowledge about packing of various dosage forms.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid- liquid and semisolid dosage forms.
4. Know the evaluation test of solid, liquid and semisolid dosage form.
5. Know the modern extraction techniques- characterization and identification of the herbal drugs.
6. Know the different types of natural compounds and their chemistry and medicinal importance.

Course Content:

I. Preparation- evaluation and packaging of:

1. Cocoa butter suppositories
2. Boric acid suppositories.
3. Glycerol gelatine suppositories.
4. Emulsifying ointment
5. Vanishing cream.
6. Zinc cream
7. Salicylic acid paste.
8. Sodium alginate jelly

9. Lipstick
10. Baby care products.

II. Packaging materials: Evaluation of materials used in pharmaceutical packaging.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Thomsen S.G.	Modern Cosmetics- Universal Publishing Corporation- Bombay	Vargeese	1991

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Remington	Remington's The Science and Practice of Pharmacy- Easton.	Valtimore	2000

WEBSITES:

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU604 **SEMESTER-VI**

PHARMACOLOGY - II 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics.
- The subject covers the complete information about the drugs like sources-physicochemical properties- mechanism of action-physiological and biochemical effects (pharmacodynamics) as well as absorption-distribution-metabolism and excretion (pharmacokinetics) along with the adverse effects-clinical uses-interactions-doses-contraindications and routes of administration of different classes of drugs.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Explain the pharmacological actions of different categories of drugs on various systems of the body.
2. Explain the mechanism of drug action at organ system/subcellular/macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Handle the animals and conduct the experiments to observe the effect of drugs from different therapeutic classes and to interpret the results using suitable statistical analysis.
5. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.
6. Comprehend the principles of toxicology and treatment of various poisonings.

Course Content:

UNIT I

Pharmacology of Central Nervous System – Neurohumoral transmission in the CNS with special emphasis on pharmacology of various neurotransmitters like histamine-serotonin –dopamine – gaba –glutamate and glycine – **general anesthetics –** alcohol and disulfiram – sedatives –hypnotics and centrally acting muscle relaxants.

UNIT II

Pharmacology of Central Nervous System - Psychopharmacological agents – Antipsychotics – antidepressants – anti anxiety agents -anti-manics and hallucinogens - Anti-epileptic drugs – Drugs used in Parkinsonism and Alzheimer's disease- Narcotic analgesics and antagonists – CNS stimulants and Nootropics – Drug addiction –drug abuse –tolerance and dependence.

UNIT III

Pharmacology of Cardiovascular System - Introduction to hemodynamic and Electrophysiology of heart - **Anti-hypertensive drugs - Anti- anginal drugs -A n t i -arrhythmic drugs.**

UNIT IV

Drugs acting of Cardiovascular System – Drugs used in congestive heart failure - **Anti-hyperlipidemic drugs** – Haematinics –anticoagulants and haemostatic agents – Fibrinolytics and antiplatelet drugs – Blood and plasma volume expanders**.**

UNIT V

Drugs acting on Respiratory System - anti-asthmatic drugs - Anti-tussives and expectorants – Respiratory stimulants – Mucolytics and nasal decongestants.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	K.D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Satoskar R.S and Bhandarkar S.D.	Pharmacology and Pharmacotherpeutics	Popular Prakasan	2009
2	Mycek M.J-Gelnet S.B and Perper M.M.	Lippincott's illustrated Reviews-Pharmacology	Harvery	1992
3	Lawrence L brunton	Goodman and Gilman's-The Pharmacological basis of therapeutics	CBS Publishers-Delhi.	2011

WEBSITES:

- **www.libguides.utep.edu**
- **www.pharmacology2000.com**
- **www.pharmacologycorner.com**

16PYU614 **SEMESTER-VI**

PHARMACOLOGY LABORATORY – II 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics.
- The subject covers the complete information about the drugs like sources-physicochemical properties- mechanism of action-physiological and biochemical effects (pharmacodynamics) as well as absorption-distribution-metabolism and excretion (pharmacokinetics) along with the adverse effects-clinical uses-interactions-doses-contraindications and routes of administration of different classes of drugs.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Explain the pharmacological actions of different categories of drugs on various systems of the body.
2. Explain the mechanism of drug action at organ system/subcellular/macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Handle the animals and conduct the experiments to observe the effect of drugs from
5. different therapeutic classes and to interpret the results using suitable statistical analysis.
6. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.
7. Comprehend the principles of toxicology and treatment of various poisonings.

Course Content:

1. Commonly used Apparatus/instruments in experimental pharmacology.
2. Commonly used laboratory animals and their handling.
3. Maintenance of laboratory animals- regulations of animal use and Ethical requirements according to CPCSEA.
4. Some common laboratory techniques : Blood withdrawal –plasma and serum separation-

5. Anesthetics used for animal studies-procedures for rendering animal unconscious and chemical euthanasia.
6. Study of different routes of drugs administration in mice/rats.
7. To study the effect of hepatic microsomal enzyme inhibitors and inducers on the Phenobarbitone sleeping time in mice.
8. Experiments on Central nervous system : Recording of spontaneous motor activity- stereotype activity -anti-catatonic activity-analgesic activity-anti convulsant
9. Local anesthetic activity of drugs by suitable animal model.
10. Effect of autonomic drugs on rabbit's eye.
11. Diuretic activity of drugs in rats.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M. N. Ghosh. .	Fundamentals of Experimental Pharmacology	Hilton and company	2015

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kulkarni.S.K. Easton.	Handbook of Experimental Pharmacology	Elsevier	2006

WEBSITES:

- **www.libguides.utep.edu**
- **www.pharmacology2000.com**
- **www.pharmacologycorner.com**

16PYU605 **SEMESTER-VI**

PHARMACEUTICAL BIOTECHNOLOGY 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- This paper has been designed to provide the advanced knowledge to the Pharmacy students in valuable areas of advanced Biotechnology.
- To play a crucial role in determining its future use and applications in medicine- drug discovery and in pharmaceutical industry**.**
- It also emphasize the study of microbiological and biotechnological processes.
- To know modern technology aspects to useful products and to correct the alternative ways to prevent the occurrence and the treatment of disease related to microorganisms and techniques.
- To understand methods of identification- cultivation and preservation of various microorganisms.
- To understand Genetic engineering applications in relation to production of pharmaceuticals.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the importance of immunological reactions and preparations of immunological products.
2. Do sterilization of various equipments/products and bacterial sensitivity testing against antibiotics and disinfectants.
3. Know the anatomy, identification, growth factors and sterilization of microorganisms;
4. Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
5. Understand methods of identification- cultivation and preservation of various microorganisms
6. Understand Genetic engineering applications in relation to production of pharmaceuticals
7. Know the importance of immunological reactions and preparations of immunological products.
8. Do sterilization of various equipments/products and bacterial sensitivity testing against antibiotics and disinfectants.

Course Content:

UNIT I

Bio process technology- Introduction to fermentation technology- study- design and operation of Fermenter - Bioprocess of the following metabolites: Alcohol- Citric acid- Penicillin- Griseofulvin- Vitamin B12- and Glutamic acid.

UNIT II

Enzyme biotechnology - Introduction- classification and uses - Techniques of immobilization - Application- biosensors and their application - Production of amylase- Catalase- peroxidase- lipase- Protease Streptokinase penicillinase.

UNIT III

Immunology and Immune Biotechnology -Introduction- types of Immunity- antigen and haptens- antigen- antibody reactions- complementary systems- structure and function of MHC- antigen recognition and presentation- hypersensitivity- Hypersensitivity response-immuno stimulation and suppression and Auto immune disorders –Immunization: Definition- types- preparation- standardization and application of official vaccines- containerization- storage conditions and stability of official vaccines -Hybridoma technology

UNIT IV

Introduction- Techniques of production and purification of monoclonal antibodies. Application of monoclonal antibodies -Immuno blotting techniques such ELISA- Western Blot- Southern Blot.
Animal Biotechnology : Introduction to animal tissue culture- characters- general procedure for the maintenance of cell culture- Nutritional requirements- Primary and established cell culture and application of animal tissue culture - **Molecular Biology and Engineering -** Study of cloning vectors- restricted endonucleases and DNA ligase - Application of r DNA technology and genetic engineering in the products: a) Interferon b) Vaccines- hepatitis- B c) Hormones- Insulin.

UNIT V

Access to Molecular Biology Data Bases: Nucleic Acid Sequences- Genomes- Protein Sequence and Structures- Entrez- Sequence Retrieval System (SRS)- Protein Identification Resource (PIR) - Sequence Alignment- Software's (BLAST- FASTA- CLUSTAL-W)- Construction of Phylogenetic Tree - Protein Structure Prediction- Applications of Bioinformatics

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ananthanarayan and Paniker	Text Book of Microbiology	Orient black swam	2015

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Pelzer- Krieg and Chan	Microbiology	ABE books	1986

2	John A Wiley	Prescott's Microbiology	Prescott's	2011
3	R.Y. Stainer	General Microbiology	Mac mallion	1952

WEBSITES:

- **www.microbiology.org**
- **www.microworld.org**
- **www.neomed.edu**

16PYU615 **SEMESTER-VI**

PHARMACEUTICAL BIOTECHNOLOGY LABORATORY 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This paper has been designed to provide the advanced knowledge to the Pharmacy students in valuable areas of advanced Biotechnology.
- To play a crucial role in determining its future use and applications in medicine- drug discovery and in pharmaceutical industry**.**
- It also emphasize the study of microbiological and biotechnological processes.
- To know modern technology aspects to useful products and to correct the alternative ways to prevent the occurrence and the treatment of disease related to microorganisms and techniques.
- To understand methods of identification- cultivation and preservation of various microorganisms.
- To understand Genetic engineering applications in relation to production of pharmaceuticals.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Know the importance of immunological reactions and preparations of immunological products.
2. Do sterilization of various equipments/products and bacterial sensitivity testing against antibiotics and disinfectants.
3. Know the anatomy, identification, growth factors and sterilization of microorganisms;
4. Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
5. Do estimation of RNA and DNA and there by identifying the source;
6. Do cultivation and identification of the microorganisms in the laboratory;
7. Do identification of diseases by performing the diagnostic tests; and
8. Appreciate the behavior of motility and behavioral characteristics of microorganisms.

Course Content:

Microbiology

1. Production of alcohol and wine by fermentation process.
2. Immobilization techniques – Whole cells- Enzymes
3. Solid media inoculation – streak plate, pour plate.
4. Motility study by hanging drop method(2 experiments)
5. Staining preparation – negative staining(2 experiments).
6. Microbiological assay – well plate method.

7. Biochemical test
8. Determination of minimum inhibitory concentration.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	James G. Cappuchino	Microbiology – A laboratory manual	Pearson	2013

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mackie and McCartney	Practical Medical Microbiology	Elsevier	1996

WEBSITES:

- **www.microbiology.org**
- **www.microworld.org**
- **www.neomed.edu**

16PYU606 **SEMESTER-VI**

HOSPITAL AND CLINICAL PHARMACY - II **3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- This course is designed to impart basic knowledge and skills that are required for the practice of pharmacy in both hospital and community settings.
- Conduct sufficiently thorough and accurate patient assessments
- Explain and properly dispense commonly used medications, formulations, and drug products.
- Identify and assess drug related problems relative to specific patient cases.
- The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.
- The purpose of this course is to introduce to students a number of health issues and their challenges.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the various drug distribution system
2. Handle the prescriptions and manage community pharmacies
3. Understand the elements of pharmaceutical care and provide comprehensive patient care services
4. Understand the concept and practice of the quality use of medicines
5. Summarize the therapeutic approach for management of various diseases including reference to the latest available evidence.
6. Evaluate alternative ways of solving problems related to health and pharmaceutical issues.

Course Content:

UNIT-I

Nuclear Pharmacy -Introduction to Radiopharmaceuticals - radioactive half-life - units of radioactivity -Production of radiopharmaceuticals - methods of isotopic tagging - preparation of radioisotopes in laboratory using radiation dosimetry and radioisotope generators - Permissible radiation dose level - radiation hazards - their prevention and specifications for radioactive laboratory.

UNIT-II

Adverse drug reactions – Classification - excessive pharmacological effects - secondary pharmacological effects – idiosyncrasy - allergic drug reactions -genetically determined toxicity - toxicity following sudden drug withdrawal - Methods of detecting adverse drug effects - spontaneous case reports - record linkage studies - Cohort studies & case control studies.

UNIT-III

Drug interactions - Types - Pharmacokinetic and Pharmacodynamic drug interactions with suitable examples - Common Drug –Drug and Drug –Food interactions.

UNIT-IV

Concept of medication history interviews - patient medication profile - patient medication counseling - Barriers and steps in counselling - types of medication error and patient compliance.

UNIT-V

Therapeutic Drug Monitoring –Introduction – indications - dosage individualization - Pharmacist's intervention - TDM of specific drugs – Digoxin – Theophyllin - Gentamycin & Phenytoin.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S-H- Merchant and J-S- Qadry	A textbook of Hospital Pharmacy	Mc Graw hill New Delhi	2004

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Malcom	Clinical Pharmacokinetics concepts and Application	Lippincotts Williams and wilcoms	2007
2	G-Parthasarathy-Karin Nyfort-Hansen- Milap C- Nahara	A text book of clinical Pharmacy Practice-Essential concepts and skills	Orient Black swam	2004
3	Sartaray Hiage	Textbook of Biopharmaceutics and Clinical Pharmacokinetics	CRC Book House	2014

WEBSITES:

- **www-jpp.sagepub.com**
- **www.jrpp.net**
- **www.pharmacypractice.com**

16PYU701 **SEMESTER-VII**

FORMULATIVE PHARMACY AND BIOPHARMACEUTICS -I 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
- This gives a knowledge of preformulation studies and stability studies
- Different machinery used for various steps in manufacture of various dosage forms. Formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market.
- To know the various pharmaceutical dosage forms and their manufacturing techniques.
- To know various considerations in development of pharmaceutical dosage forms.

Course Outcomes (CO's):
Upon completion of this course the student will:

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid and novel drug delivery system .
4. Know evaluation of pharmaceutical dosage forms.
5. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation
6. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Course Content:

UNIT-I
Preformulation studies - Study of physical properties of drugs like physical form- particle size shape – density – wetting- dielectric constant – solubility – dissolution- organoleptic property and their effect on formulation- stability and bioavailability.

UNIT-II
Stability studies - Study of chemical properties of drugs like hydrolysis – oxidation – reduction – racemisation – polymerization- their influence on formulation and stability of products - Stabilization and stability testing protocol for various pharmaceutical products.

UNIT-III

Capsules - Advantages - disadvantages of capsule dosage form- material for production of hard gelatin capsules- size of capsules and method of capsule filling - Soft gelatin capsule- capsule shell and capsule content- importance of base absorption – manufacturing - quality control- stability testing and storage of capsule dosage forms.

UNIT-IV

Micro-encapsulation - Types of microcapsules- importance of micro encapsulation in pharmacy- micro encapsulation by Co-acervation phase separation- multi-orifice centrifugation- spray drying- spray congealing – polymerisation- air suspension technique- pan coating and other techniques - Evaluation of microcapsules.

UNIT-V

Tablets - Classification of different types of tablets- tablet excipients- granulation technology on large scale by various techniques- different types of tablet compression machinery and equipment employed- processing problems of tablets and evaluation of tablets.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Liberman and Lachman.	Pharmaceutical dosage forms- Disperse systems Vol-1-Vol-2-Vol-3	Informa healthcare	2008

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Banker and Gilberts	Modern pharmaceutics	Marcel dekker	2002
2	Liberman and Lachman.	Pharmaceutical dosage forms- parenteral medication Vol-1 & Vol-2	Informa healthcare	2008
3	H.C. Ansel	Pharmaceutical Dosage form and Drug delivery system	New Delhi	2000
4	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007
5	Remington	Science and Practice of Pharmacy	Philadelphia	2005

WEBSITES

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU711 **SEMESTER-VII**

FORMULATIVE PHARMACY AND BIOPHARMACEUTICS LABORATORY –I **3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
- This gives a knowledge of preformulation studies and stability studies
- Different machinery used for various steps in manufacture of various dosage forms. Formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market.
- To know the various pharmaceutical dosage forms and their manufacturing techniques.
- To know various considerations in development of pharmaceutical dosage forms.

Course Outcomes (CO's):
Upon completion of this course the student will:

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid and novel drug delivery system.
4. Know evaluation of pharmaceutical dosage forms.
5. To understand the criteria for selection of drugs and polymers for the development of
6. Novel drug delivery systems, their formulation and evaluation
7. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Course content:

Preformulation studies

1. Determination of flowability of powder by assessing compressibility index
2. Determination of flow property by assessing angle of repose.
3. Determination of effect of glidants
4. Determination of effect of different concentration of glidants.
5. Evaluation of liquid dosage forms.
6. Evaluation of semi solid dosage form.
7. Preparation of sodium bicarbonate tablets.
8. Preparation of Phenobarbitone tablets.

9. Preparation of aspirin effervescent tablets.
10. Preparation of ferrous sulphate tablets.

TEXT BOOKS:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Liberman & Lachman	Theory And Practice Of Industrial Pharmacy	Lea and febiger	1986

REFERENCES:

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Remington	The science and practice of pharmacy- 20th edition Pharmaceutical Science	Lippincott Williamson	2000
2	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

WEBSITES

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU702 **SEMESTER-VII**

ADVANCED PHARMACOGNOSY-I 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs.
- The students are given sufficient knowledge to be able to describe morphology and histology of different plant organs.
- To identify drugs in the whole state and in powdered condition with suitable examples of medicinal plants.
- To learn and understand the techniques involved in the herbal drug-cosmetic preparation and their Standardization.
- To learn their use and application in eradicating ailments.

Course Outcomes (CO's):

Upon completion of this course the student will:

1. Explain the basic principles of extraction and various modern extraction techniques.
2. Understand the biogenesis of secondary metabolites.
3. Elaborate the plant basedindustries and institutions involved in work on medicinal and aromatic plants in India.
4. Demonstrate the Industrial production and estimation of Phytoconstituents.
5. Perform the Herbal formulation and standardization.
6. Explain the Nutraceuticals.

Course Content:

UNIT I

Modern methods of extraction-application of latest techniques like Spectroscopy, types and applications– various types and applications of chromatography, and electrophoresis in the isolation-purification and identification of crude drugs.

UNIT II

Introduction to plant biochemistry with special reference to basic metabolic pathways - Introduction to biogenesis of secondary metabolites like Atropine–Ergotamine-Morphine and Steroidal glycosides-Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

UNIT III

A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India - introduction – classification of medicinal plant based industry – production and utilization of medicinal plants and their products in India –manufacturers of herbal formulations manufacturers of standardized herbal extracts, phytoconstituents and essential oils – list of government institution involved in the development of plant based industrial technology.

UNIT IV

Industrial production and estimation of the following phytoconstituents –production –estimations–uses of Forskolin –Sennoside– Artemisinin – Diosgenin-Tropanealkaloids –Curcumin –Rutin – Phyllanthin –Asiaticoside-Andrographolides and Gymnemic acid.

UNIT V

Herbal formulation development and standardization – Preparation-stability testing of Herbal extracts and formulations-Role of Herbs in Cosmetics – Hair care preparation–Henna–Amla-Hibiscus – Skin Care preparation- Aloe vera–Turmeric-Sandalwood – Nutraceuticals.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kokate C.K-Purohit A.P-Gokhale S.B	Text book of Pharmacognosy	Nirali prakasan	2008

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Trease and Evans	Pharmacognosy	W.B Sauders	2002
2	James Robbers-Marilyn K. Speedice and Varro E.- Tyler	Pharmacognosy and Pharmacobiotechnology	Williams and Wilkins	1996
3	TE Wallis	Textbook of Pharmacognosy	CBS publishers and Distributors- New Delhi	2005
4	K.N.Kalia	Industrial Pharmacognosy	CBS publishers and Distributors- New Delhi	2005
5	The Indian Pharmacopoeia Commission		Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

WEBSITES:

- **www.autorstream.com**
- **www.epharmacognosy.com**
- **www.science20.com**

16PYU712 **SEMESTER-VII**

ADVANCED PHARMACOGNOSY LABORATORY – I **3H** **2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs.
- The students are given sufficient knowledge to be able to describe morphology and histology of different plant organs.
- To identify drugs in the whole state and in powdered condition with suitable examples of medicinal plants.
- To learn and understand the techniques involved in the herbal drug-cosmetic preparation and their Standardization.
- To learn their use and application in eradicating ailments.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Describe the isolation of the Phytoconstituents.
2. Prepare the hair care preparation.
3. Prepare the skin care the preparation.
4. Demonstrate the Amino acid by ascending chromatography.
5. Perform the Thin layer chromatography of Curcumin.
6. Understand the isolation and formulation procedure.

Course Content:

1. Caffeine – from tea dust
2. Quinine – from Cinchona bark
3. Citric acid – from Lemon.
4. Casein – from Milk.
5. Starch – from Potato
6. Pectin – from Orange peel
7. Curcumin from turmeric
8. Hair care preparation
   I. Amla
   II. Hibiscus
9. Skin Care preparation
   I. Aloe vera
10. Determination of Aminoacid by Ascending chromatography
11. Thin layer chromatography of curcumin

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.K. Kokate.	Practical Pharmacognosy- III edition-	Nirali prakashan	2011

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vinod. D. Rangari	Pharmacognosy and Phytochemistry I edition-vol- l &II	Carrier publications	2009

WEBSITES:

- **www.autorstream.com**
- **www.epharmacognosy.com**
- **www.science20.com**

16PYU703 **SEMESTER-VII**

MEDICINAL CHEMISTRY- III **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Course Outcomes:

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Understand the importance of drug design and understand the different modern techniques of drug design.
6. Know the metabolism- adverse effect and therapeutic value of drugs.

Course Content:

UNIT I

Introduction to Drug Design - Principles of Drug Design-Various approaches used in drug design**-** Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient- Hammets electronic parameter- Tafts steric parameter and Hansch analysis. Pharmacophore and docking technique**s-Prodrugs-** Basic concepts and application of prodrugs design-**Combinatorial Chemistry-** Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis

UNIT II

Anti-infective agents - Local anti-infective agents - Ethyl alcohol- Isopropyl alcohol- Formaldehyde- Sodium glutaraldehyde solution- Liquified phenol- Hexachlorophene*- Eugenol-

Hexyl resorcinol- Anthralin- Hydrousbenzoylperoxide- Halazone*- Benzalkonium chloride*- Methylbenzethorium chloride*- Cetylpyridinium chloride- Chlorhexidinegluconate*- Gentianviolet- Methylene blue- Thiomersal- Methyl paraben and Sodium benzoate**- Antifungal agents - Antifungal antibiotics-** Amphotericin-B- Nystatin- Natamycin and Griseofulvin-**Synthetic Antifungal agents-** Clotrimazole- Econazole nitrate- Butoconazole- Oxiconazole nitrate- Tioconozole- Miconazole*- Ketoconazole- Terconazole- Itraconazole- Fluconazole- Naftifine hydrochloride- Tolnaftate*- Cyclopiroxolamine.

UNIT III

Anti-infective agents - Urinary tract anti-infective agents - Quinolones: SAR of quinolones- Nalidixic Acid*- Cinoxacin- Norfloxacin- Enoxacin Ciprofloxacin- Ofloxacin- Lomefloxacin- Sparfloxacin-**Miscellaneous-**Furazolidine- Nitrofurantoin* and Methanamine-**Anti-tubercular Agents**-**Synthetic anti tubercular agents-**INH*- Ethionamide- ethambutol- Pyrazinamide- Para amino salicylic acid*-**Anti tubercular antibiotics-** Rifampicin- Rifabutin- Cycloserine* and sterile Capreomycin sulphate-**Anti-protozoal Agents-** Metronidazole*- Diloxanide*- Iodoquinol- Pentamidine Isethionate- Atovaquone- Eflornithine-**Anthelmintics-** Piperazine salts*- Diethylcarbamazine citrate*- Thiabendazole*- Mebendazole*- Albendazole- Niclosamide- Oxamniquine- Praziquantal and Ivermectin-**Anti-scabious and Anti-pedicular Agents-**Benzyl Benzoate*- Lindane* (Gamaxene)- Crotamiton* and Permethrin.

UNIT IV

Anti-infective agents - Antimalarials - Etiology of malaria- SAR-**Quinolines-** Quinine sulphate- Chloroquine phosphate*- Hydroxy chloroquine sulphate- Amodiaquine hydrochloride*- Primaquine phosphate- Quinacrine hydrochloride- Mefloquine-**Biguanides and dihydro triazines-** Cycloguanil pamoate- Proguanil-**Miscellaneous-**Pyrimethamine- Trimethoprim and Sulfadoxine

UNIT V

Antibiotics - Historical background- Nomenclature- stereochemistry- Structure activity relationship chemical degradation classification and important products of the following classes-**β Lactam antibiotics-**Penicillin- Cepholosporins- β- Lactamase inhibitors- Monobactams **Aminoglycosides-** Streptomycin- Neomycin-**Tetracyclines-**Tetracycline- Chlortetracycline- Menocycline- Doxycycline-**Macrolide-**Erythromycin and Azithromycin – **Miscellaneous-**Chloramphenicol*- Clindamycin

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William Foye	Foye's Principles of Medicinal Chemistry- 5th edition.	LWW	2002

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Wilson and Gisvold's	Wilson and Gisvold's Organic medicinal and Pharmaceutical Chemistry-	11th edition	2003
2	Burger	Burger's Medicinal Chemistry Vol I to IV	Wiley	2010
3	K.D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

WEBSITES

- **www.rsc.org**
- **www.acs.org**
- **www.medicinalchemistry.org**

16PYU713 **SEMESTER-VII**

MEDICINAL CHEMISTRY LABORATORY– III **3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Course Outcomes:

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Emphasizes on chemical synthesis of important drugs under each class.

Course Content:

I. Preparation of medicinally important compounds or intermediates required for synthesis of drugs (4 compounds)

II. Monograph analysis of selected drugs from course content. (4 compounds)

III. Assay of Selected drugs from course content prescribed as per I.P or B.P. (4 compounds)

TEXT BOOKS

S.No	Author(s)	Title of the book	Publisher	Year of

	Name			Publication
1	A.I.Vogel	Text book of practical organic chemistry	Dorling Kindersely	2008

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ashutoshkar	Ashutoshkar's Medicinal Chemistry	New Age International	2007

WEBSITES:

- **www-rsc-org**
- **www-acs-org**
- **www-medicinalchemistry-org**

16PYU704 **SEMESTER-VII**

PHARMACOLOGY - III **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P:0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics.
- The subject covers the complete information about the drugs like sources-physicochemical properties- mechanism of action-physiological and biochemical effects (pharmacodynamics) as well as absorption-distribution-metabolism and excretion (pharmacokinetics) along with the adverse effects-clinical uses-interactions-doses-contraindications and routes of administration of different classes of drugs.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

Course Outcomes:

On successful completion of the course the student will

1. Describe the Pharmacology of various endocrine Hormones.
2. Explain the Insulin, Oral Hypoglycemic agents, Sex hormones, and oral contraceptives.
3. Enlight the Pharmacology of Drugs acting on the Gastrointestinal Tract.
4. Brief the principles, methods of Bioassay and the bioassay of insulin, oxytocin, vasopressin, ACTH, histamine and 5-HT.
5. Explain the Immunopharmacology, Immunostimulants and Immunosuppressants.
6. Define the drugs acting on the uterus.

Course Content:

UNIT I

Pharmacology of Endocrine System - Basic concepts in endocrine pharmacology - Hypothalamic and pituitary hormones - Thyroid hormones and anti thyroid drugs – Parathormone - Calcitonin and Vitamin-D.

UNIT II

Insulin - Oral Hypoglycemic agents and glucagon - ACTH and corticosteroids - Androgens and Anabolic steroids – Estrogens - progesterone and oral contraceptives - **Drugs acting on the uterus.**

UNIT III

Pharmacology of Drugs acting on the Gastrointestinal Tract – Antacids - anti-secretary and anti ulcer drugs - Laxatives and anti-diarrheal drugs - Appetite stimulants and suppressants - Digestants and carminatives -Emetics and anti-emetics.

UNIT IV

Bioassay - Principles and methods of bioassay - Bioassay of insulin - oxytocin-vasopressin - ACTH- histamine and 5-HT.

UNIT V

Immunopharmacology - Immunostimulants and immunosuppresants.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rang M.P- Dale M.M- Reter J.M	Rang M.P- Dale M.M- Reter J.M- Pharmacology	Elsevier	2012

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Craig C.R. and Stitzel R.R-	Craig C.R. and Stitzel R.R- Modern Pharmacology	LWW	2003
2	Lawrence L brunton	GoodmanandGilman's- ThePharmacologicalbasis oftherapeutics	CBS Publishers- Delhi.	2011
3	K.D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

WEBSITES

- **www.libguides.utep.edu**
- **www.pharmacology2000.com**
- **www.pharmacologycorner.com**

16PYU714 **SEMESTER-VII**

PHARMACOLOGY –III LABORATORY **3H** **2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics.
- The subject covers the complete information about the drugs like sources-physicochemical properties- mechanism of action-physiological and biochemical effects (pharmacodynamics) as well as absorption-distribution-metabolism and excretion (pharmacokinetics) along with the adverse effects-clinical uses-interactions-doses-contraindications and routes of administration of different classes of drugs.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

Course Outcomes:

On successful completion of the course the student will

1. Explain about in-vitro pharmacology and prepare the Physiological salt solutions.
2. Estimate the bioavailability parameters viz AUC, Tmax ,Kel from blood sample.
3. Demonstrate the CRC of acetylcholine by using suitable muscle preparations.
4. Estimate the bioavailability parameters viz AUC, Tmax ,Kel from urine sample.
5. Record the CRC of Nor adrenaline on rat anococcygeus muscle.
6. Record the CRC of 5HT on rat fundus preparation.

Course Content:

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Record CRC of acetylcholine by using suitable muscle preparations.
3. Record the CRC of 5HT on rat fundus preparation.
4. Record CRC of Nor adrenaline on rat anococcygeus muscle
5. Estimation of bioavailability parameters viz AUC from blood sample.
6. Estimation of bioavailability parameters viz T_{max} from blood sample.
7. Estimation of bioavailability parameters viz K_{el} from blood sample.
8. Estimation of bioavailability parameters viz AUC from urine sample.
9. Estimation of bioavailability parameters viz T_{max} from urine sample.

10. Estimation of bioavailability parameters viz K_{el} from urine sample.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M.N.Ghosh. .	Fundamentals of Experimental Pharmacology	Hilton and company	2015

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kulkarni.S.K. Easton	Handbook of Experimental Pharmacology	Elsevier	2006

WEBSITES:

- **www-libguides-utep-edu**
- **www-pharmacology2000-com**
- **www-pharmacologycorner-com**

16PYU705 **SEMESTER-VII**

MODERN METHODS OF PHARMACEUTICAL ANALYSIS – I 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart a fundamental knowledge on the testing of drugs by various instrumental methods of analysis.
- This focuses on various modern instruments that are used for testing the purity of drugs in various dosage forms.
- course also gives knowledge about modern instruments that are used for drug testing like NMR- IR- Mass- HPLC- HPTLC etc.
- This course deals with the fundamentals of analytical chemistry and principles of electro chemical analysis of drugs.
- To know the principle and applications of instrumentation
- To understand the components and working of various analytical instruments.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Know the principle and applications of instrumentation
2. Understand the components and working of various analytical instruments.
3. Understand the different modern techniques of drug analysis.
4. Appreciate the advantages of instrumental methods of drug analysis.
5. Understand the principles of volumetric and electro chemical analysis.
6. Carry out various volumetric and electro chemical titrations.
7. Develop analytical skills.

Course Content:

UNIT I
UV/Visible spectroscopy - Theory of atomic and molecular spectra - Electronic transitions - Beer and Lambert's law - Derivation and deviations - Applications of Beer law to single and multi component systems – Chromophores – Auxochromes - Spectral shifts - Solvent effect on absorption spectra - Instrumentation - Sources of radiation - wavelength selectors - sample cells – Detectors - Barrier layer cell - Photo tube - Photomultiplier tube - Silicon Photodiode -Applications - Spectrophotometric titrations - Measurement of equilibrium constant and rate constant - **Fluorimetry** – Theory - Concepts of singlet - doublet and triplet electronic states - internal and external conversions - factors affecting fluorescence – quenching - Instrumentation and applications.

UNIT II
IR spectroscopy – Introduction - Fundamental modes of vibrations in poly atomic molecules - Sample handling - Instrumentation - Sources of radiation - wavelength selectors - sample cells - Detectors –

Golay cell - Bolometer – Thermocouple – Thermister - Pyrroelectric detector - Structure – frequency correlation with examples.

UNIT III

Atomic absorption spectroscopy – Introduction - Theory - instrumentation- and applications - **Flame emission spectroscopy** – Introduction – Theory – Instrumentation -Interferences and applications - **Nephelometry and Turbidimetry** – Theory - Instrumentation and applications.

UNIT IV

NMR Spectroscopy - Principles- Instrumentation and applications.

UNIT V

Mass Spectroscopy - Principles- Fragmentation- Instrumentation- applications - Introduction to MALDI and ICPMS.

TEXT BOOKS

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Y.R. Sharma.	Organic Spectroscopy	S.Chand	2010

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	World Health Organization	Use of Essential Drugs	WHO expert committee	1997
2	Darrin Salle	Inspired- Organized & Effective	Darrin Salle	2012
3	Ken Blanchard	The One Minute Manager Meets- The Monkey	Quill	1991

WEBSITES

- **www.jpr.info.com**
- **www.sciencedomain.org**
- **www.pharmaresearchlibrary.com**

16PYU715 **SEMESTER-VII**

MODERN METHODS OF PHARMACEUTICAL ANALYSIS LABORATORY – I **3H 3C**

Instruction hours/ week: L: 0 T: 3 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart a fundamental knowledge on the testing of drugs by various instrumental methods of analysis.
- This focuses on various modern instruments that are used for testing the purity of drugs in various dosage forms.
- course also gives knowledge about modern instruments that are used for drug testing like NMR- IR- Mass- HPLC- HPTLC etc.
- This course deals with the fundamentals of analytical chemistry and principles of electro chemical analysis of drugs.
- To know the principle and applications of instrumentation
- To understand the components and working of various analytical instruments.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the principle and applications of instrumentation
2. Understand the components and working of various analytical instruments.
3. Understand the different modern techniques of drug analysis.
4. Appreciate the advantages of instrumental methods of drug analysis.
5. Understand the principles of volumetric and electro chemical analysis.
6. Carry out various volumetric and electro chemical titrations.
7. Develop analytical skills.

Course Content:

1 Chromatographic analysis of some pharmaceutical products-(3 experiments).

2 Exercises involving
- Colorimetry - (3 experiments).
- Spectrophotometry - (2 experiments).
- Flamephotometry – (2 Experiments)

3 Infra Red spectra peak identification for different functional groups (2 experiments).

TEXT BOOKS

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication

1	Beckett and Stenlake	Practical Pharmaceutical Analysis	A & C Black	1988

REFERENCES

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	R.M. Silverstein-John Wiley and Sons Inc.	Spectrometric identification of organic compounds	Heyden & sons Ltd	1969

WEBSITES

- **www.jpr.info.com**
- **www.sciencedomain.org**
- **www.pharmaresearchlibrary.com**

16PYU7E01 **SEMESTER-VII**

PHARMACEUTICAL MARKETING **3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The pharmaceutical industry not only needs highly qualified researchers, chemist, technical people but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry.
- Sales & Marketing which grooms the people for taking a challenging role in Sales and Product management.
- The career in product management starts from having hands on experience in sales and marketing only.
- The course curriculum incorporates various assignments, quizzes, and presentations.
- It is mandatory for students to take up any related internship while pursuing the course.
- The course aims at producing skilled professionals for managerial and related positions in the Pharmaceutical industry.

Course Outcomes (CO's):

On successful completion of the course the student will

1. The course aim is to provide an understanding of marketing concepts and techniques and the application of the same in the pharmaceutical industry.
2. Know the product decision and product management in pharmaceutical industry.
3. Know the Pharmaceutical marketing channels and Designing channel.
4. The course touches various aspects of the Pharmaceutical industry like analysis, research, sales, consultation, administration and distribution. It incorporates various managerial and research skills and business strategies.
5. The areas of study within the course include research, communication, management, accounting, finance, pharmaceutical science, and several other aspects of the Pharmaceutical business.
6. The course deals with the theoretical as well as with the practical aspect of the subject. Apart from the theory papers, It is also supported by various assignments, presentations, quizzes and internships.

Course Content:

UNIT I

Marketing - Definition - general concepts - and scope of marketing - Distinction between marketing & selling - Marketing environment - Industry and competitive analysis - Analyzing consumer buying behavior; industrial buying behaviour - **Pharmaceutical market -**Quantitative and qualitative aspects; size and composition of the market - demographic descriptions and socio-psychological characteristics of the consumer - market segmentation&targeting - Consumer profile - Motivation and prescribing habits of the physician – patients choice of physician and retail pharmacist - Analyzing the Market - Role of market research.

UNIT II

Product decision – Meaning – Classification - product line and product mix decisions - product life cycle - product portfolio analysis - product positioning - new product decisions - Product branding - packaging and labelling decisions - Product management in pharmaceutical industry.

UNIT III

Promotion - Meaning and methods -determinants of promotional mix - promotional budget - An overview of personal selling – advertising - direct mail – journals – sampling – retailing - medical exhibition - public relations - online promotional techniques for OTC Products.

UNIT IV

Pharmaceutical marketing channels - Designing channel - channel members - selecting the appropriate channel - conflict in channels - physical distribution management - Strategic importance - tasks in physical distribution management - **Professional sales representative (PSR) -** Duties of PSR - purpose of detailing - selection and training – supervising - norms for customer calls – motivating – evaluating - compensation and future prospects of the PSR.

UNIT V

Pricing – Meaning – importance – objectives - determinants of price - pricing methods and strategies -issues in price management in pharmaceutical industry - An overview of DPCO (Drug Price Control Order)and NPPA (National Pharmaceutical Pricing Authority) - **Emerging concepts in marketing -** Vertical & Horizontal Marketing -Rural Marketing – Consumerism - Industrial Marketing - Global Marketing.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Philip Kotler and Kevin Lane Keller	Marketing Management	New Delhi	2010

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Walker, Boyd and Larreche	Marketing Strategy- Planning and Implementation	MC GrawHill	2001
2	Dhruv Grewal and	Marketing	MC GrawHill	2000

	Michael Levy			
3	Arun Kumar and N Menakshi	Marketing Management	Vikas Publishing	2008

WEBSITES

- **www.enotesmba.com**
- **www.kbmanage.com**
- **www.sciencedomain.org**

16PYU7E02 **SEMESTER-VII**

PHARMACEUTICAL REGULATORY SCIENCE **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, drug products in regulated countries like US, EU, Japan, Australia and Canada.
- It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products in regulated countries.
- Explain the process of drug discovery, development and generic product development.
- Describe the regulatory approval process and registration procedures for API and drug products in various countries.
- Learn the basic understanding of regulations of India with other global regulated markets
- Understand the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know about the process of drug discovery and development
2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
3. Know the regulatory approval process and their registration in Indian and international marketsExplain basic understanding of developing clinical trial protocols
4. Understand the concept of pharmacovigilance and its significance
5. Learn the basic understanding the importance of Orange book, Federal Register, Code of Federal Regulatory, and Purple book
6. Explain the Registration of Indian drug product in overseas market.

Course Content:

UNIT I

New Drug Discovery and development - Stages of drug discovery - Drug development process - pre-clinical studies - non-clinical activities - clinical studies -Innovator and generics - Concept of generics- Generic drug product development.

UNIT II

Regulatory Approval Process - Approval processes and timelines involved in Investigational New Drug (IND) - New Drug Application (NDA) - Abbreviated New Drug Application (ANDA) in US - Changes to an approved NDA / ANDA -**Regulatory authorities and agencies -** Overview of regulatory authorities of

United States - European Union - Australia – Japan - Canada (Organization structure and types of applications).

UNIT III

Registration of Indian drug product in overseas market - Procedure for export of pharmaceutical products - Technical documentation - Drug Master Files (DMF) -Common Technical Document (CTD) - electronic Common Technical Document (eCTD) - ASEAN Common Technical Document (ACTD)d research.

UNIT IV

Clinical trials - Developing clinical trial protocols - Institutional Review Board / Independent Ethics committee - formation and working procedures - Informed consent process and procedures - GCP obligations of Investigators - sponsors & Monitors - Managing and Monitoring clinical trials - Pharmacovigilance - safety monitoring in clinical trials.

UNIT V

Regulatory Concepts - Basic terminologies – guidance – guidelines – regulations - laws and acts - Orange book - Federal Register - Code of Federal Regulatory - Purple book.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dr. N.S. Vyawahare	Drug Regulatory Affairs by Sachin Itkar	Nirali Prakashan	2010

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Richard A Guarino	Pharmaceutical Regulatory Process	Informa Health care Publishers	2001
2	Leon Shargel and Isader Kaufer	Generic Drug Product Development, Solid Oral Dosage forms	Marcel Dekker series	2000
3	Douglas J. Pisano	FDA Regulatory Affairs: a guide for prescription drugs	Vikas Publishing	2008

WEBSITES

- **www.pdfbit.com**
- **www.chem.ucla.edu**
- **www.chemistrylectures.com**

16PYU7E03 **SEMESTER-VII**

PHARMACOVIGILANCE **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This paper will provide an opportunity for the student to learn about development of pharmacovigilance as a science, basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance, train students on establishing pharmacovigilance programme in an organization, various methods that can be used to generate safety data and signal detection.
- This paper also develops the skills of classifying drugs, diseases and adverse drug reactions.
- Explain the regulatory requirements for conducting clinical trials.
- Describe in detail about various types of clinical trial designs.
- Explain the responsibilities of key players involved in clinical trials.
- Describe the documentational requirements for Clinical trials.

Course Outcomes (CO's):
On successful completion of the course the student will

1. History and development of pharmacovigilance
2. National and international scenario of pharmacovigilance
3. Dictionaries, coding and terminologies used in pharmacovigilance
4. Detection of new adverse drug reactions and their assessment
5. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
6. ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning
7. CIOMS requirements for ADR reporting
8. Writing case narratives of adverse events and their quality.

Course Content:

UNIT I

Introduction to Pharmacovigilance - History and development of Pharmacovigilance - Importance of safety monitoring of Medicine - WHO international drug monitoring programme - Pharmacovigilance in India - **Introduction to adverse drug reactions** - Definitions and classification of ADRs - Detection and reporting - Methods in Causality assessment - Severity and seriousness assessment - Predictability and preventability assessment - Management of adverse drug reactions - **Basic terminologies used in pharmacovigilance** - Terminologies of adverse medication related events - Regulatory terminologies.

UNIT II

Drug and disease classification – Anatomical - therapeutic and chemical classification of drugs - International classification of diseases - Daily defined doses - International Non proprietary Names for drugs - **Drug dictionaries and coding in pharmacovigilance** - WHO adverse reaction terminologie - MedDRA and Standardised MedDRA queries - WHO drug dictionary - Eudravigilance medicinal product dictionary - **Information resources in pharmacovigilance -** Basic drug information resources - Specialised resources for ADRs - **Establishing pharmacovigilance programme -** Establishing in a hospital - Establishment & operation of drug safety department in industry - Contract Research Organisations (CROs) - Establishing a national programme

UNIT III

Vaccine safety surveillance - Vaccine Pharmacovigilance - Vaccination failure - Adverse events following immunization - **Pharmacovigilance methods** - Passive surveillance – Spontaneous reports and case series - Stimulated reporting - Active surveillance – Sentinel sites - drug event monitoring and registries - Comparative observational studies – Cross sectional study - case control study and cohort study -Targeted clinical investigations - **Communication in pharmacovigilance -** Effective communication in Pharmacovigilance - Communication in Drug Safety Crisis management - Communicating with Regulatory Agencies - Business Partners - Healthcare facilities & Media.

UNIT IV

Statistical methods for evaluating medication safety data - **Safety data generation -** Pre clinical phase - Clinical phase - Post approval phase - **ICH Guidelines for Pharmacovigilance** - Organization and objectives of ICH - Expedited reporting - Individual case safety reports - Periodic safety update reports - Post approval expedited reporting - Pharmacovigilance planning - Good clinical practice in pharmacovigilance studies.

UNIT V

Pharmacogenomics of adverse drug reactions - Drug safety evaluation in specialpopulation PaediatricsPregnancy and lactation – Geriatrics – **CIOMS -** CIOMS Working Groups **-** CIOMS For - **CDSCO (India) and Pharmacovigilance -** D&C Act and Schedule Y **-** Differences in Indian and global pharmacovigilance requirements

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	S K Gupta	Textbook of Pharmacovigilance	Medical Publishers	2010

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Elizabeth B. Andrews	Mann's Pharmacovigilance	Wiley Publishers	2001
2	John Talbot	Stephens' Detection of New Adverse Drug Reactions	Wiley Publishers	2000
3	Patrick Waller	An Introduction to Pharmacovigilance	Wiley Publishers	2008

WEBSITES

- **http://cdsco.nic.in/**
- **http://www.cioms.ch/**
- **http://www.ich.org/**

16PYU7E04 **SEMESTER-VII**

QUALITY CONTROL AND STANDARDIZATION OF HERBALS

3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- To learn and understand the medicinal plants material and dosage forms.
- To understand the WHO guigelines for quality control of herbal drugs.
- To understand WHO Guidelines on good manufacturing Practices.
- To know the Quality assurance in herbal drug industry of GMP
- To know the evaluation techniques for the herbal drugs.
- To know the Stability testing of herbal medicines

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the Quality assurance in herbal drug industry of GMP.
2. Know the evaluation techniques for the herbal drugs.
3. Know the Stability testing of herbal medicines
4. Explain basic tests for drugs to obtain dosage form for pharmaceutical substances and medicinal plants.
5. Explain methods for evaluation of pharmaceutical substances, medicinal plants and commercial crude drugs along with WHO guidelines for quality control for herbal drugs,
6. Describe guidelines for cGMP, GAP, GMP and GLP for quality assurance of herbal drugs in industry.

Course Content:

UNIT I

Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms - WHO guidelines for quality control of herbal drugs - Evaluation of commercial crude drugs intended for use

UNIT II

Quality assurance in herbal drug industry of GMP – GAP - GMP and GLP in traditional system of medicine - WHO Guidelines on good manufacturing Practices (GMP) for Herbal Medicines - WHO Guidelines on GACP for Medicinal Plants.

UNIT III

EU and ICH guidelines for quality control of herbal drugs - Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines

UNIT IV

Stability testing of herbal medicines - Application of various chromatographic techniques in standardization of herbal products - Preparation of documents for new drug application and export registration - GMP requirements and Drugs & Cosmetics Act provisions.

UNIT V

Regulatory requirements for herbal medicines - WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems - Comparison of various Herbal Pharmacopoeias - Role of chemical and biological markers in standardization of herbal products.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kokate C.K-Purohit A.P-Gokhale S.B	Text book of Pharmacognosy	Nirali prakasan	2008

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Trease and Evans	Pharmacognosy	W.B Sauders	2002
2	James Robbers-Marilyn K. Speedice and Varro E.- Tyler	Pharmacognosy and Pharmacobiotechnology	Williams and Wilkins	1996
3	TE Wallis	Textbook of Pharmacognosy	CBS publishers and Distributors- New Delhi	2005
4	Agarwal.S.S	Herbal drug technology	Universities press	2002

WEBSITES

- **www.autorstream.com**
- **www.epharmacognosy.com**
- **www.science20.com**

16PYU7E05 **SEMESTER-VII**

CELL AND MOLECULAR BIOLOGY **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- Perceive over all mechanism of cell growth and cell cycle and division.
- To understand the biochemical pathways associated with the cellular organelles.
- To understand the cell signaling mechanisms.
- Understand the sequential events that occur during mitosis and meiosis.
- Introduce the concepts of stem cell and cell culturing techniques.
- Sensitized on cancer types, oncogenes and tumor suppressor genes.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Understand the importance, evolution and diversity of cells.
2. Learns to visualize the cells by employing different types of microscopes.
3. Able to describe the organization, structure and functions of cell organelles.
4. Understand the biochemical pathways associated with the cellular organelles.
5. Rationalize different transport mechanisms occurring in the cell.
6. Understand the cell signaling mechanisms.

Course Content:

UNIT-I

Introduction to Drug Discovery and Development - Stages of drug discovery and development

Lead discovery and Analog Based Drug Design - Rational approaches to lead discovery based on traditional medicine - Random screening - Non-random screening - serendipitous drug discovery - lead discovery based on drug metabolism, lead discovery based on clinical observation - **Analog Based Drug Design** – Bioisosterism – Classification - Bioisosteric replacement - Any three case studies.

UNIT-II

Quantitative Structure Activity Relationship (QSAR) - SAR versus QSAR, History and development of QSAR - Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient- Hammets substituent constant and Tafts steric constant - Hansch analysis - Free Wilson analysis - 3D-QSAR approaches like COMFA and COMSIA.

UNIT-III

Molecular Modeling and virtual screening techniques - Virtual Screening techniques -Drug likeness screening - Concept of pharmacophore mapping and pharmacophore based Screening - **Molecular docking** -Rigid docking -flexible docking - manual docking - Docking based screening -*De novo* drug design.

UNIT-IV

Informatics & Methods in drug design - Introduction to Bioinformatics, chemoinformatics - ADME databases – chemical - biochemical and pharmaceutical databases.

UNIT-V

Molecular Modelin - Introduction to molecular mechanics and quantum mechanics –Energy Minimization methods and Conformational Analysis - global conformational minima determination.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Robert GCK	Drug Action at the Molecular Level	University Prak Press	2008

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Martin YC	Quantitative Drug Design	Dekker	2002
2	Delgado JN	Wilson & Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry	Lippincott	1996
3	Foye WO	Principles of Medicinal chemistry	Lea & Febiger	2005

WEBSITES

- **www.cellbio.com**
- **www.scripps.edu**
- **www.cmb.medicine.umich.edu.**

16PYU801 **SEMESTER-VIII**

FORMULATIVE PHARMACY AND BIOPHARMACEUTICS –II 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
- This gives a knowledge of preformulation studies and stability studies
- Different machinery used for various steps in manufacture of various dosage forms. Formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market.
- To know the various pharmaceutical dosage forms and their manufacturing techniques.
- To know various considerations in development of pharmaceutical dosage forms.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid and novel drug delivery system .
4. Know evaluation of pharmaceutical dosage forms.
5. To understand the criteria for selection of drugs and polymers for the development of
6. Novel drug delivery systems, their formulation and evaluation
7. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Course Content:

UNIT- I
Prolonged action pharmaceuticals - benefits – limitations – oral products terminology – types and construction of products – evaluation – applications in pharmaceutical field.

UNIT-II
Novel Drug delivery systems – definition **-** advantages - disadvantages -Transdermal delivery systems - Osmotic drug delivery systems – Liposomes –microsomes – Nanoparticles – applications in pharmaceutical field .

UNIT-III

Bio-pharmaceutics- Rate of drug absorption after administration- drug concentration in blood- biological factors in drug absorption- physico-chemical factors- dosage form consideration for gastrointestinal absorption- drug distribution- site seeking and drug elimination.

UNIT-IV

Pharmacokinetics -Compartment models- a brief study of parameters like biological half life- apparent volumes of distribution- renal clearance- total body clearance- absorption- elimination rate constants and significance of the data.

UNIT-V

Bioavailability and bio-equivalency testing - Definitions - dosage forms - dissolution rate and bio-equivalency testing – biopharmaceutical classification system.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	D. M. Brahmankar and Sunil B.Jaiswal-	Bio pharmaceutics and Pharmacokinetics- A Treatise	Vallabh Prakashan Pitampura- Delhi	2011

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Liberman and Lachman.	Pharmaceutical dosage forms: Disperse systems Vol-1- Vol-2- Vol-3	Informa healthcare	2008
2	Milo Gibaldi.	Biopharmaceutics and Clinical Pharmacokinetics	Lea and febiger	1991
3	Leon Shargel and Andrew B.C.YU	Applied biopharmaceutics and pharmacokinetics-	Appleton & Lange	2004

WEBSITES

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU811 **SEMESTER-VIII**

FORMULATIVE PHARMACY AND BIOPHARMACEUTICS LABORATORY –II **3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
- This gives a knowledge of preformulation studies and stability studies
- Different machinery used for various steps in manufacture of various dosage forms. Formulation and evaluation of dosage forms and their advantages over other dosage forms.
- This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market.
- To know the various pharmaceutical dosage forms and their manufacturing techniques.
- To know various considerations in development of pharmaceutical dosage forms.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid and novel drug delivery system.
4. Know evaluation of pharmaceutical dosage forms.
5. To understand the criteria for selection of drugs and polymers for the development of
6. Novel drug delivery systems, their formulation and evaluation
7. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Course content:

1. Formulation and filling of hard gelatin capsules.
2. Evaluation test for capsules.

3. Manufacture of parenteral
4. Preparation of microsomes.
5. Determination of pseudo first order kinetics and half life.
6. Determination of second order kinetics.
7. Improvement of dissolution characteristics of slightly soluble drugs.
8. Calculation ka, ke, t ½ , Cmax.
9. Calculation of bioavailability from urinary excretion data for drugs.
10. Calculation of AUC and bioequivalence from the given data for drugs.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Liberman & Lachman	Theory And Practice Of Industrial Pharmacy	Lea and febiger	1986

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Remington	The science and practice of pharmacy- 20th edition Pharmaceutical Science	Lippincott Williamson	2000
2	The Indian Pharmacopoeia Commission	Indian Pharmacopoeia	Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

WEBSITES

- **www.picscheme.org**
- **www.ijper.org**
- **www.pharmpress.org**

16PYU802 **SEMESTER-VIII**

ADVANCED PHARMACOGNOSY-II **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs.
- The students are given sufficient knowledge to be able to describe morphology and histology of different plant organs.
- To identify drugs in the whole state and in powdered condition with suitable examples of medicinal plants.
- To learn and understand the techniques involved in the herbal drug-cosmetic preparation and their Standardization.
- To learn their use and application in eradicating ailments.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Explain the basic principles of extraction and various modern extraction techniques.
2. Understand the biogenesis of secondary metabolites.
3. Elaborate the plant basedindustries and institutions involved in work on medicinal and aromatic plants in India.
4. Demonstrate the Industrial production and estimation of Phytoconstituents.
5. Perform the Herbal formulation and standardization.
6. Explain the Nutraceuticals.

Course Content:

UNIT I
WHO Guidelines for the assessment of Herbal Medicine and Cosmetics – introduction – standardization involving ash and extractives values – foreign matter – volatile matter – moisture content determination – evaluation – classification of evaluation methods of herbal medicine and cosmetics.

UNIT II

Basic principles involved in the alternative system of medicine viz – Ayurveda –Siddha – Unani and Homeopathy - Preparation and standardization of Ayurvedic formulations – Aristas –Asawas –Ghutika – Churna –Leha and Bhasma.

UNIT III

Plant Toxins and adverse drug reactions – Natural allergens –Hallucinogens- Teratogens - Industrial production and pharmaceutical application of phytoconstituents such as – Sennosides - Cardiac glycosides - Vinca alkaloids - Quinoline alkaloids – Menthol - Citric acid – Podophyllotoxin – Diosgenin - Solasodine, and Tropane alkaloids.

UNIT IV

Plant tissue culture - Historical development- nutritional requirements - growth and their maintenance –applications of plant tissue culture and types of cultures related to cell suspension culture –callus culture –hairy root culture and protoplast culture.

UNIT V

Enzyme Biotechnology - Introduction- general methods of isolation - purification and application of immobilized enzymes – Biological sources –methods of preparation –chemical nature and uses of - Papain-Pepsin-Trypsin-Pancreatin–Asparaginase -urokinase – Herbal-Drug interaction-Edible Vaccine.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kokate C.K- Purohit A.P- Gokhale S.B	Text book of Pharmacognosy	Nirali prakasan	2008

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Trease and Evans	Pharmacognosy	W.B Sauders	2002
2	James Robbers- Marilyn K. Speedice and Varro E.- Tyler	Pharmacognosy and Pharmacobiotechnology	Williams and Wilkins	1996

3	TE Wallis	Textbook of Pharmacognosy	CBS publishers and Distributors- New Delhi	2005
4	K.N.Kalia	Industrial Pharmacognosy	CBS publishers and Distributors- New Delhi	2005
5	The Indian Pharmacopoeia Commission		Press of IPC under Ministry of Health & Family Welfare, Govt. of India	2007

WEBSITES:

- **www.autorstream.com**
- **www.epharmacognosy.com**
- **www.science20.com**

16PYU812 **SEMESTER-VIII**

ADVANCED PHARMACOGNOSY LABORATORY – II 3H 2C

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The department is to acquaint the students with the basic knowledge of the natural products.
- Students engaged in pharmacy and in other health professionals should know the role of natural products in discovery of drugs.
- The students are given sufficient knowledge to be able to describe morphology and histology of different plant organs.
- To identify drugs in the whole state and in powdered condition with suitable examples of medicinal plants.
- To learn and understand the techniques involved in the herbal drug-cosmetic preparation and their Standardization.
- To learn their use and application in eradicating ailments.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Prepare and standardize the Herbal medicine.
2. Prepare and standardize the Herbal cosmetics.
3. Perform the Ayurvedic formulation leghya
4. Demonstrate the plant tissue culture
5. Extract the volatile oils from natural sources.
6. Isolate the plant enzymes.

Course Content:

1. Preparation and standardization of Herbal medicine
   - Turmeric
   - Garlic
2. Preparation and standardization of Herbal cosmetics
   - Shampoos
   - Creams
   - Lipsticks
3. Preparation and standardization of Ayurvedic formulation leghya
4. Demonstration experiment on plant tissue culture
5. Extraction of volatile oils

- Menthol oil
- Coriander oil
- Fennel oil

6. Isolation of a plant enzyme
    - Papain
    - Pepsin

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	C.K. Kokate.	Practical Pharmacognosy- III edition-	Nirali prakashan	2011

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vinod. D. Rangari	Pharmacognosy and Phytochemistry I edition- vol- l &II	Carrier publications	2009

WEBSITES:

- **www.autorstream.com**
- **www.epharmacognosy.com**
- **www.science20.com**

16PYU803 **SEMESTER-VIII**

MEDICINAL CHEMISTRY- IV **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Course Outcomes:

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Understand the importance of drug design and understand the different modern techniques of drug design.
6. Know the metabolism- adverse effect and therapeutic value of drugs.

Course Content:

UNIT I

Non Steroidal Anti-inflammatory Drugs & antigout - Anti-inflammatory agents: Sodium salicylate- Aspirin- Salsalate*- Mefenamic acid Meclofenamate sodium- Indomethacin*- Sulindac- Tolmetin sodium- Zomepriac sodium- Diclofenac sodium- Ketorolac- Ibuprofen*- Naproxen*- Piroxicam Phenacetin-Acetaminophen- Antipyrine- Aminopyrine- Phenylbutazone* and Oxyphenbutazone. **Antiviral agents-**Types of virus- stages of viral infection- targets for prevention of viral infections.Amantadine hydrochloride- Rimantadine hydrochloride- Idoxuridine trifluoride- Acyclovir*- Gancyclovir- Zidovudine- Didanosine- Zalcitabine- Lamivudine- Ribavirin- Saquinavir- Indinavir and Ritonavir.

UNIT II

Anti-neoplastic agents: - Alkylating agents- Meclorethamine*- Cyclophosphamide- Melphalan- Chlorambucil- Busulfan- Thiotepa-**Antimetabolites-** Mercaptopurine*- Thioguanine- Fluorouracil- Floxuridine- Cytarabine- Methotrexate*- Azathioprine-**Antibiotics-** Dactinomycin- Daunorubicin- hydrochloride- Doxorubicin hydrochloride- Bleomycin-**Plant products** Etoposide- Vinblastin sulphate- Vincristin sulphate-**Miscellaneous-** Cisplatin and Mitotane.

UNIT III

Sulphonamides and Sulphones - Historical development- chemistry- classification and SAR of Sulfonamides-Sulphamethizole- Sulfisoxazole- Sulphamethizine- Sulfacetamide Sodium*- Sulphapyridine-Sulfamethoxaole*- Sulphadiazine- Mixed Sulfonamides- Mefenide Acetate- Silver Sulfadiazine- Sulfasalazine-**Folate reductase inhibitors-**Trimethoprim*- Cotrimoxazole.- **Sulfones:** Dapsone*-**Sex hormones-Androgens- t**estosterone-**Estrogens-** Esterodiol- Estrone- Estriol- Diethyl Stilbestrol-**Progesterone and Oral contraceptives.**

UNIT IV

Antihistaminic agents - Histamine- receptors and their distribution in the human body-**H1 – antagonists-Amino alkyl ethers-**Diphenhydramine*- Dimenhydrinate- Doxylamine- **Ethylene diamines-**Tripelennamine- Thonzylamine-**Piperazine derivatives-**Meclizine- Buclizine- Chlorcyclizine- Cetirizine-**Propylamine derivatives:** Chlorpheniramine*- Pheniramine- **Tricyclic derivatives-** Promethazine*- Trimeprazine- Phenidamine- Cyproheptadine- Azatidine- **Second generation non sedating-** Astemizole- Loratadine- Cetirizine- Acrivastine-**H2- antagonists-** Development of selective H2 antagonists - Cimetidine*- Famotidine- Ranitidine- **Gastric Proton pump inhibitors-**Omeprazole and Lansoprazole**.**

UNIT V

Prostaglandins and other eicosanoids - History and discovery; eicosanoid biosynthesis; drug action mediated by eicosanoids; design of eicosanoid drugs; eicosanoids approved for human clinical use-**Narcotic analgesic- Morphine and related drugs-** SAR of Morphine analogues- Morphine sulphate- Codeine phosphate- Hydromorphone hydrochloride- Meperidine hydrochloride*- Alphaprodine-hydrochloride- Anilerdine hydrochloride- Diphenoxylate hydrochloride- Loperamide hydrochloride- Fentanyl citrate*- Methadone hydrochloride*- Propoxyphene hydrochloride- Pentazocine- Levorphanol tartarate- **Narcotic antagonists-** Nalorphine hydrochloride- Levallorphan tartarate and Naloxone hydrochloride-**Anti-tussives-** Noscapine- Dextromethorphan hydrobromide and Benzonatate- Carbetapentane.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William Foye	Foye's Principles of Medicinal Chemistry- 5th edition.	LWW	2002

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Wilson and Gisvold's	Wilson and Gisvold's Organic medicinal and Pharmaceutical Chemistry-	11th edition	2003
2	Burger	Burger's Medicinal Chemistry Vol I to IV	Wiley	2010
3	K.D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

WEBSITES

- **www.rsc.org**
- **www.acs.org**
- **www.medicinalchemistry.org**

16PYU813 **SEMESTER-VIII**

MEDICINAL CHEMISTRY LABORATORY– IV **3H 2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart fundamental knowledge on the structure- chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs
- To know the importance of physicochemical properties and metabolism of drugs.
- This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
- The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Course Outcomes:

On successful completion of the course the student will

1. Understand the chemistry of drugs with respect to their pharmacological activity.
2. Understand the drug metabolic pathways- adverse effect and therapeutic value of drugs.
3. Know the structural activity relationship of different class of drugs.
4. Write the chemical synthesis of some drug.
5. Know the Structural Activity Relationship (SAR) of different class of drugs.
6. Perform assay of medicinal compounds.

Course Content:

I. Assay of medicinal compounds (5 compounds).

II. Monograph analysis of selected drugs from course content. (2 compounds).

III. Preparation of medicinally important compounds or intermediates required for synthesis of drugs. (5 compounds).

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	A.I.Vogel	Text book of practical organic chemistry	Dorling Kindersely	2008

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ashutoshkar	Ashutoshkar's Medicinal Chemistry	New Age International	2007

WEBSITES:

- **www-rsc-org**
- **www-acs-org**
- **www-medicinalchemistry-org**

16PYU804 **SEMESTER-VIII**

PHARMACOLOGY - IV **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P:0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is intended to impart the fundamental knowledge on various aspects (classification- mechanism of action- therapeutic effects- clinical uses- side effects and contraindications) of drugs used in systemic diseases as well as infectious diseases.
- The subject covers the complete information about the drugs like sources-physicochemical properties- mechanism of action-physiological and biochemical effects (pharmacodynamics) as well as absorption-distribution-metabolism and excretion (pharmacokinetics) along with the adverse effects-clinical uses-interactions-doses-contraindications and routes of administration of different classes of drugs.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- In addition- emphasizes on the basic concepts of bioassays and principles of toxicology.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

Course Outcomes:

On successful completion of the course the student will

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases.
2. Comprehend the principles of toxicology and treatment of various poisonings.
3. Locate and isolate different organs/tissues from the laboratory animals used in pharmacological experiments.
4. Demonstrate the various receptor actions using isolated tissue preparation.
5. Appreciate correlation of pharmacology with related medical sciences.
6. Enlight the Pharmacology of Drugs acting on the Gastrointestinal Tract.

Course Content:

UNIT I

Chemotherapy - General Principles of Chemotherapy - Sulfonamides and co-trimoxazole – Antibiotics – Penicillins - Cephalosporins – Chloramphenicol – Erythromycin - Quinolones and Fluoroquinolins - tetracycline and aminoglycosides.

UNIT II

Chemotherapy of tuberculosis – leprosy - fungal diseases - viral diseases-antiprotozoal drugs – anthelminitics - urinary tract infections and sexuallytransmitted diseases.

UNIT III

Histamine - 5-HT and their antagonists – Prostaglandins - Thromboxanes and Leukotrienes – Pentagastrin – Cholecystokinin – Angiotensin - Bradykinin and Substance P-Analgesic - anti-pyretic - anti-inflammatory and anti-gout drugs.

UNIT IV

Definition of poison - general principles of treatment of poisoning - Heavy metals and heavy metal antagonists - Definition for acute - sub acute and chronic toxicity – genotoxicity – **Carcinogenicity** - teratogenicity and mutagenicity studies.

UNIT V

Chronopharmacology - Definition of rhythm and cycles - Biological clock andtheir significance leading to chronotherapy.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rang M.P- Dale M.M- Reter J.M	Rang M.P- Dale M.M- Reter J.M- Pharmacology	Elsevier	2012

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Craig C.R. and Stitzel R.R-	Craig C.R. and Stitzel R.R- Modern Pharmacology	LWW	2003
2	Lawrence L brunton	GoodmanandGilman's-ThePharmacologicalbasisoft herapeutics	CBS Publishers- Delhi.	2011
3	K.D Tripathi	Essentials of Medical Pharmacology by Tripathi	Jaypee	2014

WEBSITES

- **www.libguides.utep.edu**
- **www.pharmacology2000.com**
- **www.pharmacologycorner.com**

16PYU814 **SEMESTER-VIII**

PHARMACOLOGY –IV LABORATORY **3H** **2C**

Instruction hours/ week: L: 0 T: 0 P: 3 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics.
- The subject covers the complete information about the drugs like sources-physicochemical properties- mechanism of action-physiological and biochemical effects (pharmacodynamics) as well as absorption-distribution-metabolism and excretion (pharmacokinetics) along with the adverse effects-clinical uses-interactions-doses-contraindications and routes of administration of different classes of drugs.
- This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.
- To appreciate the applications of various commonly used laboratory animals.
- To appreciate and demonstrate the various screening methods used in preclinical research.
- To appreciate and demonstrate the importance of biostatistics and research methodology.

Course Outcomes:

On successful completion of the course the student will

1. Explain about in-vitro pharmacology and prepare the Physiological salt solutions.
2. Estimate the bioavailabilityparameters viz AUC,Tmax ,Kelfrom blood sample.
3. Demonstratethe CRC of acetylcholineby using suitable muscle preparations.
4. Estimate the bioavailabilityparameters viz AUC,Tmax ,Kelfrom urine sample.
5. Record the CRC of Nor adrenalineon rat anococcygeus muscle.
6. Record the CRC of 5HT on rat fundus preparation.

Course Content:

1. Record the agonistic and antagonistic response by using suitable muscle preparation (2 experiments).

2. Estimate the strength of the test sample of agonist/ drug (e.g. Acetylcholine- Histamine- 5HT- Oxytocin etc) using a suitable isolated muscle preparation employing matching bioassay- interpolation (2 experiments).
3. Bioassay- three point bioassay and four point bioassay (2 experiments).
4. Alternate methods for animal experimentation for both efficacy and toxicity studies (2 experiments).
5. Estimation of serum biochemical parameters by using semi- auto analyzer (2 experiments).

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	M.N.Ghosh. .	Fundamentals of Experimental Pharmacology	Hilton and company	2015

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kulkarni.S.K. Easton	Handbook of Experimental Pharmacology	Elsevier	2006

WEBSITES:

- **www-libguides-utep-edu**
- **www-pharmacology2000-com**
- **www-pharmacologycorner-com**

16PYU805 **SEMESTER-VIII**

MODERN METHODS OF PHARMACEUTICAL ANALYSIS – II 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart a fundamental knowledge on the testing of drugs by various instrumental methods of analysis.
- This focuses on various modern instruments that are used for testing the purity of drugs in various dosage forms.
- course also gives knowledge about modern instruments that are used for drug testing like NMR- IR- Mass- HPLC- HPTLC etc.
- This course deals with the fundamentals of analytical chemistry and principles of electro chemical analysis of drugs.
- To know the principle and applications of instrumentation
- To understand the components and working of various analytical instruments.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Know the principle and applications of instrumentation.
2. Understand the components and working of various analytical instruments.
3. Understand the different modern techniques of drug analysis.
4. Appreciate the advantages of instrumental methods of drug analysis.
5. Understand the principles of volumetric and electro chemical analysis.
6. Carry out various volumetric and electro chemical titrations.
7. Develop analytical skills.

Course Content:

UNIT I

X- Ray diffraction studies – Introduction - diffraction methods and applications - **Electro chemical methods of analysis - Condutometry** – Introduction - Conductivity cell - Conductometric titrations –applications **-Potentiometry** – Electrochemical cell - construction and working of referenceand indicator electrodes - methods to determine end point of titration.

UNIT II

Thermal Methods of Analysis – Theory - Instrumentation and applications of Differential Scanning Calorimetry (DSC).

UNIT III

Chromatography-Adsorption and partition column chromatography – Methodology – advantages - disadvantages and applications **- Thin layer chromatography -** Introduction – Principle – Methodology - Stahl's triangle - Rf values – advantages - disadvantages and applications - **High Performance Thin Layer Chromatography (HPTLC) –** Introduction – instrumentation – advantages – application - **Paper chromatography** – Introduction – Principle – Methodology - developmentaltechniques – advantages – disadvantages – applications - **Ion exchange chromatography** – Introduction – Definition – classification - ion exchange resins – properties - mechanism of ion exchange process - Factors affecting ion exchange – methodology - applications.

UNIT IV

High Performance Liquid Chromatography (HPLC) – Introduction – theory – instrumentation - advantages and applications - Introduction to UPLC and supercritical fluid chromatography **- Gas Chromatography –** Introduction – theory – instrumentation – derivatization - temperature programming – advantages - disadvantages and applications - **Electrophoresis -** Principle of separation – classification - equipment for movingboundary electrophoresis – gel - paper electrophoresis and applications - **Gel Filtration Chromatography** – Introduction – technique - factors affecting - Applications.

UNIT V

Quality assurance- Calibration and validation of following Instruments - UV-Visible spectrophotometer - pH meter - HPLC- Electronic balance - Conductivity meter - IR spectrophotometer – Fluorimeter - Flame Photometer **- Introduction to analytical method development.**

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Y.R. Sharma.	Organic Spectroscopy	S.Chand	2010

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	K.A. Connors	Textbook of Pharmaceutical Analysis	Wiley-Interscience	1982

2	Gurdeep Chatwal	Instrumental methods of analysis	Mrs. Meena Pandey Himlaya Publishing house	1979
3	William Kemp	Spectroscopy	Palgrave Mc million	2008

WEBSITES

- **www.jpr.info.com**
- **www.sciencedomain.org**
- **www.pharmaresearchlibrary.com**

16PYU815 **SEMESTER-VIII**

MODERN METHODS OF PHARMACEUTICAL ANALYSIS LABORATORY – II **3H 3C**

Instruction hours/ week: L: 0 T: 3 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- This subject is designed to impart a fundamental knowledge on the testing of drugs by various instrumental methods of analysis.
- This focuses on various modern instruments that are used for testing the purity of drugs in various dosage forms.
- course also gives knowledge about modern instruments that are used for drug testing like NMR- IR- Mass- HPLC- HPTLC etc.
- This course deals with the fundamentals of analytical chemistry and principles of electro chemical analysis of drugs.
- To know the principle and applications of instrumentation
- To understand the components and working of various analytical instruments.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Know the principle and applications of instrumentation
2. Understand the components and working of various analytical instruments.
3. Understand the different modern techniques of drug analysis.
4. Appreciate the advantages of instrumental methods of drug analysis.
5. Understand the principles of volumetric and electro chemical analysis.
6. Carry out various volumetric and electro chemical titrations.
7. Develop analytical skills.

Course Content:

1 Chromatographic analysis of some pharmaceutical products (2 experiments).
2 Exercises involving
   - fluorimetry(2 experiments)

- conductometry(2 experiments)
- potentiometry(2 experiments)
- polarography
- amperometric titrations

3 Infra Red spectra peak identification for different functional groups.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Beckett and Stenlake	Practical Pharmaceutical Analysis	A & C Black	1988

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	R.M. Silverstein- John Wiley and Sons Inc.	Spectrometric identification of organic compounds	Heyden & sons Ltd	1969

WEBSITES

- **www.jpr.info.com**
- **www.sciencedomain.org**
- **www.pharmaresearchlibrary.com**

16PYU891 **SEMESTER-VIII**

PROJECT WORK & VIVA VOICE **5H** **3C**

Instruction hours/ week : L: 0 T:0 P: 5 Marks: Internal: 120 External: 180 Total : 300

Course Objectives:

- To work in team and undertake a project in the area of Pharmacy.
- To apply concepts of pharmaceutical sciences for executing the project.
- To apply appropriate research methodology while formulating a project.
- To define specifications, synthesize, analyse, develop and evaluate a project.
- To present, exhibit and document the project work.
- To develop a project report.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Work in team and undertake a project in the area of Pharmacy.
2. Apply concepts of pharmaceutical sciences for executing the project.
3. Apply appropriate research methodology while formulating a project.
4. Define specifications, synthesize, analyse, develop and evaluate a project.
5. Present, exhibit and document the project work .
6. Develop a project report.

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages). The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students).

16PYU8OE01 **SEMESTER-VIII**

MOLECULAR MODELLING **3H** **3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- To learn various force fields, simulation methods in molecular modeling.
- To have better understanding on molecular docking and ligand based drug design methods.
- To recognize the benefits of simulation model studies.
- To have knowledge of quantum mechanics and molecular mechanics & dynamics.
- To understand the docking and ligand based drug design methods.
- To understand and be conversant with the basic principles of molecular modeling.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Learn various force fields, simulation methods in molecular modeling.
2. Have better understanding on molecular docking and ligand based drug design methods.
3. Recognize the benefits of simulation model studies.
4. Have knowledge of quantum mechanics and molecular mechanics & dynamics.
5. Understand the docking and ligand based drug design methods.
6. Understand and be conversant with the basic principles of molecular modeling.

Course Content:

UNIT-I
MOLECULAR MODELLING - Introduction to concept of molecular modeling - molecular structure and internal energy - applications of molecular graphics - coordinate system - potential energy surfaces - discussion of local and global energy minima.

UNIT-II
QUANTUM MECHANICS - Introduction to the computational quantum mechanics - one electron atom -ply electronic atoms and molecules - Hartree Fock equations - calculating molecular properties using abs initio and semi empirical methods.

UNIT-III

MOLECULAR MECHANICS - Molecular mechanics - general features of molecular mechanics force field, bond stretching - angle bending - torsional terms - non – bonded interactions - force field parameterization and transferability - energy minimization - derivative and non – derivative methods - applications of energy minimization.

UNIT-IV

MOLECULAR DYNAMCS - Molecular dynamics simulation methods - molecular dynamics using simple models - molecular dynamics with continuous potential - setting up and running a molecular dynamic simulation - constraint dynamics - Monte Carlo simulation - Monte Carlo simulation of molecules.

UNIT-V

MODELLING AND DRUG DESIGN - Macromolecular modeling, design of ligands for known macro molecular target sites - Drug- receptor interaction - classical SAR /QSAR studies and their implications to the 3 D modeler - 2-D and 3-D database searching - pharmacophore identification and novel drug design - molecular docking - Structure-based drug design for all classes of targets.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Andrew Leach	Molecular Modeling: Principles and Applications	Prentice Hall	2001

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Yvonne C.Martin, editor, Peter Willett	Designing bioactive molecules : three-dimensional techniques and applications	Washington, DC : American Chemical Society	1998
2	Matthew F. Schlecht	Molecular Modeling on the PC	Wiley-Blackwell; Har	1998
3	N. Claude Cohen	Guidebook on Molecular Modeling in Drug Design	Academic Press	1996

WEBSITES

- **www.3dmoleculardesigns.com**
- **www.darlingmodels.com**
- **www.ncbi.nlm.nih.gov.**

16PYU8OE02 **SEMESTER-VIII**

MOLECULAR BIOLOGY **3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- To have strong understanding of classical genetics,
- To understand the structure of nucleic acids, transcription, translation and gene regulation.
- To understand the types of RNA, gene coding, mutation and repair of DNA.
- To understand the structure of DNA and differentiate the process of replication in prokaryotes and eukaryotes.
- To understand the structure of nucleic acids and DNA replication.
- To understand about transcription in prokaryotes and eukaryotes.

Course Outcomes (CO's):

On successful completion of the course the student will

1. Have strong understanding of classical genetics,
2. Understand the structure of nucleic acids, transcription, translation and gene regulation.
3. Understand the types of RNA, gene coding, mutation and repair of DNA.
4. Understand the structure of DNA and differentiate the process of replication in prokaryotes and eukaryotes.
5. Understand the structure of nucleic acids and DNA replication.
6. Understand about transcription in prokaryotes and eukaryotes.

Course Content:

UNIT-I

CLASSICAL GENETICS - Mendelian genetics - linkage - crossing over - classical experiments – Hershey and Chase - Avery McLeod& McCart - Bacterial conjugation - transduction and transformation - Conformation of DNA and RNA.

UNIT- II

STRUCTURE OF NUCLEIC ACIDS AND DNA REPLICATION - Types of RNA - Replication in prokaryotes - D-loop and rolling circle mode of replication - replication of linear viral DNA. Organization of eukaryotic chromosome – cot value, replication of telomeres in eukaryotes.

UNIT-III

TRANSCRIPTION - In prokaryotes and eukaryotes - features of promoters and enhancers - transcription factors - nuclear RNA splicing - regulation of transcription - prokaryote and eukaryote

UNIT-IV

TRANSLATION - Elucidation of genetic code - basic machinery of translation and its mechanism- Post translational modifications - codon usage - suppressor mutation - regulation of translation - prokaryote and eukaryote.

UNIT-V

REGULATION OF GENE EXPRESSION - Lac and trp operon - phage life cycle - mutation and repair of DNA - regulation of gene expression in eukaryotes .

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	David, F	Molecular biology	Narosa Publ	2001

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Weaver, R. F	Molecular biology	Mc Grraw Hill	2005
2	Benjamin, L	Gene VIII	Pearson Education	2004
3	Watson, J. D	Molecular Biology of the Gene	Pearson Education	2004

WEBSITES

- **www.microbiology.org**
- **www.microworld.org**
- **www.neomed.edu**

16PYU8OE03 **SEMESTER-VIII**

BIOINFORMATICS 3H 3C

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- To get introduced to the basic concepts of Bioinformatics and its significance in Biological data analysis.
- To describe the history, scope and importance of Bioinformatics and role of internet in Bioinformatics.
- To gain knowledge about various Biological databases that provide information about nucleic acids and protein.
- To understand the structural organisation, structural properties and various techniques employed in the structure determination of Biological macromolecules – DNA, Protein and Carbohydrates
- To get exposed to computational methods, tools and algorithms employed for Biological Data Interpretation
- To gain knowledge on various techniques, algorithms and tools employed in DNA sequencing, assembly and its applications in Next Generation Sequencing.

Course Outcomes (CO's):

On successful completion of the course the student will.

1. Introduction to the basics of sequence alignment and analysis.
2. Overview about biological macromolecular structures and structure prediction methods.
3. To get exposure with the use of database tools.
4. To understand in depth about protein structure prediction.
5. To understand the alignment types like local alignment global alignment.
6. Explain about different types of protein and other organism specific databases.

Course Content:

UNIT-I

INTRODUCTION TO BIOLOGICAL DATABASES – Introduction - types - Biological databases - Information Retrieval from Biological Databases - for example Nucleic acid databases – Genbank - Protein Databases – Swissprot - Sequence Formats - Sequence storage - Sequence submission to sequence Database.

UNIT-II

ANALYZING DNA, RNA AND PROTEIN SEQUENCES IN DATABASES - Database technology – Genbank - organisms in Genbank - genomic DNA databases - cDNA databases corresponding to expressed genes - Introduction to phylogenetics- distance based trees – UPGMA - neighbour joining trees - Expressed sequence tags - Sequence tagged sites - Genome survey sequences - High throughput genomic sequence.

UNIT-III

PAIRWISE SEQUENCE ALIGNMENT -Alignment Types - Local alignment - Global alignment - scoring matrices- PAM – BLOSUM – Gaps -Dot Plots - Dynamic programming Approach - Needleman and Wunsch Algorithm - Smith andwaterman Algorithm - Heuristic Approach – BLAST – FASTA.

UNIT-IV

MULTIPLE SEQUENCE ALIGNMENT - Exhaustive Algorithm**-** Divide and Conquer alignment **-** Heuristic Algorithm - Progressive Alignment- ClustalW – Tcoffee - Iterative Alignment – PRRN - Block based method- Match-Box - DIALIGN2.

UNIT-V

INTRODUCTION TO PROTEIN STRUCTURE PREDICTION - Secondary structure prediction for Globular and Trans-membrane proteins - 3D Protein structure file **-** format – PDB – mmCIF – MMDB - Methods of Tertiary structure prediction - Threading and fold **-** recognition methods - Homology modeling - Fold recognition databases.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Dan E. Krane, Michael L. Rayme	Fundamental Concepts of Bioinformatics	Pearson education	2004

REFERENCES

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Andreas D. Baxevanis, B. F. Francis Ouellette	Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins	Wiley-Interscience	2004

2	David W. Mount	Sequence and Genome Analysis	Cold Spring Harbor Laboratory	2004
3	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

WEBSITES

- **www.lehigh.edu**
- **www.bioinformatics.org**
- **www.bits.vib.be**

16PYU8OE04 **SEMESTER-VIII**

BIOPROCESS ENGINEERING **3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100
External Semester Exam: 3 Hours

Course Objectives:

- To help the students to familiarize with various reactors used in bioprocess engineering
- To learn analysis of STR and other configurations.
- To understand WHO Guidelines on good manufacturing Practices.
- To learn about the scale up of bioreactors.
- To get clear understanding of the fermentation processes.
- To get exposure for the commercial production of bioproducts.

Course Outcomes (CO's):
On successful completion of the course the student will

1. Help the students to familiarize with various reactors used in bioprocess engineering
2. Learn analysis of STR and other configurations.
3. Understand WHO Guidelines on good manufacturing Practices.
4. Learn about the scale up of bioreactors.
5. Get clear understanding of the fermentation processes.
6. Get exposure for the commercial production of bioproducts.

Course Content:

UNIT-I
ANALYSIS OF STR - Stirred tank reactor - non-ideality - RTD and stability analysis - tanks inseries and dispersion models – application to design of continuous sterilizer.

UNIT-II
ANALYSIS OF OTHER CONFIGURATIONS - Analysis of other configurations - Packed bed reactor -airlift reactor - fluidized bed reactor bubble column reactors – non- ideality - RTD and stability analysis.

UNIT-III

BIOREACTOR SCALE – UP - Regime analysis of bioreactor processes, oxygen mass transfer in bioreactors - microbial oxygen demands - methods for the determination of mass transfer coefficients - mass transfer correlations - Scale up criteria for bioreactors based on oxygen transfer - power consumption and impeller tip speed.

UNIT-IV

MODELLING AND SIMULATION OF BIOPROCESSES - Study of structured models for analysis of various - bioprocess – compartmental models - models of cellular energetic and metabolism - single cell models - plasmid replication and plasmid stability model - Dynamic simulation of batch - fed batch - steady and transient culture metabolism.

UNIT-V

BIOREACTOR CONSIDERATION IN ENZYME SYSTEMS - Analysis of film and pore diffusion effects on kinetics of immobilized enzyme reactions - formulation of dimensionless groups and calculation of effectiveness factors - Design of immobilized enzyme reactors – packed bed - fluidized bed and membrane reactors.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Anton Moser	Bioprocess Technology, Kinetics and Reactors	SpringerVerlag	1988
2	James E. Bailey & David F. Ollis	Biochemical Engineering Fundamentals	McGrawHill	1986
3	Shuler and Kargl	Bioprocess Engineering	PrenticeHall	1992

REFERENCES

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1	James E. Bailey & David F. Ollis	Biochemical Engineering Fundamentals	McGrawHill	1986
2	Shuler and Kargl	Bioprocess Engineering	PrenticeHall	1992
3	James E. Bailey & David F. Ollis	Biochemical Engineering Fundamentals	McGrawHill	1986

WEBSITES

- **www.bse.vt.edu**
- **www.gch.ulaval.ca**
- **www.slideshare.net**

16PYU8OE05 **SEMESTER-VIII**

COMPUTER AIDED DESIGN **3H 3C**

Instruction hours/ week: L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total: 100

External Semester Exam: 3 Hours

Course Objectives:

- To learn and understand the computer basics
- To provide an overview of how computers are being used in mechanical component design
- To learn the statistical method of analysis that can apply in the development and use of therapeutic drug.
- Explain the methodology involved in Design and discovery of lead molecules
- Identify the Objectives: of QSAR , molecular modeling and virtual screening methods
- Discuss the concepts of QSAR and docking

Course Outcomes (CO's):

On successful completion of the course the student will

1. Able to organize, summarize, and display quantitative data.
2. Comfortable with statistical methods for calculating summary estimates, measures of variability, and confidence intervals.
3. Know about parametric design and object representation and geometric modeling.
4. Apply the strategies of drug design to develop new molecules with therapeutic activity
5. Design new drugs using informatics and databases
6. Understand significance and concept of advanced instrumentation

Course Content:

UNIT I

OVERVIEW OF CAD SYSTEMS

Conventional and computer aided design processes-advantages and disadvantages - Subsystems of CAD-CAD hardware and software - analytical and graphics packages - CAD workstations - Networking of CAD systems.

UNIT II

INTERACTIVE COMPUTER GRAPHICS AND GRAPHICS TRANSFORMATIONS

Generative - cognitive and image processing graphics - Static and dynamic data graphics - Transport of graphics data - Graphic standards - Generation of graphic primitives - display transformation in Two- and Three – Dimensional graphics concepts - Graphical input technique - Geometric transpformations -Visual Realism - Computer animation - customizing graphics software.

UNIT III

Geometric Modeling

Wireframe – surface - NURBS and solid modeling- applications and advantages - Creating primitive solids - sweeping solids - boolean operations - Extracting entities from a solid - Filleting of edges of solids - Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

UNIT IV

PARAMETRIC DESIGN AND OBJECT REPRESENTATION

Types of co-ordinate systems - Parametric design - definition and advantages - Parametric representation of analytic and synthetic curves - Parametric representation of surfaces and solids - manipulations.

UNIT V

PRODUCT DESIGN AND DEVELOPMENT

Automated 2D drafting - basics, mechanical assembly - bill of materials generation - Mass property calculations.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vera B Anand	Computer Graphics and Geometric Modeling for Engineers	John Wiley & Sons, New York	2000
2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

REFERENCES

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	Dhanpat Rai & Sons, New Delhi	2002
2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	William M Newman and Robert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994
5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998

WEBSITES

- **www.en.wikipedia.org**
- **www.cs.wellesley.edu**
- **www.lazarus.elte.hu**