# **BE-ELECTRONICS AND COMMUNICATION ENGINEERING**

# CURRICULUM AND SYLLABI 2023 (Choice Based Credit System)

# FACULTY OF ENGINEERING



(Established Under Section 3 of UGC Act, 1956 )

# **KARPAGAM ACADEMY OF HIGHER EDUCATION**

(Deemed to be University, Established Under Section3 of UGC Act 1956)

Eachanari post, COIMBATORE 641021, INDIA



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#### Eachanari, Coimbatore-641 021. INDIA

# FACULTY OF ENGINEERING DEGREE OF BACHELOR OF ENGINEERING / TECHNOLOGY REGULAR PROGRAMME REGULATIONS 2023 CHOICE BASED CREDIT SYSTEM

These regulations are effective from the academic year 2023 – 2024 and applicable to the candidates admitted to B. E. / B. Tech. during 2023 - 2024 and onwards.

#### 1. ADMISSION

**1.1** Candidates seeking admission to the first semester of the eight semesters B. E./B.Tech Degree Programme:

Should have passed the Higher Secondary Examination (10+2) prescribed by the State Government / Central Government with Mathematics/ Physics/ Chemistry/ Computer Science/ Electronics/ Information Technology/ Biology/ Informatics Practices/ Biotechnology/ Technical Vocational subject/ Agriculture/ Engineering Graphics/ Business Studies/ Entrepreneurship. (Any of the above three subjects) or any similar Examination of any other institution/ University or authority accepted by the Karpagam Academy of Higher Education as equivalent thereto).

Should obtained at least 45% marks (40% marks in case of candidates belonging to reserved category) in the above subjects taken together.

#### (**OR**)

Passed min. 3 years Diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category) subject to vacancies in the First Year, in case the vacancies at lateral entry are exhausted. (The Universities will offer suitable bridge courses such as Mathematics, Physics, Engineering drawing, etc., for the students coming from diverse backgrounds to achieve desired learning outcomes of the programme)

#### **1.2 Lateral Entry Admission**

Candidates who possess Diploma in Engineering / Technology (10+3 or 10+2+2) awarded by the Directorate of Technical Education with passed minimum THREE years / TWO years (Lateral Entry) Diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category) in ANY branch of Engineering and Technology are eligible to apply for admission to the third semester of B. E./B. Tech.. Such candidates shall undergo two additional engineering subjects in the 3<sup>rd</sup> and 4<sup>th</sup> semester as prescribed by the University.

#### OR

Passed B.Sc. Degree from a recognized University as defined by UGC, with at least 45% marks (40% marks in case of candidates belonging to reserved category) and passed 10+2 examination with Mathematics as a subject.

#### OR

Passed D.Voc. Stream in the same or allied sector. (The Universities will offer suitable bridge courses such as Mathematics, Physics, Engineering drawing, etc., for the students coming from diverse backgrounds to achieve desired learning outcomes of the programme)

S. No.	Programme	Eligibility criteria
1.	B.E Bio Medical Engineering	Passed Minimum THREE years / TWO years
		(Lateral Entry) Diploma examination with at
2	B. E. Civil Engineering	candidates belonging to reserved category) in ANY branch of Engineering and Technology.
3.	B. E. Computer Science and Engineering	OR Decend D.So. Decrea from a recognized
4.	B. E. Computer Science and Engineering (Cyber security)	University as defined by UGC, with at least 45% marks (40% marks in case of candidates
5.	B. E. Electrical and Electronics	belonging to reserved category) and passed 10+2 examination with Mathematics as a subject.
	Engineering	OR
6.	B. E. Electronics and Communications Engineering	Passed D.Voc. Stream in the same or allied sector. (The Universities will offer suitable bridge courses such as Mathematics Physics
7.	B. E. Mechanical Engineering	Engineering drawing, etc., for the students coming from diverse backgrounds to achieve
8.	B. Tech. Artificial Intelligence and Data Science	desired learning outcomes of the programme)
9.	B. Tech Bio - Technology	
10.	B. Tech Food Technology	

Eligibility criteria for admission in the third semester is given in the table below.

# **1.3 Migration from other University**

Candidates who have completed their first to sixth semesters of B. E./B. Tech. study in any University are eligible to apply for admission to their next semester of B. E./B. Tech. in the branch corresponding to their branch of study. The student will be exempted from appearing for Examination of the equivalent courses passed in the earlier programme and will have to appear for courses which he/she has not done during the period of his/her earlier programme. Along with the request letter and mark sheets, he/she has to submit a copy of syllabus of the programme duly attested by the Registrar, Competent authority, he/she has undergone. Equivalence Certificate shall be provided by the "Students' Affairs Committee" of Karpagam Academy of Higher Education. Students' Affairs Committee comprises all the Heads of the Departments and Dean of the Faculty of Engineering and a nominee of the Registrar.

#### 2. PROGRAMMES OFFERED

A candidate may undergo a programme in any one of the branches of study approved by the University as given below.

#### List of B. E. and B. Tech. Degree Programmes

- 1. B.E Bio Medical Engineering
- 2. B. E. Civil Engineering
- 3. B. E. Computer Science and Engineering
- 4. B. E. Computer Science and Engineering (Cyber Security)
- 5. B. E. Electrical and Electronics Engineering
- 6. B. E. Electronics and Communications Engineering
- 7. B. E. Mechanical Engineering
- 8. B.Tech. Artificial Intelligence and Data Science
- 9. B. Tech. Bio-Technology
- 10. B. Tech Food Technology

# **3. MODE OF STUDY**

# 3.1 Full-Time:

In this mode of study, the candidates are required to attend classes regularly on the specified working days of the University.

- **3.2** Conversion from full time mode of study to part time is not permitted.
- **3.3** Change from one programme to another is not permitted.

# 4. STRUCTURE OF PROGRAMMES

- **4.1** Every programme will have a curriculum with syllabus consisting of theory and practical courses such as:
- (i) General core courses comprising Mathematics, Basic Sciences, Engineering Sciences and Humanities.
- (ii) Core courses of Engineering/Technology.
- (iii) Elective courses for specialization in related fields.
- (iv) Workshop practice, computer practice, engineering graphics, laboratory work, in-plant training, seminar presentation, project work, industrial visits, camps, etc.

Every student is encouraged to participate in at least any one of the following programmes

- NSS / Sports/Physical exercise/NCC/YRC/Red Ribbon club/Environment club and Energy club
- Other Co-Curricular and Extra Curricular activities

#### (V) Choice Based Credit System

CBCS is introduced for students admitted in the academic year 2017-18. As per AICTE guidelines, CBCS is an approach in which students opt for courses of their choice. CBCS provides greater flexibility with multiple courses and enable students to undergo additional courses. CBCS is applicable to Full Time Undergraduate & Post Graduate Programmes of study. It provides a choice for students to select from the prescribed courses (Professional soft core, Professional Hard core, Professional Electives, Open Electives, Value added courses, Humanity Sciences, Basic sciences & Engineering sciences). A course designated as hard core for a particular programme of study must invariably be completed by the student to receive the degree in the programme. The Hardcore courses cannot be substituted by another courses. Students can exercise their choice among a set of Soft core courses from the list of Soft core courses specified for each Programme of study. The student should meet the criteria for prerequisites to become eligible to register for that course. The student should request for the course for every semester within the first week of semester. Maximum no of students to be registered in each course shall depend on availability of physical facilities, classroom availability and lab capacity. Registration of already requested courses by students in previous semester is not allowed.

4.2 Each course is normally assigned certain number of credits.

No. of credits per lecture period per week	1
No. of credits per tutorial period per week	1
No. of credits for 3 periods of laboratory course per week	2
No. of credits for 3 periods of project work per week	2
No. of credits for 2 weeks of field project/internship training during	
semester vacations	1

**4.3** In every semester, the curriculum shall normally have a blend of theory courses not exceeding 6 and practical courses not exceeding 4. However, the total number of coursesper semester shall not exceed 9.

**4.4** The prescribed credits required for the award of the degree shall be within the limits specified below.

PROGRAMME	PRESCRIBED CREDIT RANGE	
B. E./B. Tech.	160–165	

**4.5** The medium of instruction for all Courses, Examinations, Seminar presentations and Project/Thesis reports is English.

#### 4.6 Value Added Course

Besides core courses and elective courses, value added course is introduced. The blend of different courses is so designed that the student would be trained not only in his / her relevant professional field but also as a socially conscious human being.

**4.7** Evaluation in the courses comprises two parts, one is the Continuous Internal Assessment (CIA) and the other one is the End Semester Examination (ESE). Evaluation in few courses may be by Internal Assessment only.

# **5. DURATION OF THE PROGRAMME**

**5.1**The prescribed duration of the programme shall be

Programme	Min. No. of semesters	Max. No. of semesters
B. E./B. Tech. (HSC Candidates)	8	14
B. E./B. Tech. (Lateral Entry Candidates)	6	12

5.2 Each semester shall normally consist of 90 working days or 540 hours.

**5.3** Additional classes for improvement, conduct of model test, etc., over and above the specified periods shall be arranged, if required. But for the purpose of calculation of attendance requirement for eligibility to appear for the end semester Examinations (as per Clause 11) by the students, 540 hours conducted within the specified academic schedule alone shall be taken into account and the overall percentage of attendance shall be calculated accordingly.

# 6. REQUIREMENTS FOR COMPLETION OF THE SEMESTER

**6.1** Ideally every student is expected to attend all classes and secure 100% attendance. However, in order to allow for certain unavoidable circumstances, the student is expected to attend at least 75% of the classes and the conduct of the candidate has been satisfactory during the course.

**6.2** A candidate who has secured attendance between 65% and 74% (both included), due to medical reasons (Hospitalization / Accident / Specific Illness) or due to participation in University / District / State / National / International level sports or due to participation in Seminar / Conference / Workshop / Training Programme / Voluntary Service / Extension activities or similar programmes with prior permission from the Registrar shall be given exemption from prescribed attendance requirements and shall be permitted to appear for the Examination on the recommendation of the Head of the Department concerned and Dean to condone the lack of attendance. The Head of the Department has to verify and certify the genuineness of the case before recommending to the Dean. However, the candidate has to pay prescribed condonation fees.

**6.3** Candidates who are not recommended for condonation and those who have less than 65% attendance will not be permitted to proceed to the next semester and have to redo the course. However, they are permitted to write the arrear Examinations, if any.

#### 7. CLASS ADVISOR

To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a teacher of the Department who shall function as Class Advisor for those students throughout their period of study. Such Class Advisors shall advise the students and monitor the courses undergone by the students, check the attendance and progress of the students and counsel them periodically. If necessary, the Class Advisor may display the cumulative attendance particulars in the Department notice board and also discuss with or inform the Parents/Guardian about the progress of the students. Each student shall be provided with course plan for each course at the beginning of each semester.

# 8. CLASS COMMITTEE

**8.1.** Every class shall have a class committee consisting of teachers of the class concerned, Maximum of six student representatives [boys and girls] and the concerned Head of the Department. It is like the 'Quality Circle' with the overall goal of improving the teaching-learning process. The functions of the class committee include

- Clarifying the regulations of the degree programme and the details of rules therein particularly Clause 4 and 5 which should be displayed on Department Notice-Board.
- Informing the student representatives, the details of Regulations regarding weight age used for each assessment. In the case of practical courses (laboratory / drawing / project work / seminar, etc.) the breakup of marks for each experiment / exercise /module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Solving problems experienced by students in the class room and in the laboratories.
- Informing the student representatives, the academic schedule, including the dates of assessments and the syllabus coverage for each assessment.
- Analyzing the performance of the students of the class after each test and finding the ways and means of solving problems, if any.
- Identifying the weak students, if any and requesting the teachers concerned to provide some additional academic support.

**8.2** The class committee for a class under a particular branch is normally constituted by the Head of the Department. However, if the students of different branches are mixed in a class (like the first semester which is generally common to all branches), the class committee is to be constituted by the Dean.

**8.3** The class committee shall be constituted within the first week of each semester.

**8.4** The Chairperson of the Class Committee may convene the meeting of the class committee.

- **8.5** The Dean may participate in any Class Committee of the Faculty.
- **8.6** The Chairperson is required to prepare the minutes of every meeting, submit the same to Dean through the HOD within two days of the meeting and arrange to circulate it among the students and teachers concerned. If there are some points in the minutes requiring action by the

Management, the same shall be brought to the notice of the Registrar by the HOD through Dean.

**8.7** The first meeting of the Class Committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weightage of assessments within the framework of the regulations. Two subsequent meetings may be held in a semester at suitable intervals. During these meetings the student members representing the entire class, shall meaningfully interact and express their opinions and suggestions of the other students of the class in order to improve the effectiveness of the teaching-learning process.

# 9. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or group, shall have a "Course Committee" comprising all the teachers handling the common course with one of the nominated as Course Coordinator. The nomination of the Course Coordinator shall be made by the Dean depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The 'Course Committee' shall meet to arrive at a common scheme of evaluation for the test and shall ensure a uniform evaluation of the tests. Where ever feasible, the Course Committee may also prepare a common question paper for the Internal Assessment test(s).

# 10. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

**10.1** Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD'(Log book) which consists of attendance marked in each theory or practical or project work class, the test marks and the record of class work (topic covered), separately for each course.

**10.2** Continuous Internal Assessment (CIA): The performance of students in each subject will be continuously assessed by the respective teachers as per the guidelines given below:

S. No.	CATEGORY	MAXIMUM MARKS
1.	Assignment	5
2.	Seminar *	5
3.	Attendance	5
4.	Test – I	8
5.	Test – II	8
6.	Test – III	9
Continuous Internal Assessment: TOTAL		40

# THEORY COURSES:

\*Evaluation shall be made by a committee.

INSTRUCTION REMARKS			
Maximum Marks	60		
Duration	2 Hours		
Port_ A	1 to 9 Two Mark Questions, uniformly covering the two		
	units of the syllabus. All the 9 Questions are to be		
	answered.		
	(9 x 2 =18Marks).		
	Question 10 to 12 will be of either or type, covering two		
Part- B	units of the syllabus. Each Question may have		
	subdivision.		
	(3 x 14 =42 Marks).		

# PATTERN OF TEST QUESTION PAPER (Test I & II)

# PATTERN OF TEST QUESTION PAPER (Test III)

INSTRUCTION	REMARKS		
Maximum Marks	Marks 100		
Duration	3 Hours		
Port _ A	Part A will be online Examination. 20 Objective type		
I alt - A	Questions, Covering all the 5 units. (20 x 1= 20 Marks)		
	(Online Examination).		
Dort R	21 to 25 Two Mark Questions, uniformly covering the		
I al t- D	Five units of the syllabus. All the 5 Questions are to be		
	answered.		
	(5 x 2= 10Marks).		
	Question 26 to 30 will be of either or type, covering Five		
Part- C	units of the syllabus. Each Question may have		
	subdivision.		
	(5 x 14=70 Marks).		

#### PRACTICAL COURSES:

S. No	CATEGORY	MAXIMUM MARKS
1.	Attendance	5
2.	Observation work	5
3.	Record work	5
4.	Model Examination	15
5.	Viva – Voce [Comprehensive]	10
Continuous	s Internal Assessment: TOTAL	40

Every practical exercise / experiment shall be evaluated based on the conduct of exercise/ experiment and records maintained.

# INTEGRATED THEORY AND PRACTICAL COURSES:

The Continuous Internal Assessment for Integrated Theory and Practical Course is awarded for 40 Marks with mark split up similar to regular theory course. But Assignment and Seminar components are replaced by Observation and Record marks.

S.No.	CATEGORY	MAXIMUM MARKS
1.	Observation	5
2.	Record	5
3.	Attendance	5
4.	Test –I	8
5.	Test –II	8
6.	Test–III	9
Continuous Internal Assessment :TOTAL		40

The external evaluation of integrated practical component from End semester Examination by internal mode is awarded for 50 Marks and later scaled down to 15 Marks and similarly the external evaluation for integrated theory from End semester Examination is awarded for 100 Marks and later scaled down to 45 Marks. Hence the external assessment for integrated theory and practical components contribute to 60 Marks.

# **10.3 ATTENDANCE**

Attendance carries a maximum of 5 marks and the distribution is as under:

S. No.	Attendance %	Marks
1	91 and above	5.0
2	81-90	4.0
3	76-80	3.0

# **10.4 PROJECT WORK/ INTERNSHIPS:**

Final year project work will be always in-house. However, as a special case, if a student is able to get a project from a government organization or private or public sector company, the student may be permitted to do his/her project work in reputed institution/research organization/industry. Hence final year students may have commencement of eighth semester classes for 30 days in fast track mode and complete their final semester and are made eligible for undergoing Internships in Industry and also interested students are permitted for doing projects in Industries.

# **10.5 CERTIFICATION COURSES:**

Students have to undergo a minimum of one value added course beyond curriculum as a certified course per semester for duration not less than 30 hours.

#### 11. REQUIREMENTS FOR APPEARING FOR END SEMESTER EXAMINATION (ESE)

A candidate shall normally be permitted to appear for the ESE of any semester commencing from I semester if he/she has satisfied the semester completion requirements (Subject to Clause 5) and has registered for Examination in all courses of the semester. Registration is mandatory for Semester Examinations as well as arrear Examinations failing which the candidate will not be permitted to attend the next semester. A candidate already appeared for a subject in a semester and passed the Examination is not entitled to reappear in the same subject of the semester for improvement of grade.

#### **12. END SEMESTER EXAMINATION**

ESE will be held at the end of each semester for each subject, for 100 marks, later scaled down to 60 marks.

INSTRUCTION REMARKS			
Maximum Marks	100		
Duration	3 Hours		
Port - A	Part A will be online Examination. 20 Objective		
I alt - A	type Questions. Covering all the 5 units. <b>20*1</b> =		
	20 Marks (Online Examination)		
Port- B	21 to 25 Two Mark Questions, uniformly		
	covering the Five units of the syllabus. All the		
	5 Questions are to be answered.		
	(5 *2= 10Marks).		
	Question 26 to 30 will be of either or type,		
Part- C	covering Five units of the syllabus. Each		
	Question may have subdivision.		
	(5*14=70 Marks)		

#### PATTERN OF ESE QUESTION PAPER:

# **13. PASSING REQUIREMENTS**

**13.1** Passing minimum: The passing minimum for CIA is 20 (i.e. out of 40 marks). The passing minimum for ESE is 30 (i.e. out of 60 marks). The overall passing minimum for theory/laboratory course is 50 (Sum of his/her score in CIA and ESE) out of 100 marks.

**13.1.1** The passing minimum for value added course is 50 marks out of 100marks. There will betwo tests, the first covering 50% of syllabus for 50 marks and the other for 50 marks.

**13.2** If the candidate fails to secure a pass in a particular course ESE, it is mandatory that candidate shall register and reappear for the Examination in that course during the subsequent semester when Examination is conducted in that course. Further the candidate should continue to register and reappear for the Examination till a pass is secured in such supplementary Examination within the stipulated maximum duration of the programme (Clause 5.1).

The CIA marks obtained by the candidate in his/her first or subsequent appearance where

he/she secures a pass shall be retained by the office of the Controller of Examinations and considered valid for all remaining attempts till the candidate secures a pass in his/her ESE.

**13.3** If the candidate fails to secure a pass in a particular course in CIA, it is mandatory that candidate shall register and reappear for the CIA in that course during the subsequent semester when CIA is conducted in that course by the faculty member assigned for that particular course during that semester by the concerned HOD. Further, the candidate should continue to register and reappear for the CIA till a pass is secured in such subsequent Examination within the stipulated maximum duration of the programme (Clause 5.1).

**13.3.1** If a candidate fails to secure a pass in value added course, he/she has to appear for the tests when course is conducted subsequently.

# 13.4 ONLINE COURSE(MOOC) COORDINATOR

To help students in planning their online courses and for general advice on online courses, the HOD shall nominate a MOOC coordinator for the online courses. The Online course MOOC coordinator

shall identify the courses which students can select for their programme from the available online courses offered by the different agencies periodically and inform the same to the students. Further, the coordinator shall advice the students regarding the online courses and monitor their course.

**13.4.1** Student Shall study atleast one online course from Sawayam/NPTEL in anyone of the first seven semesters for which examination shall be conducted at the end of the course by the respective organization body. The student can register to the course which are approved by the department. The student shall produce a pass certificate from the respective body before the end of the seventh semester.

# **14. AWARD OF LETTER GRADES**

**14.1** All assessments of a course will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate letter grades, each carrying certain number of points will be awarded as per the range of total marks (out of 100) obtained by the candidate in each subject as detailed below:

Letter grade	Marks Range	Grade Point	Description
0	91 - 100	10	OUTSTANDING
A+	81-90	9	EXCELLENT
Α	71-80	8	VERY GOOD
B+	66- 70	7	GOOD
В	61 – 65	6	ABOVE AVERAGE
С	55 - 60	5	AVERAGE
D	50 - 54	4	PASS
RA	<50	-	REAPPEARANCE

AB	0	ABSENT

#### **14.2 GRADE SHEET**

After results are declared, Grade sheet will be issued to each student which will contain the following details:

- i. The list of courses enrolled during the semester and the grade scored,
- ii. The Grade Point Average (GPA) for the semester and
- iii. The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

**GPA** is the ratio of the sum of the products of the number of Credits (**C**) of courses enrolled and the Grade Points (**GP**) corresponding to the grades scored in those courses, taken for all the courses to the sum of the number of credits of all the courses in the semester.

$$GPA = \frac{Sum of [C*GP]}{sum of c}$$

**CGPA** will be calculated in a similar manner, considering all the courses enrolled from First semester. **RA** grade and value added course will be excluded for calculating **GPA** and **CGPA**.

#### **14.3 REVALUATION**

Revaluation and Re-totaling are allowed on representation. A candidate can apply for revaluation of his/her semester Examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Head of the Department and Dean. A candidate can apply for revaluation of answer scripts for not exceeding 5 subjects at a time. The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate through the Head of the Department and Dean. Revaluation is not permitted for Supplementary Examinations, Practical Examinations, Technical Seminars, In-plant Training and Project Work.

#### 14.4 TRANSPARENCY AND GRIEVANCE COMMITTEE

A student may get the Photostat copy of the answer script on payment of prescribed fee, if he/she wishes. The students can represent the grievance, if any, to the Grievance Committee, which consists of Dean of the Faculty, (if Dean is HOD, the Dean of another Faculty nominated by the University), HOD of the Department concerned, the faculty of the course and Dean from other discipline nominated by the University and the COE. If the Committee feels that the grievance is genuine, the script may be sent for external valuation; the marks awarded by the External Examiner will be final. The student has to pay prescribed fee for the same.

#### **15. ELIGIBILITY FOR AWARD OF DEGREE**

#### A student shall be declared to be eligible for award of Degree if he/she has

 Successfully gained the required number of total credits as specified in the curriculum Karpagam Academy of Higher Education (Deemed to be University), Coimbatore-641021 XII corresponding to his/her programme within the stipulated time.

• No disciplinary action is pending against him/her.

The award of the degree must be approved by the Board of Management of Karpagam

Academy of Higher Education.

# 16. CLASSIFICATION OF THE DEGREE AWARDED

- **16.1** A candidate who qualifies for the award of the Degree (vide Clause 15) having passed the Examination in all the courses in his/her first appearance within the specified minimum number of semesters (vide Clause 5.1) securing a CGPA of not less than **8** shall be declared to have passed the Examination in First Class with Distinction.
- 16.2 A regular is eligible candidate or a lateral entrant to register for BE(Honors), B.Tech.(Honors). If, he / she has passed all the courses in the first appearance and holds / maintains a CGPA of 7.5 at VI Semester. He / she has to take an additional 20 credits by studying online courses through Swayam/NPTEL. Such a candidate is eligible for the award of BE (Honor), B.Tech.(Honor). However, is he / she fails in securing 20 additional credits but maintains CGPA of 7.5 and above is not eligible for Honors degree but eligible for First class with Distinction.
- 16.3 A candidate who qualifies for the award of the Degree (vide Clause 15) having passed the Examination in all the courses within the specified minimum number of semesters (vide Clause 5.1) plus one year (two semesters), securing CGPA of not less than 6.5 shall be declared to have passed the Examination in First Class.
- **16.3** All other candidates (not covered in Clauses 17.1 and 17.2) who qualify for the award of the degree (vide Clause 15) shall be declared to have passed the Examination in Second Class.

# 17. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

- **17.1** A candidate may for valid reasons and on prior application, be granted permission to Withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.
- **17.2** Such withdrawal shall be permitted only once during the entire duration of the degree programme. Withdrawal application shall be valid only if the candidate is otherwise eligible to write the Examination
- .17.3 Withdrawal application is valid only if it is made within 10 days prior to the commencement of the Examination in that course or courses and recommended by the Head of the Department, Dean and approved by the Registrar.
- **17.3.1** Notwithstanding the requirement of mandatory TEN days notice, applications for withdrawal for special cases under extraordinary conditions may be considered on the merit of the case.
- **17.4** Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction. This provision is not applicable to those who seek withdrawal during III semester.

- **17.5** Withdrawal from the ESE is NOT applicable to arrear Examinations.
- **17.6** The candidate shall reappear for the withdrawn courses during the Examination conducted in the subsequent semester.

# **18. PROVISION FOR AUTHORISED BREAK OF STUDY**

**18.1** Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme. However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons and to rejoin the programme in a subsequent year, permission may be granted based on the merits of the case provided he/she applies to the Registrar, through the Head of the Department and Dean stating reasons thereof and the probable date of rejoining the programme.

**18.2** The total number of semesters for completion of the programme from the commencement of the first semester to which the candidate was admitted shall not exceed the maximum no. of semesters specified in Clause 5.1 irrespective of the period of break of study (vide Clause 18) in order that he/she may be eligible for the award of the degree (vide Clause 15). The candidate thus permitted to rejoin the programme at the commencement of the semester after the break shall be governed by the curriculum and regulations in force at the time of rejoining. Such candidates may have to do additional courses as per the curriculum and regulations in force at that period of time.

**18.3** The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification (vide Clause17). However, additional break of study granted will be counted for the purpose of classification.

**18.4** The total period for completion of the programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in Clause 5.1 irrespective of the period of break of study (vide Clause 18.3) in order that he/she may be eligible for the award of the degree.

**18.5** If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Withdrawal' or 'Break of Study' (Clause18 and 18 respectively).

**19. SUPPLEMENTARY ESE:** After the publication of VIII semester results, if a student has **ONE** arrear in any theory course of the entire programme, he/she will be permitted to apply within 15 days of the publication of results, and appear for supplementary Examination.

# **20. INDUSTRIAL VISIT**

Every student is required to undergo one industrial visit for every semester, starting from the third semester of the programme.

# **21. DISCIPLINE**

Every student is required to observe discipline and decorous behavior both inside and outside the University and not to indulge in any activity which will tend to bring down the prestige of the University. The erring student will be referred to the Disciplinary Committee constituted by the University, to enquire into acts of indiscipline and recommend to the University about the disciplinary action to be taken.

If a student indulges in malpractice in any of the ESE/CIA he/she shall be liable for punitive action as prescribed by the University from time to time.

#### 22. REVISION OF REGULATION AND CURRICULUM

The University may from time to time revise, amend or change the Regulations, Scheme of Examinations and syllabi, if found necessary on the recommendations of Board of Studies, Academic Council and Board of Management of Karpagam Academy of Higher Education.

# 23.KARPAGAM INNOVATION AND INCUBATION COUNCIL (KIIC) (A Section 8 Company)

Based on the 2019 National Innovation and Startup Policy and the 2019–2023 Tamil Nadu Startup Policy, KIIC has recommended to the KAHE students who are affiliated with the KIIC that it be incorporated in the university Program Regulations 2023-24 and implement from this academic year.

#### 23.1 Norms to Student Start-Ups

- a) Any (UG/PG /(Ph.D.) Research scholars, student, right from the first year of their programme is allowed to set a startup (or) work part time/ full time in a startup or work as intern in a startup
- b) Any (UG/PG / (Ph.D.) Research scholars) student right from the first year of their programme is allowed to earn credit for working on Innovative prototypes/business Models/ Pre incubation (case to case basis). Start Up activities will be evaluated based on the guidelines being given by the expert committee of the KIIC
- c) Student Entrepreneurs may use the address of incubation center (KIIC) to register their venture while studying in KAHE.
- d) Students engaged in startups affiliated with the KIIC or those who work for them may be exempted from KAHE's attendance requirements for academic courses under current regulations, up to a maximum of 30% attendance per semester, including claims for ODs and medical emergencies Potential Students who have been incubated at KIIC may be permitted to take their University semester exams even if their attendance is below the minimum acceptable percentage, with the proper authorization from the head of the institution.

(On case-to-case basis depends upon the applicability strength, societal benefits and quality of the Innovation and Subsequent engagement of the students with the/ her business)

- e) Any Students Innovators/entrepreneurs are allowed to opt their startup in place mini project /major project, /seminar and summer training etc. (In plant training, Internship, value added Course.). The area in which the student wishes to launch a Startup may be interdisciplinary or multidisciplinary.
- f) Student's startups are to be evaluated by Expert committee, formed by KIIC and KAHE.

#### 23.2 Guide lines to award Credits/ Marks to a Student startup

Student's startup stages are divided into five phases and these startup phases can be considered equally in place of the course title as mentioned below with the same credits allotted to the course title in a university curriculum.

Sl. No.	Description/Startup phases	In place of the Subject / Course title	Grades/Credits /Marks
1	Idea stage/Problem Identification	Seminar	
2	<b>Proof of Concept (POC) /Solution development</b>	In-plant training /Internship	Same Marks/Credits can
3	Product Development (Lab scale) /Prototype Model/ Company Registered	Mini Project/ Value added Course	be awarded that are listed in the course title's curriculum for the
4	Validation/Testing	Main Project phase I	respective startup phases.
5	Business Model/Ready for Commercialization/Implementation	Main Project phase II	

# **PROGRAMME EDUCATIONAL OBJECTIVES(PEOs):**

- 1. To impart skill-based training to apply engineering practices to design, implement model and analyze real time problems and interpret the result.
- 2. To impart students with strong fundamental knowledge in the field of Electronics and Communication Engineering to meet the emerging industrial needs and to promote Research
- 3. To build and lead cross-functional teams upholding the professional responsibilities & ethical values.

# **PROGRAM OUTCOMES (POs)**

- **1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **6.** The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **8.** Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **10.Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and

write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

- **11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

# PROGRAMME SPECIFIC OUTCOMES(PSOs)

- 1. Be acquainted with the continuous learning in the field of Embedded systems, VLSI design, Communication and Signal Processing and hold expertise in the modern tools for quenching the techno-thirsty society.
- 2. Incorporate the socio-responsible electronics and communication engineer with leadership, teamwork skills and exhibit a commitment to the lifelong learning.



#### KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University), Established Under Section 3 of UGC Act, 1956. Eachanari Post, Pollachi Main Road, Coimbatore, Tamil Nādu – 641021, INDIA.

#### FACULTY OF ENGINEERING

#### DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

# ACADEMIC YEAR - 2023-2024

			Semester -	Ι								
Course	Course Title	gory	Objective Outcom	s & es	In: Ho	struc urs /'	ction Week	dits	Max	ximum	Marks	Page
Code	Course The	Cate	РО	PSO	L	Т	Р	Cre	CIA	ESE	Total	No.
23BECC101	Professional Communicative English	HS	8,9,10,12	2	3	0	0	3	40	60	100	1
23BECC102	Matrices and Calculus	BS	1,2,3,12	1	3	1	0	4	40	60	100	3
23BEEC141	Semiconductor Physics (Theory & Laboratory)	BS	1,2,3,6,9,1 0,12	1	3	0	2	4	40	60	100	5
23BEEC142	Basic Electrical and Electronics Engineering (Theory & Laboratory)	ES	1,2,3,8,12	1,2	3	0	2	4	40	60	100	8
23BECC143	Programming in C (Theory & Laboratory)	ES	1,2,3,4,9,1 0,12	1	4	0	2	5	40	60	100	10
23BECC111	Design Thinking	MC	1,2,3,4,6,7, 8,9,10,12	2	1	0	2	2	100	-	100	13
23BEMC151	Sports and Yoga	MC	_	-	1	0	0	0	100	-	100	15
23BTMC152	_	1	0	0	0	100	-	100	17			
	TOTAL		19	1	8	22	500	300	800			

	Semester -II												
Course Code	Course Title	gory	Objective Outcom	es & les	Ins Hou	truct rs /V	tion Veek	dits	Ma	ximum	Marks	Page	
		Cate	РО	PSO	L	Т	Р	Cre	CIA	ESE	Total	190.	
23BECC201A/ 23BECC201B/ 23BECC201C	Graph Theory/ Computational Methods for Engineers / Transforms and its Applications	BS	1,2,3,12	2	3	1	0	4	40	60	100	18 20 22	
23BEEC202	Fundamentals of Web Design	undamentals of Web DesignES1,2,3,4,5, 9,10,12Sircuit TheoryES1,2,3,10							40	60	100	24	
23BEEC203	Circuit Theory	1	3	1	0	4	40	60	100	26			
23BEEC204	Electronic Devices and Circuits	ES	1,2,3,10	1	3	0	0	3	40	60	100	28	
23BECC241A/ 23BECC241B	Data Structure and Algorithms / Object Oriented Programming with PYTHON (Theory & Laboratory)	ES	1,2,3,4,9, 10,12	1	4	0	2	5	40	60	100	30 33	
23BEEC211	Engineering Graphics	ES	1,2,3,5,8, 10,12	2	2	0	2	3	40	60	100	36	
23BEEC212	Electronic devices and circuits Laboratory	ES	1,2,3,4,5, 8,9,10,12	1,2	0	0	4	2	40	60	100	39	
23BEMC251	Soft Skills	MC	_	_	1	0	0	0	100	-	100	41	
23BEMC252	2 Women Safety and Security MC – –						0	0	100	-	100	42	
	ΤΟΤΑ		20	2	8	24	480	420	900				

	SEMESTER - III												
		x	Objectiv Outcor	ves & mes	In: Ho	struc urs //	tion Week		Max	timum	Marks		
Course Code	<b>Course Title</b>	Categor	PO	PSO	T	т	Р	Credits	CIA	ESE	Total	Page No	
			10	150		-	-		40	60	100		
23BEEC301A/ 23BEEC301B/ 23BEEC301C	Discrete Mathematics / Numerical Methods / Numerical Linear Algebra	BS	1,2,3,12	1,2	3	1	0	4	40	60	100	44 47 49	
23BEEC302A/ 23BEEC302B	Electromagnetic Fields and waves/ Design and analysis of Algorithm	PC	1,2,3,4, 9, 10,12	1,2	3	1	0	4	40	60	100	51 53	
23BEEC303	Environmental Science	HS	1,2,6,7,8 ,10,12	2	3	0	0	3	40	60	100	56	
23BEEC304	Digital System Design	PC	1,2,3,4,5 , 10,12	2	3	0	0	3	40	60	100	59	
23BEEC341A / 23BEEC341B	Data Structures and Algorithms/ Java Programming/	PC	1,2,3,4,9 ,10,12	1,2	3	0	2	4	40	60	100	62 65	
23BEEC305	Measurements and Instrumentation	PC	1,2,3,8, 10	1,2	3	0	0	3	40	60	100	68	
23BEEC311	Digital design System Lab	PC-LC	1,2,3,4,5 ,9, 10	1	0	0	2	1	40	60	100	70	
23BEMC351	Aptitude and Reasoning	MC	-	-	1	0	0	0	100	0	100	71	
23BEMC352	Foreign Language (German/ French)	MC	-	-	1	0	0	0	100	0	100	73	
23BEEC391 Internship/field project PROJ							2	1	100	0	100	76	
	TOTAL		20	2	6	23	580	420	1000				

SEMESTER - IV												
		•	Objecti Outco	ives & omes	Inst Hour	ructi s / W	ion /eek		Max	imum	Marks	Page No
Course Code	Course Title	ategory	DO	DSO	Ţ	Т	D	Credits	CIA	ESE	Total	
		C	PO	PSO	L	T	P		40	60	100	
23BEEC401A /23BEEC401B	Probability and Statistics/ Statistics and Optimization Techniques	BS	1,2,3, 6, 12	1	3	1	0	4	40	60	100	77 79
23BEEC402A /23BEEC402B	Analog Integrated Circuits / Operating Systems	PC	1,2,3, 4,10, 12	1,2	3	0	0	3	40	60	100	82 84
23BEEC403	23BEEC403Analog and Digital CommunicationPC1,2,3, 4, 101Microprocessor &								40	60	100	87
23BEEC404A /23BEEC404B /23BEEC404C	Microprocessor & Microcontroller /Web Application and Development / Low Code Application and Development	PC	1,2,3,4 ,5, 8,9, 10,12	1,2	3	0	0	3	40	60	100	89 91 94
23BEEC405A /23BEEC405B	Signals and Systems / Advanced Algorithms	PC	1,2,3,4 ,9,10, 12	1,2	3	0	0	3	40	60	100	96 98
23BEEC406	Control Systems	PC	1,2,3, 8,10	1,2	3	1	0	4	40	60	100	101
23BEEC411	Analog Circuits Laboratory	PC -LC	1,2,3,4 ,5,8,9, 10	1,2	0	0	2	1	40	60	100	103
23BEEC412	Analog and Digital Communication Laboratory	PC -LC	1,2,3, 4, 5, 8, 10	1	0	0	2	1	40	60	100	105
23BEEC413	Microprocessor & Microcontroller Laboratory	PC -LC	1,2,3, 4,5,8, 10	1,2	0	0	2	1	40	60	100	107
23BEMC451	Foundation of Entrepreneurship	MC	-		1	0	0	0	100	0	100	109
23BEMC452	23BEMC452 Essence of traditional Indian Knowledge & Heritage MC -						0	0	100	0	100	110
	TOTAL							23	560	540	1100	

SEMESTER - V												
		ry	Objectiv Outcor	res & nes	Inst Ho W	ruc our /ee	tion s / k	S	<b>M</b>	aximı Mark	ım s	
Course Code	Course Title	Catego	DO	DCO	Ţ		D	Credit	CIA	ESE	Total	Page No
			PO	PS0	L	I	P		40	60	100	
23BEEC501	Antennas and Wave Propagation	PC	1,2,3,4,8 ,10	1,2	3	1	0	4	40	60	100	111
23BEEC502A/ 23BEEC502B	Embedded Systems / Network Architecture and Security	PC	1,2,3,4, 5,6,8,9,1 0,12	2	3	0	0	3	40	60	100	113 115
23BEEC503A/ 23BEEC503B/ 23BEEC503C	Digital Signal Processing / Advanced Web Frame Works/ Business Data Processing	PC	1,2,3,4,9 ,10,12	1,2	3	1	0	4	40	60	100	117 119 121
23BEEC5E**	Professional Elective-I	PE	-	-	3	0	0	3	40	60	100	149
23BEEC5E**	Professional Elective-II	PEC	-	-	3	0	0	3	40	60	100	149
23BE**OE**/	Open Elective - I	OE	-	-	3	0	0	3	40	60	100	193
23BEEC511	Digital Signal Processing Laboratory	PC-LC	1,2,3,4, 5,9,10,1 2	1,2	0	0	2	1	40	60	100	123
23BEEC512	Embedded System Laboratory	PC-LC	1,2,3,4,5,9 ,10,12	1,2	0	0	2	1	40	60	100	125
23BEEC591	Internship	PROJ	-	-	0	0	2	1	100	0	100	126
23BEMC551	23BEMC551 Mobile Application Development MC									0	100	127
	TOTAL				19	2	6	23	520	480	1000	

	SEMESTER - VI											
		ıry	Objectiv Outco	ves & mes	Inst Ho V	ructi ours Veek	on /	ts	N	Iaxim Mark	um s	
Course Code	Course Title	Catego	DO	DGO		T	D	Credi	CIA	ESE	Total	Page No
		Ŭ	PO	P50	L	1	Р		40	60	100	
23BEEC601	Very Large-Scale Integrated Design	PC	1,2,3,4, 5,11, 12	1,2	3	0	0	3	40	60	100	129
23BEEC602	Fiber Optics Communication	PC	1,2,3,4, 5,6,11,1 2	1,2	3	0	0	3	40	60	100	131
23BEEC603	Microwave Engineering	PC	1,2,3,4, 5,11, 12	1,2	3	0	0	3	40	60	100	133
23BEEC604	Cyber Security	BS	1,2,3,4, 5,11, 12	1,2	3	0	0	3	40	60	100	135
23BEEC6E**	Professional Elective-III	PE	-	-	3	0	0	3	40	60	100	165
23BE**OE**/	Open Elective-II	OE	-	-	3	0	0	3	40	60	100	193
23BEEC611	VLSI design Laboratory	PC- LC	1,2,3,4,5	1,2	0	0	2	1	40	60	100	137
23BEEC612	Optical and Microwave Engineering Laboratory	PC- LC	1,2,3,4,5	1,2	0	0	2	1	40	60	100	138
23BEEC691	Mini project	PROJ	-	-	0	0	2	1	0	100	100	139
23BEMC651	23BEMC651 Universal Human Values MC							0	0	100	100	140
	TOTAL								320	680	1000	

		SEME	STER - VI	I								
		,	Objectiv Outcor	ves & mes	Inst hour	ruc s /v	tion veek	s	N	laxim Mark	um s	
Course Code	<b>Course Title</b>	ategoi	PO	PSO	T	т	р	Credit	CIA	ESE	Total	Page No
			10	150		Ŧ	1		40	60	100	
23BEEC701	Professional Ethics	HS	1,2,3,4,5 ,7,8,9,10 , 11,12	1,2	3	0	0	3	40	60	100	142
23BEEC702	Internet of things	PC	1,2,3,8, 10	1,2	3	0	0	3	40	60	100	144
23BEEC7E**	Professional Elective-IV	PE	1,2,3,8, 10	1,2	3	0	0	3	40	60	100	173
23BEEC7E**	Professional Elective-V	PE	1,2,3,8, 10	1,2	3	0	0	3	40	60	100	173
23BECSOE**/ 23BEEEOE**/ 23BEBMEOE**	Professional Elective-VI	PE	1,2,3,8, 10	1,2	3	0	0	3	40	60	100	193
23BEEC791	Project Work-Phase I	PROJ	1,2,3,4,5 ,6,7,9,10 , 11,12	1,2	0	0	8	4	100	0	100	146
23BEEC751	23BEEC751 Technical Seminar PROJ 1,2,3,8,9 1,2   2 2 2 1 1 1 2								100	0	100	147
	TOTAL								400	300	700	

# SEMESTER VIII

Course Code	Course Title	Objectives & Outcomes			Inst Ho W	ruc our: Veel	tion s / k	its	N	Iaxim Mark	um s	Dogo
		Categ	BO	DCO	т	т	р	Cred	CIA	ESE	Total	No
		U	PO	P50	L	I	r		40	60	100	
23BEEC891	Project Work-Phase-II &Viva-Voce	PROJ	1,2,3,4,5 ,6,7,9,10 , 11,12	1,2	0		16	8	120	180	300	148
	TOTAL			0	0		16	8	120	180	300	

# PROFESSIONAL ELECTIVE LIST

# SEMESTER V-ELECTIVE I & II

		y	Objective	es &	Instr	uct	tion		Μ	aximu	ım	
Course		gor	Outcom	nes	Hours	5 /V	Veek	lits		Marks	5	Page
Code	Course Title	ateg	DO	DCO	т	т	п	rec	CIA	ESE	Total	No
		C	PO	PS0	L	I	Р	0	40	60	100	
23BEEC5E01	Sensors and Transducers	PE	1,2,3,4,5, 6,11,12	1,2	3	0	0	3	40	60	100	149
23BEEC5E02	Biomedical Electronics	PE	1,2,3,4,5, 6,11,12	1,2	3	0	0	3	40	60	100	151
23BEEC5E03	Digital Image Processing	PE	1,2,3,4,5, 11,12	1,2	3	0	0	3	40	60	100	153
23BEEC5E04	RADAR communication	PE	1,2,3,4,5, 6,11,12	1,2	3	0	0	3	40	60	100	155
23BEEC5E05	Long Term Evolution and 5G Communication	PE	1,2,3,4,5, 6,11,12	1,2	3	0	0	3	40	60	100	157
23BEEC5E06	Multimedia Compression Technique	PE	1,2,3,4,5, 6,11,12	1,2	3	0	0	3	40	60	100	159
23BEEC5E07	Pattern Recognition	PE	1,2,3,4,5, 6,12	1,2	3	0	0	3	40	60	100	161
23BEEC5E08	Nano Electronics	PE	1,2,3,4,5, 6,12	1,2	3	0	0	3	40	60	100	163
	TOTAL						0	24	320	480	800	

# SEMESTER VI -ELECTIVE III

Course			Objective Outcom	Inst Hour	ructi s /W	ion /eek	S	Ma N	um s			
Course Code	<b>Course Title</b>	tego						redit	CIA	ESE	Total	Page No
Couc		Ca	РО	PSO	L	Т	Р	C	40	60	100	110
23BEEC6E01	Application Specific Integrated Circuit Design	PE	1,2,3,4,5,6, 12	1,2	3	0	0	3	40	60	100	165
23BEEC6E02	Wireless Sensor Networks	PE	1,2,3,4,5,6, 12	1,2	3	0	0	3	40	60	100	167
23BEEC6E03	Speech and Audio Processing	PE	1,2,3,4,5,6, 11,12	1,2	3	0	0	3	40	60	100	169
23BEEC6E04	Big Data Analytics	PE	1,2,3,4,5,6, 12	1,2	3	0	0	3	40	60	100	171
	ТОТА	L			12	0	0	12	160	240	400	

Karpagam Academy of Higher Education (Deemed to be University), Coimbatore – 641 021

# SEMESTER VII - ELECTIVE IV, V, VI

Course	Course Title	egory	Objectives & Outcomes			ruc our Vee	ction rs / ek	edits	Ma N	um s	Page		
Code		Cat	РО	PSO	L	Т	Р	Cr	CIA 40	ESE 60	Total 100		
23BEEC7E01	Computer Architecture	PE	1,2,3,4,5, 6,12	1,2	3	0	0	3	40	60	100	173	
23BEEC7E02	Advanced Embedded Systems	PE	1,2,3,4,5	1,2	3	0	0	3	40	60	100	175	
23BEEC7E03	Smart Antennas	PE	1,2,3,4,5, 6,10,12	1,2	3	0	0	3	40	60	100	177	
23BEEC7E04	Computer Networks	PE	1,2,3,4,5, 6,7,12	1,2	3	0	0	3	40	60	100	179	
23BEEC7E05	Natural Language Processing	PE	1,2,3,4,6, 7	1	3	0	0	3	40	60	100	181	
23BEEC7E06	Robotics and Automation	PE	1,2,3,4, 12	1,2	3	0	0	3	40	60	100	183	
23BEEC7E07	Micro and Smart System Technology	PE	1,2,3,4, 12	1,2	3	0	0	3	40	60	100	185	
23BEEC7E08	Artificial Intelligence	PE	1,2,3,4, 12	1,2	3	0	0	3	40	60	100	187	
23BEEC7E09	Micro Electronic Mechanical System (MEMS)	PE	1,2,3,4,5, 6,12	1,2	3	0	0	3	40	60	100	189	
23BEEC7E10	Satellite Communication	PE	1,2,3,4,5, 6,10,12	1,2	3	0	0	3	40	60	100	191	
	TOTAL		30	0	0	30	400	600	1000				

#### **OPEN ELECTIVE LIST**

#### SEMESTER VI &VII

Course	Course Title	egory	Objectives & Outc	omes	Ins E	truc Iours Weel	tion s / k	edits	M	aximu Marks	ım S	Page No
Code		Cat	РО	PSO	L	Т	Р	Cr	CIA	ESE	Total	
									40	60	100	
23BEBMEOE01	Human anatomy and Physiology	OE	1,2,3,4,9,10,12	1	3	0	0	3	40	60	100	205
23BEBMEOE02	Artificial Organs and implants	OE	1,2,3,4,9,10,12	1	3	0	0	3	40	60	100	207
	Con	npute	r Science and Engine	ering								
23BECSOE01	Internet of things	OE	1,2,3,4,5,9,11,12	1,2	3	0	0	3	40	60	100	236
23BECSOE02	Machine Learning	OE	1,2,3,4,6,12	1,2	3	0	0	3	40	60	100	238
23BECSOE03	Block chain Technologies	OE	1,2,3,4,5,6,12	1,2	3	0	0	3	40	60	100	240
23BECSOE04	Cloud Computing	OE	1,2,3,4,5,6,12	1,2	3	0	0	3	40	60	100	242
	Cyber Security											
23BECYOE01	Basics of Cybercrime and Cyber Security	OE	1,2,3,4,5,6,12	1,2	3	0	0	3	40	60	100	226
23BECYOE02	Basics of Cyber Forensics	OE	1,2,3,4,6,12	1,2	3	0	0	3	40	60	100	229
23BECYOE03	Cyber laws and intellectual property rights	OE	1,2,3,4,5,6,12	1,2	3	0	0	3	40	60	100	231
23BECYOE04	Blockchain and cyber security	OE	1,2,3,4,6,12	1,2	3	0	0	3	40	60	100	233
			Artificial Intelligen	ce and I	Data	Scie	nce					
23BTADOE01	Fundamentals of Data Science	OE	1,2,3,4,5,6,9,11,12	1,2	3	0	0	3	40	60	100	193
23BTADOE02	Fundamentals of Artificial Intelligence	OE	1,2,3,4,6,12	1,2	3	0	0	3	40	60	100	195
23BTADOE03	Internet Programming	OE	1,2,3,4,5,6,9,12	1,2	3	0	0	3	40	60	100	197
23BTADOE04	Robotics and Automation	OE	1,2,3,4,5,6,9,11,12	1,2	3	0	0	3	40	60	100	199
		E	<b>Electrical and Electron</b>	nics Eng	ginee	ering						
23BEEEOE01	Renewable Energy Systems	OE	1,2,3,4,5	1,2	3	0	0	3	40	60	100	201
23BEEEOE02	Hybrid Electric Vehicles	OE	1,2,3,4,5	1,2	3	0	0	3	40	60	100	203

Course Code	Course Title	gory	Objectives & Outc	ectives & Outcomes		Instruction Hours / Week			Μ	aximu Marks	ım S	Page No
	Course The	Cate	PO	DSO	т	т	n	Cre	CIA	ESE	Total	
			10	150			1		40	60	100	
23BEECOE01	Real Time Embedded Systems	OE	1,2,3,4,5,6,12	1,2	3	0	0	3	40	60	100	244
23BEECOE02	Consumer Electronics	OE	1,2,3,4,5	1,2	3	0	0	3	40	60	100	247

# COURSES OFFERED TO OTHER DEPARTMENTS

#### LIST OF OPEN ELECTIVES

#### COURSE OFFERED BY OTHER DEPARTMENT

Course Code	Course Title	PO P		PSO	L	Т	Р	С	CIA	ESE	Total	Page No
	ARTIFIC	IAL IN	TELLIGE	NCE	ANI	D DA	АТА	SC	IENCE	1		
23BTADOE01	Fundamentals of Data Science	OE	1,2,3,4,5,6,9 ,11,12	1,2	3	0	0	3	40	60	100	214
23BTADOE02	Fundamentals of Artificial Intelligence	OE	1,2,3,4,6,12	1,2	3	0	0	3	40	60	100	216
23BTADOE03	Internet Programming	OE	1,2,3,4,5,6,9 ,12	1,2	3	0	0	3	40	60	100	218
23BTADOE04	Robotics and Automation	OE	1,2,3,4,5,6,9 ,11,12	1,2	3	0	0	3	40	60	100	220
BIOMEDICAL ENGINEERING												
23BEBMEOE01	Human Anatomy and Physiology	OE	1,2,3,4,9,10, 12	1	3	0	0	3	40	60	100	222
23BEBMEOE02	Artificial Organs and Implants	OE	1,2,3,4,9,10, 12	1	3	0	0	3	40	60	100	224
		1	BIO TECH	NOL	OGY	7			1			
23BTBTOE01	Basic Bioinformatics	OE	1,2,3,5,6,12	1,2	3	0	0	3	40	60	100	226
23BTBTOE02	Fundamentals of Nano Biotechnology	OE	1,3,4,5,6,8,1	1,2	3	0	0	3	40	60	100	228
			CIVIL ENG	INEE	RIN	G						
23BECEOE01	Housing, Plan and Management	OE	1,2,3,4,5,6,9 ,11,12	1,2	3	0	0	3	40	60	100	230
23BECEOE02	Building Services	OE	1,3,4,5,6,12	1,2	3	0	0	3	40	60	100	232
23BECEOE03	Repair and rehabilitation of structures	OE	1,2,3,4,5,6,9 ,11,12	-	3	0	0	3	40	60	100	234
23BECEOE04	Computer-Aided Civil Engineering Drawing	OE	1,2,4,5,6,7,9,11,12	2	3	0	0	3	40	60	100	236
23BECEOE05	Contracts Management	OE	1,2,4,5,6,7,9 ,12	-	3	0	0	3	40	60	100	238

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23BECEOE06	Air and Noise Pollution and Control	OE	1,2,4,5,6,7,9 ,11,12	1	3	0	0	3	40	60	100	240	
	COMPUTER	SCIE	NCE ENGIN	EERI	NG	(CYI	BER	SEC	URITY	<u>(</u> )	L	1	
23BECYOE01	Basics of Cyber Crime and Cyber Security	OE	1,2,3,4,6,12	1,2	3	0	0	3	40	60	100	242	
23BECYOE02	Basics of Cyber Forensics	OE	1,2,3,4,5,6,1 2	1,2	3	0	0	3	40	60	100	244	
23BECYOE03	Cyber Laws and Intellectual Property Rights	OE	1,2,3,4,6,12	1,2	3	0	0	3	40	60	100	246	
23BECYOE04	Block chain and Cyber Security	OE	1,2,3,4,5,6,1 2	1,2	3	0	0	3	40	60	100	248	
	COM	PUTE	CR SCIENCE	AND	EN	GIN	EER	ING					
23BECSOE01	Internet Of Things	OE	1,2,3,4,5,9,1 1,12	1,2	3	0	0	3	40	60	100	251	
23BECSOE02	Machine Learning	OE	1,2,3,4,6,12	1,2	3	0	0	3	40	60	100	253	
23BECSOE03	Blockchain Technologies	OE	1,2,3,5,6,12	1,2	3	0	0	3	40	60	100	255	
23BECSOE04	Cloud Computing	OE	1,2,3,4,5,6,1 2	1,2	3	0	0	3	40	60	100	257	
ELECTRICAL AND ELECTRONICS ENGINEERING													
23BEEEOE01	Hybrid Electric Vehicles	OE	1,2,3,4,5,6,7	1,2	3	0	0	3	40	60	100	201	
23BEEEOE02	Renewable Energy Systems	OE	1,2,3,4,5,6,7 ,8,9, 10,11,12	1,2	3	0	0	3	40	60	100	203	
			FOOD TEC	HNOI	LOG	Y							
23BTFTOE01	Processing of Food Materials	OE	1,2,3,4,5,6,8 ,9,10,11	1,2	3	0	0	3	40	60	100	263	
23BTFTOE02	Nutrition and Dietetics	OE	1,2,3,4,8,9,1 0,11	1,2	3	0	0	3	40	60	100	265	
23BTFTOE03	Ready to eat foods	OE	1,2,3,4,8,9,1 0,11,12	1,2	3	0	0	3	40	60	100	267	
23BTFTOE04	Agricultural Waste and Byproducts Utilization	OE	1,2,3,4,6,7,8 ,9,10,11	1,2	3	0	0	3	40	60	100	269	
23BTFTOE05	Design of Food process equipment	OE	1,2,3,4,6,8,9 ,10,11	1,2	3	0	0	3	40	60	100	271	
		MEG	CHANICAL	ENGI	NEE	RIN	G						
23BEMEOE01	Battery Management System	OE	1,2,3,4,5,6,7 ,8,9,10,11,1 2	1,2	3	0	0	3	40	60	100	273	

23BEMEOE02	Industrial Safety and Environment	OE	1,2,3,4,5,6,7 ,8,9, 12	-	3	0	0	3	40	60	100	275	
23BEMEOE03	Non-destructive Testing	OE	1,2,3,4,5,6,9 ,11, 12	-	3	0	0	3	40	60	100	277	
23BEMEOE04	Operation Research	OE	1,2,3,4,5,6,9 , 11,12	1,2	3	0	0	3	40	60	100	279	
		SCI	ENCE AND	HUM	IANI	TIE	S						
23BESHOE01	Mass communication	OE	8,9,10,12	-	3	0	0	3	40	60	100	281	
23BESHOE02	Fuzzy mathematics	OE	1,2,3,4,12	1,2	3	0	0	3	40	60	100	283	
23BESHOE03	Material sciences	OE	1,2,3,12	-	3	0	0	3	40	60	100	285	
23BESHOE04	Green Chemistry	OE	1,2,3,7,8,12	-	3	0	0	3	40	60	100	287	
		FA	CULTY OF	PHA	RMA	ACY							
	Pharmaceutical												
23BP804ET	Regulatory Science- Theory	OE	3	-	3	0	0	3	40	60	100	291	
23BP809ET	Cosmetic Science- Theory	OE	3	-	3	0	0	3	40	60	100	293	
FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT													
23MBAPOE30 1	Organizational behavior	OE	6,7,8	-	3	0	0	3	40	60	100	295	
23PHPOE301	Material characterization	OE	1,2,3,4,5,10	-	3	0	0	3	40	60	100	297	
23PHPOE302	Numerical methods and programming	OE	1,2,5,12	-	3	0	0	3	40	60	100	299	
23CAPOE301	Robotics process automation	OE	1,2,3,4,9,10	-	3	0	0	3	40	60	100	302	
23BCPOE301	Nutrition and dietetics	OE	1,2,11		3	0	0	3	40	60	100	304	
23CSPOE301	Cyber forensics	OE	1,2,3,4,12	1,2	3	0	0	3	40	60	100	306	
23CMPOE301	Personal finance and planning	OE	7,8,9,10,11, 12	-	3	0	0	3	40	60	100	308	
23CHEOE301	Chemistry in everyday life	OE	-	-	3	0	0	3	40	60	100	310	
23MBPOE301	Fermentation technology	OE	1,2,3,11,12	-	3	0	0	3	40	60	100	312	
23EGPOE301	English for competitive examinations	OE	9,10,12	-	3	0	0	3	40	60	100	314	
23BTPOE301	Sericulture	OE	1,2,3,4,7,12	-	3	0	0	3	40	60	100	316	

	COURSES OFFERED TO OTHER DEPARTMENT												
23BEECOE01	Real Time Embedded Systems	OE	1,2,3,4,5	1,2	3	0	0	3	40	60	100	259	
23BEECOE02	Consumer Electronics	OE	1,2,3,4,5	1,2	3	0	0	3	40	60	100	261	

# **Total Number of Credits: 162**

# **Total Marks: 6400**

Color code	Total Count
Employability	69
Skill Development	29
Entrepreneurship	3

2023-2024 Semester I

# 23BECC101 PROFESSIONAL COMMUNICATIVE ENGLISH 3H-3C

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for students to

- Extend the communicative competence of learners.
- Develop usage of language effectively in academic /work contexts
- Make use of Language skills in Reading and Writing
- Use language efficiently in expressing their opinions via various media.
- Enhance inter-personal communication skills.

# **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Identify new words by employing vocabulary building techniques.
- Build correct sentence structures and grammatical patterns in oral and written communication
- Construct business letters, proposals and E-Mail communication.
- Adopt the skills of planning, structuring, and delivery techniques in group discussions and presentations.
- Follow leadership, work ethics and management principles.

# UNIT-1 VOCABULARY BUILDING

Word formation process - One-word Substitutes – Homophones – Homonyms – British and American vocabulary – Punctuation marks and capitalization

# **UNIT-2 FUNDAMENTALS OF ENGLISH GRAMMAR**

Subject –verb agreement (Concord) – If-conditionals – Modal verbs - Question types (Wh, Yes or No & Question tag), Prepositions- Articles

# UNIT- 3 LANGUAGE SKILLS (READING AND WRITING)

Reading (Skimming Scanning) - Reading Methods (SQR3) – Writing -Business Letters (Job Application Letter & Resume Preparation, sales letter, Quotation letter) – E- Mail communication & etiquettes – Business Proposals (Structure & Types)

# **UNIT-4 PROFESSIONAL SKILLS**

Interview skills – Dos and Don'ts of an Interview, Group Discussion – Dos and Don'ts of GD, Presentation skills – Planning, structuring and Delivering Techniques

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#### **UNIT -5 INTERPERSONAL SKILLS**

Personality development -Conflict management, Team work, Leadership Principles, Negotiation skills

**Note:** Students shall have hands on training in improving Speaking skill in the language laboratory @ 2 periods per each unit.

#### **TOTAL: 45**

#### **TEXT BOOKS**

- 1. Raman. Meenakshi, Sharma. Sangeeta (2015). Professional English. Oxford university press. New Delhi.
- 2. Sanjay Kumar, Pushpalata, (2011), Communication skills, 1stEditionOxfordPress.
- 3. Ashraf Rizvi M, Effective Technical Communication, McGraw Hill Education, First Edition, 2013.

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	2	3	-	3	-	1
CO2	-	-	-	-	-	-	-	1	2	3	-	2	-	1
CO3	-	-	-	-	-	-	-	2	2	3	-	2	-	1
CO4	-	-	-	-	-	-	-	3	2	3	-	2	-	1
CO5	-	-	-	-	-	-	-	3	2	3	-	3	-	1
Average	-	-	-	-	-	-	-	2	2	3	-	2.4	-	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation
2023-2024 Semester I

**4H-4C** 

#### 23BECC102

#### MATRICES AND CALCULUS

Instruction Hours/week: L:3 T:1 P:0

## Marks: Internal:40 External:60 Total:100

#### End Semester Exam: 3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for students :

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the student with the differential calculus of multivariable functions. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals.
- To make the students acquire sound knowledge in techniques of solving linear ordinary differential equations.
- To provide knowledge about the concepts of partial differential equation with constant coefficients.

## **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Make use of orthogonal transformation to reduce the quadratic form to canonical form.
- Utilize differential calculus of multivariable to optimization problems.
- Apply multiple integrals for finding area and volume.
- Solve the n<sup>th</sup> order Ordinary Differential Equations (ODE) and Homogeneous equation of Euler's type.
- Solve the n<sup>th</sup> order Partial Differential Equations.

## **UNIT – I MATRICES**

Eigenvalues and Eigenvectors of a real matrix– Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

## UNIT – II DIFFERENTIAL CALCULUS OF MULTIVARIABLE FUNCTIONS

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions –Applications: Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

## **UNIT – III MULTIPLE INTEGRALS**

Proper and Improper integrals - Bernoulli's extension formula – Double integrals – Change of order of integration – Double integrals in polar coordinates – Area using double integrals – Evaluation of Triple Integrals.

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## **UNIT – IV ORDINARY DIFFERENTIAL EQUATIONS**

Linear differential equation of second and higher order with constant coefficients – Euler-Cauchy linear differential equation – Method of Variation of parameters.

## **UNIT – V PARTIAL DIFFERENTIAL EQUATIONS**

Homogeneous linear partial differential equations of second and higher order with constant coefficients – Classification of partial differential equations.

## **TEXT BOOKS:**

- 1. Grewal, B. S., & Grewal, J. S. (1996). Higher engineering mathematics. 2018, Khanna Publishers, New Delhi.
- 2. Kreyszig, E. (2007). Advanced Engineering Mathematics 10th Edition with Wiley Plus Set (p. 334). John Wiley & Sons.

## **REFERENCE BOOKS:**

- 1. Thomas, B. T., and Ross L Finney (2002). Calculus and Analytic Geometry, Pearson Publishers, Ninth edition
- 2. Ross, S. L. (1984). Differential Equation-Jhon Wiley & Sons. Inc. New York.
- 3. Henner, V., Belozerova, T., & Khenner, M. (2013). Ordinary and partial differential equations. CRC Press.

## **WEBSITES:**

- 1. www.archive.nptel.ac.in/courses/111/108/111108157/
- 2. www.nptel.ac.in/courses/111107108
- 3. www.archive.nptel.ac.in/courses/111/104/111104125/
- 4. www.nptel.ac.in/courses/111108081
- 5. www.nptel.ac.in/courses/111108144

COs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO3	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO4	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO5	3	2	1	-	I	-	I	-	-	I	-	1	1	-
Average	3	2	1	-	-	-	-	-	-	-	_	1	1	-

## CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL: 60** 

#### **23BEEC141**

#### SEMICONDUCTOR PHYSICS (THEORY & LABORATORY)

Instruction Hours/week: L:3 T:0 P:2

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### (i) THEORY

#### **COURSE OBJECTIVES**

The Goal of this course is for students to

- Understand the fundamentals of electrons flow and band structure.
- Inculcate the characteristics of electronic materials through basics.
- Divulge knowledge on the basics of semiconducting materials for diode applications.
- Understand the basics of laser and optical fiber with appropriate applications.
- Impart the basic knowledge of new semiconducting material for engineering applications.

#### **COURSE OUTCOMES**

Upon completion of this course, the students will be able to

- Apply the basics of free electron theory for classification of materials
- Identify the types of semiconductors and its carrier concentration using Hall effect
- Make use of magnetic properties of materials to study B H Curve
- Experiment with the characteristics of laser and Optical fibers
- Illustrate the properties of low dimensional materials and its fabrication methods

## UNIT I ELECTRONIC THEORY OF SOLIDS

Classical free electron theory, Expression for electrical conductivity – Thermal conductivity, expression - Quantum free electron theory - Fermi- Dirac distribution function - Density of states in metals and energy band diagrams, Energy bands in solids, Direct and indirect band gaps, types of electronic materials: metals, semiconductors, and insulators, Occupation probability, Fermi level, Effect of temperature on Fermi level.

#### **UNIT II SEMICONDUCTORS**

Properties of semiconductor, Types: Intrinsic and extrinsic semiconductors – Intrinsic carrier concentration, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier transport: diffusion and drift - Hall Effect – Determination of Hall coefficient – Applications

## UNIT III MAGNETIC AND DIELECTRIC MATERIALS

Magnetic moment, magnetic dipoles - magnetic permeability and susceptibility, types of magnetic materials - Ferromagnetism, Domain Theory, Hysteresis on the basis of domains, Energy product,

#### 2023-2024

Semester I

5H-4C

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hysteresis loss, soft and Hard magnetic materials - Dielectric materials: Polarization, Types - dielectric loss, internal field, Clausius - Mosotti relation, dielectric breakdown.

## UNIT IV LASER AND FIBER OPTICS

LASER: Introduction - characteristics - Einstein's co-efficient derivation Principle of laser actionpopulation inversion- pumping methods -Types of lasers - Nd: YAG, CO<sub>2</sub> - Applications of LASER in industry and medicine.

Fiber optics - principle- modes of propagation of light in optical fibers - numerical aperture and acceptance angle - types of optical fibers (Material, refractive index and mode) - fiber optical communication system (block diagram).

## **UNIT V NANOMATERIALS**

Density of states in 2D, 1D and 0D (qualitatively), Practical examples of low-dimensional systems such as quantum wells, wires, and dots – Nanostructures: Fabrication technique (Chemical vapour deposition, Physical laser deposition), Properties and its applications – Carbon nanotubes: Properties and applications.

#### Total: 45

9

## TEXT BOOKS

- 1. Bhattacharya D.K. & Poonam T., Engineering Physics, Oxford University Press, (2015).
- 2. B.K. Pandey, S. Chaturvedi, Engineering Physics, Cengage Learning India Pvt. Ltd. 2nd Edition, (2022).
- 3. S.M. Sze, Kwok K. Ng, Physics of Semiconductor Devices, Wiley Publishers, (2006).
- 4. William T Silfvast, Laser Fundamentals, Cambridge Univ Press. 2012.

## **REFERENCES:**

- 1. Halliday. Resnick R. & amp; Walker. J, Principles of Physics, Wiley, 2015.
- 2. Charles Kittel, Kittel's, Introduction to Solid State Physics, Wiley India Edition, 2019.
- 3. Donald A. Neamen, Semiconductor Physics and Devices, McGraw Hill Education private limited; 4 edition, (2021).
- 4. LeszekMalkinski, Advanced Magnetic Materials, Published by InTech, (2012).
- 5. Michael Shur, Physics of Semiconductor Devices, Published by Pearson Education; First edition, (2019).
- 6. Kulkarni, Sulabha K, Nanotechnology: Principles and Practices, Springer International Publishing, (2015).
- 7. R P Khare, Fiber Optics and Optoelectronics, Oxford, 2012

## WEB LINKS

- 1. www.nptel.ac.in/courses/115102025/
- 2. www.nptel.ac.in/courses/108/108/108108122/
- 3. www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-012-microelectronic-devices-and-circuits-fall-2009/lecture-notes/MIT6\_012F09\_lec01.pdf

## (ii) LABORATORY

## **COURSE OBJECTIVE:**

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To prepare for the lab experiment and perform individually a wide spectrum of experiments.
- To present experimental data in various appropriate forms like tabulation, and plots.
- To analyze, Interpret and summarize experimental results.
- To communicate clearly understanding of various experimental principles, instruments/setup, and procedure.

## **COURSE OUTCOME:**

- Apply the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- Model the lab experiment and perform individually a wide spectrum of experiments.
- Illustrate the experimental data in various appropriate forms like tabulation, and plots.
- Examine the experimental results using the tabulated values and plotted graphs.
- Demonstrate the various experimental principles, instruments/setup, and procedure.

## LIST OF EXPERIMENTS – PHYSICS (Any 7 Experiments)

- 1. Determination of Band gap of a semiconductor.
- 2. Characteristics of photo diode.
- 3. Determination of Hall Coefficient and carrier type for semi-conducting Materials.
- 4. Carey Foster Bridge Determination of specific resistance of a given coil of wire
- 5. Determination of magnetic materials using B-H Curve.
- 6. Determination of resistivity of four probe method.
- 7. Laser- Determination of the wave length of the laser using grating,
- 8. Optical Fiber Determination of Numerical Apearture and Acceptance angle of the optical fiber
- 9. Viscosity of Liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow.
- 10. Air wedge Determination of thickness of a thin sheet/wire.

## CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	2	2	-	1	1	-
CO2	3	2	-	-	-	-	-	-	2	2	-	1	1	-
CO3	3	2	-	-	-	-	-	-	2	2	-	1	1	-
CO4	3	3	2	-	-	1	-	-	2	2	-	1	1	-
CO5	2	1	-	-	-	-	-	-	-	1	-	1	1	-
Average	2.8	2	2	-	-	1	-	-	2	1.8	-	1	1	-
1 - Low	, 2 - N	lediu	m, 3 -	High,	, <b>'-' - I</b>	No Co	rrelat	tion						

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Semester I

#### **23BEEC142 BASIC ELECTRICAL & ELECTRONICS ENGINEERING 5H-4C** (THEORY & LABORATORY)

Instruction Hours/week: L:3 T:0 P:2

Marks: Internal: 40 External:60 Total:100 EndSemesterExam: 3Hours

## (i) THEORY

## **COURSE OBJECTIVES**

- To impart the basic knowledge about the Electric circuits.
- To understand the concept of Electrical Machines and Transformers. •
- To understand the working of Semiconductor devices and Digital Circuits.
- To impart the basic knowledge of Measuring Instruments and Electrical Installation.
- Know the fundamentals of Electrical Engineering and Practical.

## **COURSE OUTCOMES**

At the end of this course, students will be able to

- Apply basic laws and theorems for a given DC circuit.
- Solve a given single phase and three phase circuits.
- Illustrate the basic principles, construction and working of AC, DC motor and transformer.
- Outline the basics of semiconductor devices and digital circuits.
- Illustrate the operation of measuring instruments, components of electrical installation and types of batteries.

## **UNIT I - DC Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin's and Norton Theorems.

## **UNIT II - AC Circuits**

Representation of sinusoidal waveforms, peak and rms values, Phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

## **UNIT III - Electrical Machines and Transformer**

Construction and working of a three-phase and Single-phase induction motor. Construction, working and speed control of DC motor. Magnetic materials, BH characteristics, Construction and working principle of ideal and practical transformer.

## **UNIT IV- Semiconductor Devices and Digital Electronics**

Bipolar Junction Transistor - Characteristics. Introduction to operational Amplifier -Model-

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Applications. Number systems – binary codes - logic gates - Boolean algebra, laws & theorems.

## **UNIT V- Measuring Instruments and Electrical Installation**

Principle, construction, and operation of moving coil and moving iron meters-Measurement of Power. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, RCCB, MCCB. Earthing. Types of Batteries and its application in Electric Vehicle, Important Characteristics for Batteries. Elementary calculations for energy consumption and battery backup.

## TEXT BOOKS

- 1. S.K.Bhattacharya, "Basic Electrical Engineering", Pearson, 2019.
- 2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
- 3. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010
- 4. VN Mittle and Arvind Mittal, (2006), Basic Electrical Engineering, McGraw Hill.
- 5. A.Sudhaka and Shyammohan S Palli, (2013), Circuits and Networks, McGraw Hill.
- 6. R.Muthusubramanian and S.Salivahanan, (2014), Basic Electrical and Electronics Engineering, McGraw Hill.

## WEB LINKS:

- 1. www.nptel.ac.in.
- 2. encyclopedia-magnetica.com/doku.php/co energy.
- 3. https://en.wikibooks.org/wiki/electronics/measuring instruments.

## (ii) LABORATORY

## LIST OF EXPERIMENTS

- 1. Experimental verification of electrical circuit problems using Ohms law
- 2. Experimental verification of electrical circuit problems using Kirchhoff's Voltage law.
- 3. Experimental verification of electrical circuit problems using Kirchhoff's Current law.
- 4. Measurement of electrical quantities voltage, current, power & power factor in R load.
- 5. Measurement of energy using single phase energy meter.
- 6. Speed control of DC Shunt Motor.
- 7. Verification of truth table of Logic Gates.

## **TOTAL: 30**

## CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	PO10	PO11	<b>PO12</b>	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	1	1	2
CO2	3	2	-	-	-	-	-	-	2	2	-	1	1	2
CO3	2	1	-	-	-	-	-	-	2	2	-	2	1	2
CO4	2	1	-	-	-	-	-	-	2	2	-	2	1	2
CO5	2	1	-	-	-	-	-	-	-	1	-	2	1	2
Average	2.2	1.4	1	-	-	-	-	-	2	1.8	-	1.6	1	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

**TOTAL: 45** 

23BECC143

## PROGRAMMING IN C (THEORY & LABORATORY)

Instruction Hours/week: L:4 T:0 P:2

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

(i) THEORY

## **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To interpret problem solving using C.
- To apply the concept of arrays and strings.
- To identify the functions of C Language.
- To apply the concept of pointers.
- To develop C Programs using user defined function and file handling.

## **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Apply problem solving techniques for a given problem
- Solve problems using arrays and strings.
- Build modular applications in C using functions.
- Categorize dynamic memory management operators with pointers.
- Examine sequential and random-access file processing.

## UNIT I INTRODUCTION

An overview of computers and programming - Understanding computer systems - Programming logic - Steps in program development – Algorithm - Using pseudocode and flowchart – types of programming languages – Compiler – Interpreter – Linker - Introduction to C – Structure of C program - Identifiers and Keywords - Data types - Constants and variables - Type conversion – Operators - Expressions. Formatted and Unformatted Input/Output functions - Control structures

## UNIT II ARRAYS AND STRINGS

Arrays in C - Declaring and initializing arrays in C - Defining and processing 1D and 2D arrays - Inserting and deleting elements of an array - Strings - Defining and initializing strings - Processing of string - Character arithmetic - String manipulation functions and library functions of string.

## **UNIT III FUNCTIONS**

Functions - Types of Functions - Function prototypes - Function definition - Function call including passing arguments by value and passing arguments by reference - Passing arrays to functions - Math library functions - Recursive functions - Scope rules (local and global scope) - Storage classes in C.

6H-5C

9

## 9

## UNIT IV POINTERS

Pointers - Pointer declaration and initialization - Types of pointers - Pointer expressions and arithmetic - Operations on pointers - Passing pointer to a function - Pointer and one-dimensional array - Pointers and strings – Command line arguments - Dynamic memory management functions.

## UNIT V USER DEFINED TYPES AND FILE HANDLING

User defined types - Enumerator – Typedef - Structures - Declaration of a structure - Accessing structures - Array of Structures - Structures and pointers - Nested structures – Bit fields – Unions - Declaration of a union – Accessing unions – Union vs Structure - File Input/Output – Preprocessor directives.

## TOTAL :45

## **TEXT BOOKS:**

- 1. Programming In C By Ashok N. Kamthane,3rd edition, Pearson, 2015.
- 2. Programming In C, Reema Thareja, Oxford University Press, Second Edition, 2016.

## **REFERENCES BOOKS:**

- 1. "C How To Program" By Paul Deitel And Harvey Deitel, 8th edition, Prentice Hall, 2015.
- 2. "Programming In Ansi C" By E. Balagurusamy, 8th edition, Mcgraw Hill Education, 2019.
- 3. "Let Us C", by Yashwant Kanetkar, 17th Edition, Bpb Publications, 2020.
- 4. "C: The complete reference", Herbert Schildt, 4<sup>th</sup> edition, Mcgraw Hill Education, 2017.

## **WEBSITES:**

- 1. www.hackerrank.com
- 2. www.codechef.com
- 3. www.learn-c.org
- 4. www.udemy.com
- 5. www.hackearth.com

## (ii) LABORATORY

## LIST OF EXPERIMENTS:

- 1. Develop a C Program to find the roots of quadratic equation for non-zero co-efficient using if-else ladder construct.
- 2. Develop Programs using simple control statements such as if else, while, do while. Example Extracting the digits of an integer, reversing digits, finding sum of digits
- 3. Develop a C Program to implement a simple calculator to perform addition, subtraction, multiplication and division operations using switch construct. Display appropriate messages for invalid operator and divide by zero error.
- 4. Develop C Program to generate Fibonacci sequence, calculation of factorials, printing various patterns and generate the Prime numbers between the ranges m & n using for loop.

- 5. Develop a C program to read n elements into an integer array, Insert and Delete element from the array. Print the input array and the resultant array with suitable messages.
- 6. Develop a C program to read two matrices A (m x n) and B (p x q) and compute the product of the two matrices. Print both the input matrices and resultant matrix with suitable headings and output should be in matrix format only. Program must check the compatibility of orders of the matrices for multiplication. Report appropriate message in case of incompatibility.
- 7. Develop a C function Program to sort the given names in Ascending Order.
- 8. Develop a C program to count the vowels & consonants in a given string.
- 9. Develop a C Program to find the GCD of two integers using Euclid's algorithm
- Develop a recursive C function to find the factorial of a number, n!, defined by fact(n)=1, if n=0. Otherwise, fact(n)=n\*fact(n-1). Using this function, develop a C program to compute the Binomial coefficient nCr. Perform input validation as well.
- 11. Develop a C program to find the smallest and largest elements in an array using pointers and then swap these elements and display the resultant array.
- 12. Develop a C program to find the sum of all the elements of an integer array using pointers.
- 13. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using structures and pointers

## **TOTAL : 30**

COs	PO1	PO2	PO3	<b>PO4</b>	<b>PO5</b>	PO6	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	2	2	-
CO2	3	2	1	-	-	-	-	-	2	2	-	2	2	-
CO3	3	2	1	-	-	-	-	-	2	2	-	2	2	-
CO4	3	3	2	1	-	-	-	-	2	2	-	2	2	-
CO5	3	3	2	1	-	-	-	-	2	2	-	2	2	-
Average	3	2.4	1.4	1	-	-	-	-	2	2	-	2	2	-

CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Instruction Hours/week: L:1 T:0 P:2

#### **COURSE OBJECTIVES:**

The goal of this course is for the students to

- Illustrate design thinking concepts and principles
- Utilize design thinking methods in every stage of the problem
- Identify the different phases of design thinking
- Plan for various product and service communication in design thinking
- Interpret the use of tools for the design process

#### **COURSE OUTCOMES:**

Upon completion of the course, students will be able to

- Explain the design thinking process, tools and theories.
- Identify the types of users and the requirements of customers.
- Explore the concepts of Prototyping and its testing.
- Analyze design thinking strategies in product and service design.
- Customize existing products by utilizing design thinking strategies.

#### **UNIT 1 INTRODUCTION**

Understanding Design thinking and tools - Human-Centric Design Process - Design Thinking Process- DT Activity with case studies.

#### **UNIT II EMPATHISE WITH USERS**

Five Whys - Needs of user - Types of user research -Customer Journey Mapping - Observational Research

#### **UNIT III PROTOTYPING**

Ideas to presentable concepts - Scenario-based Prototyping - Testing prototypes - Usability and ergonomic testing - Rapid prototyping.

#### UNIT IV PRODUCT AND SERVICE DESIGN

Product Design - Interaction Design - Service Design - Communication Design - Transportation Design.

#### **UNIT V DESIGN AND INNOVATION**

DT For strategic innovations - Extreme Competition - Experience design - Standardization -Humanization - Creative Culture.

**TOTAL: 30** 

#### **23BECC111**

## **DESIGN THINKING**

Marks: Internal:100 Total:100 End Semester Exam:3 Hours

2023-2024 Semester I

**3H - 2C** 

6

6

6

6

#### **TEXT BOOKS:**

- 1. Bala Ramadurai, "Karmic Design Thinking", 2020.
- 2. Christian Mueller-Roterberg, "Handbook of Design thinking", Amazon Digital Services LLC KDP Print US, 2018.
- 3. Tim Brown, "Change by Design", Harper Business Publisher, 2019
- 4. Hasso Plattner, Christoph Meinel and Larry Leifer, "Design Thinking: Understand –Improve Apply", Springer, 2011
- 5. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	-	-	-	1	1	1	-	3	-	2
CO2	3	2	1	-	-	-	-	2	1	1	-	3	-	2
CO3	3	2	2	1	-	2	1	2	2	2	-	3	-	2
CO4	3	3	2	1	-	2	1	2	2	2	-	3	-	2
CO5	3	3	2	1	-	2	1	2	2	2	-	3	-	2
Average	2.8	2.2	1.6	1	-	2	1	1.8	1.6	1.6	-	3	-	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

2023-2024 Semester I

23BEMC151	SPORTS AND YOGA	1H-0C

Instruction Hours/week: L: 1 T: 0 P: 0

Marks: Internal: 100 External: 0 Total:100

#### **COURSE OBJECTIVES:**

The goal of this course, is for the students:

- To have knowledge of Physical fitness and exercise management to lead better quality life
- To enable to officiate, supervise various sports events and organize sports events
- To acquire the knowledge of Physical Education, Sports and Yoga and understand the purpose and its development
- To gain knowledge to plan, organize and execute sports events

## **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Practice physical activities and yoga for strength, flexibility and relaxation.
- Use techniques for increasing concentration and decreasing anxiety for stronger academic performance.
- Perform yoga exercises in various combination and forms.
- Improve personal fitness through participation in sports and yoga activities.
- Follow sound nutritional practices for maintaining good health and physical performance.

#### Unit – I **Introduction to Physical fitness**

Explain importance of physical education - Describe importance of Physical Fitness & Wellness -Explain the components of physical fitness - Demonstrate healthy life style - Prevent health threats by changing life style.

## Unit - II Fundamentals of Anatomy & Physiology in sports & yoga

Explain importance of anatomy and physiology - Describe effects of exercise in various body systems - Describe concept of correct posture - Explain corrective measures for posture deformities.

## Unit-III Yoga & Pranayama

Explain importance of yoga - Perform various pranayama for increasing concentration - Use meditation and other relaxation techniques for improving concentration.

## **TEXT BOOKS:**

- 1. Ajmer Singh, Modern Trends and Physical Education class 11 & class 12, Kalyani Publication, New Delhi ISBN: 9789327264319.
- 2. B.K.S. Iyengar, Light on Yoga, Thomson's Publication, New Delhi ISBN: 8172235011
- 3. V.K.Sharma, Health and Physical Education, NCERT Books; Class11,12 Saraswati House Publication, New Delhi
- 4. Acharya Yatendra, Yoga and Stress Management, Fingerprint Publishing ISBN: 938905303X
- 5. Swami Vivekanand, Patanjali Yoga Sutras, Fingerprint Publishing ISBN 9389567351.

Karpagam Academy of Higher Education (Deemed to be University), Coimbatore – 641 021 Page 15

## **TOTAL: 15**

- 6. Ramdev, Pranayam Rahasya, Patanjali-Divya Prakashan, HaridwarISBN: 9788189235017
- 7. Ramdev, Yoga its Philosophy & Practice, Divya Prakashan, Haridwar.

#### 2023-202 பருவம் -I

## 23BTMC152 தமிழர் மரபும் பண்பாடும் 1 H – 0 C

கற்பித்தல் நேரம்/வாரம்: L:1 T:0 P:0 **மதிப்பெண்: இடைத்தேர்வு: 100 மொத்தம்:100** 

## பாடத்திட்ட பயன் விளைவு:

- வரலாற்றிற்கு முற்பட்ட தமிழகத்தை மாணவர்களுக்கு அறிமுகப்படுத்துதல்
- பழந்தமிழர் பண்பாடு சார்ந்த வாழ்க்கை முறையை மாணவர்கள் அறிய ஊக்குவித்தல்
- தமிழ் மொழியின் பழைமையும், திராவிட மொழிகளில் தமிழ்மொழியின் தனிச்சிறப்பையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.
- தமிழர்களின் வாழ்வியல், தமிழர்கலைகள், ஆற்றங்கரைப்பண்பாடுகள் குறித்து மாணவர்கள் அறியச்செய்தல்.
- இந்தியக்குடியுரிமைப்பணி முதலான போட்டித்தேர்வுகளில் விருப்பப்பாடமாக இடம்பெறுகின்ற தமிழ்நாகரிகமும் பண்பாடும் குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்

## பாடத்திட்டப் பொதுநோக்கம்:

- இந்தியக்குடியுரிமைப்பணி முதலான போட்டித்தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத்தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின்வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்'; 'இணையதமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.
- 4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல்.
- 5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப்பேணுவதற்குக்கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மைவளர்ச்சி. மொழிபெயர்ப்புத்துறை சார்ந்த வேலைவாய்புத்திறன் பெற்றிருத்தல்.

## அலகு:1 தமிழர் மரபு

மரபு-விளக்கம்-சங்ககால தமிழர் மரபு – திணைப்பகுப்பும் தமிழர் மரபும்-உலகப்பொதுமை – அகத்திணை மரபு – புறத்திணை மரபு-இடைக்காலத்தமிழர் மரபு – பிற்கால மரபும் மாற்றமும் – தற்கால தமிழர்மரபு - வளர்ச்சி.

## அலகு: 2 தமிழர் பண்பாடு

பண்பாடு – விளக்கம் – பழந்தமிழர் பண்பாடு – இயற்கை சார்ந்த வாழ்வியல் – தமிழர் சமயம் – அரசியல் நிலை–சமூகப் பழக்கவழக்கங்கள் – நம்பிக்கைகள் – வாழ்வியல் அறங்கள் – வணிகம் போன்றவை.

## அலகு:3 தமிழர் கலைகள்

தமிழகத்தில் கலைகளின் வளர்ச்சி – சிற்பக்கலை வளர்ச்சி –கோயில் கலை – கற்கோவில்கள் - ஓவியக்கலை – அழகுக்கலைகள் - கூத்துக்கலை – மருத்துவக்கலை–நாடகக்கலை– இசைக்கலை போன்றவை.

## அலகு: 4 தமிழர் சமயம்

பழந்தமிழரின் சமயம் – சங்ககால சமயம் – தொல்காப்பியத்தில் சமயம் – சைவ சமயம் – வைணவம் – தமிழ்ப் பண்பாட்டில் பௌத்தம் – தமிழ்ப் பண்பாட்டில் சமணத்தின் தாக்கம்–தமிழ்ப் பண்பாட்டில் இசுலாம் மற்றும் கிறித்துவ சமயத்தின் தாக்கம்-தமிழர் பண்பாட்டில் விழாக்கள்-கோயில்களும் விழாக்களும்- சமூக ஒருங்கிணைப்பில் விழாக்களின் பங்கு-இலக்கியத்தில் விழாக்கள் பற்றிய குறிப்புகள்-இடைக்கால சங்க செய்திகள் – விழாக்கள் பற்றிய இலக்கியங்களில் விழாக்களின் சமூகப்பங்களிப்பு – தற்காலத்தில் தமிழர் விழாக்கள் - விளையாட்டும் விழாக்களும்.

## அலகு: 5 இலக்கியங்களில் தமிழர் பண்பாட்டுப் பதிவுகள்

சங்க இலக்கியமும் வாழ்வியலும்-திருக்குறளில் வாழ்வியல் நெறிகள் – இரட்டைக் காப்பியங்களும் வாழ்வியலும் – சிற்றிலக்கியங்களில் வாழ்வியல் பதிவுகள்-இக்கால இலக்கியமும் வாழ்வியலும்.

## பார்வை நூல்கள்:

- 1. தமிழ் இலக்கிய வரலாறு தமிழண்ணல், மீனாட்சி புத்தக நிலையம்-மதுரை-இரண்டாம் பதிப்பு-ஜூலை – 2000.
- 2. தமிழர் நாகரிகமும் பண்பாடும், அ. தட்சிணாமூர்த்தி, ஐந்திணைப் பதிப்பகம், சென்னை, திருத்திய பதிப்பு – 2022.

- தமிழர் வரலாறும் பண்பாடும், நா. வானமாமலை, நியூசெஞ்சுரி புக் ஹவுஸ், சென்னை, ஆறாம்பதிப்பு - 2007.
- 4. தமிழக வரலாறு மக்களும் பண்பாடும், கே.கே. பிள்ளை, உலகத் தமிழராய்ச்சி நிறுவனம், சென்னை.

2023-2024 Semester II

#### **23BECC201A**

#### **GRAPH THEORY**

**4H-4C** 

## Instruction Hours/week: L:3 T:1 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students

- To provide the basic concepts of graphs.
- To impart the knowledge of trees and its properties via various algorithms.
- To afford the adequate knowledge on matrix representation of graphs.
- To inculcate the concept of coloring and dominating sets.
- To understand the concepts and significance of lattices which are widely used in engineering fields.

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Infer the basic terminologies of directed and undirected graphs.
- Illustrate the properties of trees, connectivity, fundamentals of circuits, cutset through algorithms.
- Apply matrix representation of graphs to explore spectra and energy of graphs.
- Interpret the coloring and domination of a given graph.
- Explain Lattice theory and its operations on discrete structural areas of computing.

#### **UNIT I-GRAPHS**

Graphs: Directed and undirected graphs – Konigsberg bridge problem – Handshaking Theorem– Walk, Trail, Path, Circuit, Cycle, sub graphs, induced and spanning subgraphs, connected graphs, complement of a graph – Euler, Hamiltonian graphs - Isomorphism of graphs.

## **UNIT II-TREES**

Trees: Properties of trees – Distance and centers in tree – Rooted and binary tree Spanning trees – Connectivity and separability – Fundamental Circuits and Cut sets – Algorithm on spanning trees: Kruskal's and Prim's Algorithm – Dijkstra's shortest path algorithm.

## UNIT III-MATRIX REPRESENTATION OF GRAPHS

Matrix Representation of Graphs: Adjacency matrix, Incidence matrix, Circuit matrix, Fundamental circuit matrix, Laplacian matrix, rank of these matrices and its properties – Spectra and Energy of Graphs.

# UNIT IV-COLORING, COVERING AND PARTITIONING 12 Coloring, Covering and Partitioning: Chromatic number – Chromatic Partitioning: Dominating set –

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Minimal Dominating set – Domination number- Chromatic Polynomial– Matching – Four color theorem (Statement only).

## **UNIT V-LATTICE THEORY**

Lattice theory: Partial ordering – Posets – Lattices as posets – Properties of lattices – Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices.

## TOTAL: 60

## **SUGGESTED READINGS:**

- 1. Narsingh Deo., "Graph Theory with applications to Engineering and Computer Science", Dove Publications Inc, First Edition, 2016.
- 2. Karin R Saoub., "Graph Theory An Introduction to Proofs, Algorithms and Applications", CRC Press, First Edition, 2021.
- 3. Kenneth H. Rosen., "Discrete Mathematics and Applications", Mcgraw Hill, 7<sup>th</sup>Edition, 2012.
- 4. Clark J and Holton D.A., "A First Look at Graph Theory", Allied Publishers, 1995.
- 5. Grimaldi R.P., "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley, 2016.
- 6. J. A. Bondy and U. S. R. Murty., "Graph Theory with Applications", Elsevier Science Publishing, 1976.
- 7. R. L. Goodstein., "Boolean Algebra", Dover Publications, 2007.

## **WEBSITES:**

- 1. www.math.fau.edu/Locke/Courses/GraphTheory/Spring2019
- 2. www.onlinecourses.nptel.ac.in/noc22\_ma10/preview
- 3. www.nptel.ac.in/courses/106108054
- 4. www.onlinecourses.nptel.ac.in/noc21\_cs48/preview
- 5. www.cectl.ac.in/images/pdf\_docs/studymaterial/cse/s3/dcs4.pdf

COs	<b>PO1</b>	PO2	PO3	PO4	<b>PO5</b>	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO2	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO3	3	2	1	-	-	-	-	-	-	-	-	1	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO5	2	1	-	-	-	-	-	-	-	-	-	1	-	1
Average	2.2	1.2	1	-	-	-	-	-	-		-	1	-	1

## CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

2023-2024 Semester II

#### 23BECC201B COMPUTATIONAL METHODS FOR ENGINEERS 4H-4C

Instruction Hours/week: L:3 T:1 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for students :

- To provide the knowledge of Vector differentiation and Integration.
- To inculcate the concepts of theories on Numbers.
- To introduce the concepts of Graphs.
- To introduce diversified methods of trees namely the algorithm on spanning trees.
- To afford the adequate knowledge of Linear Programming Problems.

#### **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Make use of vector calculus for finding area and volume.
- Interpret the concepts of divisibility, prime number, congruence and number theorems.
- Explain the terminology of basic graphs and its matrix representation.
- Illustrate the properties of trees, connectivity, fundamentals of circuits, cut set through algorithms.
- Solve linear programming models by Graphical method, Simplex method and Dual simplex method.

#### **UNIT I VECTOR CALCULUS**

Vector differential operator – Gradient, divergence and curl – Identities (Statement only) – Directional derivatives – Irrotational and solenoidal vector fields –Conservative vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) – Simple applications involving square, rectangle, cubes and rectangular parallelepipeds.

#### UNIT II NUMBER THEORY

Divisibility – Fundamental Properties – Euclidean algorithm – Euclid's lemma – Fundamental theorem of arithmetic – Congruence – Fermat's Little theorem – The Fermat-Euler theorem.

## **UNIT III GRAPH THEORY**

Incidence and degree – Finite and Infinite graphs – Sub graphs – Isomorphism of graphs – Walks, Paths and Circuits – Eulerian and Hamiltonian graphs – Planar graph – Matrix representation of graphs – Incidence and Adjacency matrices.

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# 4H-4C

## UNIT IV TREES

Trees: Properties of trees – Distance and centers in tree – Rooted and binary tree – Spanning trees – Properties of trees – Algorithm on spanning trees – Kruskal's algorithm.

## UNIT V LINEAR PROGRAMMING PROBLEM

Formulation of Linear Programming Problem– Advantages and disadvantages of LPP – Algebraic solution of a LPP - Graphical method - The Simplex method - Principle of duality - Dual and primal problems - Dual Simplex method.

## **TEXT BOOKS:**

 Grimaldi R.P, Discrete and Combinatorial Mathematics: An Applied Introduction, Addison Wesley, 2016

## **REFERENCE BOOKS:**

- 1. Karin R Saoub, Graph Theory An Introduction to Proofs, Algorithms and Applications CRC Press 2021
- 2. Ramana B V, Higher Engineering Mathematics, McGraw Hill Education, Twenty Ninth, Reprint 2017
- 3. Erwin Kreyszig, Advanced Engineering Mathematics John Wiley and Sons, Tenth Edition 2017

## **WEBSITES:**

- 1. www.nptel.ac.in/courses/111105122
- 2. www.nptel.ac.in/courses/111/101/111101137/
- 3. www.nptel.ac.in/courses/111/106/111106050/
- 4. www.nptel.ac.in/courses/111/106/111106050/
- 5. www.nptel.ac.in/courses/112106134

## CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-		-	-	1	-	1
CO2	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO3	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO5	3	2	1	-	-	-	-	-	-	-	-	1	-	1
Average	2.4	1.4	1	-	-	-	-	-	-	-	-	1	-	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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Total 45+15

2023-2024

## 23BECC201C TRANSFORMS AND ITS APPLICATIONS

## Instruction Hours/week: L:3 T:1 P:0

## Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hours

## **COURSE OBJECTIVES:**

The goal of this course is for students :

- To make the students to understand the concept of periodic function and represent them in Fourier series.
- To make the students to understand the applications of partial differential equations.
- To acquaint the students with the concepts of Fourier transform techniques.
- To impart knowledge in Laplace, transform techniques and its applications.
- To provide knowledge about solving ordinary differential equations using the Inverse Laplace transform.

## **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Infer the ideas of Fourier Series in the interval (0,21), (-1,1), (0,1) and harmonic analysis.
- Apply the physical significance of Fourier series techniques in solving heat equations and wave equations.
- Solve Fourier Transform by applying the concept of convolution theorem and Parseval's identity.
- Illustrate Laplace transformation techniques to convert time-domain systems into frequencydomain system.
- Make use of partial fractions to find inverse Laplace transforms and in convolution theorem.

## **UNIT I FOURIER SERIES**

Dirichlet's conditions – General Fourier series in the interval (0,2l) & (-l,l) – Half range sine series – Half range cosine series –Harmonic analysis.

## UNIT II: APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Fourier series solution for one dimensional wave equation – Fourier series solution for one dimensional heat equation with zero end conditions.

## **UNIT III FOURIER TRANSFORMS**

Fourier transform pair – Complex form of Fourier transform- Fourier sine and cosine transforms – Convolution theorem – Parseval's identity of Fourier transform.

## UNIT IV LAPLACE TRANSFORM

Transforms of standard functions – Properties of Laplace transform – Transforms of derivatives and integrals –Initial and final value theorem – Transforms of periodic functions.

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## UNIT V INVERSE LAPLACE TRANSFORM

Inverse Laplace transforms of standard functions – Inverse Laplace transform using second shifting theorem – Method of partial fractions– Solution of ordinary differential equations with constant coefficients using Laplace transforms

## Total: 45+15

## **TEXT BOOKS:**

- 1. John W. Miles Integral Transforms in Applied Mathematics Cambridge University Press 2008
- 2. Erwin Kreyszig Advanced Engineering Mathematics John Wiley and Sons, Tenth Edition 2017

## **REFERENCE BOOKS:**

- 1. Eric W Hansen Fourier Transforms: Principles and Applications John Wiley 2014
- 2. N.W. McLachlan Laplace Transforms and Their Applications to Differential Equations Dover Publications Inc. 2014
- 3. Richard Haberman Applied Partial Differential Equations with Fourier Series and Boundary Value Problems Pearson, Fifth edition 2021

## Web URL:

- 1. www.nptel.ac.in/courses/111106111
- 2. www.nptel.ac.in/courses/111107111
- 3. www.nptel.ac.in/courses/111102129
- 4. www.nptel.ac.in/courses/111106139
- 5. www.archive.nptel.ac.in/courses/111/105/111105123/

## CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1	-	1
CO3	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO5	3	2	1	-	-	-	-	-	-	-	-	1	-	1
Average	2.4	1.4	1	-	-	-	-	-	-	-	-	1	-	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### 23BEEC202

#### FUNDAMENTALS OF WEB DESIGN

3H-3C

Instruction Hours/week: L:3 T:0 P:0

## Marks: Internal:40 External:60 Total:100

#### End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To understand the principles of web design.
- To gain knowledge of HTML and its elements.
- To infer the concepts of CSS and various layouts for styling a web page.
- To develop designing interactive web pages using JavaScript.
- To learn about responsive web design using Bootstrap.

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Develop interactive front-end web user interfaces using responsive web design principles
- Experiment with HTML tags and its elements for designing static pages.
- Apply the concepts of CSS and layouts for styling web pages.
- Categorize dynamic web pages using JavaScript.
- Analyze responsive web pages by using Bootstrap.

## UNIT I - THE ESSENTIALS OF WEB DESIGN

Introduction to web design – the internet versus the web – web browsers – the design process - defining good design - web page anatomy - grid theory – balance – unity – emphasis – layouts – web trends - responsive design - screen resolutions - responsive web design principles - responsive frameworks – accessibility – site performance - modern web development tools.

## **UNIT II - INTRODUCTION TO HTML**

 $Introduction \ to \ HTML \ - \ document \ structure \ - \ paragraphs \ - \ headings \ - \ lists \ - \ div \ - \ span \ - \ improving \ accessibility \ with \ aria \ - \ hyperlinks \ - \ adding \ images \ - \ table \ markup \ - \ forms \ - \ embedded \ media.$ 

## **UNIT III - CASCADING STYLE SHEETS**

 $Introduction \ to \ CSS - units \ of \ measurement - formatting \ text \ with \ css3 - colours \ and \ backgrounds - padding - borders - margins - floating \ and \ positioning - CSS \ layout \ with \ Flexbox \ and \ Grid.$ 

## **UNIT IV - DYNAMIC WEB PAGES USING JAVASCRIPT**

Introduction to JavaScript – adding JavaScript to a page – anatomy of a script – the browser object – events – DOM – polyfills – JavaScript libraries.

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## UNIT V - RESPONSIVE WEB DESIGN USING BOOTSTRAP

Introduction to Bootstrap – setting up bootstrap – structuring web page using bootstrap – grid system – typography – tables – forms – images – effects – icons - components.

## **TEXT BOOKS:**

- 1. "Learning Web Design", Jennifer Niederst Robbins, O'Reilly Media, Inc, Fifth Edition, 2018.
- 2. "Introducing Bootstrap 4", Jorg Krause, Apress Media LLC, Second Edition, 2020.

## **REFERENCE BOOKS:**

- 1. "The Principles of Beautiful Web Design", Jason Beaird, James George and Alex Walker, Site Point Pty. Ltd., Fourth Edition, 2020.
- 2. "Responsive Web Design with HTML5 and CSS", Ben Frain, Packt Publishing, Third Edition, 2020.
- 3. "Mastering Bootstrap 4", Benjamin Jakobus and Jason Marah, Packt Publishing, Second Edition, 2016.

## **WEBSITES:**

- 1. www.w3schools.com/html/
- 2. www.w3schools.com/css/
- 3. www.udacity.com/course/responsive-web-design-fundamentals--ud893
- 4. www.javascript.info/
- 5. www.getbootstrap.com/docs/4.6/getting-started/introduction/

## CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	1	-	-	-	2	2	-	2	-	1
CO2	3	2	1	-	1	-	-	-	2	2	-	2	-	1
CO3	3	2	1	-	1	-	-	-	2	2	-	2	-	1
CO4	3	3	2	1	1	-	-	-	2	2	-	2	-	1
CO5	3	3	2	1	1	-	-	-	2	2	-	2	-	1
Average	3	2.4	1.4	1	1	-	-	-	2	2	-	2	-	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

## TOTAL: 45

## 23BEEC203

Instruction Hours/week: L: 3 T:1 P:0

Marks: Internal: 40External:60 Total:100

End Semester Exam: 3Hours

## **COURSE OBJECTIVES:**

The goal of this course for students is

• To introduce various laws for DC circuit analysis and to understand various network theorems for DC circuits.

**CIRCUIT THEORY** 

- To introduce different methods of circuit analysis using Graph theory and Network topology.
- To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
- To study the transient behavior of RL,RC and RLC circuits using initial and final conditions.
- To learn series and parallel resonance circuits and make them aware of various network parameters in two port network.

## **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Apply the basic laws for DC and AC circuits.
- Interpret graph theory in coupled circuits
- Identify the Phasor relationship for RL, RC and RLC circuits
- Apply transients and resonance in RLC circuits
- Interpret two-port network parameters.

## UNIT I DC CIRCUIT ANALYSIS

Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff 's Current Law, Kirchoff's voltage law, The single Node – Pair Circuit, series and Parallel Connected Independent Sources, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis. Linearity and superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer.

## UNIT II GRAPH THEORY IN COUPLED CIRCUITS

Terminologies used in Graph Theory, Cut Sets – Fundamental Cut Sets and f-Cut Set Matrix, Incidence Matrix, drawing a graph from an Incidence matrix, Tie set and Tie-set matrix, Fundamentals of Tie Set/Loops and f-Tie Set Matrix, Analysis of Network using Graph Theory, Duality. Magnetically Coupled Circuits, mutual Inductance, the Linear Transformer, the Ideal Transformer.

## UNIT III SINUSOIDAL STEADY STATE ANALYSIS

Sinusoidal Steady – State analysis, Characteristics of Sinusoids, The Complex Forcing Function, The Phasor, Phasor relationship for RL, RC and RLC, impedance and Admittance, Nodal and Mesh

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#### 2023-2024 Semester II

#### Semester II 4H-4C

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Analysis, Phasor Diagrams, AC Circuit Power Analysis, Instantaneous Power, Average Power, apparent Power and Power Factor, Complex Power.

#### UNIT IV TRANSIENTS AND RESONANCE IN RLC CIRCUITS 12

Basic RL and RC Circuits, The Source-Free RL Circuit, The Source-Free RC Circuit, The Unit-Step Function, Driven RL Circuits, Driven RC Circuits, RLC Circuits, Frequency Response, Parallel Resonance, Series Resonance, Quality Factor.

## **UNIT V TWO PORT NETWORKS**

Introduction, Parameters of two port network - Impedance, Admittance, Hybrid and Transmission Parameter. Relationship between different parameter- Z-Parameter in terms of Y-Parameter, Y -Parameter in terms of Z-Parameter, h- Parameter in terms of Y- Parameter, ABCD- Parameter in terms of Z-parameter. Interconnection of Two Port Network.

## **TOTAL: 60**

## **TEXT BOOKS:**

- 1. HaytJackKemmerly, Steven Durbin, "Engineering Circuit Analysis", McGraw Hill education, 9 th Edition, 2018.
- 2. Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12th Edition, 2014.

## **REFERENCES:**

- 1. Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", Mc Graw-Hill, 2<sup>nd</sup> Edition, 2003.
- 2. D.R.Cunningham, J.A. Stuller, "Basic Circuit Analysis", Jaico Publishing House, 2005.
- 3. David Bell, "Fundamentals of Electric Circuits", Oxford University press, 7<sup>th</sup>Edition, 2009.
- 4. Charles.K.Alexander, Mathew N.O.Sadiku," Fundamentals of Electric Circuits", McGraw Hill, 5 th Edition, 2012.
- 5. John O Mallay, Schaum's Outlines "Basic Circuit Analysis", The Mc Graw Hill companies, 2nd Edition, 2011. C

## CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	1	-	-	2	-
CO2	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO3	3	2	1	-	-	-	-	-	-	1	-	-	2	-
CO4	3	2	1	-	-	-	-	-	-	1	-	-	2	-
CO5	2	1	-	-	-	-	-	-	-	1	-	-	2	-
Average	2.6	1.6	1	-	-	-	-	-	-	1	-	-	2	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

## B.E. Electronics and Communication Engineering

23BEEC204

Instruction Hours/week: L:3 T:0 P:0

## Marks: Internal:40 External:60 Total:100 End Semester Exam:3Hours

## **COURSE OBJECTIVES:**

The goal of this course for students is

- To understand the working of Semiconductor PN junction devices.
- To study the working principle of Bipolar Transistors (BJT).
- To impart knowledge on working of Field Effect Transistor (FET) and MOSFET.

**ELECTRONIC DEVICES AND CIRCUITS** 

- To understand the concept biasing circuits.
- To provide the knowledge about small signal model and BJT.

## **COURSE OUTCOMES:**

At the end of this course , the students will be able to

- Explain the structure of the basic electronic devices.
- Illustrate the concept of FET and MOSFET.
- Classify the biasing circuit for BJT and MOSFET.
- Apply small signal analysis of BJT and FET
- Develop DC power supplies and voltage regulators.

## UNIT I PN DODE AND BJT

PN junction diode –structure, operation and V-I characteristics, diode currents and diode capacitance, – Zener diode, -Shockley diode, Tunnel diode, Varactor diode, point contact diode, step recovery diode, schottkky diode - LED, -BJT-types of configurations-input, output characteristics- Thermal Runaway – stability factor.

## UNIT II FET AND MOSFET

Introduction to FET–operation- Drain and transfer characteristics- drain current -parameters -MOSFET – Types structure-operation-characteristics, UJT, - Structure and characteristics. IGBT.

## UNIT III BIASING CIRCUITS FOR BJT AND MOSFET

DC Load line, AC load line – Quiescent point - Various biasing methods --Fixed base bias – collector to base bias – voltage divider bias – for BJT &FET -Design-Stability-Bias compensation, Thermal stability, DC biasing circuits for FET&MOSFET.

## UNI IV SMALL SIGNAL MODELS FOR BJT AND FEED BACK CIRCUITS

Small signal analysis OF BJT AND FET, low frequency transistor models using H parameters, Estimation of voltage gain, input resistance, output resistance, etc-Feedback topologies: Voltage series,

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**3H-3C** 

current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.

#### UNIT V DC POWER SUPPLIES AND VOLTAGE REGULATORS

Half wave rectifier, Full wave and bridge Rectifier, Ripple factor – Filters –Types – Applications – Voltage regulators – Types – Zener diode as Regulators – Transistor –series – shunt regulators – Switching regulators.

#### TOTAL: 45

9

#### **TEXT BOOKS:**

- 1. David A. Bell," Electronic Devices and Circuits", Prentice Hall of India, 2004.
- 2. Sedra and smith, "Microelectronic Circuits "Oxford University Press, 2004.
- 3. Rashid, "Micro Electronic Circuits" Thomson publications, 1999.
- 4. Floyd, "Electron Devices" Pearson Asia 5th Edition, 2001.
- 5. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.
- 6. Robert L.Boylestad, "Electronic Devices and Circuit theory", 2002.
- 7. Robert B. Northrop, "Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation", CRC Press, 2000

COs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO2	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO3	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO4	3	2	1	-	-	-	-	-	-	1	-	-	2	-
CO5	3	2	1	-	-	-	-	-	-	1	-	-	2	-
Average	2.4	1.4	1	-	-	-	-	-	-	1	-	-	2	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

**B.E Electronics and Communication Engineering** 

2023-2024 Semester II

Marks: Internal:40 External:60 Total:100

**End Semester Exam:3 Hours** 

## 23BECC241A

## DATA STRUCTURES AND ALGORITHMS (THEORY AND LABORATORY)

nester II

## 6H-5C

Instruction Hours/week: L:4 T:0 P:2

## (i) THEORY

#### **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To understand the concepts of ADTs.
- To learn linear data structures lists, stacks, and queues.
- To interpret non-linear data structures trees and graphs.
- To implement sorting, searching and hashing algorithms.
- To apply Tree and Graph structures to real world scenario.

## **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Build abstract data types for linked list data structure.
- Apply the concepts of stack, queue and its applications.
- Experiment with operations on binary trees.
- Identify the traversal techniques of graphs and its applications.
- Inspect sorting, searching and hashing techniques.

## **UNIT I LISTS**

Abstract Data Types (ADTs) – Elementary Data types–List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Doubly-linked lists – Circularly linked lists – Applications of lists – Polynomial ADT –Multilists–Sparse Matrices.

## UNIT II STACKS AND QUEUES

Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressions-Infix to Postfix conversion – Function Calls – Queue ADT – Operations – Circular Queue – Deque – Applications of Queues.

## **UNIT III TREES**

Tree ADT – Tree Traversals - Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees – Red-Black Trees – Priority Queue (Heaps) – Binary Heap.

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## UNIT IV MULTIWAY SEARCH TREES AND GRAPHS

B-Tree – B+ Tree – Tries – Graph Definition – Representation of Graphs – Types of Graphs -Breadth-first traversal – Depth-first traversal — Bi-connectivity – Euler circuits – Topological Sort – Dijkstra's algorithm – Minimum Spanning Tree – Prim's algorithm – Kruskal's algorithm

## UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES

Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort — Quick Sort – Merge Sort – Heap Sort – Radix Sort – Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

## **TOTAL: 45**

## **TEXT BOOKS:**

- 1. Mark Allen Weiss," Data Structures and Algorithm Analysis in C", Pearson Education, Second Edition, 2005
- 2. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein," Introduction to Algorithms", Mcgraw Hill/ MIT Press, Fourth Edition,2022

## **REFERENCE BOOKS:**

- 1. Narasimha Karumanchi," Data Structures and Algorithms Made Easy", CareerMonk Publications, First Edition,2016
- 2. Langsam, Augenstein and Tanenbaum, "Data Structures Using C", Pearson Education, Second Edition, 2015
- 3. Kamthane," Introduction to Data Structures in C", Pearson Education, First Edition, 2007
- 4. Kruse," Data Structures and Program Design in C", Pearson Education, Second Edition, 2003

## **WEBSITES:**

- 1. www.nptel.ac.in/courses/106106145
- 2. www.nptel.ac.in/courses/106102064
- 3. www.coursera.org/learn/data-structures
- 4. www.edx.org/learn/data-structures
- 5. www.cs.usfca.edu/~galles/visualization/Algorithms.html

## (ii) LABORATORY

## LIST OF EXPERIMENTS:

- 1. Array implementation of Stack, Queue and Circular Queue ADTs
- 2. Implementation of Singly Linked List
- 3. Linked list implementation of Stack and Linear Queue ADTs
- 4. Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion
- 5. Implementation of Binary Search Trees and AVL Trees

- 6. Implementation of Heaps using Priority Queues
- 7. Implementation of Dijkstra's Algorithm
- 8. Implementation of Prim's Algorithm

CO, PO, PSO Mapping

- 9. Implementation of Linear Search and Binary Search
- 10. Implementation of Insertion Sort and Selection Sort
- 11. Implementation of Merge Sort and Quick Sort
- 12. Implementation of Open Addressing (Linear Probing and Quadratic Probing)

#### **TOTAL: 30**

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	2	2	-
CO2	3	2	1	-	-	-	-	-	2	2	-	2	2	-
CO3	3	2	1	-	-	-	-	-	2	2	-	2	2	-
CO4	3	2	1	-	-	-	-	-	2	2	-	2	2	-
CO5	3	3	2	1	-	-	-	-	2	2	-	2	2	-
Average	3	2.2	1.2	1	-	-	-	-	2	2	-	2	2	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

## **B.E Electronics and Communication Engineering**

#### **23BECC241B OBJECT ORIENTED PROGRAMMING WITH PYTHON** 6H-5C (THEORY AND LABORATORY)

Instruction Hours/week: L:4 T:0 P:2

## (i) THEORY

## **COURSE OBJECTIVES:**

The goal of this course is for the students

- To learn basic python language syntax, semantics and control structures.
- To apply list, tuple, set and dictionary to handle data.
- To solve the problems using functions and modules.
- To infer the object-oriented programming concepts in python.
- To interpret inheritance and exception handling in python.

## **COURSE OUTCOMES:**

Upon completion of this course the students will be able to

- Apply python control flow statements to solve problems.
- Model data structures using string, tuple, list, set, and dictionary.
- Identify Python built-in functions to write user defined functions.
- Apply object-oriented programming concepts in python.
- Analyze the concepts of exception handling to a real-world scenario.

## **UNIT I - PYTHON FUNDAMENTALS**

Introduction to Python – language classification - python language syntax - keywords - identifiers indentation - comments - input - output - escape characters - variables - operators - Control Statements.

## **UNIT II - DATA STRUCTURES IN PYTHON**

String - Mutable vs immutable types - indexing and slicing - String functions - Tuple - Tuple operations- List - List operations - List as array - List comprehension - Set - Set operations -Dictionary – Dictionary operations.

## **UNIT III - FUNCTIONS AND MODULES**

Python built in functions - User defined functions - Creating function - Invoking functions - Types of function arguments - Recursion and lambda or anonymous functions - Defining, Creating and Accessing a Package, importing packages and user defined modules.

# Marks: Internal:40 External:60 Total:100

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## **End Semester Exam:3 Hours**

## **UNIT IV - CLASSES AND OBJECTS**

Object Oriented terminologies (class, object, method, inheritance, abstraction, encapsulation, polymorphism) – UML Class diagram - access specifiers – Creating classes – Creating object – Accessing members - \_\_init\_\_() method - instance, static and class methods - Importance of self – Implementing encapsulation.

## UNIT V - INHERITANCE, POLYMORPHISM AND EXCEPTION HANDLING 9

Implementing inheritance – Types of inheritance – Implementing Polymorphism - Method overloading – Method overriding – Operator overloading - Abstract Classes - Association and Aggregation - Errors vs exceptions – Handling exceptions – Raising exception – Creating user defined exception.

#### **TOTAL: 45**

## **TEXT BOOKS:**

- 1. Think Python: How to Think Like a Computer Scientist Anany Levitin, Allen B. Downey Second Edition, O'Reilly, 2016.
- 2. Python 3 Object-oriented Programming, Dusty Phillips, Third Edition, Packet Publishing, 2018.

## **REFERENCES BOOKS:**

- 1. The Absolute Beginner's Guide to Python Programming, Kevin Wilson, Apress Media LLC, First Edition, 2022.
- 2. Python 3 The Comprehensive Guide, Johannes Ernesti, Peter Kaiser, Rheinwerk Publishing Inc., First Edition, 2022
- 3. Fundamentals of Python Programming, Richard L. Halterman, Southern Adventist University, First Edition, 2019

## WEB SITES:

- 1. www.docs.python.org/3/
- 2. www.programiz.com/python-programming
- 3. www.scaler.com/topics/python/
- 4. www.geeksforgeeks.org/python-oops-concepts/
- 5. www.edureka.co/blog/object-oriented-programming-python/

## (ii) LABORATORY

## LIST OF EXPERIMENTS:

- 1. Programs using operators and control structures.
- 2. Programs using string functions.
- 3. Programs using tuple.

- 4. Programs using list.
- 5. Programs using set.
- 6. Programs using dictionary.
- 7. Programs using built-in functions.
- 8. Implementing user defined functions with various parameter options
- 9. Implementation of class & objects.
- 10. Implementation of inheritance and association.
- 11. Implementation of overloading and overriding.
- 12. Implementation of exception handling.

#### CO, PO, PSO Mapping

#### COs PO1 PO2 PO3 **PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12** PSO1 PSO2 2 2 **CO1** 3 1 2 2 1 \_ \_ \_ -\_ \_ \_ **CO2** 3 2 1 2 2 2 1 -\_ \_ -\_ \_ \_ 3 2 2 2 2 1 **CO3** 1 -\_ -\_ ---**CO4** 3 2 1 2 2 2 1 \_ \_ \_ \_ \_ \_ \_ **CO5** 3 3 2 2 2 2 1 1 \_ \_ \_ --\_ 3 2.2 1.2 1 2 2 2 1 Average ------

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### **TOTAL: 30**

## **B.E Electronics and Communication Engineering**

## 23BEEC211

## **ENGINEERING GRAPHICS**

Instruction Hours/week: L:2 T:0 P:2

## End Semester Exam:3 Hours

Marks: Internal:40 External:60 Total:100

## **COURSE OBJECTIVES:**

The goal of this course is for the students to:

- Expose them to existing national standards related to technical drawings and develop their ability to produce engineering drawings using drawing instruments.
- Emphasize freehand sketching to aid in the visualization process and to efficiently communicate ideas graphically.
- Introduce CAD software for the creation of 2D engineering drawings.
- Develop a clear understanding of projection and the projection of points.
- Produce computer generated drawings using CAD software and develop a clear understanding of plane geometry.

## **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Apply BIS and ISO standards in engineering drafting
- Illustrate orthographic projections using free hand sketching.
- Construct the projection of points and lines using CAD software.
- Develop the projection of plane surface and simple solids using CAD software
- Construct the isometric projections using CAD software.

## UNIT I INTRODUCTION

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conic sections including the Ellipse, Parabola and Hyperbola (eccentricity method only); Cycloid, Epicycloid, Hypocycloid and Involute.

## UNIT II FREE HAND SKETCHING

Representation of Three-Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views –

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Semester II 4H-3C

2023-2024
Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

## **UNIT III INTRODUCTION TO COMPUTER GRAPHICS – 2D**

Overview of Computer Graphics, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software, Consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Annotations, layering and other functions. Sketching of 2D simple geometries, editing and dimensioning of 2D geometries.

## UNIT IV PROJECTION OF POINTS AND LINES

Projection of points and straight lines located in the first quadrant inclined to both planes– Determination of true lengths and true inclinations (By using CAD software).

## UNIT V PROJECTION OF PLANE SURFACES

Projection of polygonal surface and circular lamina inclined to both reference planes (By using CAD software).

## **TEXT BOOKS:**

- 1. Venugopal K and Prabhu Raja V, (2021), Engineering Graphics, New Age International Publishers.
- 2. James D. Bethune, (2020), Engineering Graphics with AutoCAD, Macromedia Press.
- 3. C M Agrawal and Basant Agrawal, (2019), Engineering Graphics, Tata McGraw Hill, New Delhi.

## **REFERENCE BOOKS:**

- 1. Annaiah M.H., Prem Kumar, Chandrappa C N, (2022), Computer Aided Engineering Drawing, New Age International Private Limited.
- 2. Narayana, K.L. and P Kannaiah, (2021), Text book on Engineering Drawing, Scitech Publications (India) Pvt. Ltd.
- 3. Shah, M.B. and Rana B.C., (2010), Engineering Drawing and Computer Graphics, Pearson Education.
- 4. Bhatt N.D., Panchal V.M. and Ingle P.R, (2019), Engineering Drawing, Charotar Publishing House.

## WEBSITES:

1. https://onlinecourses.nptel.ac.in/noc21\_me128

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**TOTAL: 45** 

- 2. https://www.mygreatlearning.com/academy/learn-for-free/courses/engineering-graphics-drawing
- 3. https://www.autodesk.in/solutions/technical-drawing

# CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	2	1	-	-	-	-	1	-	2	-	2	-	1
CO2	2	1		-	-	-	-	1	-	2	-	2	-	1
CO3	3	2	1	-	3	-	-	1	-	2	-	2	-	1
CO4	3	2	1	-	3	-	-	1	-	2	-	2	-	1
CO5	3	2	1	-	3	-	-	1	-	2	-	2	-	1
Average	2.8	1.8	1	-	3	-	-	1	-	2	-	2	-	1

# 23BEEC212 ELECTRONIC DEVICES AND CIRCUITS THEORY LABORATORY 4H-2C

## Instruction Hours/week: L: 0 T:0 P:4

## Marks: Internal:40 External:60 Total:100 EndSemesterExam:3Hours

# **COURSE OBJECTIVES:**

The goal of this course for students is

- To understand the working of Semiconductor PN junction devices.
- To study the working principle of Bipolar Transistors (BJT).
- To impart knowledge on working of Field Effect Transistor (FET).
- To understand the concept biasing circuits.
- To provide the knowledge on circuit laws and theorems.

# **COURSE OUTCOMES:**

At the end of this course , the students will be able to

- Examine the characteristics of semiconductor diodes
- Analyze the characteristics of transistor.
- Solve the circuits using basic theorems
- Develop the rectifier circuits using PN Junction diode
- Analyze the characteristics of RC, RL, RLC circuits.

# LIST OF EXPERIMENTS:

- 1. Characteristics of PN Junction Diode.
- 2. Zener diode Characteristics & Regulator using Zener diode.
- 3. Common Emitter input-output Characteristics.
- 4. FET Characteristics.
- 5. SCR Characteristics.
- 6. Clipper and Clamper & Full Wave Rectifier
- 7. Verifications of Thevenin& Norton theorem.
- 8. Verifications of KVL & KCL.
- 9. Verifications of Super Position Theorem.
- 10. Verifications of Maximum Power Transfer & Reciprocity Theorem.

- 11. Determination of Resonance Frequency of Series & Parallel RLC Circuits.
- 12. Transient analysis of RL and RC circuits.

## **TOTAL: 30**

COs	<b>PO1</b>	<b>PO2</b>	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	3	-	-	1	1	2	-	-	2	-
CO2	3	3	2	1	3	-	-	1	1	2	-	-	2	-
CO3	3	2	1	-	3	-	-	1	1	2	-	1	2	1
CO4	3	2	1	-	3	-	-	1	1	2	-	-	2	-
CO5	3	3	2	1	3	-	-	1	1	2	-	-	2	-
Average	3	2.6	1.6	1	3	-	-	1	1	2	-	-	2	1

## CO, PO PSO Mapping

## 23BEMC251

## SOFT SKILLS

## Instruction Hours/week: L:1 T:0 P:0

## **COURSE OBJECTIVES:**

The goal of this course is for the students to

- Encourage all round development of the students by focusing on soft skills.
- Make the students aware of critical thinking and problem-solving skills.
- Develop leadership skills and organizational skills through group activities.
- Function effectively with heterogeneous teams.
- Develop social and work-life skills as well as personal and emotional well-being.

## **COURSE OUTCOMES:**

Upon completion of this course the students will be able to

- Memorize various elements of effective communicative skills.
- Interpret people at the emotional level through emotional intelligence.
- Apply critical thinking skills in problem solving.
- Analyze the needs of an organization for team building.
- Judge the situation and take necessary decisions as a leader.

## **UNIT-1 COMMUNICATION SKILLS**

Introduction, meaning, significance of soft skills –definition, significance, types of communication skills -Intrapersonal & Inter-personal skills

## **UNIT-2 CRITICAL THINKING**

Active Listening –Observation –Curiosity –Introspection –Analytical Thinking –Open-mindedness – Creative Thinking- Public Speaking

# **UNIT -3 PROBLEM SOLVING & DECISION MAKING**

Meaning & features of Problem Solving –Managing Conflict –Conflict resolution –Methods of decision making –Effective decision making in teams –Methods & Styles - Time Management.

## **TEXT BOOKS:**

1. Personality Development and Soft Skills (English, Paperback, Mitra Barun K.) Publisher: Oxford

# Semester II 1H - 0C

Marks: Internal:100 Total:100 End Semester Exam:3 Hours

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# 5

**TOTAL: 15** 

University Press; Pap/Cdr edition (July 22, 2012)

- 2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha Kapoor Publisher : I K International Publishing House; 0 edition (February 28, 2018)
- 3. Soft skills: personality development for life success by Prashant Sharma, BPB publications 2018

<b>B.E Electronics and Communication Engineering</b>	2023-2024
	Semester II

23BEMC252	WOMEN SAFETY AND SECURITY	1H - 0C

## Instruction Hours/week: L:1 T:0 P:0

## Marks: Internal:100 Total:100 End Semester Exam: 3 Hours

## **COURSE OBJECTIVES:**

The goal of this course is for the students to

- Highlight the social construction of gender in Indian society and the role of social institutions in the socialization process.
- Make aware about the practical issues concerning gender and politics.
- Classify the students in engendering national policies and programmes.
- Observe the liability of women and women's work in the context of globalization.
- Acquaint knowledge about the political participation of women and the gendered structures of governance and polity.

# **COURSE OUTCOMES:**

Upon completion of this course the students will be able to

- Infer into the basic concepts related to sex, gender, femininity etc.
- Demonstrate the rationale for women's studies
- Compare Gender Equality Issues and Movements in Women's Studies
- Summarize the Social construction of Gender, Gender Roles and Gender stereotyping.
- Illustrate Social Structures, Changing Status of Women in India.

# **UNIT I: FUNDAMENTAL CONCEPTS OF WOMEN'S STUDIES**

Definition- Objectives of Women's Studies; Importance of Women's Studies; Women's Studies as an Academic Discipline; Role of UGC Centre for Women's Studies

# **UNIT II: SOCIAL EMPOWERMENT**

Women in Higher Education; Gender issues in Health, Environment, Family welfare Measures, Indecent representation of Women in media; Women in Difficult circumstances; Constitutional.

# **UNIT III: POLITICAL EMPOWERMENT**

Women leaders in politics- Women in Local Governance- Barriers- Reservation policies- Women's Political Rights, Property Rights - Violence against Women - Women's work.

## **TOTAL: 15**

# **TEXT BOOKS:**

- 1. Amy S. Wharton. (2005). "The Sociology of Gender: An Introduction to Theory and Research". (Key Themes in Sociology) Blackwell Publishing, UK, Indian Reprint, Kilaso Books, New Delhi.
- 2. Devaki Jain and Pam Rajput (Ed). (2003). "Narratives from the Women"s Studies Family: Recreating Knowledge, Sage, and New Delhi.
- 3. Jasbir Jain (Ed). (2005). "Women in Patriarchy: Cross Cultural". Rawat Publication Jaipur.

## **4H-4C**

Instruction Hours/week: L:3 T:1 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hours

## **COURSE OBJECTIVES:**

**23BEEC301A** 

The goal of this course is for students:

- To inculcate the concepts of theories on Numbers.
- To extend student's logical and mathematical maturity and ability to deal with abstraction.

**DISCRETE MATHEMATICS** 

- To synthesize methods of solving problems in summation of series and recurrence relations. •
- To introduce the concept of Theoretical Distributions.
- To make the students to interpret the importance of correlation function and spectral studies.

## **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Interpret the concepts of divisibility, prime number, congruence and number theorem.
- Solve a given problem using propositional logic.
- Explain the concept of Mathematical induction and the fundamentals of Probability •
- Infer standard distributions of random variables. •
- Explain the perceptions of correlation and spectral densities. •

## **UNIT I NUMBER THEORY**

Divisibility - Fundamental Properties - Euclidean algorithm - Euclid's lemma - Fundamental theorem of arithmetic – Congruence – Fermat's Little theorem (statement only) and the Chinese remainder theorem (statement only).

## **UNIT II PROPOSITIONAL CALCULUS**

Propositional Calculus: Propositions - Logical connectives - compound propositions conditional and biconditional propositions - Truth tables - Tautologies and contradictions contrapositive – Logical equivalences and implications – Demorgan's Laws – Normal forms – Principal conjunctive and disjunctive normal forms.

## **UNIT III COMBINATORICS**

Mathematical Induction – Permutations and combinations - Recurrence Relation – Formation of Recurrence relation – Solution of recurrence relation by Generating Functions – Concept of Probability – Conditional– Theorem of Total Probability – Baye's theorem.

## UNIT IV THEORETICAL DISTRIBUTIONS

One dimensional Random Variables - Discrete and Continuous Random variables - Probability distribution function - Probability density function - Mathematical Expectations - Moments -. Mean and Variance - Moment generating function of Binomial, Poisson and Normal distributions-

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## **UNIT V STOCHASTIC PROCESS**

12

**TOTAL: 45+15** 

Classification of Random Process – Discrete and Continuous cases — Auto Correlation Functions – Properties – Stationary Random processes – WSS and SSS processes – Power spectral density

- properties of power spectral density – Cross-power spectral density and properties – Auto-

correlation function and power spectral density of a WSS random sequence.

# **TEXT BOOKS:**

- 1. Grimaldi, Ralph P. Discrete and combinatorial mathematics, 5<sup>th</sup> edition. Pearson Education India, 2016.
- 2. Rosen, Kenneth H. Discrete mathematics and its applications. 7<sup>th</sup> edition The McGraw Hill Companies, 2017.
- 3. Peebles P.J. Problems and solutions in probability, random variables and random signal principles (SIE), 1<sup>st</sup> edition The McGraw Hill Companies, 2017.
- Roy D Yates and David J Goodman, Probability and Stochastic processes, 2nd Edition, Wiley India Pvt Ltd, 2005
- Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, John Wiley, 6<sup>th</sup> Edition, 2016

# **REFERENCE BOOKS:**

- 1. Kenneth H Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Revised Edition, Tata McGraw Hill Pub Co Ltd, 2017
- 2. Kishor S Trivedi, Probability and Statistics with reliability, Queueing and Computer Science Applications, 2nd Edition, Revised Paper book, Prentice Hall of India 2016
- 3. Bernard Kolman, Robert C Busby and Sharon Ross Discrete Mathematical Structures 6th Edition, Pearson publishers, 2008
- 4. Henry Stark and John W Woods, Probability and Random Processes with application to signal processing, 3rd Edition, Pearson Education, 2002

## WEB SITES:

- 1. www.geeksforgeeks.org/proposition-logic/
- 2. www.tutorialspoint.com/discrete\_mathematics/
- 3. www.nptel.ac.in/courses/108103185
- 4. www.nptel.ac.in/courses/108106083
- 5. www.mathworld.wolfram.com

# CO, PO, PSO Mapping

СО	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	PO7	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO3	2	1	-	-	-	-	-	-	-	-	-	1	1	-
CO4	2	1	-	-	-	-	-	-	-	-	-	1	1	-
CO5	2	1	-	-	-	-	-	-	-	-	-	1	1	-
Average	2.2	1.2	1	-	-	-	-	-	-	-	-	1	1	-

Semester III

2023-2024

### **23BEEC301B** NUMERICAL METHODS **4H-4C**

Instruction Hours/week: L:3 T:1 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hours

## **COURSE OBJECTIVES:**

The goal of this course is for students:

- To inculcate the basic concepts of solving algebraic and transcendental equations.
- To understand the numerical techniques of interpolation in various intervals
- To provide the knowledge of numerical differentiation and integration
- To provide the knowledge of solving ordinary differential equations numerically •
- To inculcate various techniques of solving partial differential equations numerically. •

# **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Solve the systems of linear and nonlinear equations by iterative methods.
- Make use of interpolation methods for finding the missing terms.
- Apply numerical methods for finding differentiation and integration of a given function.
- Solve ordinary differential equations using Euler's, Taylor's, Runge Kutta and Milne Thomson's method.
- Utilize implicit and explicit methods in heat and wave equations.

# **UNIT I SOLUTION OF EQUATIONS**

Regula Falsi Method - Newton Raphson method for solving algebraic and transcendental equations -Solution of system of linear equations - Gauss elimination method - Gauss Jordan method -Gauss Seidel method.

# **UNIT II INTERPOLATION**

Interpolations with unequal intervals-Lagrange's interpolation -Newton's divided interpolation -Interpolation with equal intervals-Newton's forward and backward interpolation.

# UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION

Approximation of derivatives using Newton's forward and backward interpolation - Numerical integration using Trapezoidal, Simpson's 1/3 and 3/8 rule.

# **UNIT IV NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 12**

Single step method- Euler's method-Taylor's series method-Fourth order Runge - Kutta method -Multi step method-Milne's predictor corrector method.

# **UNIT V NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12**

Solutions of one-dimensional heat equation by Bender-Schmidt and Crank Nicholson methods -Numerical solutions of one-dimensional wave equation by explicit method.

# **TOTAL: 60**

## 12

### 12

# **TEXT BOOKS:**

- Steven C.Chapra and Raymond P.Canale, Numerical Methods for Engineers, McGraw Hill Education, 7<sup>th</sup> Edition, 2015
- Curtis F. Gerald and Patrick O. Wheatley Applied Numerical Analysis, Addison Wesley, 13<sup>th</sup> Edition, 2004

# **REFERENCE BOOKS:**

- 1. Richard L. Burden and J. Douglas Faires, Numerical Methods, Brooks/Cole,4<sup>th</sup> edition, 2012
- 2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 10th edition, 2011

## WEB SITES:

- 1. https://archive.nptel.ac.in/courses/111/107/111107105/
- 2. https://ocw.mit.edu/courses/18-03-differential-equations-spring-010/resources/lecture-2-eulers-numerical-method-for-y-f-x-y/
- 3. http://www.infocobuild.com/education/audio-video-courses/mathematics/numerical-analysisiit-madras.html
- 4. http://www.infocobuild.com / education / audio-video-courses/mathematics / Numerical Methods -Finite Difference-IIT-Roorkee / lecture-06.html

CO	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	_	-	-	_	-	-	1	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO3	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO4	3	2	1	-	I	-	-	-	-	-	-	1	1	-
CO5	3	2	1	-	I	-	I	-	-	-	-	1	1	-
Average	3	2	1	-	-	-	-	-	-	-	-	1	1	-

## CO, PO, PSO Mapping

23BEEC301C	NUMERICAL LINEAR ALGEBRA	<b>4H-4C</b>

Instruction Hours/week: L:3 T:1 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hours

## **COURSE OBJECTIVES:**

The goal of this course is for students to:

- Import the knowledge of solving system of algebraic equations.
- Provide the concept of Algebraic Structures such as Groups, Ring, Field and Vector spaces.
- Inculcate various spaces namely Null space, Row space, Column space and Range space and its matrix representations.
- Apply the concept of inner product spaces in orthogonalization.
- To afford the adequate knowledge of least square approximation, Singular Value Decomposition and Principal Component Analysis.

## **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Solve algebraic equations using direct and indirect methods.
- Infer the basics of vector spaces, subspaces and its properties.
- Explain the properties and matrix representation of a linear transformation.
- Interpret the inner product spaces in Gram Schmidt orthogonalization process and orthogonal projection.
- Apply Least Square Approximation, Singular Value Decomposition and Principal Component Analysis in vector spaces.

# UNIT - I NUMERICAL SOLUTION OF SYSTEM OF ALGEBRAIC EQUATION 12

Solving system of equations – Direct methods: Gauss Elimination and Gauss Jordan Methods — Inverses of Matrix by Gauss Jordan method – LU Factorizations – Iterative method: Gauss Seidel method – Power method for finding Eigen values.

## **UNIT - II VECTOR SPACES**

Algebraic Structures – Binary Operation – Semi Group, Monoid and Group – Subgroups – Rings and Fields (Concept only) – Vector Spaces – Subspaces – Linear Span – Linear Independence and dependence of vectors - Basis and Dimension.

## **UNIT – III LINEAR TRANSFORMATION**

Linear Transformation – Properties of Linear Transformation — Null Space and Nullity of a matrix – Rank-Nullity theorem – Range Space – Dimension Theorem – Matrix Representation of Linear Transformation

## **UNIT - IV INNER PRODUCT SPACE**

Inner Products and Norms - Inner Product Spaces - Cauchy-Schwartz inequality - Orthogonal

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12 Rin Projection – Projection Theorem -Orthogonal Vectors – Gram- Schmidt Orthogonalization Process – Orthogonal Complement

## **UNIT - V POSITIVE DEFINITE MATRICES**

Least Square Approximations – Tests for positive definite, semi definite and indefinite matrices – Positive Definite Matrices – Singular value Decomposition (SVD) – Principal Component Analysis (PCA).

## **TEXT BOOKS:**

- Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra Pearson Education, 5<sup>th</sup> Edition, 2018
- 2. Gilbert Strang Edition, 2019 Linear Algebra and Learning from Data, Cambridge University Press, 1<sup>st</sup>

## **REFERENCE BOOKS:**

- 1. Sheldon Axler, Linear Algebra Done Right, Springer Cham, 3<sup>rd</sup> Edition, 2016
- 2. Kenneth Hoffman, Ray Kunze, Linear Algebra, Pearson Inc, 2<sup>nd</sup> Edition, 2018
- Williams, G, Linear Algebra with Applications, Jones & Bartlett Learning, 1<sup>st</sup> Indian Edition, New Delhi, 2019
- 4. Gene H. Golub, Charles F. Van Loan, Matrix Computations, The Johns Hopkins University Press, 4<sup>th</sup> Edition 2013

## Web URL's:

- 1. www://nptel.ac.in/courses/122106033
- 2. www://nptel.ac.in/courses/127106019
- 3. www://nptel.ac.in/courses/111105112
- 4. www://nptel.ac.in/courses/111105111
- 5. www://nptel.ac.in/courses/111101115
- 6. www://onlinecourses.nptel.ac.in/noc21\_ma38/course

## CO, PO, PSO Mapping

СО	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	2	1	-	-	-	-	-	-	-	-	1	-	1
CO2	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO3	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO5	3	2	1	-	-	-	-	-	-	-	-	1	-	1
Average	2.4	1.4	1	-	-	-	-	-	-	-	-	1	-	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL: 45+15** 

Semester-III

## 23BEEC302A ELECTROMAGNETIC FIELDS AND WAVES 4H-4C

Instruction Hours/week: L:3 T:1 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

## **COURSE OBJECTIVES:**

The goal of this course for students is

- To impart knowledge on static electric field with its associated laws.
- To familiarize the concepts of electrostatics, electric potential, energy density.
- To gain knowledge on the application of Poisson's and Laplace's equations.
- To study the various law in static magnetic fields.
- To understand magnetic field concept and to learn the concept of Maxwell's equations.

# **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Interpret field potentials due to static charges and static magnetic fields.
- Analyze the characteristics of conductors and boundary conditions for dielectric materials.
- Explain the physical concepts of static magnetic field.
- Identify the problems associated with magnetic fields
- Solve electromagnetic problems using maxwell's equations in time varying fields.

# UNIT I STATIC ELECTRICFIELD

Vector Algebra, Coordinate Systems, Vector differential operator, Gradient, Divergence, Curl, Divergence theorem, Stokes theorem, Coulombs law, Electric field intensity, Point, Line, Surface and Volume charged distributions, Electric flux density, Gauss law and its applications, Gauss divergence theorem, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electro static Energy and Energy density.

# UNIT II CONDUCTORS AND DIELECTRICS

Conductors and dielectrics in Static Electric Field, Current and current density, Continuity equation, Polarization, Method of images, Resistance of a conductor, Capacitance, Parallel plate, Coaxial and Spherical capacitors, Boundary conditions for perfect dielectric materials, Poisson's equation, Laplace's equation, Solution of Laplace equation, Application of Poisson's and Laplace's equations.

# UNIT III STATIC MAGNETIC FIELDS

Biot- Savart Law, Magnetic field Intensity, Estimation of Magnetic field Intensity for straight and circular conductors, Ampere's Circuital Law, Point form of Ampere's Circuital Law, Stokes theorem, Magnetic flux and magnetic flux density, The Scalar and Vector Magnetic potentials, Derivation of Steady magnetic field Laws.

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## UNIT IV MAGNETIC FORCES AND MATERIALS

Force on a moving charge, Force on a differential current element, Force between current elements, Force and torque on a closed circuit, The nature magnetic materials, Magnetization and permeability, Magnetic boundary conditions in evolving magnetic fields, The magnetic circuit, Potential energy and forces on magnetic materials, Inductance, Basic expressions for self and mutual inductances, Inductance evaluation for solenoid, toroid, coaxial cables and transmission lines, Energy stored in Magnetic fields.

# UNIT V TIME VARYING FIELDS & MAXWELL'S EQUATIONS AND PLANE ELECTROMAGNETIC WAVES 9

Fundamental relations for Electro static and Magneto static fields, Faraday's law for Electromagnetic induction, Transformers, Motional Electromotive forces, Differential form of Maxwell's equations, Integral form of Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Electromagnetic Spectrum. Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector. Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary.

## TOTAL:45 +15

# **SUGGESTED READINGS:**

- 1. William.Hayt and Jr.John.A, Buck Engineering Electromagnetic Tata McGraw-Hill Publishing Company Ltd New Delhi 2008.
- 2. Sadiku M H Principles of Electro magnetics Oxford University Press Inc, New Delhi 2009.
- 3. David.K Cheng Field and Wave Electromagnetic Pearson Education Inc, Delhi 2004.
- 4. John D Kraus and Daniel A Fleisch," Electromagnetic with Applications McGraw Hill Book 2005.
- 5. Karl E Longman and Sava V Savov, "Fundamentals of Electromagnetic", Prentice Hall of India New Delhi 2006.
- 6. Ashutosh Pramanic Electromagnetism Prentice Hall of India, New Delhi 2006.

## Web links:

1. https://swayam.gov.in/nd1\_noc20\_ph08/

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	1	2	-
CO2	3	3	2	1	-	-	-	-	-	1	-	1	2	-
CO3	2	1	-	-	-	-	-	-	-	1	-	1	2	-
CO4	3	2	1	-	-	-	-	-	-	1	-	1	2	-
CO5	3	2	1	-	-	-	-	-	-	1	-	1	2	
Average	2.6	1.8	1.3	-	-	-	-	-	-	1	-	1	2	-

## CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**4H-4C** 

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23BEEC302B
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# DESIGN AND ANALYSIS OF ALGORITHMS

Instruction Hours/week: L:3 T:1 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

# i) THEORY

# **COURSE OBJECTIVES:**

The goal of this course for the students to:

- To understand and apply the algorithm analysis techniques on searching and sorting algorithms.
- To illustrate different algorithm design techniques.
- To critically analyze the efficiency of graph algorithms.
- To solve programming problems using state space tree.
- To examine NP Completeness, Approximation algorithms and randomized algorithms.

# **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Solve the basic problems with asymptotic notations.
- Apply graph traversal algorithms for a given applications.
- Experiment with dynamic programming and greedy techniques.
- Examine backtracking strategy for solving real time problems.
- Analyze the algorithmic techniques for tractable and intractable problems

# UNIT I INTRODUCTION

Algorithm analysis: Time and space complexity - Asymptotic Notations and its properties – Best case, Worst case and average case analysis – Recurrence relation: substitution method - Lower bounds – searching: linear search, binary search and Interpolation Search, Pattern search: The naïve string-matching algorithm - Rabin-Karp algorithm - Knuth-Morris-Pratt algorithm. Sorting: Insertion sort – heap sort

# **UNIT II GRAPH ALGORITHMS**

Graph algorithms: Representations of graphs - Graph traversal: DFS – BFS - applications - Connectivity, strong connectivity, bi-connectivity - Minimum spanning tree: Kruskal's and Prim's algorithm- shortest path: Bellman-Ford algorithm - Dijkstra's algorithm - Floyd-Warshall algorithm Network flow: Flow networks - Ford-Fulkerson method – Matching: Maximum bipartite matching

# UNIT III ALGORITHM DESIGN TECHNIQUES

Divide and Conquer methodology: Finding maximum and minimum - Merge sort - Quick sort Dynamic programming: Elements of dynamic programming — Matrix-chain multiplication -Multi stage graph — Optimal Binary Search Trees. Greedy Technique: Elements of the greedy strategy - Activity-selection problem — Optimal Merge pattern — Huffman Trees.

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# UNIT IV STATE SPACE SEARCH ALGORITHMS

Backtracking: n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem - Graph colouring problem Branch and Bound: Solving 15-Puzzle problem - Assignment problem - Knapsack Problem - Travelling Salesman Problem

# UNIT V NP-COMPLETE AND APPROXIMATION ALGORITHM

Tractable and intractable problems: Polynomial time algorithms – Venn diagram representation – NP algorithms - NP-hardness and NP-completeness – Bin Packing problem - Problem reduction: TSP – 3-CNF problem. Approximation Algorithms: TSP - Randomized Algorithms: concept and application - primality testing - randomized quick sort - Finding kth smallest number

**TOTAL :45+15** 

# **TEXT BOOKS:**

- 1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein," Introduction to Algorithms", Mcgraw Hill/ MIT Press, Fourth Edition,2022
- 2. Anany Levitin," Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition,2012

# **REFERENCE BOOKS:**

- 1. Narasimha Karumanchi," Data Structures and Algorithms Made Easy", CareerMonk Publications, First Edition,2016
- 2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran," Computer Algorithms/C++", Orient Blackswan, Second Edition,2019
- 3. S. Sridhar," Design and Analysis of Algorithms", Oxford university Press, First Edition, 2014
- 4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman," Data Structures and Algorithms", Pearson Education, Reprint Edition, 2006

# **WEBSITES:**

- 1. www.nptel.ac.in/courses/106105164
- 2. www.nptel.ac.in/courses/106106131
- 3. www.coursera.org/specializations/algorithms
- 4. https://www.geeksforgeeks.org/design-and-analysis-of-algorithms/
- $5.\ www.cs.usfca.edu/~galles/visualization/Algorithms.html$

# CO, PO, PSO Mapping

CO	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO2	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO3	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO4	3	3	2	1	-	-	-	-	2	2	-	2	-	1
CO5	3	3	2	1	-	-	I	-	2	2	I	2	-	1
Average	3	2.4	1.4	1	-	-	-	-	-	2	•	2	-	1

Semester III

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23BEEC303ENVIRONMENTAL SCIENCE3H-3C

Instruction Hours/week: L:3 T:0 P:0

End Semester Exam: 3 Hours

Marks: Internal:40 External:60 Total:100

## **COURSE OBJECTIVES:**

The goal of this course is for students to:

- Create the awareness about environmental problems among people.
- Develop an attitude of concern for the environment.
- Motivate public to participate in environment protection and improvement.
- To gain a variety of experiences and acquire a basic understanding of environment and it's associated problems.
- Relate critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

## **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Outline the ecological processes supporting the life system.
- Infer the importance of environment and impact of human activities on natural resources.
- Explain the levels and values of biodiversity and its conservation.
- Summarize the problems of environmental pollution and its control measures.
- Interpret the remediation methods for social issues and degraded environment.

## UNIT I INTRODUCTION - ENVIRONMENTAL STUDIES & ECOSYSTEMS 9

Environment Definition, Scope and importance; Ecosystem, Structure and functions of ecosystem. Energy flow, Food chains and food webs, Ecological succession. Classification of ecosystem. Forest ecosystem, Grass and Ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

## UNIT II NATURAL RESOURCES-RENEWABLE AND NON-RENEWABLE RESOURCE

Natural resources - Renewable and Non - Renewable resources. Land resources and land use change, Land degradation, soil erosion and desertification. Forest resources- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water resources- Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water. Use of alternate energy sources, growing energy needs, case studies. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

# **UNIT III - BIODIVERSITY AND ITS CONSERVATION**

Levels of biological diversity - genetic, species and ecosystem diversity. Ecosystem and biodiversityservices: Ecological, economic, social, ethical, aesthetic and Informational value. Bi

o-geographical classification of India. Biodiversity patterns (global, National and local levels). Hot-spots of biodiversity. India as a mega-diversity nation. Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

# UNIT IV -ENVIRONMENTAL POLLUTION

Definition, causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution. Nuclear hazards and human health risks. Solid waste management and control measures of urban, industrial and e-wastes. Role of an individual in prevention of pollution. Case studies.

# UNIT V - SOCIAL ISSUES AND THE ENVIRONMENT

Concept of sustainability and sustainable development. Water conservation -Rain water harvesting, watershed management. Climate change, global warming, ozone layer depletion, acid rain and its impacts on human communities and agriculture. Environment Laws (Environment Protection Act, Air Act, Water Act, Wildlife Protection Act, Forest Conservation Act). International agreements (Montreal and Kyoto protocols). Resettlement and rehabilitation of project affected persons. Disaster management (floods, earthquake, cyclones and landslides). Environmental Movements (Chipko, Silent valley, Bishnois of Rajasthan). Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g.,CNG vehicles in Delhi).Human population growth: Impacts on environment ,human health and welfare.

## **SUGGESTED READINGS:**

- 1. Anubha Kaushik, and Kaushik, C.P. 2004. Perspectives in Environmental Studies. New Age International Pvt. Ltd. Publications, New Delhi.
- 2. Erach Bharucha. 2004. A text book for Environmental Studies, University Grants Commission and Bharat Vidypeeth Institute of Environmental Education Research, New Delhi.
- 3. Rajagopalan, R. 2016. Environmental Studies: From Crisis to Cure, Oxford University Press.
- Sing, J.S., Sing. S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand & Publishing Company, New Delhi.
- 5. Mishra, D.D. 2010. Fundamental Concepts in Environmental Studies. S. Chand& Company Pvt. Ltd., New Delhi.
- 6. Arvind Kumar. 2004. A Textbook of Environmental Science. APH Publishing Corporation, New Delhi.
- 7. Singh, M.P., Singh, B.S., and Soma, S. Dey. 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, New Delhi.
- 8. Tripathy. S.N., and Sunakar Panda. (2004). Fundamentals of Environmental Studies (2nd ed.). Vrianda Publications Private Ltd, New Delhi.
- 9. Verma, P.S., and Agarwal V.K. 2001. Environmental Biology (Principles of Ecology). S. Chand and Company Ltd, New Delhi.
- 10. Uberoi, N.K. 2005. Environmental Studies. Excel Books Publications, New Delhi.

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## Total: 45

# CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	2	3	3	-	1	-	2	-	1
CO2	2	1	-	-	-	2	3	3	-	1	-	2	-	1
CO3	2	1	-	-	-	2	3	3	-	1	-	2	-	1
CO4	2	1	-	-	-	2	3	3	-	1	-	2	-	1
CO5	2	1	-	-	-	2	3	3	-	1	-	2	-	1
Average	2	1	-	-	-	2	3	3	-	1	-	2	-	1

Semester III

# 23BEEC304 DIGITAL SYSTEM DESIGN

## **3H-3C**

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Instruction Hours/week: L:3 T:0 P:0 Mar

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

## (i) THEORY COURSE OBJECTIVE:

The goal of this course for students is

- To introduce Basics of Digital logics and Boolean algebra
- To simplify the Boolean expressions.
- To impart foundational knowledge on logic gates & combinational circuits.
- To design synchronous sequential circuits.
- To learn about asynchronous sequential circuits design and to introduce the programming concept of Verilog HDL.

# **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Solve the Boolean functions using K-Map
- Develop combinational circuits for a given functions using logic gates.
- Build synchronous sequential circuits for the given condition.
- Construct asynchronous sequential circuits
- Analyze the digital circuits using VHDL codes.

# UNIT I NUMBER SYSTEMS AND BOOLEAN ALGEBRA

Number Systems and its conversions Number representation: Signed, Unsigned, Fixed point, Floating point. Computer codes: Weighted - BCD -2421, Gray code, Excess 3 code, ASCII code, Error detection and correction codes, Parity codes, Hamming codes, conversion from one code to another. Boolean postulates and laws –De-Morgan's Theorem–Boolean expression – Boolean function- Minimization of Boolean expressions – Sum of Products (SOP) –Product of Sums (POS)-Minterm- Maxterm- Canonical forms – Conversion between canonical forms –Karnaugh map up to 6 variable Minimization – Don't care conditions.

# UNIT II LOGIC GATES AND COMBINATIONAL CIRCUITS

LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR-Implementations of Logic Functions using gates, NAND –NOR implementations –Multi level gate implementations - Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates.

COMBINATIONAL CIRCUITS: Design procedure – Adders-Subtractors – Serial adder/ Subtractor - Parallel adder/ Subtractor- Carry look ahead adder- BCD adder- Magnitude Comparator- Multiplexer/ Demultiplexer- encoder / decoder – parity checker. Implementation of combinational logic using MUX.

## UNIT III SYNCHRONOUS SEQUENTIAL CIRCUIT

Flip flops SR, JK, T, D and Master slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering –Realization of one flip flop using other flip flops –Ripple counters – Synchronous counters –Modulo – n counter –Classification of sequential circuits – Moore and Mealy -Design of Synchronous counters: state diagram- State table –State minimization –State assignment- ASM-Excitation table and maps-Circuit implementation – Register – shift registers- Universal shift register – Shift counters – Ring counters.

## UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS

Design of fundamental mode and pulse mode circuits – primitive state / flow table – Minimization of primitive state table –state assignment – Excitation table – Excitation map- cycles – Races – Hazards: Static –Dynamic –Essential –Hazards elimination.

# UNIT V INTRODUCTION TO VERILOG HDL

Verilog Design flow: Design entry: Schematic, different modeling styles in Verilog, Data types and objects, Dataflow, Behavioral and Structural Modeling, Verilog Simulation, Verilog constructs and codes for combinational and sequential circuits.

# **SUGGESTED READINGS:**

- 1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 5th Edition, Pearson, 2014.
- 2. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
- 3. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011.
- 4. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
- 5. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition ,2006.
- Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2<sup>nd</sup>Edition, Pearson Education, 2003.

## **WEB REFERENCES:**

- 1. https://examupdates.in/digital-logic-design-books/
- 2. http://american.cs.ucdavis.edu/academic/ecs154a.sum14/postscript/cosc205.pdf
- 3. https://nptel.ac.in/courses/117106086/
- 4. https://nptel.ac.in/content/syllabus\_pdf/108105113.pdf

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# CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	-	-	-	-	1	-	1	-	1
CO2	3	2	1	-	-	-	-	-	-	1	-	1	-	1
CO3	3	2	1	1	-	-	-	-	-	1	-	1	-	1
CO4	3	2	1	1	-	-	-	-	-	1	-	1	-	1
CO5	3	3	2	1	3	-	-	-	-	1	-	1	-	1
Average	3	2.2	1.2	1	3	-	-	-	-	1	-	1	-	1

### **5H-4C**

Instruction Hours/week: L:3 T:0 P:2

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

# i) THEORY

**23BEEC341A** 

## **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To understand the concepts of ADTs.
- To learn linear data structures lists, stacks, and queues.
- To interpret non-linear data structures trees and graphs.
- To implement sorting, searching and hashing algorithms.
- To apply Tree and Graph structures to real world scenario.

## **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Build abstract data types for linked list data structure.
- Apply the concepts of stack, queue and its applications.
- Experiment with operations on binary trees.
- Identify the traversal techniques of graphs and its applications.
- Inspect sorting, searching and hashing techniques.

## UNIT I LISTS

Abstract Data Types (ADTs) – Elementary Data types–List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Doubly-linked lists – Circularly linked lists – Applications of lists – Polynomial ADT –Multilists–Sparse Matrices.

DATA STRUCTURES AND ALGORITHMS

## UNIT II STACKS AND QUEUES

Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressions-Infix to Postfix conversion – Function Calls – Queue ADT – Operations – Circular Queue – Deque – Applications of Queues.

## UNIT III TREES

Tree ADT – Tree Traversals - Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees – Red-Black Trees – Priority Queue (Heaps) – Binary Heap.

# UNIT IV MULTIWAY SEARCH TREES AND GRAPHS

B-Tree – B+ Tree – Tries – Graph Definition – Representation of Graphs – Types of Graphs -Breadth-first traversal – Depth-first traversal — Bi-connectivity – Euler circuits – Topological Sort – Dijkstra's algorithm – Minimum Spanning Tree – Prim's algorithm – Kruskal's algorithm

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# UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES

Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort — Quick Sort – Merge Sort – Heap Sort – Radix Sort – Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

# **TEXT BOOKS:**

- 1. Mark Allen Weiss," Data Structures and Algorithm Analysis in C", Pearson Education, Second Edition, 2005
- 2. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein," Introduction to Algorithms", Mcgraw Hill/ MIT Press, Fourth Edition,2022

# **REFERENCE BOOKS:**

- 1. Narasimha Karumanchi," Data Structures and Algorithms Made Easy", CareerMonk Publications, First Edition,2016
- 2. Langsam, Augenstein and Tanenbaum, "Data Structures Using C", Pearson Education, Second Edition, 2015
- 3. Kamthane," Introduction to Data Structures in C", Pearson Education, First Edition, 2007
- 4. Kruse," Data Structures and Program Design in C", Pearson Education, Second Edition, 2003

# **WEBSITES:**

- 1. www.nptel.ac.in/courses/106106145
- 2. www.nptel.ac.in/courses/106102064
- 3. www.coursera.org/learn/data-structures
- 4. www.edx.org/learn/data-structures
- 5. www.cs.usfca.edu/~galles/visualization/Algorithms.html

# ii) LABORATORY

# LIST OF EXPERIMENTS:

- 1. Array implementation of Stack, Queue and Circular Queue ADTs
- 2. Implementation of Singly Linked List
- 3. Linked list implementation of Stack and Linear Queue ADTs
- 4. Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion
- 5. Implementation of Binary Search Trees and AVL Trees
- 6. Implementation of Heaps using Priority Queues
- 7. Implementation of Dijkstra's Algorithm
- 8. Implementation of Prim's Algorithm
- 9. Implementation of Linear Search and Binary Search
- 10. Implementation of Insertion Sort and Selection Sort
- 11. Implementation of Merge Sort and Quick Sort
- 12. Implementation of Open Addressing (Linear Probing and Quadratic Probing)

**TOTAL: 30** 

**TOTAL: 45** 

# CO, PO, PSO Mapping

CO	PO1	PO2	PO3	<b>PO4</b>	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	2	1	2
CO2	3	2	1	-	-	-	-	-	2	2	-	2	1	2
CO3	3	2	1	-	-	-	-	-	2	2	-	2	1	2
CO4	3	2	1	-	-	-	-	-	2	2	-	2	1	2
CO5	3	3	2	1	-	-	I	-	2	2	-	2	1	2
Average	3	2.2	1.2	1	-	-	-	-	2	2	-	2	1	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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### **23BEEC341B**

### JAVA PROGRAMMING

Marks: Internal:40 External:60 Total:100

**End Semester Exam:3 Hours** 

## i)THEORY

## **COURSE OBJECTIVES:**

Instruction Hours/week: L:3 T:0 P:2

The goal of this course is for the students:

- To learn the fundamental concepts of Java programming.
- To gain knowledge of inheritance in Java.
- To understand the concepts of abstraction, exception and packages in Java.
- To infer Java Collection API and Multithreading plugins.
- To implement JDBC and Lambda expression in Java.

## **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Solve a given problem using basic object-oriented programming concepts.
- Develop Java programs using inheritance.
- Build Java programs using interface and package for complex problem.
- Analyze the collection API for given problem statement.
- Inspect an application using JDBC connections for Java programming.

## **UNIT I- INTRODUCTION TO JAVA**

History of Java - Features of Java - Java Architecture - Comments - Data Types - Variables – Operators Type Conversion and Casting - Flow Control Statements - Reading Input from keyboard, Command Line Arguments, Using Scanner Class, Arrays - Classes and Objects - UML Class diagram - Methods - Constructors - static variables and Methods - this Keyword -Encapsulation -Concept of Access Control.

## **UNIT II-- INHERITANCE**

Inheritance, Types of Inheritance - Super and Sub Classes - super keyword - final class and methods - Object class - Understanding Polymorphism, Types of polymorphism, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching - garbage collection - String class - String Buffer class - String Builder class.

### 2023-2024

Semester III

# 5H-4C

9

## **UNIT III- DATA ABSTRACTION**

Packages, Introduction to Packages, User-Defined Packages, Accessing Packages - Abstract classes and Methods - Interfaces - Defining an interface - implementing interfaces - extending interfaces - Multiple Inheritance Using Interfaces - Exception Handling -Errors vs Exceptions - Exception hierarchy - usage of try, catch, throw, throws and finally - built in exceptions - user defined exceptions.

## UNIT IV- COLLECTION API AND MULTITHREADING

Introduction to wrapper classes, Predefined wrapper classes, Conversion of types, Concept of Auto boxing and unboxing - Java Collections API - Introduction to Collection - Generics - List implementations - Set implementations - Map implementations - Multithreading: Introduction to Multithreading - Process Vs Thread, Thread life cycle -Thread class, Runnable Interface - Thread creation, Thread control and priorities - Thread synchronization

# UNIT V- JDBC AND LAMBDA

JDBC - Introduction to JDBC - Establishing connection - Executing query -Processing results -Prepared Statement - Callable Statement - Transactions - Meta-Data objects.Functional Interfaces -Predicates - Functions - Suppliers - Consumers - Lambda Expressions - Accessing local variables-Accessing class variables - Function argument in lambda expression - Sorting - Predicates and Lambda Expressions

# **TEXT BOOKS:**

- 1. Herbert Schildt, "Java2: The Complete Reference", Tata McGraw- Hill, Twelth Edition, 2022.
- 2. Cay S Horstmann and Gary Cornell, "Core Java: Volume I Fundamentals", Prentice Hall, Eleventh Edition, 2020.
- 3. Raoul Gabriel Urma, Mario Fusco and Alan Mycroft," Java 8 in Action: Lambdas, Streams and Functional style Programming", Manning Publications, First Edition, 2015.

## **REFERENCES BOOKS:**

- 1. David Flanagan and Benjamin Evans," Java in Nutshell", O'Reilly Media, Seventh Edition, 2018.
- 2. Deitel and Deitel," Java How to Program, Early Objects", Prentice Hall, Eleventh Edition, 2018.

## **WEBSITES:**

- 1. http://docs.oracle.com/javase/tutorial/java/nutsandbolts
- 2. http://www.javabeginner.com/learn-java
- 3. http://www.javapoint.com/creating-thread
- 4. http://www.ntu.edu.sg/home/ehchua/programming/java/JDBC\_Basic.html
- 5. http://www.javapoint.com/java-8-method-reference

# TOTAL:45

## **9** of A

## ii) LABORATORY

## LIST OF EXPERIMENTS:

- 1. Programs using flow control statements and arrays.
- 2. Programs using classes and objects.
- 3. Programs using inheritance and polymorphism.
- 4. Programs using String, StringBuffer and StringBuilder class.
- 5. Programs using package, abstract class and interface.
- 6. Programs using exception handling mechanism.
- 7. Programs using user defined exception.
- 8. Programs using Collection API.
- 9. Programs using Multithreading.
- 10. Programs using Thread synchronization.
- 11. Programs using JDBC.
- 12. Programs using Lambda Expression.

**TOTAL : 30** 

СО	PO1	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO2	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO3	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO4	3	3	2	1	-	-	-	-	2	2	-	2	-	1
CO5	3	3	2	1	-	-	-	-	2	2	-	2	-	1
Average	3	2.4	1.4	1	-	-	-	-	2	2	-	2	-	1

## **CO-PO MAPPING**

23BEEC305 MEASUREMENTS AND INSTRUMENTATION 3H-3C

Instruction Hours/week: L:3 T:0 P:0

End Semester Exam:3 Hours

Marks: Internal:40 External:60 Total:100

## **COURSE OBJECTIVES:**

The goal of this course for students is

- To introduce characteristics of instruments and concepts of errors.
- To study various standards used for measuring instruments.
- To provide knowledge on electrical and electronic instruments.
- To impart knowledge on bridge measurement techniques.
- To outline the concept of storage and display devices and introduce data acquisition elements and transducers.

# **COURSE OUTCOMES:**

At the end of this course, the students will be able to

- Identify the types of electronic instruments and its associated errors
- Demonstrate the working of electrical and electronic measuring instruments
- Choose the bridge arrangement for measurement of RLC Circuits
- Demonstrate the working of storage devices
- Explain transducers and data acquisition systems

# UNIT I INTRODUCTION

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Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration- Principle and types of analog and digital voltmeters, ammeters.

# UNIT II ELECTRICAL AND ELECTRONIC INSTRUMENTS

Principle and types of multi meters – Single and three phase watt meters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

# UNIT III COMPARATIVE METHODS OF MEASUREMENTS

D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) & A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops – Electrostatic and electromagnetic Interference – Grounding techniques.

# UNIT IV STORAGE AND DISPLAY DEVICES

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Data Logger

## UNIT V TRANSDUCERS AND DATA ACQUISITION

Transducers: Classification, Strain gauges, Bonded, unbounded; Force and Displacement Transducers. Resistance Thermometers. Hotwire Anemometers, LVDT, Thermocouples, Synchrous – Elements of data acquisition system – Smart sensors-Thermal Imagers.

# **SUGGESTED READINGS:**

- 1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2010.
- 2. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2013.
- 3. Doebelin E.O. and Manik D.N., Measurement Systems Applications and Design, Special Indian Edition, McGraw Hill Education Pvt. Ltd., 2007
- 4. H.S. Kalsi, 'Electronic Instrumentation', McGraw Hill, III Edition 2010.
- 5. D.V.S. Murthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2015.
- 6. David Bell, ' Electronic Instrumentation & Measurements', Oxford University Press, 2013.
- 7. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.
- 8. Alan. S. Morris, Principles of Measurements and Instrumentation, 2nd Edition, Prentice Hall of India, 2003.

# WEB LINK:

- 1. https://swayam.gov.in/nd1\_noc19\_ee44/preview
- 2. https://www.classcentral.com/course/swayam-electrical-measurement-and-electronicinstruments-14032

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	1	-	1	-	-	2	1
CO2	2	1	-	-	-	-	-	1	-	1	-	-	2	1
CO3	3	2	1	-	-	-	-	1	-	1	-	-	2	1
CO4	2	1	-	-	-	-	-	1	-	1	-	-	2	1
CO5	2	1	-	-	-	-	-	1	-	1	-	-	2	1
Average	2.4	1.4	1	-	-	-	-	1	-	1	-	-	2	1

## CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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### **TOTAL: 45**

## 20BEEC311 DIGITAL SYSTEM DESIGN LABORATORY 2H-1C

Instruction Hours/week: L:0 T:0 P:2

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

## **COURSE OBJECTIVE**

The goal of this course for students is

- To learn various logic gates and flip-flops
- To study different combinational circuits
- To implement combinational function using multipliers
- To simulate simple combinational and sequential circuits
- To learn about asynchronous sequential circuits design.

## **COURSE OUTCOMES**

At the end of this course students will be able to

- Construct combinational logic circuits.
- Develop digital circuits using sequential logic.
- Choose suitable combinational logic circuit for a given application.
- Identify a suitable sequential logic circuit for a given application.
- Simulate the combinational logic circuits using VHDL/Verilog HDL

## LIST OF EXPERIMENTS

- 1. Study of Gates & Flip-flops.
- 2. Design and implementation of arbitrary functions and Code Converters using logic gates
- 3. Design and implementation of four bit adder/subtractor
- 4. Implementation of combinational logic function using multiplexers
- 5. Design and Implementation of Shift Registers.
- 6. Design and implementation Synchronous Counters.
- 7. Design and implementation Asynchronous sequential circuits
- 8. Simulation of combinational and sequential circuits using VHDL/Verilog
- 9. Design and implementation of Magnitude Comparator (2-Bit).

## **TOTAL: 30**

## CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	3	-	-	-	2	2	-	-	2	-
CO2	3	2	1	-	3	-	-	-	2	2	-	-	2	-
CO3	3	2	1	-	3	-	-	-	2	2	-	-	2	-
CO4	3	2	1	-	3	-	-	-	2	2	-	-	2	-
CO5	3	3	3	2	3	-	-	-	2	2	-	-	2	-
Average	3	2.2	1.4	2	3	-	-	-	2	2	-	-	2	-
1 - Low,	1 - Low, 2 - Medium, 3 - High, '-' - No Correlation													

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# 23BEMC351 APTITUDE & REASONING 1H - 0C

## Instruction Hours/week: L:1 T:0 P:0

# Marks: Internal:100 Total:100

End Semester Exam:3 Hours

## **COURSE OBJECTIVES:**

The goal of this course is for the students to

- Categorize, apply, and use thought processes to distinguish between concepts of Quantitative methods.
- Prepare and explain the fundamentals related to various possibilities and probabilities related to quantitative aptitude.
- Critically evaluate numerous possibilities related to puzzles.
- Understand and solve puzzle-related questions from specific and other competitive tests.
- Solve questions related to Time and distance and time and work etc.

# **COURSE OUTCOMES:**

Upon completion of this course, the students will be able to

- Understand the basic concepts of quantitative ability
- Understand the basic concepts of logical reasoning Skills
- Acquire satisfactory competency in the use of reasoning
- Solve campus placements aptitude papers covering Quantitative Ability, Logical
- Gaun Reasoning Ability Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

## UNIT - I 1. Quantitative Ability (Basic Mathematics)

- 1.1. Number Systems
- 1.2. LCM and HCF
- 1.3. Decimal Fractions
- 1.4. Simplification
- 1.5. Square Roots and Cube Roots
- 1.6. Problems on Ages
- 1.7. Surds & Indices
- 1.8. Percentages

# UNIT – II 2. Quantitative Ability (Applied & Engineering Mathematics)

- 2.1. Logarithm
- 2.2. Permutation and Combinations
- 2.3 Probability
- 2.4 Profit and Loss
- 2.5 Simple and Compound Interest
- 2.6. Time, Speed and Distance

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2.7. Time & Work2.8. Ratio and Proportion2.9. Area2.10 Mixtures and Allegation

# UNIT – III 3. Verbal – Aptitude

- 1.1 Words
- 1.2 Idioms
- 1.3 Phrases in Context
- 1.4 Reading comprehension techniques
- 1.5 Narrative sequencing
- 1.6 Data interpretation

## **TOTAL: 15**

5

## **TEXTBOOKS:**

- 1. A Modern Approach to Verbal & Non-Verbal Reasoning By R S Agarwal
- 2. Analytical and Logical Reasoning By Sijwali B S
- 3. Quantitative aptitude for Competitive examination By R S Agarwal
- 4. Analytical and Logical Reasoning for CAT and other management entrance tests By Sijwali B S
- 5. Quantitative Aptitude by Competitive Examinations by Abhijit Guha 4th edition
- 6. https://prepinsta.com/
- 7. https://www.indiabix.com/
- 8. https://www.javatpoint.com/
#### **B.E Electronics and Communication Engineering**

2023 - 2024 Semester III

1H-0C

FOREIGN LANGUAGE – GERMAN 23BEMC352

#### Instruction Hours/week: L:1 T:0 P:0

#### Marks: Internal:100 Total:100

#### End Semester Exam: 3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students to

- Learn design thinking concepts and principles
- Use design thinking methods in every stage of the problem
- Learn the different phases of design thinking
- Apply various methods in design thinking to different problems
- Identify a solution to any problem of life and business

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to

- Demonstrate the critical theories of design, systems thinking, and design methodologies
- Define key concepts of design thinking
- Practice design thinking in all stages of problem solving
- Apply design thinking approach to real world problems
- Use the concept of design thinking in their business world.

#### UNIT-I:

Herzlich willkommen! - Wie ist dein Name ? - Ich trinke gern Kaffee. - Wir konjugieren die Verben.

#### UNIT-II:

A bit of history and ZAHLEN - Verben, W-Fragen, Ja-Nein Fragen, Imperativ-das Alphabet, die Woche, das Jahr - Was sind deine Hobbys ? Formular ausfÃ<sup>1</sup>/<sub>4</sub>llen

#### UNIT-III :

Mein Lehrbuch | Meine persĶnlichen Daten-Mein Arbeitsbuch -Wir beginnen Lektion -Wir lesen Lektion

#### UNIT-IV:

formeller Brief- Wie lernst du Deutsch? -Wir harem ein deutsches Lied- Wir lernen Hörverständnis | Wir beginnen Lektion

#### UNIT V :

Eine E-Mail schreiben | Eine Wohnung beschreiben- Im Kaufhaus | Welche/Diese-Gesund und munter

#### **TOTAL: 15**

# 3

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#### **BOOKS AND REFERENCES:**

- 1. NETZWERK Deutsch als Fremdsprache A1(Goyal, New Delhi, 2015)
- 2. Schulz-Griesbach: Deutsch als Fremdsprache. Grundstufe in einem Band (for Grammar)

#### WEB RESOURCES:

- 1. https://www.tatsachen-ueber-deutschland.de/en
- 2. https://www.goethe.de/en/spr/kup/prf/prf/sd1/ueb.html

23BEMC352 FOREIGN LANGUAGE – FRENCH

Instruction Hours/week: L:1 T:0 P:0

#### Marks: Internal:100 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students to

- Learn design thinking concepts and principles
- Use design thinking methods in every stage of the problem
- Learn the different phases of design thinking
- Apply various methods in design thinking to different problems
- Identify a solution to any problem of life and business

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to

- Demonstrate the critical theories of design, systems thinking, and design methodologies
- Define key concepts of design thinking
- Practice design thinking in all stages of problem solving
- Apply design thinking approach to real world problems
- Use the concept of design thinking in their business world.

#### UNIT- I

Recognize the French letters, Identify the letter-combinations that are characteristic of the French language, Identify the remaining letter-combinations that are characteristic of the French language.

#### UNIT - II

Use the imperative in the affirmative form, Say the time in French, talk about the weather in French, talk about actions that just happened, speak about actions that are yet to happen.

#### UNIT – III

Learn a few basic and commonly used 2nd group verbs, Understand the concept of French 'modal verb, learn a few basic and commonly used 3rd group verbs, learn what reflexive verbs, Distinguish between moods and tenses.

#### $\mathbf{UNIT} - \mathbf{IV}$

Place an order in a restaurant, learn a third past tense, identify a direct object, identify an indirect object, Use direct and indirect objects pronouns in a single sentence.

#### **BOOKS AND REFERENCES:**

- 1. Alter Ego Méthode de Français, A1 (2006): Berthet, Hugot et al., Hachette
- 2. Alter Ego Cahier d'activités, A1 (2006): Berthet, Hugot et al., Hachette
- 3. Écho Méthode de Français, A1 (2013): Girardet, Pecheur, CLE International

#### **WEB RESOURCES:**

- www.leo.org
- WWW. Nptel.com

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## 4

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#### TOTAL: 15

Semester-III

23BEEC391	INTER	NSHIP	2H-1C
<b>Instruction Hours/we</b>	eek: L:0 T:0 P:2	Marks: Internal:40 E	xternal:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To bridge the gap between academia and industry in providing an industry exposure for satisfying local industrial needs.
- To enable the students to get connected with Industry / Laboratory / Research Institute.
- Get practical knowledge on production process in the industry and develop skills to solve related problems.
- Develop skills to carry out research in the research Institutes / Laboratories.
- To learn the design methodologies and documentation process.

#### **COURSE OUTCOMES:**

At the end of this course, the students will be able to

- Gain knowledge on various tools used in industry.
- Know recent technological advancement happening in industry.
- Gain the knowledge in System-level design processes, verification and validation techniques, manufacturing and production processes in the firm or research facilities in the Laboratory/Research Institute.
- Analysis of industrial / research problems and their solutions.
- Documentation of system specifications, design methodologies, process parameters, testing parameters and results and preparing of technical report and presentation. The students individually undergo training in reputed Firms/ Research Institutes / Laboratories for the specified duration. After the completion of training, a detailed report should be submitted within ten days from the commencement of next semester.

**TOTAL: 30** 

**23BEEC401A PROBABILITY AND STATISTICS 4H-4C** 

#### Instruction Hours/week: L:3 T:1 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for students:

- To provide the required fundamental concepts of probability theory and Random variables.
- To introduce the concept of Theoretical Distributions.
- To impart the knowledge of Measures of Central tendencies, Dispersions
- To impart the knowledge of correlation and Regression
- To inculcate the knowledge of testing of hypothesis using small and large sampling tests.

#### **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Infer the fundamentals of probability and random variables.
- Explain standard distributions of random variables.
- Make use of statistical data for finding the measures of central tendency and measures of dispersion.
- Interpret the data using correlation and regression.
- Apply small and large sample tests in testing of hypothesis.

#### UNIT I PROBABILITY AND RANDOM VARIABLES

Concept of Probability – Addition and multiplication laws – Conditional probability – Total Probability - Baye's theorem and its applications - One dimensional Random Variables (Discrete and Continuous) – Mathematical Expectation.

#### UNIT II THEORETICAL

Discrete distributions - Binomial, Poisson, Geometric Distributions - Continuous distributions – Uniform, Exponential and Normal Distributions.

#### **UNIT III DESCRIPTIVESTATISTICS**

Measures of Central Tendency – Mean, Median, Mode – Measures of Dispersion – Mean deviation - Standard deviation - Coefficient of variation

#### UNIT IV CORRELATION AND REGRESSION

Correlation - Pearson's Correlation coefficient - Spearman's Rank correlation coefficient -Regression - Regression lines- Linear, Multiple Regression- Logistic Regression -Polynomial Regression.

## 12

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Semester IV

#### **UNIT V TESTING OF HYPOTHESIS**

Large sample tests based on normal distribution – Test for single mean – Difference between means – Proportion – Difference between proportions – Small sample test – Student-t test – Test for single mean – Difference between means – Snedecor's F test – Chi-square test for goodness of fit, independence of attributes.

#### **TEXT BOOKS:**

- Geoffrey Grimmett and David Stirzaker, Probability and Random Processes Oxford University Press, 4<sup>th</sup> Edition, 2020
- Robert V. Hogg, Joseph W. McKean and Allen T. Craig, Introduction to Mathematical Statistics, Pearson, 8<sup>th</sup> Edition, 2019
- 3. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, John Wiley, 6<sup>th</sup> Edition, 2016

#### **REFERENCE BOOKS:**

- 1. Irwin Miller and Marylees Miller, John E Freund's Mathematical Statistics with Applications, Pearson, 8<sup>th</sup> Edition, 2014
- 2. Sheldon M Ross, Introduction to Probability and statistics for Engineers and scientists, Elsevier, Fourth Edition, 2014

#### WEB SITES:

- 1. www://onlinecourses.nptel.ac.in/noc23\_ge25/preview
- 2. www://nptel.ac.in/courses/111104032
- 3. www://nptel.ac.in/courses/111106112
- 4. www://nptel.ac.in/courses/111105042
- 5. www://nptel.ac.in/courses/103106120

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	1	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	1	-
CO3	3	2	1	-	-	-	-	-	-	-	-	2	1	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	1	-
CO5	3	2	1	-	-	-	-	-	-	-	-	2	1	-
Average	2.4	1.4	1	-	-	-	-	-	-	-	-	2	1	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

**Total Hours: 60** 

### 2023-2024 Semester IV

#### **23BEEC401B** STATISTICS AND OPTIMIZATION TECHNIQUES **4H-4C**

Instruction Hours/week: L:3 T:1 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for students:

- To understand the concept of statistical tools and apply in engineering.
- To understand various statistical techniques from both applied and theoretical points of view.
- To provide the concept of linear programming problem and its various solution procedures.
- To impart the knowledge of transportation and assignment models.
- To afford the adequate knowledge on networking models and game theory.

#### **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Explain the concept of measures of central tendency and measures of dispersion.
- Apply small and large sample tests in testing of hypothesis.
- Make use of Graphical method, Simplex method and Dual simplex method in linear programming models.
- Interpret solutions for transportation and assignment problems.
- Solve network models, 2xn and mx2 games with and without saddle point.

#### UNIT I **DESCRIPTIVE STATISTICS**

Measures of central tendency – Mean, median, mode, geometric mean and harmonic mean – Dispersions - Range, mean deviation, variance, standard deviation, coefficient of variation -Relative measures - Coefficient of correlation - Pearson's correlation coefficient - Lines of regression.

#### **UNIT II SAMPLING THEORY**

Test of hypothesis – Large sample tests based on normal distribution – Test for single mean – Difference between means – Proportion – Difference between proportion – Small sample test - Student-t test - Test for single mean - Difference between means - Snedecor's F test - Chisquare test for goodness of fit, independence of attributes.

#### UNIT III LINEAR PROGRAMMING PROBLEM

Advantages and disadvantages of LP - Formulation of LP - Algebric solution of a LP -Graphical method - The simplex method - Principle of duality - Dual and primal problems -Dual simplex method.

#### 12

# 12

#### UNIT IV TRANSPORTATION AND ASSIGNMENT MODELS

Initial basic feasible solution - North west corner rule, row-minima, column minima, matrix minima and Vogel's approximation methods - MODI method for finding optimum solution - Unbalanced transportation problems – Assignment Model - Initial basic feasible solution - Hungarian algorithm - Unbalanced Assignment Problem - Maximization in assignment problems.

#### UNIT V NETWORK MODELS AND GAME THEORY

CPM & PERT techniques - Critical path method - PERT approach - Expected length of a project - Probability of project completion by due date - Game theory – Pay-off matrix - Pure strategies: Games with saddle point - The rules of dominance - mixed strategies: Games without saddle point - Solution of 2xn and mx2 games.

#### TOTAL: 60

12

12

#### **TEXT BOOKS:**

- 1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig Introduction to Mathematical Statistics Pearson, 8<sup>th</sup> Edition 2019
- 2. Geoffrey Grimmett and David Stirzaker, Probability and Random Processes, Oxford University Press, 4<sup>th</sup> Edition, 2020
- 3. Hamdy A.Taha, Operations Research An Introduction, Pearson Prentice Hall of India, Pvt. Ltd., New Delhi, 10<sup>th</sup> Edition , 2017
- 4. Kanti Swarup, Gupta P K, Manmohan, Operations Research Sultan Chand & Sons, 15<sup>th</sup> edition, 2010

#### **REFERENCE BOOKS:**

- 1. Irwin Miller and Marylees Miller, John E Freund's Mathematical Statistics with Applications Pearson, 8<sup>th</sup> Edition, 2014
- 2. Sheldon M Ross, Introduction to Probability and statistics for Engineers and scientists, Elsevier, 4<sup>th</sup> Edition, 2014
- 3. Frederick S. Hillier Gerald J. Lieberman Bodhibrata Nag Preetam Basu, Introduction to Operations Research, Tata McGraw-Hill Education Private Limited, 10<sup>th</sup> Edition, 2017
- 4. Ronald L Rardin, Optimization in Operations Research, Pearson, 2<sup>nd</sup> edition 2016
- 5. Ravindran, Phillips Solberg, Operations Research Principles and Practice Wiley, Second edition, 2007

#### WEB SITES:

- 1. www://nptel.ac.in/courses/111104120
- 2. www://nptel.ac.in/courses/110106062
- 3. www://archive.nptel.ac.in/courses/111/103/111103159/#
- 4. www://nptel.ac.in/courses/110104063

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	1	-	-	-	-	-	1	1	-
CO2	3	2	1	-	-	1	-	-	-	-	-	1	1	-
CO3	3	2	1	-	-	1	-	-	-	-	-	1	1	-
CO4	3	2	1	-	-	1	-	-	-	-	-	1	1	-
CO5	3	2	1	-	-	1	-	-	-	_	_	1	1	-
Average	2.8	1.8	1	-	-	1	-	-	-	-	-	1	1	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To learn various biasing arrangements for BJT and FET.
- To know about various high frequency models for BJT & its feedback configurations.
- To be familiar with construction of oscillators.
- To study Op-amp configurations with its applications.
- To design simple circuits using OPAMPs and to understand various data convertors.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Identify the transistors based on their characteristics
- Analyze high frequency transistor models
- Construct the sinusoidal and non-sinusoidal oscillators
- Interpret the functions of OP-AMP circuits
- Categorize ADC and DAC circuits

#### UNIT I BJT & MOSFET AMPLIFIERS

Small signal model – BJT &FET amplifiers – Darlington Amplifier- Boot strap technique-Multi stage amplifiers -Differential amplifiers- CMRR Cascade Amplifier –BiMOS Cascade amplifier-, Various classes of operation (Class A, B, AB, C)- efficiency calculations.

#### UNIT II- FREQUENCYANALYSISOFBJTANDMOSFETAMPLIFIERS

High frequency transistor models, frequency response of single stage and multistage amplifiers -cascade amplifier. Low frequency analysis, Miller effect, High frequency analysis of CE, MOSFET CS amplifier and single stage amplifiers, Short circuit current gain, cut off frequency– $f\alpha f\beta$ , unity gain bandwidth.

#### UNIT III IC MOSFET AMPLIFIERS

IC biasing Current steering circuits for IC amplifiers- current mirrors, - current sources-PMOS and NMOS current sources, Cascade current source, Widlar current source. Amplifier with resistive load, active Load-Depletion load, current source load, Differential amplifiers with active load.

#### UNIT IV OPERATIONAL AMPLIFIERS AND ITS APPLICATIONS

IC fabrication process – operational amplifier- characteristics -Inverting and non-inverting amplifier-differential amplifier; instrumentation amplifier; differentiator; integrator;



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programmable gain Amplifier-Comparators-Schmitt trigger; sample and hold circuits-voltage regulators introduction to phase lock loop circuits.

#### UNIT V SIGNAL GENERATORS, ACTIVE FILTERS AND DATA CONVERTERS 9

Sinusoidal oscillator - RC phase shift- wein bridge oscillator- crystal oscillator - RC relaxation oscillator; 555 timer Astable mode of operation -PWM Generation-Active filters-first and second order-low pass and high pass filters-frequency response- DAC- Weighted resistor, R-2R ladder- ADC - dual slope, successive approximation. Switched capacitor circuits.

#### **TOTAL: 45**

#### **SUGGESTED READINGS:**

- 1. J. Millman and A. Grabel, "Microelectronics", 2nd edition, McGraw Hill, 2009.
- 2. Ramakant A.Gayakwad, "Op-Amps and Linear Integrated Circuits, Prentice Hall of India, New Delhi, 2000.
- 3. P. Horowitz and W. Hill, "The Art of Electronics", 2nd edition, Cambridge University Press, 2006.
- 4. A.S. Sedra and K.C. Smith, "Microelectronic Circuits", Oxford University Press, Incorporated, Edition IV, 2019.
- 5. Paul R. Gray and Robert G.Meyer, "Analysis and Design of Analog Integrated Circuits", John Wiley, 3rd Edition, 2001.

#### WEB LINKS:

- 1. https://archive.org/details/ApplicationsOfOperationalAmplifiers3rdGenerationTechniques
- 2. http://ocw.mit.edu/resources/res-6-010-electronic-feedbacksystems-spring-2013/textbook/
- 3. http://www.nptel.ac.in/courses/117106088/1
- 4. http://analogcorner.net/ https://nptel.ac.in/courses/117101106/
- 5. http://www.owlnet.rice.edu/~dodds/Files331/analog\_notes.pdf

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	1	-	1	2	-
CO2	3	3	2	1	-	-	-	-	-	1	-	1	2	-
CO3	3	2	1	-	-	-	-	-	-	1	-	1	2	-
CO4	2	1	-	-	-	-	-	-	-	1	-	1	2	-
CO5	3	3	2	1	-	-	-	-	-	1	-	1	2	-
Average	2.8	2.2	1.5	1	-	-	-	-	-	1	-	1	2	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

2023-2024

Semester IV

#### 23BEEC402B

#### **OPERATING SYSTEMS**

**5H-4C** 

Instruction Hours/week: L:3 T:0 P:2

Marks: Internal:40 External:60 Total:100

#### (i) THEORY

PRE-REQUISITES: Programming Logic and Design

#### **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To learn the basic concepts of operating systems.
- To understand the concepts of scheduling techniques.
- To infer different memory management techniques.
- To familiarize with the important mechanisms in file systems.
- To appreciate the emerging trends in memory management and networking.

#### **COURSE OUTCOMES:**

Upon Completion of this course the students will be able to:

- Outline the basic services and functionalities of operating systems.
- Experiment with pre-emptive and non-preemptive scheduling algorithms.
- Identify memory management techniques in operating system
- Analyze the functionality of file systems.
- Compare Linux and Windows operating systems.

#### UNIT IOPERATING SYSTEM OVERVIEW

Operating systemstructure–Operations–Process–Memory–Storagemanagement– Protectionandsecurity–Distributed systems – Computing Environments – Open source operating systems – OS services – User operating system interface – System calls – Types – System programs – OS structure – OS generation –System boot – Process concept – Scheduling – Operations on processes – Cooperating processes – Inter process communication – Examples – Multithreading models – Thread libraries – Threading issues – OS examples.

#### UNIT II SCHEDULING AND DEADLOCK

Basic concepts – Scheduling criteria – Scheduling algorithms – Thread scheduling – Multiple processor scheduling – Operating system examples – Algorithm evaluation – The critical section problem –Peterson's solution – Synchronization hardware – Semaphores – Classic problems of synchronization –Critical regions – Monitors – Synchronization examples – Deadlocks – System model – Deadlock characterization – Methods for handling deadlocks – Deadlock Prevention – Deadlock avoidance –Deadlock detection – Recovery from deadlock.

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End Semester Exam:3 Hours

#### **UNIT III MEMORY MANAGEMENT9**

Memory management – Swapping – Contiguous memory allocation–Paging–Segmentation– Example: The Intel Pentium–Virtual memory: Background–Demandpaging–Copyonwrite– Pagereplacement–Allocationofframes–Thrashing.

#### UNIT IV FILE SYSTEMS

File concept – Access methods – Directory structure – File system mounting – Protection – Directory implementation–Allocation methods–Free space management –Disk scheduling– Disk management–Swap space management–Protection.

#### UNIT V THELINUX AND WINDOWS SYSTEM

The Linux system–History–Designprinciples–Kernel modules –Process management– Scheduling –Memory management–File systems–Input and output – Inter process communication – Network structure – Security – Windows 7 – History – Designprinciples– System components – Terminal services and fast user – Filesystem– Networking.

#### TOTAL:45

9

#### **TEXTBOOK:**

1. Abraham Silberschatz, Peter B Galvin and Greg Gagne, Operating System Concepts Essentials, John Wiley and Sons, Ninth Edition, 2012

#### **REFERNCESBOOKS:**

- 1. Andrew S Tanenbaum, Modern Operating Systems, Pearson Education, Fourth Edition, 2015.
- 2. Dhamdhere DM, Operating Systems: A Concept–based Approach, McGraw–Hill, Second Edition, 2012
- 3.WilliamStallings, Operating Systems: Internals and Design Principles, Prentice Hall, Seventh Edition, 2011.

#### **WEBSITES:**

- 1. www.os-book.com/
- 2. www.williamstallings.com/OperatingSystems/
- 3. www.cs.hmc.edu/~keller/courses/cs156/s98/
- 4. www.nptel.ac.in/courses/106108101/2

#### (ii) LABORATORY LISTOFEXPERIMENTS:

- 1. Basic UNIX commands.
- 2. Shell Programming.
- 3. File system related system calls. (Learn to create, open, read, write, seek into, close files; open, read, write, search, close directories).

- 4. Process management–Fork, Exe c (Learn to create a new process and to overlay an executable binary image on an existing process).
- 5. Inter-process communication between related processes using pipes.
- 6. Inter-processcommunicationamongunrelatedprocessesusingmessagequeues.
- 7. CPU scheduling algorithms.
- 8. Contiguous memory allocation strategies -best fit, first fit and worst fit strategies.
- 9. Page replacement algorithms.

#### **TOTAL: 30**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	2	2	-	2	-	1
CO2	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO3	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO4	3	3	2	1	-	-	-	-	2	2	-	2	-	1
CO5	3	3	2	1	-	-	-	-	2	2	-	2	-	1
Average	2.8	2.2	1.5	1	-	-	-	-	2	2	-	2	-	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### Semester IV

23BEEC403 ANALOG AND DIGITAL COMMUNICATION 3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

#### End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- Study different analog modulation techniques
- Expose various digital modulation techniques
- Understand Pulse Code Modulation (PCM) techniques
- Provide knowledge on inter symbol interference and Nyquist criterion.
- Learn about pass band digital modulation and understand the concept of various error correcting codes.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Identify analog modulation principles in terms of efficiency and bandwidth
- Interpret the concepts of digital modulation
- Analyze the bit error performance of digital modulation schemes
- Inspect the characteristics of base band pulse transmission techniques
- Illustrate multiple access techniques

#### UNIT I ANALOG MODULATION SYSTEMS

Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

#### UNIT II DIGITAL MODULATION SYSTEMS

Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.

#### UNIT III BASE BAND PULSE TRANSMISSION

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion.

#### UNIT IV PASS BAND DIGITAL MODULATION

Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying. Digital Modulation tradeoffs. Optimum

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demodulation of digital signals over band-limited channels Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.

#### UNIT V SPREAD SPECTRUM AND MULTIPLE ACCESS TECHNIQUES

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Introduction, Pseudo-noise sequence, DS spread spectrum with coherent binary PSK, processing gain, FH spread spectrum, multiple access techniques – wireless communication, TDMA and FDMA, wireless communication systems, source coding of speech for wireless communications.

#### TOTAL:45

#### **TEXT BOOKS:**

- 1. Haykin S., "Communications Systems", John Wiley and Sons, 2008.
- 2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
- 3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill,2008.
- 4. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication", Kluwer Academic Publishers, 2004.
- 5. Proakis J.G., "Digital Communications", 4th Edition, McGraw Hill, 2001.
- 6. Martin S.Roden, "Analog and Digital Communication System", 3rd Edition, PHI, 2002.

### **REFERENCE SITES:**

- 1. https://www.youtube.com/watch?v=PygLdNMDr\_E&list=PLNEqvET0cb64T1v3SrANLP 5zC8OQpjXB I&index=1
- 2. https://www.youtube.com/watch?v=\_YahdHyZLL4&index=10&list=PLqGm0yRYwTgX2 FkPVcY 6io003-tZd8Ru
- 3. https://www.youtube.com/ watch?v=6028j9VLlXA& list=PLqGm0yRYwTgX2FkPVcY 6io003-tZd8Ru&index=14
- 4. https://www.youtube.com/watch?v=HCltbJapAf8&index=38&list=PLqGm0yRYwTgX2F kPVcY 6io003-tZd8Ru

COs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	1	-	-	2	-
CO2	3	3	2	-	-	-	-	-	-	1	-	-	2	-
CO3	3	3	2	-	-	-	-	-	-	1	-	-	2	-
CO4	3	3	2	-	-	-	-	-	-	1	-	-	2	-
CO5	3	3	2	-	-	-	-	-	-	1	-	-	2	-
Average	3	2.8	1.8	-	-	-	-	-	-	1	-	-	2	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### 2023-2024 Semester IV

#### 23BEEC404 MICROPROCESSOR & MICROCONTROLLER 3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:60 External:40 Total:100

### End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To study various processor architecture
- To expose them to programming concepts
- To learn the concepts of Interfacing with Peripherals
- To outline advanced processor architecture
- To understand the concepts of PIC Microcontroller architecture and provide knowledge on advanced RISC machine (ARM) architecture

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Explain the architecture and operation of 8085 / 8086.
- Construct ALP for 8086 microprocessors
- Analyze advanced processors and controllers
- Explain peripheral interfaces and memory concepts
- Build architectures of RISC and ARM processors

#### UNIT I MICROPROCESSOR

Introduction to 8085-Instruction sets and addressing Modes-Assembly language programs in 8085, Introduction to 8086 -Architecture- Memory Organization-Bus Operation-I/O Addressing-Minimum Mode-Maximum Mode-Timing Diagram- Interrupts - Service Routines – I/O and Memory Interfacing concepts.

#### UNIT II PROGRAMMING OF 8086

Instruction Format - Instruction set - Addressing Modes- -Assembly language programs in 8086, Strings, Procedures, Macros, Assembler Directives- Interrupts and Interrupt Applications.

#### UNIT III ADVANCED PROCESSOR AND MICROCONTROLLER

Advanced coprocessor Architectures- 286, 486, - Architecture of 8051 microcontroller, Register Set - I/O and memory addressing- Interrupts- Instruction set- Addressing modes.-Latest Pentium architectures- Core i7, Timer, A/D and D/A converters; System level interfacing design.

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#### UNIT IV INTRODUCTION TO PIC MICROCONTROLLER

Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–IC16cxx–-Pipelining - – Register File Structure - Instruction Set - Addressing modes – Simple Operations.

#### UNIT V INTRODUCTION TO RISC AND ARM

Introduction to RISC processors; RISC architecture – Review of ARMv7 core and its architecture, introduction to ARM Programming-register configuration and instruction set – sample program. ARM microcontrollers interface designs.

#### **TOTAL: 45**

#### **SUGGESTED READINGS:**

- 1. R. S. Gaonkar, "Microprocessor Architecture: Programming and Applications with the8085/8080A", Penram International Publishing, 2002.
- 2. D A Patterson and J H Hennessy, "Computer Organization and Design The hardware and software interface". Morgan Kaufman Publishers 2018
- 3. Douglas Hall, "Microprocessors Interfacing", Tata McGraw Hill, 2005.
- 4. Kenneth J. Ayala, "The 8051 Microcontroller", Clifton Park, NY : Thomson Delmar Learning, 2005.
- 5. Jonathan W Valvano "Introduction to Arm(r) Cortex-M Microcontrollers" Create space Independent Publisher 2012

#### **WEB LINKS:**

- 1. http://www.engineersgarage.com
- 2. www.comtechdoc.org
- 3. www.emu8086.com
- 4. www.microcontroller.com
- 5.www.newelectronics.co.uk/electronics

6.http://nptel.ac.in/courses/108107029

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	PO7	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	-	3	-
CO2	3	2	1	-	-	-	-	-	-	1	-	-	3	-
CO3	3	3	2	1	-	-	-	-	-	1	-	1	3	-
CO4	2	1	-	-	-	-	-	-	-	1	-	-	3	-
CO5	3	2	1	-	-	-	-	-	-	1	-	1	3	-
Average	2.6	1.8	1.33	1	-	-	-	-	-	1	-	1	3	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

2023-2024 Semester IV

23BEEC404BWEB APPLICATION DEVELOPMENT3H-3C

Instruction Hours/week: L:3 T:0 P:0

#### Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSEOBJECTIVES:**

The goal of this course is for the students

- To understand the concepts of Servlet API.
- To gain knowledge of JSP and its tags.
- To illustrate the concepts of Hibernate for interacting with database.
- To understand Spring container, Modules, Dependency Injection and aspect-oriented programming.
- To understand how to design and develop application using Spring Boot

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to

- Apply web based applications using Servlet.
- Build user interface for web applications using JSP and JDBC.
- Make use of object relational mapping with hibernate query language.
- Analyze web based applications using Spring MVC.
- Examine web based applications using Spring Boot.

#### UNIT I -SERVLET API

Introduction to MVC - Features of MVC - Components of MVC. Servlet Introduction, Servlet Life Cycle, Types of Servlets, Servlet Configuration with Deployment Descriptor, Working with Servlet Context and Servlet Config Object, Attributes in Servlet, Response and Redirection using Request Dispatcher, send Redirect Method, Session Tracking: using Cookies, HTTP Session Performing CRUD (Create, Read, Update, Delete) operation using Servlet with JDBC

#### UNIT II - JSP API

Introduction to JSP, Comparison with Servlet, JSP Architecture, JSP: Life Cycle, Scripting Elements, Directives, Action Tags, Implicit Objects, Java Beans in JSP, Expression Language (EL), JSP Standard Tag Libraries (JSTL) Core Tags, Session Management, Exception Handling, CRUD Application.

#### UNIT III - HIBERNATE API

Introduction to Hibernate, Exploring Architecture of Hibernate, Object Relation Mapping (ORM) with Hibernate, Hibernate Annotation, Querying in Hibernate - Hibernate Query Language (HQL) - Criteria Queries - Create queries with Native SQL, Basic O/R Mapping - Collection Mapping - Association Mappings - CRUD Operation using Hibernate API

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#### UNIT IV SPRING MVC

Spring: Introduction, Architecture, Spring MVC Module, Life Cycle of Bean Factory, Constructor Injection, Dependency Injection, Inner Beans, Aliases in Bean, Bean Scopes, Spring Annotations, Spring AOP Module, Spring DAO, Database Transaction Management, CRUD Operation using DAO and Spring API. Build Tools – Maven and Gradle, pom.xml and build. Gradle, building application using Maven and Gradle

#### **UNIT V - SPRING BOOT**

Introduction to Spring Boot - Spring Vs. Spring Boot - Internals of Spring Boot - Spring Boot Application Creation - Spring Boot Auto Configuration - Spring Boot Annotations - Spring Data JPA Introduction - Crud Repository and JPA Repository Methods in JPA - Custom Queries in JPA - Spring Boot Profiles - Spring Web MVC – Thyme leaf – Spring boot application with CRUD operation.

#### **TOTAL : 45**

#### **TEXT BOOKS:**

- 1. "J2EE: The complete Reference", Jim Keogh, McGraw-Hill, 2017.
- 2. "Spring and Hibernate (2<sup>nd</sup> Edition)", Santhosh Kumar, McGraw Hill, 2013.
- 3. "Mastering Spring Boot 2.0: Build modern, cloud-native, and distributed systems using Spring Boot", Shagun Bakliwal, Packt Publishing Ltd, 2018.

#### **REFERENCE BOOKS:**

- 1. "Servlet & JSP: A Tutorial (2nd Edition)", Budi Kurniwan, Brainy Software, 2015.
- 2. "Mastering Spring Boot 2.0: Build modern, cloud-native, and distributed systems using Spring Boot", Rajput.D, Packt Publishing, 2018.
- 3. "Developing Java Applications with Spring and Spring Boot", Claudio and Greg, Packt Publishing Ltd, 2018.

#### **WEBSITES:**

- 1. https://docs.oracle.com/javaee/7/tutorial/index.html
- 2. https://javaee.github.io/tutorial/
- 3. https://hibernate.org/orm/documentation/6.1/
- 4. https://docs.spring.io/spring-framework/docs/3.2.x/spring-framework-reference/html/mvc.html
- 5. https://docs.spring.io/spring-boot/docs/current/reference/htmlsingle/

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	<b>PO4</b>	PO5	PO6	<b>PO7</b>	PO8	PO9	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
C01	3	2	1	1	1	-	-	1	2	2	-	2	-	1
CO2	3	2	1	1	1	-	-	1	2	2	-	2	-	1
CO3	3	2	1	1	2	-	-	1	2	2	-	2	-	1
CO4	3	3	2	1	2	-	-	1	2	2	-	2	-	1
CO5	3	3	2	1	2	-	-	1	2	2	-	2	-	1
Average	3	2.4	1.4	1	1.6	-	-	1	2	2	-	2	-	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**23BEEC404C** LOW CODE APPLICATION DEVELOPMENT 3H-3C

Instruction Hours/week: L:3 T:0 P:0

### Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To identify the key components of no-code development and explain their applications.
- To demonstrate the ability to use various no-code platforms and tools to create and publish applications.
- To analyze data using machine learning tools and present results in a meaningful way.
- To create voice applications and bots that integrate with external services to enhance functionality.
- To develop basic UI/UX design skills to create and design effective and aesthetically pleasing applications.

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Illustrate low-code tools in web scraping
- Build low-code platforms applications with zapier, voice flow and figma.
- Experiment with the machine learning algorithm.
- Categorize voice-based applications using voice API
- Analyze UI/UX design for Figma application.

#### UNIT I – WEB SCRAPING AND API PARABOLA WITH NO CODE

No-Code Stacks\_No-Code Fundamentals. Web Scraping : Scrape Data From Websites\_ Initial Scraper Setup\_ Defining our data\_ Using our Scraped Data. Work With APIs : Filtering Data\_ Numerical Formatting\_ Exporting Data\_ Publishing

#### UNIT II - BUILD AUTOMATIONS AND CREATE BOTS WITH NO CODE 9

Automations using Zapier : Introduction \_ Connecting Google sheets \_ Connecting twitter\_ Publishing Zapier Automation . Bots : Configuring Slack \_ Creating First bot using slack \_ Including conditional and helper functions \_ Connecting Giphy \_Connecting slack to bot \_ Publishing our bot.

#### **UNIT III - DATA SCIENCE**

Introduction to Data science: Data flow\_ Machine learning . Obviously AI : Introduction\_ Sourcing our data\_Uploading our data\_Analyze our data \_ Publish using Obviously AI.

#### **UNIT IV - VOICE APP**

Voice App: Introduction\_VoiceFlow\_Initialsetup\_Create the launch sequence for voice application\_Querying the user\_Calling API for data\_Returning Data to the user\_Testing the application\_Publish the voice app.

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#### UNIT V – UI / UX DESIGN FOR APPLICATION

UI/UX: Introduction\_Business Use case\_Tools.Figma :Introduction\_Filesetup\_Placing Images\_ Add logo to the Frame\_ Body copy\_ Building Forms\_ Profile Image\_ Proportions\_ Project.

#### TOTAL:45

#### **TEXTBOOKS:**

- Paul E Love ,"Mastering No-Code: Create Professional Quality Apps Without Coding" (Vol. 1), 2021.
- 2. Mikhail Zhilkin," Data Science Without Makeup 1st Edition", 2021.

#### **REFERENCESBOOKS:**

- 1. Mittal Akhil," Getting Started with Chatbots", 2019.
- 2. Fabio staiano," Designing and Prototyping Interfaces with Figma", 2022.

#### **WEBSITES:**

- 1. https://www.udemy.com/course/no-code-developer/
- 2. https://www.nocode.tech/academ

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	1	-	-	1	2	2	-	2	-	1
CO2	3	2	1	-	2	-	-	1	2	2	-	2	-	1
CO3	3	2	1	-	2	-	-	1	2	2	-	2	-	1
CO4	3	3	2	1	2	-	I	1	2	2	-	2	-	1
CO5	3	3	2	1	2	-	I	1	2	2	-	2	-	1
Average	2.8	2.2	1.5	1	1.8	-	-	1	2	2	-	2	-	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

23BEEC405A SIGNALS AND SYSTEMS 3H-3C

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

End Semester Exam:3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To understand Linear Shift-Invariant Systems and its properties.
- To learn the concepts of Fourier transform in signal analysis.
- To study Laplace Transform.
- To familiarize with Z Transform and its application on signals.
- To get familiarize of sampling of signals.

#### **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Classify the types of signals and systems
- Apply Fourier series and Fourier transforms to signals
- Examine the sampling theorem for discretization and reconstruction.
- Make use of Laplace Transforms for LTI systems
- Apply Z Transforms for signals

#### UNIT I INTRODUCTION TO SIGNALS AND LSI SYSTEMS

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids\_ Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant & Timeinvariant, Causal & Non-causal, Stable & Unstable.

#### UNIT II FOURIER TRANSFORM

Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases.

#### UNIT III SAMPLING

The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.

# 3H-3C

Semester IV

9

#### UNIT IV LAPLACE TRANSFORM ANALYSIS

The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior.

#### UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS

Impulse response – Difference equations-Convolution sum- Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems-DT systems connected in series and parallel.

#### **SUGGESTED READINGS:**

- 1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, 2015.(Unit 1- V)
- 2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems Continuous and Discrete", 4<sup>th</sup> edition, Prentice Hall, 2007.
- 3. B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.
- 4. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, 2003.
- 5. Dr.J.S.Chitode, Signals And Systems.. Publisher, Technical Publications, 2009.

#### WEB LINKS:

- 1. https://swayam.gov.in/nd1\_noc20\_ee15/preview
- 2. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/
- 3. https://nptel.ac.in/courses/117101055/
- 4. https://nptel.ac.in/courses/108104100/

#### PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 COs **CO1** 2 1 1 2 \_ \_ -\_ -\_ -1 \_ **CO2** 3 3 2 2 1 1 1 \_ \_ \_ \_ \_ \_ 3 2 **CO3** 1 1 1 2 \_ \_ \_ \_ \_ \_ **CO4** 3 3 2 1 1 1 2 \_ \_ \_ \_ \_ \_ **CO5** 3 2 1 1 1 2 -------2.8 2.2 1.5 Average 1 1 1 2 --

## CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL: 45** 

2023-2024

Semester IV 3H-3C

#### **23BEEC405B**

#### ADVANCED ALGORITHMS

Instruction Hours/week: L:3 T:0 P:0

#### Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### i) THEORY

#### **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To learn programming and mathematical backgrounds for design and analysis of algorithm.
- To study the concept of designing an algorithm.
- To have a complete understanding of the various advanced data structures.
- To implement advanced algorithms using appropriate design techniques.
- To inculcate advanced graph algorithms and applications.

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Explain data structures and mathematical background in programming.
- Solve problems using hungarian algorithm.
- Compare backtracking techniques with branch and bound techniques.
- Examine Eulerian and hamiltonian paths in graphs
- Analyze searching and pattern matching algorithms.

#### UNIT IPROGRAMMING LANGUAGE BACKGROUNDS

Programming language backgrounds: STL in C++ – Data structures support in python. Mathematical backgrounds: Logarithmic exponentiation – Efficient prime factorization – Combinatorics – Sieve of Eratosthenes–Geometry–Co-ordinate compression–Binomial coefficients–Euclid's extended algorithm – Line intersections

#### UNIT II ADVANCED AGORITHMS

Probability – Modular multiplicative inverse – Matrix exponentiation –Millerrabin primality test–Heavy light decomposition–Convex hull –Hungarian algorithm –Sweep line algorithm – Gaussian algorithm – Pollard rho factorization – Euler's totient function –Burnside lemma.

#### UNIT III DYNAMIC PROGRAMMING

Recursion – Dynamic programming – Backtracking – Branch and bound – Suffix automata – Game theory – Meet in the middle – Arbitrary precision integer – Square root decomposition. Knapsack problem – Stable marriage problem – N-queen problems – Tug of wars – Sudoku problem. Advanced Trees: Binary indexed tree – Segment tree – Lowest common ancestors – Counting inversions – Suffix tree –Interval tree–Sparse table–K-Dtree–Treap–Link/cuttree

#### 9

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#### UNIT IV GRAPH ALGORITHMS

Advanced Graph Algorithms: Union find/disjoint set – Cycle detection – Bellman ford – Maxflow –Ford-fulkerson – Edmonds karp algorithm – Min cut – min cost flow – Dinic's algorithm – Maximum bipartite matching–Topological sorting– Eulerian and Hamiltonian paths– Graph coloring–Blossom's algorithm – Jarvis algorithm – Graham Scan – Johnson's algorithm.

#### UNIT V SEARCHING AND PATTERN MATCHING

Searching and pattern matching: Rabin-karp algorithm – Z-algorithm – Aho-corasick string matching algorithm – Manacher's algorithm–Kasai's algorithm – Levenshtein distance. Sorting: Quick select.

#### TOTAL:45

#### **TEXT BOOKS:**

- 1. Cormen TH, Leiserson CE and Stein C, Introduction to Algorithms, PHI Learning, Third Edition, 2011
- 2. Yonghui Wu, Jiande Wang," Data structure Practice for Collegiate Programming Contests and Education",2016
- 3. Steven Halim, Felix Halim, "Competitive Programming, The New Lower Bound of Programming Contests," ",Lulu publication, Third Edition, 2013

#### **REFERENCES BOOKS:**

- 1. Jon Kleinberg, Eva Tardos," Algorithm design", Pearson Education, First Edition, 2006
- 2. Jeff Edmonds, How to Think about Algorithms, Cambridge University, First Edition, 2014
- 3. Anany Levitin, Introduction to Design and Analysis of Algorithm, Pearson Education, Third Edition, 2017

#### **WEBSITES:**

- 1. www.cpbook.net/methodstosolve
- 2. www.codechef.com/certification/prepare#foundation
- 3. www.people.cs.clemson.edu/~bcdean/dp\_practice/
- 4. www.infoarena.ro/blog/meet-in-the-middle
- 5. www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-854j-advancedalgorithms-fall-2005/

## CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	2	2	-	2	2	1
CO2	3	2	1	1	-	-	-	-	2	2	-	2	2	1
CO3	3	3	2	1	-	-	-	-	2	2	-	2	2	1
CO4	3	3	2	1	-	-	-	-	2	2	-	2	2	1
CO5	3	3	2	1	I	-	-	I	2	2	-	2	2	1
Average	2.8	2.4	1.8	1	-	-	-	-	2	2	-	2	2	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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2023-2024 Semester -IV

**4H-4**C

23BEEC406 CONTROL SYSTEMS

Instruction Hours/week: L:3 T:1 P:0

End Semester Exam:3 Hours

Marks: Internal:40 External:60 Total:100

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To study the control system components.
- To learn feedback concepts.
- To understand the use of transfer function models for analysis of physical systems.
- To provide adequate knowledge in time response of systems and steady state error analysis.
- To gain basic knowledge on open loop and closed-loop frequency response of systems and outline state variable analysis and Non-linear control.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Characterize a system and its steady state behavior.
- Analyze time response specifications of a system.
- Inspect frequency response specifications of a system.
- Design a controller for given specifications.
- Solve nonlinear system using state variables.

#### UNIT I INTRODUCTION TO CONTROL PROBLEM

Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra. Signal flow graphs.

#### UNIT II TIME RESPONSE ANALYSIS

Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

#### UNIT III FREQUENCY-RESPONSE ANALYSIS

Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. M & N Circle. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

#### UNIT IV INTRODUCTION TO CONTROLLER DESIGN

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design

#### 12

12

### 12

specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

#### UNIT V STATE VARIABLE ANALYSIS AND NON-LINEAR CONTROL 12

Introduction, State space representation, State modes of linear systems, State equations, transfer matrices, diagonalization solution of state equations, controllability and observability, effect of pole zero cancellation in transfer function. Nonlinear system–Basic concepts and analysis. Advances in Control Systems: Basic Introduction to Neural Networks and Fuzzy logic control.

#### TOTAL:60

#### SUGGESTED READINGS:

- 1. Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill, 2012.
- 2. Kuo, B.C., "Automatic Control System", Prentice Hall, ninth edition, 2002.
- 3. Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, 2010.
- 4. Nagrath & Gopal, "Modern Control Engineering", New Age International, New Delhi 2009.

#### WEB LINKS:

- 1. http://gtu-info.com/Subject/2150909/CSE/Control\_System\_Engineering/Syllabus
- 2. https://swayam.gov.in/nd1\_noc19\_de04/preview

### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	1	-	-	2	-
CO2	3	3	2	1	-	-	-	-	-	1	-	-	2	-
CO3	3	3	2	1	-	-	-	-	-	1	-	-	2	-
CO4	3	3	2	1	-	-	-	-	-	1	-	-	2	-
CO5	3	2	1	-	-	-	-	-	-	1	-	-	2	-
Average	3	2.6	1.6	1	-	-	-	-	-	1	-	-	2	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester -IV

#### 23BEEC411 ANALOG CIRCUITS LABORATORY 2H-1C

Instruction Hours/week: L:0 T:0 P:2

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To gain knowledge on various feedback configurations.
- To learn different RC and LC oscillators.
- To understand various non-linear application of Op-amp.
- To know about filter design.
- To learn multivibrator circuits using op-amp and study multivibrator circuits using NE555 Timer.

#### **COURSE OUTCOMES:**

At the end of this course, the students will be able to

- Inspect the performance of types of amplifiers and oscillator
- Analyze OP-AMP circuits.
- Construct multivibrators using ICs
- Build the filters for given cutoff frequencies
- Make use of Pspice/Multisim to simulate the oscillators and amplifiers.

#### LIST OF EXPERIMENTS:

- 1. Series and Shunt feedback amplifiers
- 2. Design of transistor RC phase shift oscillator
- 3. Design of LC-Hartley and Colpitt oscillator
- 4. Phase shift and wienbridge oscillator using op-amp.
- 5. Inverting, Non-inverting and differential amplifiers.
- 6. Integrator and Differentiator.
- 7. Astable, Monostable multivibrators and Schmitt Trigger using op-amp.
- 8. Instrumentation amplifier.
- 9. Active lowpass, highpass and Bandpass filter.
- 10. Astable and monostable using NE555 Timer.
- 11. Simulation of Experiments1,2,3,4,5 using PSpice / MultiSim

#### TOTAL:30

## CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	3	-	-	1	2	2	-	-	2	-
CO2	3	3	2	1	3	-	-	1	2	2	-	-	2	-
CO3	3	2	1	-	3	-	-	1	2	2	-	-	2	-
CO4	3	2	1	-	3	I	I	1	2	2	-	-	2	-
CO5	3	2	1	-	3	-	-	1	2	2	-	-	2	-
Average	3	2.4	1.4	1	3	-	-	1	2	2	-	-	2	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### 2023-2024

# 23BEEC412 ANALOG AND DIGITAL COMMUNICATION 2H-1C LABORATORY

Instruction Hours/week: L: 0 T: 0 P:2 Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To understand the building blocks of digital communication system.
- To impart knowledge on sampling of signals.
- To study different coding techniques.
- To study about multiplexing mechanisms.
- To understand different modulation scheme and to learn about analog and digital modulation technique.

#### **COURSE OUTCOMES:**

At the end of this course, the students will be able to

- Examine the process of converting analog signal to digital signal using sampling and its reconstruction.
- Construct time division multiplexing and demultiplexing circuits.
- Experiment with PAM / PWM / PPM and PCM circuits.
- Analyse the modulation techniques used in digital communication.
- Simulate analog and digital modulation techniques using Multisim.

#### LIST OF EXPERIMENTS:

- 1. Signal Sampling and its reconstruction.
- 2. Time division multiplexing and Demultiplexing.
- 3. Pulse modulation and demodulation-PAM/PWM/PPM.
- 4. Pulse code modulation & demodulation.
- 5. Line Coding & Decoding.
- 6. Delta modulation and demodulation.
- 7. Digital modulation & demodulation-ASK, PSK, FSK.
- 8. Software simulation of Signal Sampling and its reconstruction using Multisim.
- 9. Software simulation of AM, FM, PM using Multisim.
- 10. Software simulation of PAM/PWM/PPM using Multisim.
- 11. Software simulation of ASK, PSK, FSK using Multisim.

#### TOTAL:30

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	3	-	-	1	2	2	-	-	2	-
CO2	3	2	1	-	3	-	-	1	2	2	-	-	2	-
CO3	3	2	1	-	3	-	-	1	2	2	-	-	2	-
CO4	3	3	2	1	3	-	-	1	2	2	-	-	2	-
CO5	3	3	2	1	3	-	-	1	2	2	-	2	2	-
Average	3	2.6	1.6	1	3	-	-	1	2	2	-	2	2	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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Semester -IV

#### 23BEEC413 MICROPROCESSOR & MICROCONTROLLER LABORATORY 2H-1C

Instruction Hours/week: L:0 T:0 P:2

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To introduce students to basic Assembly Language Programming (ALP) in 8086 and 8085.
- To infuse practical training on interfacing peripheral devices with 8086 microprocessors.
- To inculcate basic programming on advanced controller.
- To know about ADC and DAC programming concepts.
- To understand interfacing concepts.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Construct ALU programs for 8085 and 8086.
- Develop programs using arithmetic, logical and bit manipulation instructions of 8051 microcontroller.
- Experiment with 8255 PPI Interface / 8279 programmable keyboard interface, interfaces.
- Experiment with 8253 programmable interval timer / 8251 USART interfaces.
- Demonstrate the programs on MSP430 microcontroller.

#### LIST OF EXPERIMENTS:

- 1. Programs for 8/16 bit Arithmetic operations (Using 8085 and 8086).
- 2. Programs for Sorting and Searching (Using 8086).
- 3. Programs on Subroutines (Using 8051).
- 4. Interfacing ADC and DAC (Using MSP 430 Controllers/8051).
- 5. Interfacing with 8255.
- 6. Interfacing with 8279.
- 7. Transfer data serially between two kits (8253/8251).
- 8. Traffic Control using MSP 430 Controller.
- 9. Interfacing and Programming of Stepper motor, DC motor using MSP 430.
- 10. Programming using Arithmetic, Logical & Bit Manipulation instructions of 8051microcontroller.

TOTAL:30

## CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	3	-	-	1	1	2	-	1	3	-
CO2	3	2	1	-	3	-	-	1	2	2	-	1	3	-
CO3	3	2	1	-	3	-	-	1	1	2	-	1	3	-
CO4	3	2	1	-	3	-	-	1	-	2	-	1	3	-
CO5	3	2	1	-	3	-	-	1	-	2	-	1	3	-
Average	3	2	1	-	3	-	-	1	1.3	2	-	1	3	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation
2023 -2024 Semester IV

23BEMC451 FOUNDATION OF ENTREPRENEURSHIP 1H - 0C

Instruction Hours/week: L:1 T:0 P:0

Marks: Internal:100 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students to

- Equip and develop the learners entrepreneurial skills and qualities essential to undertake business.
- Impart the learners entrepreneurial competencies needed for managing business efficiently and effectively.
- Understand basic concepts in the area of entrepreneurship
- Develop personal creativity and entrepreneurial initiative
- Adopt the key steps in the elaboration of business idea

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to

- Gain entrepreneurial competence to run the business efficiently.
- Undertake businesses in the entrepreneurial environment
- Prepare business plans and undertake feasible projects.
- Be efficient in launching and develop their business ventures successfully
- Monitor the business effectively towards growth and development

#### UNIT I ENTREPRENEURIAL COMPETENCE

Entrepreneurship concept – Entrepreneurship as a Career – Entrepreneurial Personality - Characteristics of Successful Entrepreneurs – Knowledge and Skills of an Entrepreneur.

#### UNIT II ENTREPRENEURIAL ENVIRONMENT

Business Environment - Role of Family and Society - Entrepreneurship Development

### UNIT III BUSINESS PLAN PREPARATION

Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product – Ownership.

#### TOTAL:15

#### TEXT BOOKS

- 1. S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, NewDelhi, 2016.
- 2. R.D.Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2018.
- 3. Rajeev Roy ,Entrepreneurship, Oxford University Press, 2nd Edition, 2011.
- 4. Donald F Kuratko, T.V Rao. Entrepreneurship: A South Asian perspective. Cengage Learning, 2012.

23BEMC452Essence of Traditional Indian Knowledge and Heritage1H - 0CInstruction Hours/week: L:1 T:0 P:0Marks: Internal:100 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students to

- Impart a holistic understanding about Indian Culture and Thoughts from a Historical perspective.
- Encourage critical appreciation of the Indian thoughts and cultural manifestations.
- Introduce the students to important concepts from the diverse intellectual traditions of India.
- Make use of Indian cultural heritage and various epistemological inquiries.
- Gain knowledge of Indian heritage.

#### **COURSE OUTCOMES:**

Upon completion of this course, the students will be able to

- Understand the cultural diversity
- Infer the need of cultural unity
- Know the Dravidian culture
- Realize the power of the Indian educational system called gurukul
- Come to know the concepts of Vedic thought

#### UNIT I INTRODUCTION TO INDIAN THOUGHT AND CULTURE

Plurality of Indian Culture - Cultural Diversity and Cultural Unity -Different Manifestations of Indian Culture: Indus Valley culture -Vedic Culture and Dravidian culture. -The Medieval Bhakti Culture

#### UNIT II TRADITIONAL KNOWLEDGE SYSTEMS OF INDIA

Introduction to the Traditional Indian Education System of Gurukul - Parampara - Understanding Indian Philosophy: Vedic Thought and the nine schools of Philosophy - Indigenous Knowledge and Women in India

#### UNIT III PROTECTION OF TRADITIONAL KNOWLEDGE

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, the value of TK in the global economy, Role of Government to harness TK.

#### TOTAL:15

#### **TEXT BOOKS:**

- 1. Chatterjee, Satishchandra, and Dhirendramohan Datta. (2007) Introduction to Indian Philosophy. Rupa Publications, New Delhi.
- 2. Husain, S. Abid. (2003). The National Culture of India. National Book Trust, NewDelhi.

23BEEC501ANTENNA AND WAVE PROPAGATION4H-4C

Instruction Hours/week: L:3, T:1, P:0

Marks: Internal:40 External:60 Total:100

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To provide insight on antennas fundamentals.
- To study electromagnetic field (EM) around an antenna.
- To introduce various antenna arrays and its radiation characteristics.
- To have an exposure on special purpose antennas.
- To understand the concept of beam forming in smart antennas and to learn the mechanism of ionosphere propagation.

#### **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Explain the fundamental concepts of antenna design
- Identify array of antenna
- Summarize special purpose antennas
- Analyse the design parameters of smart antenna
- Explain radio wave propagation in ionosphere

#### UNIT I FUNDAMENTAL CONCEPTS

Physical concept of radiation, Radiation pattern, near-and far-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions, Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication

#### UNIT II ANTENNA ARRAYS

Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays, and synthesis of antenna arrays using Schelkunoff polynomial method, Woodward-Lawson method.

#### UNIT III SPECIAL PURPOSE ANTENNA

Aperture and Reflector Antennas-Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas. Broadband Antennas- Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas.

#### UNIT IV SMART ANTENNAS

Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of

# End Semester Exam:3 Hours

#### 12

#### 12

12

#### 12

rectangular and circular patch antennas. Concept and benefits of smart antennas, fixed weight beam forming basics, Adaptive beam forming.

#### UNIT V RADIO WAVE PROPAGATION

Modes of propagation, Structure of atmosphere, ground wave propagation, Tropospheric propagation, Duct propagation, Troposcatter propagation, Flat earth and curved earth concept Sky wave propagation – Virtual height, critical frequency, Maximum usable frequency – Skip distance, Fading, Multi hop propagation

#### **SUGGESTED READINGS:**

- 1. D. Kraus, Antennas, McGraw Hill, 2008.
- 2. C.A. Balanis, Antenna Theory Analysis and Design, John Wiley, 2007
- 3. R.E. Collin, Antennas and Radio Wave Propagation, McGraw Hill, 1985.
- 4. R.C. Johnson and H. Jasik, Antenna Engineering Handbook, McGraw hill, 1984.
- 5. I.J. Bahl and P. Bhartia, Micro Strip Antennas, Artech House, 1980.
- 6. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill, 2005.
- 7. R.E. Crompton, Adaptive Antennas, John Wiley.
- 8. H.Sizun "Radio Wave Propagation for Telecommunication Applications", First Indian Reprint, Springer Publications, 2007.

#### WEB LINK:

- 1. https://swayam.gov.in/nd1\_noc20\_ee20/preview
- 2. http://www.gvpcew.ac.in/Material%203%20Units/3%20ECE%20AWP.pdf

COs	<b>PO1</b>	<b>PO2</b>	PO3	PO4	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	1	3	1
CO2	3	2	1	-	-	-	-	-	-	1	-	1	3	1
CO3	2	1	-	-	-	-	-	-	-	1	-	1	3	1
CO4	3	3	2	1	-	-	-	1	-	1	-	1	3	1
CO5	2	1	-	-	-	-	-	-	-	1	-	1	3	1
Average	2.4	1.6	1.5	1	-	-	-	1	-	1	-	1	3	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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TOTAL: 60

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			Semester-V
23BEEC502A	EMBEDDED	SYSTEMS	<b>3H-3</b> C
Instruction Hours/week: L:3, T:0	, <b>P:0</b>	Marks: Internal:40 External:	:60 Total:100
		End Semester Ex	xam:3 Hours
<b>COURSE OBJECTIVE:</b>			

The goal of this course for students is

- To impart basic knowledge on Embedded systems.
- To understand various bus configurations used in embedded systems.
- To Inculcate the understanding of ARM programming.
- To study about real time operating system and programming.
- To learn RTOS and their applications.

**B.E Electronics and Communication Engineering** 

#### **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Explain the component of embedded systems.
- Infer the types of I/O devices and buses.
- Inspect the instruction set for faster execution.
- Outline the importance of RTOS.
- Choose system level functions in RTOS.

#### UNIT I INTRODUCTION TO EMBEDDED SYSTEMS

Processor Embedded into a system - Embedded Hardware units and devices in a system -Embedded Software in a System - Classification of Embedded Systems - Embedded Design Life Cycle - Design Example: Model Train Controller. ARM Embedded System - CISC and RISC Processors - ARM Architecture - Programming Model - Operating Modes.

#### UNIT II BUSES FOR DEVICES NETWORK

I/O Devices - Device I/O Types and Examples – Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports- Timer and Counting Devices - '13C', 'USB', 'CAN' and advanced I/O Serial high speed buses- ISA, PCI, PCI-X, cPCI and advanced buses.

#### UNIT III ARM PROGRAMMING

ARM Instruction Set - ARM Instruction Types: Data Transfer, Data Processing and Control Flow Instructions - Interrupts - Exceptions types - NVIC Registers for interrupt control.

#### UNIT IV REAL TIME OPERATING SYSTEM

Operating System Basics - Types of Operating Systems - Foreground / Background systems - Critical section of code - Resource - Shared Resource - Tasks, Process and Threads, States - Types of Real-time tasks -Task Periodicity - Multiprocessing and Multitasking.



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### 2023-2024

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#### UNIT V REAL TIME TASK COMMUNICATION& APPLICATION

RTOS Task scheduling models: Co-operative Round Robin Scheduling, Cyclic Scheduling with Time Slicing, RM and EDF - Priority Inheritance Protocol - Semaphores and Shared Data - Message Queues - Mailboxes and Pipes - Dead lock -Case Study of Automotive Application- Smart card System Application - ATM machine –Digital camera – Weather monitoring.

#### **TOTAL: 45**

9

#### **SUGGESTED READINGS:**

- 1. Raj Kamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw Hill, 2nd Edition, 2009
- 2. JosephYiu, —The Definitive Guide to ARM Cortex M31, Second Edition, Newnes 2010.
- Andrew N.Sloss, Dominic Symes and Chris Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", Morgan Kaufmann Publishers, 1st Edition, 2004.
- 4. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.
- 5. Jonathan W Valvano, "Embedded Systems: Introduction to Arm® Cortex TM-M Microcontrollers", 5th Edition, 2015.
- 6. Steve Furber, "ARM System on Chip Architecture", Addison Wesley Professional, 2nd Edition, 2000
- 7. Joseph Yiu, "The Definitive Guide to ARM Cortex-M3 processors", Elsevier Newness publication, 3rd Edition, 2014.
- 8. Shibu K.V, "Introduction to Embedded Systems", Tata Mc Graw Hill, 1st Edition, 2009.
- 9. Jean J.Labrosse, "Embedded Systems Building Blocks", CMP Books, 2nd Edition, 2010.

#### WEB LINKS:

- 1. https://swayam.gov.in/nd1\_noc20\_cs15/preview
- 2. https://swayam.gov.in/nd1\_noc20\_ee42/preview

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	2	3	2
CO2	2	1	-	-	-	-	-	-	-	1	-	2	3	2
CO3	3	3	2	1	2	-	-	-	-	1	-	2	2	2
CO4	2	1	-	-	2	-	-	-	-	1	-	2	3	2
CO5	3	2	1	-	2	-	-	-	-	1	-	2	3	2
Average	2.4	1.6	1.5	1	2	-	-	-	-	1	-	2	2.8	2

#### CO, PO, PSO Mapping

Semester-V

**3H-3C** 

Instruction Hours/week: L:3 T:0 P:0

**23BEEC502B** 

### Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students

• To outline the fundamental concepts, technologies, and protocols used in computer networks

**NETWORK ARCHITECTURE AND SECURITY** 

- To gain knowledge in network design, implementation, and management
- To identify the problems related to network performance and security
- To understand about the principles of data transmission, routing, and switching
- To implement network architecture, including local area networks (LANs), wide area networks (WANs), and internet protocols (IP)

### **COURSE OUTCOMES:**

Upon completion of the course the students will be able to

- Infer the layered architecture of computer networks functionalities.
- Apply error detection techniques in the data link layer.
- Examine the process of transition mechanisms from IPv4 to IPv6.
- Analyze networking protocols in real-world problems.
- Inspect security architectures for protecting common network attacks.

#### **UNIT I – INTRODUCTION**

Introduction – history and development of computer networks – Networks topologies – Layering and protocols. Physical Layer: Different types of transmission media – errors in transmission – attenuation – noise. Repeaters – Encoding – NRZ, NRZI, Manchester, 4B/5B MAC Layer: Aloha, CSMA, CSMA/CD, CSMA/CA protocols. Examples: Ethernet, including Gigabit Ethernet and WiFi (802.11). Time permitting, a quick exposure to Token Ring and to Bluetooth, WiMax may also be included.

### UNIT II - DATA LINK LAYER

Data Link Layer: Error detection (Parity, CRC), Sliding Window, Stop and Wait protocols. LAN: Design, specifications of popular technologies, switching. A student should be able to design the LAN of a campus or a building.

### UNIT III - NETWORK LAYER AND TRANSPORT LAYER

Network layer: Internet Protocol, IPv6, ARP, DHCP, ICMP, Routing algorithms: Distance vector, Link state, Metrics, Inter-domain routing. Subnetting, Classless addressing, Network Address Translation. Transport layer: UDP, TCP. Connection establishment and termination, sliding window revisited, flow and congestion control, timers, retransmission, TCP extensions. Design issues in protocols at different layers.

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## UNIT IV - NETWORK PROGRAMMING

Network Programming: Socket Programming. Session, Presentation, and Application Layers. Examples: DNS, SMTP, IMAP, HTTP, etc.

### **UNIT V – NETWORK SECURITY**

Network Security: Concepts of symmetric and asymmetric key cryptography. Sharing of symmetric keys - Diffie Hellman. Public Key Infrastructure. Public Key Authentication Protocols. Symmetric Key Authentication Protocols. Pretty Good Privacy (PGP), IPSec, Firewalls.

# TEXT BOOKS:

- 1. "Computer Networks", 5th Edition, AS Tanenbaum, DJ Wetherall, Prentice Hall, 2010.
- 2. "Computer Networks: A Systems Approach", 5<sup>th</sup> Edition, LL Peterson, BS Davie, Morgan Kauffman, 2011.

#### **REFERENCE BOOKS:**

- 1. "Computer Networking: A Top-Down Approach", 5<sup>th</sup> Edition JF Kurose, KW Ross, Addison Wesley, 2009.
- 2. "Cryptography and Network Security, Principles and Practise", 5<sup>th</sup> Edition, W.Satllings, Prentice Hall, 2010.

#### **WEBSITES:**

- 1. https://in.coursera.org/learn/fundamentals-network-communications
- 2. https://www.udemy.com/course/the-ultimiate-computer-networks-part-2/

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COs	<b>PO1</b>	<b>PO2</b>	PO3	PO4	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	2	2	-	2	-	1
CO2	3	2	1	-	-	-		-	2	2	-	2	-	1
CO3	3	3	2	1	-	1	-	2	2	2	-	2	-	1
CO4	3	3	2	1	-	1	-	2	2	2	-	2	-	1
CO5	3	3	2	1	-	1	-	2	2	2	-	2	-	1
Average	2.8	2.4	1.8	1	-	1	-	2	2	2	-	2	-	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL: 45** 

#### **B.E Electronics and Communication Engineering**

**23BEEC503A** 

Instruction Hours/week: L:3, T:1, P:0

End Semester Exam:3 Hours

Marks: Internal:40 External:60 Total:100

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To impart knowledge on processing of discrete signals. •
- To study discrete Fourier, transform and its applications. •
- To design Finite Impulse Response (FIR) filter using window function.
- To introduce the concept of Infinite Impulse Response (IIR) filters for different frequencies.

**DIGITAL SIGNAL PROCESSING** 

• To learn the effect of finite word length in FIR filter design and understand DSP architecture and its algorithms.

#### **COURSE OUTCOMES:**

At the end of this course, the students will be able to

- Construct continuous and discrete signals mathematically in time and frequency domain
- Identify the response of LSI system for given signals.
- Examine FIR Digital filters
- Inspect IIR Digital filters
- Utilize the effects of word length for designing filters

#### **DISCRETE FOURIER TRANSFORM** UNIT I

Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes, Z-Transform, Analysis of LSI systems, frequency Analysis, Inverse Systems, Discrete Fourier Transform (DFT), Fast Fourier Transform Algorithm, Implementation of Discrete Time Systems.

#### UNIT II FIR FILTER DESIGN

Design characteristics of FIR filters with linear- phase - Frequency response of linear phase FIR filters – Design of FIR filters using window functions (Rectangular, Hamming, Hanning, Blackmann, and Kaiser)- Comparison of design methods of FIR filters

#### UNIT III **FINITE WORD LENGTH EFFECTS**

Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multirate signal processing. Application of DSP.

#### **UNIT IV IIR FILTER DESIGN**

Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low pass, High pass, Band pass and Band stop filters, Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.

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2023-2024 Semester-V

**4H-4C** 

#### UNIT V DIGITAL SIGNAL PROCESSORS

Introduction to Commercial DS Processors-Architecture- addressing mode -Features – Functional modes.

#### **TOTAL: 45+15**

#### **SUGGESTED READINGS:**

- 1. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH,2011.
- 2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, 3rd edition, Prentice Hall, 2009.
- 3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Pearson Education, 4/e, 2007.
- 4. Emmanuel C.Ifeachor, "Digital Signal Processing A Practical Approach" 2nd edition, Pearson Education, 2011.
- 5. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall,2009.
- 6. B. Venkataramani M Bhaskar, Digital Signal Processors, McGraw Hill Education, 2017.
- 7. B.Venkataramani, M.Bhaskar, "Digital Signal Process", 2<sup>nd</sup> edition, McGraw Hill Education, 2017.

#### WEB LINKS:

- 1. https://www.coursera.org/learn/dsp
- 2. <u>https://www.tutorialspoint.com/digital\_signal\_processing/index.htm.</u>

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COs	PO1	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	1	-	1	3	1
CO 2	3	2	1	-	-	-	-	-	-	1	-	1	3	1
CO3	3	3	2	1	-	-	-	-	-	1	-	1	3	1
CO 4	3	3	2	1	-	-	-	-	-	1	-	1	3	1
CO5	3	2	1	-	-	-	-	-	-	1	-	1	3	1
Average	3	2.4	1.4	1	-		-	-	-	1	-	1	3	1

#### CO, PO, PSO Mapping

B.F	Electronics	and (	Communicat	ion	Engineering	5
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23BEEC503BADVANCED WEB FRAMEWORKS4H-4C

Instruction Hours/week: L:3, T:1, P:0

#### **COURSEOBJECTIVES:**

The goal of this course is for the students:

- To learn the fundamental concepts of Git and JavaScript.
- To gain knowledge of Node.js.
- To understand the concepts of working with MongoDB.
- To gain knowledge of ReactJS.
- To create Restful Web Services.

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Utilize the syntax, semantics of JavaScript for a web application.
- Apply NodeJS concepts in web applications.
- Develop JavaScript's Shell using Mongo DB.
- Apply the React JS to web based applications.
- Analyze the backend connection in React JS web applications.

#### UNIT I – INTRODUCTION TO GIT AND JAVASCRIPT

Introduction to Full Stack Development - Intro to Git - Git Commands using CLI - Git vs. GitHub - Git Work Flow - Pull Requests. JavaScript: Variables – Datatypes - Operators -Expressions – Data structures – Control statements – Functions – this keyword – AJAX – Callbacks – Promises – Classes – Modules – Debugging.

#### **UNIT II - NODE JS BASICS**

Introduction to Node.js – Modules: Common JS – ESM – Custom Modules. Package Manager: npm. Error Handling: Types of Errors – Handling Async Errors – Stack Trace – Asynchronous Programming – Command Line Apps – Working with APIs – Templating Engines.

#### **UNIT III - WORKING WITH MONGODB**

Introduction to MongoDB – MongoDB through the JavaScript's Shell – Creating and Querying through Indexes – Collections and Documents – MongoDB Query Language – Connecting node.js with MongoDB.

#### UNIT IV - FRONTEND DEVELOPMENT WITH REACT JS

Introduction to ReactJS – CLI tools – Components: Component Basics – Functional Components. Rendering – Hooks: Basic Hooks – Common Hooks – Custom Hooks –

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2023-2024 Semester-V

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Routing using React Router – State Management with Context – Styling using Material UI and Tailwind.

#### UNIT V - REST API AND TESTING

API calls: Axios – react-query – SWR – Testing: React Testing Library – Jest – Playwright – Forms with React Hook Form – Connecting react application to the backend.

#### **TOTAL: 45+15**

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- 1. Jennifer Niederst Robbins, "Fullstack React: The Complete Guide to ReactJS and Friends", Fullstack.IO, First Edition, 2017.
- 2. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node", Apress Media LLC, Second Edition, 2019.

#### **REFERENCES BOOKS:**

**TEXT BOOKS:** 

- 1. Alex Banks and Eve Porcello, "Learning React: Functional Web Development with React and Redux", O'Reilly Media, First Edition, 2017.
- 2. Sebastian Springer, "Node.js: The Comprehensive Guide to Server-Side JavaScript Programming", Shroff publishers, First Edition, 2022.
- 3. Shannon Bradshaw, Eoin Brazil and Kristina Chodorow, "MongoDB: The Definitive Guide", O'Reilly Media, Third Edition, 2020.

#### WEB SITES:

- 1. https://www.w3schools.com/jsrEF/default.asp
- 2. https://devdocs.io/javascript/
- 3. https://reactjs.org/docs/getting-started.html
- 4. https://nodejs.org/en/docs/

COs	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO 2	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO3	3	2	1	-	2	-	-	1	2	2	-	2	-	1
CO 4	3	2	1	-	2	-	-	1	2	2	-	2	-	1
CO5	3	3	2	1	2	-	-	1	2	2	-	2	-	1
Average	3	2.2	1.2	1	2	-	-	1	2	2	-	2	-	1

#### CO, PO, PSO Mapping

#### **B.E Electronics and Communication Engineering**

23BEEC503C

### **BUSINESS DATA PROCESSING**

Instruction Hours/week: L:3, T:1, P:0

End Semester Exam:3 Hours

Marks: Internal:40 External:60 Total:100

#### **COURSE OBJECTIVES:**

The goal of this course for students is:

- To understand the fundamentals of business data processing and its significance in modern organizations.
- To gain knowledge of database management systems, including database design principles, relational database concepts, and SQL fundamentals.
- To develop skills in data analysis and visualization techniques for business decisionmaking and reporting.
- To learn data analysis and visualization techniques.
- To summarize the applications of robotic process automation.

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Apply business data processing in modern organizations.
- Build a relational database table using SQL query for normalization technique
- Utilize data analysis and data visualization techniques to support business decisionmaking.
- Identify Robotic Process Automation (RPA) in business data processing.
- Analyze secure data transmission and storage practices to protect user data.

#### UNIT I INTRODUCTION TO BUSINESS DATA PROCESSING

Introduction - Overview of business data processing - significance in modern organizations - structured - unstructured - and semi-structured data - Data processing lifecycle - data collection - data entry - data storage - data processing - data output - information systems - Ethical and legal considerations.

#### UNIT II DATABASE MANAGEMENT SYSTEMS

Introduction to database management systems - Database design principles - Relational database concepts - tables - relationships - keys - normalization - SQL fundamentals - DDL - DML - Data integrity - Data Security – Privacy.

#### UNIT III DATA ANALYSIS AND VISUALIZATION

Introduction - importance in business decision-making - techniques - descriptive - diagnostic - predictive - prescriptive analysis - data visualization tools - techniques - Exploratory data analysis - visualization for business reporting and performance tracking.

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#### 2023-2024 Semester-V

**4H-4C** 

#### UNIT IV BUSINESS PROCESS AUTOMATION

Introduction to business process automation - Workflow management systems - process modeling - Business process reengineering - process optimization - Robotic Process Automation (RPA) - its applications in business data processing.

#### UNIT V DATA SECURITY AND PRIVACY IN BUSINESS

Overview of data security and privacy concerns - Data protection regulations - compliance -Secure data transmission and storage practices - Access control - user authentication - Data backup - disaster recovery.

#### **TEXT BOOKS:**

- 1. Ramesh Sharda, DursunDelen, Efraim Turban, "Business Intelligence and Analytics: Systems for Decision Support", 11th Edition, Pearson, 2021
- 2. Carlos Coronel, Steven Morris, Peter Rob, "Database Systems: Design, Implementation, and Management", 13th Edition, Cengage Learning, 2019

#### **REFERENCE BOOKS**

- 1. Thomas H. Davenport, "Big Data at Work: Dispelling the Myths, Uncovering the Opportunities", Harvard Business Review Press, 2014
- 2. Alberto Cairo, "The Truthful Art: Data, Charts, and Maps for Communication", New Riders, 2016
- 3. Randy Krum, "Cool Infographics: Effective Communication with Data Visualization and Design", Wiley, 2013

#### **WEBSITES:**

- 1. https://www.coursera.org/specializations/business-data-management-communication
- 2. https://indiafreenotes.com/business-data-processing/

CO	PO1	PO2	PO3	<b>PO4</b>	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO2	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO3	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO4	3	2	1	-	-	-	-	-	2	2	-	2	-	1
CO5	3	3	2	1	-	-	-	-	2	2	-	2	-	1
Average	3	2.2	1.2	1	-	-	-	-	2	2	-	2	-	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL:45** 

2023-2024 Semester-V

22BEEC511 DIGITAL SIGNAL PROCESSING LABORATORY 2H-1C

#### Instruction Hours/week: L:0, T:0, P:2

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To implement the IIR and FIR filters.
- To implement linear and circular convolution.
- To study the architecture of DSP processor.
- To learn DFT and FFT operations and effect of aliasing.
- To implement adaptive filters for different applications of DSP.

#### **COURSE OUTCOMES:**

At the end of this course, the students will be able to

- Demonstrate the addressing modes of TMS320C5X.
- Analyze sampling and effects of aliasing.
- Construct the FIR filters and compute FFT.
- Generate signals and perform linear and circular convolution of two sequences.
- Simulate FIR and IIR filters.

#### LIST OF EXPERIMENTS USING TMS 320C5X

- 1. Study of various architecture and addressing modes of Digital Signal Processor.
- 2. Waveform Generation.
  - Sine Wave.
  - Cosine Wave.
- 3. Implementation of FIR filters.
- 4. Calculation of FFT.

#### Simulation Using Mat lab / Equivalent Software Package

- 5. Generation of Signals.
- 6. Linear and circular convolution of two sequences.
- 7. Sampling and effect of aliasing.
- 8. Design of FIR filters.
- 9. Design of IIR filters.
- 10. Design and demonstration of Butter worth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering.

### TOTAL:30

### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	3	-	-	-	2	2	-	1	2	1
CO2	3	3	2	1	3	-	-	-	2	2	-	1	2	1
CO3	3	2	1	-	3	-	-	-	2	2	-	1	2	1
CO4	3	2	1	-	3	-	-	-	2	2	-	1	2	1
CO5	3	2	1	-	3	-	-	-	2	2	-	2	3	2
Average	2.8	2	1.25	1	3	-	-	-	2	2	-	1.2	2.2	1.2

<b>B.E Electronics</b>	and Communication Engi	ineering	2023-2024
			Semester-V
23BEEC512	EMBEDDED SYSTE	M LABORATORY	<b>2H-1C</b>
<b>Instruction Hou</b>	rs/week: L:0, T:0, P:2	Marks: Internal:40 Exter	nal <b>:60</b> Total <b>:100</b>
		End Semester	Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is:

- To learn the working of ARM processor
- To understand PIC controller programming
- To explore various interfacing board using ARM
- To gain knowledge on PIC microcontroller interfacing
- To expose them to the concept of memory
- To gain inputs on stepper motor interface

#### **COURSE OUTCOMES:**

At the end of this course, the students will be able to:

- Simulate the programs in ARM for a given application.
- Examine A/D and D/A convertors with ARM system.
- Construct real time clock and serial port programs in ARM Processor.
- Inspect the programming skill using EPROM and interrupt.
- Analyze the programs for given interfacing boards.

#### LIST OF EXPERIMENTS

- 1. Study of ARM evaluation system
- 2. Interfacing ADC and DAC.
- 3. Interfacing LED and PWM.
- 4. Interfacing real time clock and serial port.
- 5. Interfacing keyboard and LCD.
- 6. Interfacing EPROM and interrupt.
- 7. Interrupt performance characteristics of ARM and FPGA.
- 8. Flashing of LEDS.
- 9. Interfacing stepper motor and temperature sensor.
- 10.Implementing zigbee protocol with ARM.

#### TOTAL:30

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	PSO1	PSO2
CO1	3	2	1	-	3	-	-	-	2	2	-	2	3	2
CO2	3	3	2	1	3	-	-	-	2	2	-	2	3	2
CO3	3	2	1	-	3	-	-	-	2	2	-	2	3	2
CO4	3	3	2	1	3	-	-	-	2	2	-	2	3	2
CO5	3	3	2	1	3	-	-	-	2	2	-	2	3	2
Average	3	2.6	1.6	1	3	-	-	-	2	2	-	2	3	2

			Semester-V
23BEEC591	INTE	RNSHIP	2H-1C
Instruction Hours/week:	L:0, T:0, P:2	Marks: Intern	al:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To bridge the gap between academia and industry in providing a industry exposure for satisfying local industrial needs.
- To enable the students to get connected with Industry / Laboratory / Research Institute.
- Get practical knowledge on production process in the industry and develop skills to solve related problems.
- Develop skills to carry out research in the research Institutes / Laboratories.
- To learn the design methodologies and documentation process.

#### **COURSE OUTCOMES:**

At the end of this course, the students will be able to

- Gain knowledge on various tools used in industry.
- Know recent technological advancement happening in industry.
- Gain the knowledge in System-level design processes, verification and validation techniques, manufacturing and production processes in the firm or research facilities in the Laboratory/Research Institute.
- Analysis of industrial / research problems and their solutions.
- Documentation of system specifications, design methodologies, process parameters, testing parameters and results and preparing of technical report and presentation. The students individually undergo training in reputed Firms/ Research Institutes / Laboratories for the specified duration. After the completion of training, a detailed report should be submitted within ten days from the commencement of next semester.

TOTAL:30

2023-2024 Semester-V

23BEMC551MOBILE APPLICATIONDEVELOPMENT1H-0C

Instruction Hours/week: L:1, T:0, P:0

Marks: Internal:100 External:0 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for the students is to

- Develop knowledge about mobile application development.
- Understand the building blocks of mobile apps.
- Gain knowledge about graphics and animations in mobile apps.
- Know about testing of mobile apps.
- Learn the advantages and limitations of development frameworks.

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to

- Explain the overview of android with its states and lifecycle.
- Apply the mobile applications for e-marketing in Android and iPhone.
- Analyze mobile data bases and types of testing.
- Develop the simple android applications.
- Evaluate alternative mobile frameworks, and contrast different programming platforms.

#### UNIT I

Mobility lands cape-Mobile platforms-Mobile apps development-Overview of and roid platform-Setting up the mobile app development environmental on gwith an emulator-Acase study on mobile app development.

#### UNIT II

App user interface designing – Mobile UI resources (Layout, UI elements, Draw- able, Menu) – Activity – States and life cycle – Interaction amongst activities – App functionality beyond user interface–Threads, async task, services–States and lifecycle, Notifications, Broad cast receivers.

#### UNIT III

Telephony and SMS APIs – Native data handling – On-device file I/O – Shared preferences – Mobile databases such as SQLite, and enterprise data access (via Internet/Intranet). Graphics and animation –Custom views – Canvas – Animation APIs – Multimedia – Audio/video playback and record–Location awareness and native hardware access (sensors such as accelerometer and gyroscope).

#### UNIT IV

Debugging mobile apps – White box testing – Black box testing and test automation of mobile apps –JUnit for android, robotism and monkey talk. Versioning – Signing and packaging mobile apps – Distributingappsonmobilemarketplace.IntroductiontoobjectiveC–iOSfeatures

#### UNITV

UI implementation – Touch frameworks – Location aware applications using core location and map kit – Integrating calendar and address book with social media application – Using WIFI – iPhone

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market place – Drawbacks on iOS over Android – Various stores available in online market– Configuration of mobile app–Online ecommerce transaction –E-booking transaction.

#### Total :15

#### **TEXT BOOK:**

1.AnubhavPradhanand Anil V Deshpande, Composing Mobile Apps Wiley, First Edition2014

#### **REFERENCE BOOK:**

1.Barry Burd, Android Application Development All-in-one for Dummies, John Wiley, First Edition2012

#### WEBSITES

- 1. www.impetus.com/mobility
- 2. www.cise.ufl.edu/~helal/classes/f10/notes/intro\_to\_mobile.ppt
- 3. www.diva-portal.org/smash/get/diva2: 626531/FULLTEXT01.pdf
- 4. www.law.fsu.edu/library/databases/ppt/Androidapps.ppt
- 5. www.infosys.com/flypp/resources/Documents/mobile-application-testing.pdf

**VERY LARGE-SCALE INTEGRATED DESIGN 3H-3C 23BEEC601** 

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To learn about the MOS process technology.
- To learn the MOS transistor working principles.
- To learn about the concept of various CMOS logic design.
- To learn the Verilog HDL of combinational and sequential circuits.
- To learn the concept of VLSI testing strategies.

#### **COURSE OUTCOMES:**

At the end of this course, the students will be able to

- Describe the processing technologies in MOS transistor and its physical design
- Interpret the principle behind MOS transistor
- Explain the design principles of sequential logic circuits for digital operations.
- Construct the model of digital system using Hardware Description Language (HDL)
- Analyze VLSI testing techniques.

#### UNIT I MOS TECHNOLOGY

Chip Design Hierarchy - IC Layers - Photolithography - Basic MOS Transistors - CMOS Fabrication: n-well – p-well –SOI. Latch up and prevention- Layout design rules, physical design- basic concepts, CAD tool sets, physical design of logic gates- Inverter, NAND, NOR.-MOS Parasitic & SPICE Model.

#### **UNIT II** MOS TRANSISTOR PRINCIPLE

Introduction to MOSFET: Symbols, Enhancement Mode-Depletion mode transistor operation - Threshold voltage derivation - Drain current derivation - non-ideal behavior of the MOS Transistor. NMOS and CMOS inverter - Determination of pull up to pull down ratio - scaling of the MOS device.

#### UNIT III **CMOS LOGIC GATES & OTHER COMPLEX GATES**

Gate delays - Logical Effort - CMOS Static Logic - Transmission Gate Logic - Tri-State Logic -Pass Transistor Logic - Dynamic CMOS Logic - Domino CMOS Logic, NORA CMOS Logic- Clocking Strategies.

#### **UNIT IV VERILOG HDL**

Hierarchical modeling concepts - Basic concepts: Lexical conventions - Data types Modules and ports. Gate level modeling - Dataflow modeling - Behavioral modeling -

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Design examples of Combinational and Sequential circuits – Switch level modeling – Functions – UDP concepts.

#### UNIT V VLSI TESTING

Need for testing, manufacturing test principles, Design strategies for test, Chip level and system level test techniques.

#### TOTAL: 45

9

#### **SUGGESTED READINGS:**

- 1. Douglas A. Pucknell Basic VLSI Systems and Circuits 3rd Edition reprintPrentice Hall of India 2008.
- 2. John P. Uyemura, Introduction to VLSI Circuits and Systems John Wiley & Sons, Reprint 2009.
- 3. Smith.M.J. S Application Specific integrated circuits Pearson Education, New York 2008.
- 4. Weste & Eshraghian, Principles of CMOS VLSI Design 2<sup>nd</sup> Edition Addison Wesley, 2011.
- 5. John P Uyemura Chip Design for Submicron VLSI: CMOS layout and simulation Thomson India Edition 2010.
- 6. Samir Palnitkar, VerilogHDL– Guide to Digital Design and Synthesis-3<sup>rd</sup> Edition Pearson Education 2003.

#### WEB LINK:

- 1. https://swayam.gov.in/nd1\_noc20\_ee29/preview
- 2. https://www.digimat.in/nptel/courses/video/108107129/L01.html

COs	<b>PO1</b>	PO2	PO3	PO4	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	1	-	-	-	-	1	-	1	3	1
CO2	2	1	-	-	1	-	-	-	-	1	-	1	3	1
CO3	2	1	-	-	1	-	-	-	-	1	-	1	3	1
CO4	3	2	1	-	1	-	-	-	-	1	-	1	3	1
CO5	3	3	2	1	1	-	-	-	-	1	-	1	3	1
Average	2.6	2	1.67	1	1	-	-	-	-	1	-	1	3	1

#### **COURSE OUTCOMES:**

At the end of the course, the students will be able to

- Explain the principles of fiber-optic communication and bandwidth
- Illustrate optical sources and detectors
- Identify fiber connectors and couplers
- Demonstrate analog and digital links in optical communication systems
- Calculate the fiber performance parameters

#### **OVERVIEW OF OPTICAL FIBER COMMUNICATION** UNIT I

Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, Ray theory, cylindrical fiber, single mode fiber, cutoff wave length, mode filed diameter. Optical Fibers: fiber materials, photonic crystal, fiber optic cables specialty fibers. Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra model dispersion, Inter model dispersion.

#### UNIT II **OPTICAL SOURCES DETECTORS AND RECEIVERS**

Introduction, LED's, LASER diodes, Photo detectors, Photo detector noise, Response time, double hetero junction structure, Photo diodes, comparison of photo detectors. Introduction to Optical Receiver Operation, receiver sensitivity, quantum limit, eye diagrams, coherent detection, burst mode receiver, operation, Analog receivers.

#### UNIT III FIBER COUPLERS AND CONNECTORS

Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers.

#### UNIT IV ANALOG AND DIGITAL LINKS

Analog links - Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters, Radio over fiber links, microwave photonics.

**23BEEC602** 

The goal of this course for students is

- To provide knowledge on principles of fiber optic communication.
- To understand the different modes of communication in optical fibers.

FIBER OPTICS COMMUNICATION

- To learn about optical detectors and receivers.
- To acquire knowledge on multichannel transmission techniques.
- To understand the concept of analog and digital links.

# **COURSE OBJECTIVE:**

Instruction Hours/week: L:3 T:0 P:0

**B.E Electronics and Communication Engineering** 

2023-2024

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

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Digital links – Introduction, point–to–point links, System considerations, link power budget, resistive budget, short wave length band, transmission distance for single mode fibers, Power penalties, nodal noise and chirping.

### UNIT V FIBER OPTICAL MEASUREMENTS

Test Equipment's OTDR, Set ups for Measurement of Attenuation, Dispersion, NA and EYE pattern.

#### **TOTAL: 45**

9

#### **SUGGESTED READINGS:**

- 1. St 1. J. Keiser, Fibre Optic communication, McGraw-Hill, 5th Ed. 2013 (Indian Edition).
- 2. T. Tamir, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.
- 3. J. Gowar, Optical communication systems, Prentice Hall India, 1987.
- 4. S.E. Miller and A.G. Chynoweth, eds., Optical fibres telecommunications, Academic Press, 1979.
- 5. P Chakrabarti, "Optical Fiber Communication", McGraw Hill Education (India)Private Limited, 2016
- 6. GredKeiser,"Optical Fiber Communication<sup>II</sup>, McGraw Hill Education (India) Private Limited. Fifth Edition, Reprint 2013.
- 7. John M.Senior, Optical fiber communication, Pearson Education, second edition.2007.
- 8. Rajiv Ramaswami, Optical Networks, Second Edition, Elsevier, 2004

#### WEB LINKS:

- 1. https://nptel.ac.in/courses/117104127/
- 2. https://nptel.ac.in/courses/117101002/
- 3. https://nptel.ac.in/courses/108104113/
- 4. https://nptel.ac.in/courses/115107095/
- 5. https://www.slac.stanford.edu/slac/sass/talks/opticalfiber.pdf

COs	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	I	1	-	1	3	1
CO2	2	1	-	-	-	-	-	-	-	1	-	1	3	1
CO3	3	2	1	-	-	-	-	-	-	1	-	1	3	1
CO4	3	3	2	1	-	-	-	-	-	1	-	1	3	1
CO5	3	3	2	1	-	-	-	-	2	2	-	1	3	1
Average	2.6	2	1.7	1	-	-	-	-	2	1.2	-	1	3	1

#### CO, PO, PSO Mapping

2023-2024 SemesterVI

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23BEEC603	MICROWAVE ENGINEERING	<b>3H-3C</b>
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### Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To learn the two port RF network parameters.
- To learn various active and passive microwave oscillators.
- To expose various amplifier in microwave devices.
- To understand the design of microwave measurements.
- To learn the various application of microwave system.

#### **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Analyze the parameters of microwave transmission lines and wave guides.
- Explain the working of microwave tubes, oscillators and solid-state devices
- Construct microwave amplifiers and antennas.
- Calculate microwave parameters using measurements and testing techniques
- Analyze the characteristics of given microwave applications.

### UNIT I TWO PORT RF NETWORKS-CIRCUIT REPRESENTATION 9

Microwave frequency band and advantages – Review of Transmission Lines and Waveguides – Low frequency parameters: impedance, admittance, hybrid and ABCD – High Frequency Parameter: S-matrix –Representation of networks- properties of S-matrix-Reciprocal and lossless networks, transmission matrix, flow graphs.

#### UNIT II PASSIVE AND ACTIVE MICROWAVE DEVICES

High frequency effects in Tubes, Two-cavity klystron amplifier; Reflex klystron oscillator; TWT amplifier, Backwards wave oscillator; Magnetron oscillator: Theory and applications -Tunnel Diodes - Transferred electron and Avalanche transit-time devices: Gunn diode, Gunn diode as an oscillator. IMPATT, TRAPATT and BARITT – Parametric Devices and Amplifiers – Noise in Microwave amplifiers.

#### UNIT III MICROWAVE DESIGN PRINCIPLES

Impedance transformation, Impedance Matching, Microwave Filter Design, RF & Microwave Amplifier Design, Microwave Power Amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Antennas -Antenna parameters, Antenna for ground-based systems, Antennas for airborne & satellite borne systems Planar Antennas, Measurement of Microwave antenna parameters.

#### UNIT IV MICROWAVE MEASUREMENTS

Power, Frequency and impedance measurement at microwave frequency, Network Analyzer and measurement of scattering parameters, Spectrum Analyzer and measurement of spectrum of a microwave signal, Noise at microwave frequency & measurement of noise figure.

#### UNIT V APPLICATION OF MICROWAVE SYSTEMS

Wireless Communications system, Radar Systems, Radiometer Systems, Satellite Communication, Remote sensing, Microwave Propagation, Microwave Antennas.

#### **SUGGESTED READINGS:**

- 1. R.E. Collins, Microwave Circuits, McGraw Hill
- 2. K.C. Gupta and I.J. Bahl, Microwave Circuits, Artech house
- 3. David, M. Pozar, Microwave Engineering, Wiley India, (2012).
- 4. Ramo, S., Whinnery, J.R., and Duzer, T.V., Fields and Waves in Communication Electronics, Wiley India
- 5. Collin, R.E., Foundations for Microwave Engineering, IEEE Press 2009

#### WEB LINKS:

- 1. https://swayam.gov.in/nd1\_noc19\_ee68/preview
- 2. https://archive.nptel.ac.in/noc/courses/noc18/SEM2/noc18-ee23/

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	PSO1	PSO2
CO1	3	3	2	1	-	-	-	-	-	1	-	1	3	1
CO2	2	1	-	-	-	-	-	-	-	1	-	1	3	1
CO3	3	2	1	-	-	-	-	-	-	1	-	1	3	1
CO4	3	2	1	-	-	-	-	-	-	1	-	1	3	1
CO5	3	3	2	1	-	-	-	-	-	1	-	1	3	1
Average	2.8	2.2	1.5	1	-	-	-	-	-	1	-	1	3	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL: 45** 

B.E	Electronics	and (	Communication	n I	Engineering	
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2023-2024 Semester-VI

			501105001 12
<b>23BEEC604</b>	CYBE	R SECURITY	<b>3H-3</b> C
Instruction Hours/week	: L:3 T:0 P:0	Marks: Internal:40	External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To learn about the introduction of cyber security.
- To learn various malware threats and hiding files.
- To expose various ethical hacking devices.
- To learn the forensics Investigation Process.
- To learn the various cyber laws.

#### **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Analyze the tools and methods used in cybercrime.
- Identify risk management processes, risk treatment methods, organization of information security.
- Classify cyber security solutions and information assurance.
- Examine software vulnerabilities and security solutions to reduce the risk of exploitation.
- Analyze the cyber security needs of an organization.

#### UNIT I INTRODUCTION

Introduction to Cyber Security - Importance and challenges in Cyber Security - Cyberspace – Cyberthreats - Cyber warfare - CIA Triad - Cyber Terrorism - Cyber Security of Critical Infrastructure–Cyber security -Organizational Implications.

#### UNIT II HACKERS AND CYBER CRIMES

Types of Hackers - Hackers and Crackers - Cyber-Attacks and Vulnerabilities - Malware threats -Sniffing - Gaining Access - Escalating Privileges - Executing Applications - Hiding Files - CoveringTracks - Worms - Trojans - Viruses - Backdoors.

#### UNIT III ETHICAL HACKINGAND SOCIAL ENGINEERING

Ethical Hacking Concepts and Scopes - Threats and Attack Vectors - Information Assurance – Threat Modeling - Enterprise Information Security Architecture - Vulnerability Assessment and Penetration Testing - Types of Social Engineering - Insider Attack.

#### UNIT IV CYBER FORENSICS AND AUDITING

Introduction to Cyber Forensics - Computer Equipment and associated storage media - Role of forensicsInvestigator - Forensics Investigation Process - Collecting Network based Evidence - Writing ComputerForensics Reports - Auditing - Plan an audit against a set of audit criteria.

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#### UNIT V CYBER ETHICS AND LAWS

Introduction to Cyber Laws - E-Commerce and E-Governance - Certifying Authority and Controller -Offences under IT Act- Computer Offences and its penalty under IT Act 2000 - Intellectual Property Rights in Cyberspace.

#### **SUGGESTED READINGS:**

- Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., "Enterprise Cyber security -How to Build a Successful Cyber defense Program against Advanced Threats", A press, 1st Edition, 2015.
- 2. Nina Godbole, Sumit Belapure, "Cyber Security", Willey, 2011.
- 3. Roger Grimes, "Hacking the Hacker", Wiley, ist Edition, 2017.

#### WEB LINKS:

- 1. https://nptel.ac.in/courses/106106129
- 2. https://onlinecourses.swayam2.ac.in/cec20\_cs15/preview

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	3	3	2	1	-	-	-	-	-	1	-	1	2	1
CO2	3	2	`1	-	-	-	-	-	-	1	-	1	2	1
CO3	3	3	2	1	-	-	-	-	-	1	-	1	2	1
CO4	3	3	2	1	-	-	-	-	-	1	-	1	2	1
CO5	3	3	2	1	-	-	-	-	-	1	-	1	2	1
Average	3	2.8	2	1	-	-	-	-	-	1	-	1	2	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

### TOTAL: 45

2023-2024

#### **23BEEC611**

#### VLSI DESIGN LABORATORY

Semester-VI

2H-1C

Instruction Hours/week: L:0 T:0 P:2

Marks: Internal:40 External:60 Total:100 End Semester Exam:3hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To learn the CADENCE EDA tools.
- To learn the various style in Hardware Description Language (HDL).
- To learn the Finite State Machine concepts using HDL.
- To learn coding concepts for simulating real time clock.
- To learn the clocking system in HDL.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Simulate the electronic circuits using Cadence tool.
- Compile adders, registers and ALU using hardware description language.
- Simulate Finite State Machine (Moore/Mealy) programs using HDL.
- Simulate real time clock using HDL.
- Simulate CMOS logics using HDL.

#### LIST OF EXPERIMENTS:

CO, PO, PSO Mapping

- 1. Study of CADENCE EDA tool.
- 2. Design and Simulate carry look ahead Adder (Min 8 Bit) using HDL.
- 3. Design and simulate a Universal Shift Register using HDL.
- 4. Design and simulate an ALU using HDL.
- 5. Design and simulate Finite State Machine (Moore/Mealy) using HDL.
- 6. Design and simulate real time clock using HDL.
- 7. Design and simulate a CMOS inverter using digital flow.
- 8. Design and simulate a CMOS Universal Gates and Flip-Flops.
- 9. Design and simulate a CMOS Non- Inverting Amplifier.

#### **TOTAL: 30**

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	<b>PO9</b>	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	1	-	-	-	2	2	-	-	3	-
CO2	3	2	1	-	2	-	-	-	2	2	-	-	3	-
CO3	3	2	1	-	2	-	-	-	2	2	-	-	3	-
<b>CO4</b>	3	2	1	-	2	-	-	-	2	2	-	-	3	-
CO5	3	2	1	-	2	_	-	-	2	2	_	_	3	_
Average	3	2.8	2	-	1.8	-	-	-	2	2	-	-	3	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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2023-2024 Semester VI

#### 23BEEC612 OPTICAL AND MICROWAVE ENGINEERING LABORATORY 2H-1C

#### Instruction Hours/week: L:0 T:0 P:2

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To learn the impedance measurement concept.
- To learn the working of Gunn Diode oscillator.
- To learn magic tee coupler and its usage.
- To learn the microwave power measurement.
- To learn the different attenuators.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Examine the characteristics of microwave sources.
- Analyze the parameters of microwave guides
- Analyze the principles of fiber-optic communications and its type of losses.
- Demonstrate characteristics of optical sources.
- Inspect the modes of a step index cylindrical core optical fiber.

#### LIST OF EXPERIMENTS:

- 1. Characteristic of the reflex klystron oscillator
- 2. Determination of standing wave ratio and reflection coefficient.
- 3. Radiation Pattern of Horns, Paraboloids.
- 4. Characteristics of Gunn diode Oscillator.
- 5. S parameter Measurement of Magic Tee.
- 6. Study of setting up an analog and digital link using optical fiber.
- 7. Measurement of numerical aperture, bending loss of the plastic fiber
- 8. Study of Characteristics of LASER diode
- 9. Study of Characteristics of LED
- 10. Write a program to study the modes of a step index cylindrical core optical fiber.

#### **TOTAL: 30**

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	PSO1	PSO2
CO1	3	3	2	1	3	-	-	1	2	2	-	-	2	-
CO2	3	3	2	1	3	-	-	-	2	2	-	2	2	1
CO3	3	3	2	1	2	-	-	-	I	-	1	-	3	-
CO4	2	1	-	-	-	-	-	-	I	-	-	1	2	-
CO5	3	3	2	1	2	-	-	-	I	-	1	-	3	-
Average	2.8	2.6	2	1	2.5	-	-	1	2	2	-	1.5	2.5	1

<b>B.E Electronics and Communication H</b>	2023-2024	
		Semester-VI
23BEEC691	MINI PROJECT	<b>2H-1</b> C
Instruction Hours/week: L:0 T:0 P:2	Marks: Internal:1	00 External:0 Total:100
	End S	emester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To make students to understand a problem statement.
- To enable students to design an electronic circuit useful to the society.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Conceive a problem statement either from rigorous literature survey or from the requirements raised from industries.
- Analyze and categorize executable project modules after considering risks.
- Design, implement and test the prototype/algorithm in order to solve the conceived problem.
- Combine all the modules through effective team work after efficient testing.
- Elaborate the completed task and compile the project report.

COs	<b>PO1</b>	<b>PO2</b>	PO3	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	PO10	PO11	<b>PO12</b>	PSO1	PSO <sub>2</sub>
CO1	3	3	-	1	3	-	-	-	3	3	3	3	-	-
CO2	-	3	2	3	3	-	2	-	3	3	3	3	2	-
CO3	-	-	3	3	3	3	2	-	-	3	3	3	-	3
CO4	-	-	-	-	3	3	2	-	-	3	3	3	2	3
CO5	-	-	-	-	3	3	-	-	3	3	3	3	2	3
Average	3	3	2.5	2.3	3	3	2	-	3	3	3	3	2	3

#### CO, PO, PSO Mapping

<b>B.E Electronics and</b>	Communication Engine	ering	2023 - 2024
			Semester VI
23BEMC651	<b>UNIVERSITY H</b>	HUMAN VALUES	1H - 0C
Instruction Hours/w	eek: L:1 T:0 P:0	Marks: Interna	al:100 Total:100

**COURSE OBJECTIVES:** 

The goal of this course is for the students to

• To help students to understand the need, basic guidelines, content and process of value education.

End Semester Exam: 3 Hours

- To help students distinguish between values and skills
- To help students initiate a process of dialog within themselves to know whatthey 'really want to be' in their life and profession
- To help students understand the meaning of happiness within theirselves.
- To help students understand the meaning of happiness and prosperity for a human being.

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to

- Understand the significance of value inputs in a classroom, distinguish between values and skills.
- Understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
- Distinguish between the Self and the Body; understand the meaning of Harmony in the Self the Co-existence of Self and Body.
- Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships.
- Explore their role in ensuring a harmonious society.

#### UNIT-1 COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION 5

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration--what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

#### UNIT II: UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF 5

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as

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an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

#### UNIT III: UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY-HARMONY IN HUMAN-HUMAN RELATIONSHIP 5

Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in societyUndivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!

#### **TOTAL: 15**

#### **TEXT BOOKS:**

- 1. R R Gaur, R Sangal and G P Bagaria(2009)."A Foundation Course in Human Values and Professional Ethics"
- 2. 1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
- 3. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
- 4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
- 5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth Club of Rome's report, Universe Books.
- 6. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
- 7. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
- 8. A N Tripathy, 2003, Human Values, New Age International Publishers.

<b>B.E Electronics and Comn</b>	unication En	gineering	2023-2024
			Semester VII
<b>23BEEC701</b>	PROFESSI	IONAL ETHICS	<b>3H-3C</b>
Instruction Hours/week: L	:3 T:0 P:0	Marks: Internal:40 E	xternal:60 Total:100
		End Sem	ester Exam:3 Hours

#### **COURSE OBJECTIVE:**

- To enable the students to create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty and to appreciate the rights of others.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.
- To familiarize the student with professional rights and employee rights.

#### **COURSE OUTCOME:**

Upon completion of the course, the student should be able to

- Explain the human values and respect for each other.
- Apply ethics in engineering practices.
- Infer roles of engineers in society.
- Relate the responsibilities and rights in the society.
- Apply ethics in global issues.

### UNIT I HUMAN VALUES

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

#### UNIT II ENGINEERING ETHICS

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

### UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law - The challenger case study.

### UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

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#### UNIT V GLOBAL ISSUES

Multinational Corporations – Professional Rights – Employee Rights – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility – International laws.

#### TOTAL:45

#### **SUGGESTED READINGS:**

- 1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
- 2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
- 3. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
- 4. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics Concepts and Cases", Cengage Learning, 2009
- 5. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
- 6. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001
- Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt.Ltd., New Delhi 2013.
- 8. World Community Service Centre, ' Value Education', Vethathiri publications, Erode, 2011.

#### WEB LINKS:

- 1. www.onlineethics.org
- 2. www.nspe.org
- 3. www.globalethics.org
- 4. www.ethics.org

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	2	1	-	-	-	2	-	3	-	1	-	2	-	2
CO2	3	2	1	-	-	2	-	3	-	1	-	2	-	2
CO3	2	1	-	-	-	2	-	3	-	1	-	2	-	2
<b>CO4</b>	2	1	-	-	-	2	-	3	-	1	-	2	-	2
CO5	3	2	1	-	-	2	-	3	-	1	-	2	-	2
Average	2.4	1.4	1	-	-	2	-	3	-	1	-	2	-	2

			Semester VII
23BEEC702	INTERNE	T OF THINGS	<b>3H-3</b> C
Instruction Hours/wee	k: L:3 T:0 P:0	Marks: Internal:40	External:60 Total:100
		End Se	emester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To understand the definition and significance of the Internet of Things (IOT).
- To learn IOT protocol.
- To identify the middleware for IOT application.

**B.E Electronics and Communication Engineering** 

- To impart knowledge on Web of Things.
- To introduce the concept of Cloud of Things and get an idea of various application areas where IOT can be applied.

#### **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Interpret IoT architecture and its underlying technology.
- Explain the protocols in IoT.
- Illustrate the concepts of Web of Things.
- Build IoT using Rapberry Pi
- Apply IoT for given application.

#### UNIT I INTRODUCTION

Overview, technology of the internet of things Architecture - Web 3.0 View of IOT– Ubiquitous IOT Applications – Four Pillars of IOT – DNA of IOT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IOT: Overview – Communication middleware for IOT –IOT Information Security.

#### UNIT II IOT PROTOCOLS

Protocol Standardization for IOT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IOT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4,802.15.4g, 802.15.4e – BACNet Protocol – Modbus – KNX – Zigbee Architecture.

#### UNIT III WEB OF THINGS

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture standardization for WOT– Platform Middleware for WOT – Unified Multitier WOT Architecture – WOT Portals and Business Intelligence. Mobile Cloud Computing – The Cloud of Things Architecture Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things - Network Dynamics: Population Models – Information Cascades - Network Effects.

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# 2023-2024
#### UNIT IV BUILDING IOT WITH RASPBERRY PI

Building IOT with RASPERRY PI- IOT Systems - Logical Design using Python – Iot Physical Devices & Endpoints - IOT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python.

#### UNIT V APPLICATIONS

Introduction to different IOT tools - Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IOT in Smart Cities, Privacy and Security Issues in IOT Clustering, Synchronization and Software Agents. Applications - Smart Grid – Commercial building automation, Smart and Connected Cities- Smart Lighting –Agriculture.

#### TOTAL:45

#### **SUGGESTED READINGS:**

- 1. Honbo Zhou The Internet of Things in the Cloud: A Middleware Perspective CRC Press 2012.
- 2. Dieter Uckelmann; Mark Harrison; Florian Michahelles Architecting the Internet of things pringer 2011.
- 3. David Easley and Jon Kleinberg Networks, Crowds, and Markets: Reasoning About a Highly Connected World Cambridge University Press 2010.
- 4. Olivier Hersent, Omar Elloumi and David Boswarthick The Internet of Things: Applications to the Smart Grid and Building Automation Wiley 2012.
- 5. The Internet of Things: Applications to the Smart Grid and Building Automation by Olivier Hersent, Omar Elloumi and David Boswarthick Wiley -2012.

#### WEB LINK:

- 1. https://nptel.ac.in/courses/106105166/
- 2. https://www.itu.int/en/ITU-D/Regional-Presence/AsiaPacific/SiteAssets/Pages/ Events/ 2017/ Nov\_IOT/NBTC%E2%80%93ITU-IoT/Session%201%20IntroIoTMZnew%20template.pdf

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	2	1	-	-	-	-	-	1	-	1	-	1	3	1
CO2	2	1	-	-	-	1	-	1	-	1	-	1	3	1
CO3	2	1	-	-	-	1	-	1	-	1	-	1	3	1
CO4	3	2	1	-	-	1	-	1	-	1	-	1	3	1
CO5	3	2	1	-	-	1	-	1	-	1	-	1	3	1
Average	2.4	1.4	1	-	-	1	-	1	-	1	-	1	3	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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<b>B.E Electronics and</b>	Communication E	Ingineering	2023-2024
			Semester VII
23BEEC791	PROJECT	WORK PHASE-I	<b>8H-4</b> C
<b>Instruction Hours/v</b>	veek: L:0 T:0 P:8	Marks: Internal:	<b>100</b> External:0 Total:100

End Semester Exam: 3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To make students to understand a problem statement.
- To enable students to design an electronic circuit useful to the society.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Conceive a problem statement either from rigorous literature survey or from the requirements raised from industries.
- Analyze and categorize executable project modules after considering risks.
- Design, implement and test the prototype/algorithm in order to solve the conceived problem.
- Combine all the modules through effective team work after efficient testing.
- Elaborate the completed task and compile the project report.

COs	<b>PO1</b>	<b>PO2</b>	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	3	3	-	1	3	-	-	-	3	3	3	3	-	-
CO2	-	3	2	3	3	-	2	-	3	3	3	3	2	-
CO3	-	-	3	3	3	3	2	-	-	3	3	3	-	3
CO4	-	-	-	-	3	3	2	-	-	3	3	3	2	3
CO5	-	-	-	-	3	3	-	-	3	3	3	3	2	3
Average	3	3	2.5	2.3	3	3	2	-	3	3	3	3	2	3

#### CO, PO, PSO Mapping

<b>B.E Electronics and Con</b>	mmunication En	gineering	2023-2024
			Semester VII
23BEEC751	TECHNICA	AL SEMINAR	2H-1C
Instruction Hours/week	: L:0 T:0 P:2	Marks: Internal:	<b>100</b> External:0 Total:100

End Semester Exam: 3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To make students aware of recent technical advancements in electronics
- To enable students to overcome stage fear

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Conceive a problem statement either from rigorous literature survey or from the requirements raised from industries.
- Analyze and categorize executable project modules after considering risks.
- Design, implement and test the prototype/algorithm in order to solve the conceived problem.
- Combine all the modules through effective team work after efficient testing.
- Elaborate the completed task and compile the project report.

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	2	2	2	2	2	3	1
CO2	3	3	2	-	-	-	-	2	2	2	-	2	3	2
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	3	2.5	-	-	-	-	1	1	1	2	1	2	1.5

#### CO, PO, PSO Mapping

2023-2024

Semester-VIII23BEEC891PROJECT WORK PHASE-II AND VIVA-VOICE16H-8CInstruction Hours/week: L:0 T:0 P:16Marks: Internal:100 External:0 Total:100

End Semester Exam: 3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To make students to understand a problem statement.
- To enable students to design an electronic circuit useful to the society.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Conceive a problem statement either from rigorous literature survey or from the requirements raised from industries.
- Analyze and categorize executable project modules after considering risks.
- Design, implement and test the prototype/algorithm in order to solve the conceived problem.
- Combine all the modules through effective team work after efficient testing.
- Elaborate the completed task and compile the project report.

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	<b>PO2</b>	PO3	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	I	1	3	-	-	I	3	3	3	3	I	-
CO2	-	3	2	3	3	-	2	I	3	3	3	3	2	-
CO3	-	-	3	3	3	3	2	-	-	3	3	3	-	3
CO4	-	-	-	-	3	3	2	-	-	3	3	3	2	3
CO5	-	-	I	-	3	3	-	I	3	3	3	3	2	3
Average	3	3	2.5	2.3	3	3	2	-	3	3	3	3	2	3

#### **PROFESSIONAL ELECTIVES**

<b>B.E Electronics and</b>	Communication Engin	eering	2023-2024
			Semester-V
23BEEC5E01	SENSORS AN	D TRANSDUCERS	<b>3H-3</b> C
Instruction Hours/we	eek: L:3 T:0 P:0	Marks: Internal:40 Exter	nal:60 Total:100
		End Semeste	er Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To understand the characteristics of sensors and errors occurring in it.
- To study basic concepts of mechanical sensors.
- To learn about electro mechanical sensors.
- To develop knowledge in selection of suitable sensor based on requirement.
- To study basic concepts of magnetic sensors.

#### **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Classify the types of errors and characters of sensors
- Illustrate the concepts of mechanical sensors.
- Interpret the thermal and radiation sensors.
- Outline magnetic and electro static sensors
- Identify sensor for a given application. •

#### UNIT I **INTRODUCTION**

Definition, classification, static and dynamic parameters, Characterization-Electrical, mechanical, thermal, optical, biological and chemical, Classification of errors-Error analysis, Static and dynamic characteristics of transducers, Performance measures of sensors.

#### **UNIT II** MECHANICAL AND ELECTRO MECHANICAL SENSORS

Resistive Potentiometer, strain gauge, Inductive sensors and transducer, capacitive sensors, ultrasonic sensors.

#### UNIT III THERMAL AND RADIATION SENSOR

Thermal Sensors: Gas thermometric sensors, acoustic temperature sensors, magnetic thermometer, resistance change-type thermometric sensors, thermos emf sensors, junction semiconductor types, Thermal radiation sensors, spectroscopic thermometry Radiation Sensors: Photo detectors, photovoltaic and photo junction cells, photo sensitive cell, photo FET sand other devices.

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#### UNIT IV MAGNETIC AND ELECTRO ANALYTICAL SENSOR

Magnetic Sensors: Force and displacement measurement, magneto resistive sensors, Hall Effect sensor, Inductance and eddy current sensors, Angular/rotary movement transducer, Electromagnetic flow meter, squid sensor.Electro analytical Sensors: Electro chemical cell, cell potential, sensor electrodes, electro ceramics in gas media, chem FET.

#### UNIT V SENSORS AND THEIR APPLICATIONS

Auto mobile sensor, home appliance sensor, Aero space sensors, sensors for manufacturing, medical diagnostic sensors, environmental monitoring.

### SUGGESTED READINGS:

- 1. Patranabis D, Sensor and Actuators Prentice Hall of India (Pvt) Ltd 2006.
- 2. Ian Sinclair, Sensor and Transducers 3rd Edition Elsevier India Pvt Ltd, 2011.
- 3. A.K. Sawhney, Puneethsawhney A Course in Electrical and Electronic Measurements and Instrumentation Dhanpat Rai Publications 2012.
- 4. Ernest O. Doeblin, Measurement System, Application and Design 5th Edition Tata McGraw Hill Publishing Company Ltd. 2008.

#### WEB LINKS:

1. https://swayam.gov.in/nd1\_noc19\_ee41/preview

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	1	3	1
CO2	2	1	-	-	-	-	-	-	-	1	-	1	3	1
CO3	2	1	-	-	-	-	-	-	-	1	-	1	3	1
CO4	2	1	-	-	-	-	-	-	-	1	-	1	2	1
CO5	2	1	-	-	-	-	-	-	-	1	-	1	2	1
Average	2	1	-	-	-	-	-	-	-	1	-	1	2.6	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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TOTAL:45

2023-2024 Semester-V

Semester-v 3H-3C

#### **BIOMEDICAL ELECTRONICS**

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

**23BEEC5E02** 

The goal of this course for students is

- To study the methods of recording various bio potentials.
- To learn the working various medical devices.
- To study the need of electrical safety in Hospitals.
- To understand the use of radiation for diagnostic and therapy.
- To acquire skills on deploying various diagnostic equipment.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Illustrate biomedical transducers and electrodes.
- Identify the measuring devices for biological needs.
- Interpret the need of assist devices and electrical safety in hospitals
- Explain the working of radiological equipment.
- Inspect the recent trends in medical instrumentation.

#### UNIT I TRANSDUCERS AND ELECTRODES

Brief introduction to human physiology. Biomedical transducers: displacement, velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases. Bio-electrodes and bio-potential amplifiers for ECG, EMG, EEG, etc.

#### UNIT II MEASURING DEVICES

Measurement of blood temperature, pressure and flow. Impedance plethysmography. Ultrasonic, X-ray and nuclear imaging.

#### UNIT III ASSIST DEVICES

Prostheses and aids: pacemakers, defibrillators, heart-lung machine, artificial kidney, aids for the handicapped. Safety aspects and Bio-telemetry.

#### UNIT-IV RADIO LOGICAL EQUIPMENTS

Ionizing radiation, Diagnostic x-ray equipment's, use of Radio Isotope in diagnosis, Radiation Therapy, Laser in medicine, Positron emission tomography, Computed Tomography scan

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#### UNIT-V INSTRUMENTATION FOR CLINICAL LABORATORY

Bio electric amplifiers-instrumentation amplifiers isolation amplifiers-chopper stabilized amplifiers -input guarding - Measurement of PH value of Blood-blood cell counting, blood flow, Respiratory transducers and instruments.

#### **TOTAL:45**

#### **SUGGESTED READINGS:**

- 1. Leislie Cromwell, Biomedical instrumentation and measurement, Prentice Hall of India, NewDelhi.2002
- 2. W.F. Ganong, Review of Medical Physiology, 8th Asian Ed, Medical Publishers, 1977.
- 3. J.G. Webster, ed., Medical Instrumentation, Houghton Mifflin, 1978.
- 4. A.M. Cook and J.G. Webster, eds., Therapeutic Medical Devices, Prentice-Hall, 1982.

#### WEB LINKS:

1. https://freevideolectures.com/course/3318/ece5030-biomedical-electronics

C <b>O, PO,</b> 1	PSO I	Марр	ing											
COs	PO1	PO2	PO3	PO4	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	F
CO1	2	1	-	-	-	1	-	-	-	1	-	1	3	1
CO2	3	2	1	-	-	1	-	-	-	1	-	1	3	1
CO3	2	1	-	-	-	1	-	-	-	1	-	1	3	
CO4	2	1	-	-	-	1	-	-	-	1	-	1	2	1
CO5	3	3	2	1	-	1	-	-	-	1	-	1	2	
Average	2.4	1.6	1.5	1	-	1	-	-	-	1	-	1	2.6	

#### C

23BEEC5E03 DIGITAL IMAGE PROCESSING

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

**COURSE OBJECTIVES:** 

The goal of this course for students is to learn digital image fundamentals.

- To impart the necessity of image enhancement techniques.
- To be familiar with restoration techniques.
- To understand image segmentation.
- To study about image compression concepts.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Explain digital image fundamentals.
- Explain the image enhancement techniques and transform.
- Identify the image restoration techniques for retrieval of images.
- Illustrate the principles of image segmentation.
- Identify image compression techniques of images

#### UNIT I DIGITAL IMAGE FUNDAMENTALS

Introduction – Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, steps in image processing, Image acquisition, representation, sampling and quantization, relationship between pixels. – color models – basics of color image processing.

#### UNIT II IMAGE ENHANCEMENT

Image enhancement in– some basic gray level transformations – histogram processing – enhancement using arithmetic, logic operations – basics of spatial filtering Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.1- D, 2 –D DFT and its inverse transform, smoothing and sharpening filters.

#### UNIT III IMAGE RESTORATION

Image restoration: Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering. Model of degradation and restoration process – noise models – restoration in the presence of noise- periodic noise reduction.

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**3H-3C** 

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#### UNIT IV IMAGE SEGMENTATION

Thresholding and region-based segmentation. Fundamentals – models – information theory – Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds.

#### UNIT V IMAGE COMPRESSION AND RECOGNITION

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.

#### **SUGGESTED READING:**

- 1. R.C. Gonzalez, R.E. Woods, 2009, Digital Image processing, 2nd Edition, Pearson Education.
- 2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
- 3. William K Pratt, "Digital Image Processing", John Willey, 2002, Digital Picture Processing, vol .I& II, Academic Press.
- 4. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.

#### WEB LINKS:

- 1. http://www.imageprocesssingplace.com/DIP/dip-downloads/
- 2. https://nptel.ac.in/courses/117105079/
- 3. http://eeweb.poly.edu/~onur/lectures/lectures.html.
- 4. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html

COs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	-	3	1
CO2	2	1	-	-	-	-	-	-	-	1	-	-	3	1
CO3	3	2	1	-	-	-	-	-	-	1	-	-	3	1
CO4	2	1	-	-	-	-	-	-	-	1	-	-	2	1
CO5	3	2	1	-	-	-	-	-	-	1	-	-	3	1
Average	2.4	1.4	1	-	-	-	-	-	-	1	-	-	2.8	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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TOTAL:45

#### 23BEEC5E04 RADAR COMMUNICATION 3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To understand the basics of radar along with radar equation.
- To define about bearing and altitude in radar communication.
- To study the moving target indication (MTI) and pulse Doppler radar with its line canceller.
- To understand the use of Conical scanning in radar units.
- To understand antennas systems and communication equipment required for the operation of RADAR.

#### **COURSE OUTCOMES:**

At the end of the course, the students will be able to

- Explain the principles of a radar system.
- Inspect the performance parameters of radar
- Illustrate MTI and pulse doppler radar
- Classify tracking of radar systems
- Interpret electronic scanning system and its operation.

### UNIT I BASICS OF RADAR

Introduction, Maximum Unambiguous Range, Radar Waveforms, Definitions with respect to pulse waveform - PRF, PRI, Duty Cycle, Peak Transmitter Power, Average transmitter Power. Simple form of the Radar Equation, Radar Block Diagram and Operation, Radar Frequencies, Applications of Radar, The Origins of Radar, Illustrative Problems.

### UNIT II THE RADAR EQUATION

Prediction of Range Performance, Detection of signal in Noise, Minimum Detectable Signal, Receiver Noise, SNR, Modified Radar Range Equation, Envelope Detector — False Alarm Time and Probability, Radar Cross Section of Targets: simple targets – sphere, cone-sphere, transmitter Power, PRF and Range Ambiguities, System Losses.

### UNIT III MTI AND PULSE DOPPLER RADAR

Introduction, Principle, Doppler Frequency Shift, Simple CW Radar, sweep to Sweep subtraction and Delay Line Canceler, MTI Radar with – Power Amplifier Transmitter, Delay Line Cancelers

## Semester-V

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— Frequency Response of Single Delay- Line Canceler, Blind Speeds, Clutter Attenuation, MTI Improvement Factor, N- Pulse Delay-Line Canceler.

#### UNIT IV TRACKING RADAR AND SEQUENTIAL LOBING

Tracking with Radar- Types of Tracking Radar Systems, Monopoles Tracking- Amplitude Comparison Monopoles (one-and two-coordinates), Phase Comparison Monopoles, Conical Scan Tracking, Block Diagram of Conical Scan Tracking Radar, Tracking in Range, Comparison of Trackers.

#### UNIT V ELECTRONIC SCANNING RADAR

Principle of phased array for electronic scanning, Advantages and capabilities of electronic scanning, block diagram of an electronic scanning system and its operation.

#### SUGGESTED READING:

- 1. Radar Engineering and fundamentals of Navigational Aids-G.S.N. Raju, I.K International, 2008.
- 2. Introduction to Radar Systems Merrill I. Skolnik, THIRD EDITION, Tata McGraw –Hill, 2001.
- 3. Radar: Principles, Technologies, Applications- Byron Edde, Pearson Education.2009
- 4. Introduction to Radar Systems Merrill I. Skolnik, SECOND EDITION, McGraw Hill, 2001.

#### WEB LINKS:

- 1. https://nptel.ac.in/courses/108105154/
- 2. https://nptel.ac.in/courses/101108056/
- 3. https://www.tutorialspoint.com/radar\_systems/radar\_systems\_tutorial.pdf
- 4. https://swayam.gov.in/nd1\_noc19\_ee58/preview

<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
2	1	-	-	-	-	-	-	-	1	-	-	2	-
3	3	2	1	-	-	-	-	-	1	-	-	2	-
2	1	-	-	-	-	-	-	-	1	-	-	2	-
2	1	-	-	-	-	-	-	-	1	-	-	2	-
2	1	-	-	-	-	-	-	-	1	-	-	2	-
2.2	1.4	2	1	-	-	-	-	-	1	-	-	2	-
	PO1 2 3 2 2 2 2 2 2.2	PO1         PO2           2         1           3         3           2         1           2         1           2         1           2         1           2         1           2         1           2         1	PO1         PO2         PO3           2         1         -           3         3         2           2         1         -           2         1         -           2         1         -           2         1         -           2         1         -           2         1         2           2         1         2           2         1         2           2         1         2	PO1         PO2         PO3         PO4           2         1         -         -           3         3         2         1           2         1         -         -           2         1         -         -           2         1         -         -           2         1         -         -           2         1         -         -           2         1         -         -           2         1         -         -           2         1         2         -           2         1         2         -	PO1         PO2         PO3         PO4         PO5           2         1         -         -         -           3         3         2         1         -           2         1         -         -         -           2         1         -         -         -           2         1         -         -         -           2         1         -         -         -           2         1         -         -         -           2         1         -         -         -           2         1         -         -         -           2         1         -         -         -           2         1         -         -         -           2         1         -         -         -	PO1         PO2         PO3         PO4         PO5         PO6           2         1         -         -         -         -           3         3         2         1         -         -           2         1         -         -         -         -           2         1         -         -         -         -           2         1         -         -         -         -           2         1         -         -         -         -           2         1         -         -         -         -           2         1         -         -         -         -           2         1         -         -         -         -           2         1         -         -         -         -           2.2         1.4         2         1         -         -	PO1         PO2         PO3         PO4         PO5         PO6         PO7           2         1         -         -         -         -         -           3         3         2         1         -         -         -           2         1         -         -         -         -         -           2         1         -         -         -         -         -           2         1         -         -         -         -         -           2         1         -         -         -         -         -           2         1         -         -         -         -         -           2         1         -         -         -         -         -           2         1         -         -         -         -         -           2.2         1.4         2         1         -         -         -         -	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8           2         1         -         -         -         -         -         -           3         3         2         1         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2.2         1.4         2         1         -         -         -         -         -	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9           2         1         -         -         -         -         -         -         -         -           3         3         2         1         -         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2         1         -         -         -         -         -         -         -           2.2         1.4         2         1         -         -         -         -         -         -	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10           2         1         -         -         -         -         -         -         1           3         3         2         1         -         -         -         -         1           2         1         -         -         -         -         -         1           2         1         -         -         -         -         -         1           2         1         -         -         -         -         -         1           2         1         -         -         -         -         -         1           2         1         -         -         -         -         -         1           2         1         -         -         -         -         -         1           2         1         -         -         -         -         -         1           2.2         1.4         2         1         -         -         -         -         1	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11           2         1         -         -         -         -         -         -         1         -           3         3         2         1         -         -         -         -         1         -           2         1         -         -         -         -         -         1         -           2         1         -         -         -         -         -         1         -           2         1         -         -         -         -         -         1         -           2         1         -         -         -         -         -         1         -           2         1         -         -         -         -         -         1         -           2         1         -         -         -         -         -         1         -           2         1         -         -         -         -         -         1         -           2.2         1.	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11         PO12           2         1         -         -         -         -         -         -         1         -         -           3         3         2         1         -         -         -         -         -         1         -         -           2         1         2         1         -         -         -         -         -         1         -         -           2         1         -	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11         PO12         PS01           2         1              1          2           3         3         2         1             1          2           2         1          -            1          2           2         1          -            1          2           2         1             1          2           2         1             1          2           2         1             1          2           2         1             1          2           2         1         -         -

### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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### TOTAL: 45

2023-2024 Semester-V

22BEEC505 LONG TERM EVOLUTION AND 5G COMMUNICATION 3H-3C

Instruction Hours/week: L:3 T:0 P:0

End Semester Exam:3 Hours

Marks: Internal:40 External:60 Total:100

#### **COURSE OBJECTIVE:**

The goal of this course for students is:

- To study the fundamentals of wireless communications
- To introduce the concept of diversity for reception
- To impart the basics of LTE and its specifications.
- To provide overview on LTE channel structure
- To familiarize the system architecture of LTE
- To learn the main factors affecting LTE performance

#### **COURSE OUTCOMES:**

At the end of this course, the students will be able to :

- Explain the basics of wireless communications
- Identify the importance of multiplexing techniques
- Interpret the channel structures in LTE 4G.
- Outline uplink channel transport processing
- Examine the features and challenges of 4G

### UNIT I WIRELESS FUNDAMENTALS

Cellular concept, Broadband wireless channel (BWC), Fading in BWC, Modeling BWC – Empirical and Statistical models, Mitigation of Narrow band and Broadband Fading. Spatial Diversity overview, Receive Diversity, Transmit Diversity, Interference cancellation and signal enhancement, Choice between Diversity

#### UNIT II MULTICARRIER MODULATION AND MULTIPLE ANTENNAS

OFDM, Single carrier FDMA, Single carrier FDE, Channel Dependent Multiuser Resource Scheduling, Multi antenna Techniques, LTE Network Architecture. OFDM basics, OFDM in LTE, Timing and Frequency Synchronization, PAR, SC-FDE. OFDMA and SC-FDMA: OFDM with FDMA, TDMA, CDMA.

### UNIT III OVERVIEW AND CHANNEL STRUCTURE OF LTE

Introduction to LTE, Channel Structure of LTE, Downlink OFDMA Radio Resource, Uplink L1, L2 146 SC-FDMA Radio Resource. Downlink Transport Channel Processing: Overview,

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Downlink shared channels, Downlink Control Channels, Broadcast channels, Multicast channels, Downlink physical channels, H-ARQ on Downlink

#### UNIT IV UPLINK CHANNEL TRANSPORT PROCESSING

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Overview, Uplink shared channels, Uplink Control Information, Uplink Reference signals, Random Access Channels. Physical Layer Procedures: Channel Quality Indicator CQI feedback, Precoder for closed loop MIMO Operations, Uplink channel sounding, Buffer status Reporting in uplink, Scheduling and Resource Allocation, Cell Search, Random Access Procedures, Power Control in uplink

#### UNIT V RADIO RESOURCE MANAGEMENT AND MOBILITY MANAGEMENT 9

4G Vision - 4G Features and Challenges - Applications of 4G; 4G Technologies - LTE FDD vs TDD comparison; frame structure and its characteristics; Smart Antenna Techniques – OFDM-MIMO Systems PDCP overview, MAC/RLC overview, RRC overview.

#### TOTAL: 45

#### **SUGGESTED READINGS:**

- 1. Simon Haykin and Michael Moher, Modern Wireless Communication, Pearson education, 2005.
- 2. LTE for UMTS Evolution to LTE-Advanced' Harri Holma and Antti Toskala, Second Edition 2011, John Wiley & Sons, Ltd. Print
- 3. 'Evolved Packet System (EPS) ; the LTE and SAE evolution of 3G UMTS' by Pierre Lescuyer and Thierry Lucidarme, 2008, John Wiley & Sons, Ltd. Print
- 'LTE The UMTS Long Term Evolution ; From Theory to Practice' by Stefania Sesia Issam Toufik, and Matthew Baker, 2009 John Wiley & Sons Ltd

#### WEB LINK:

1. <u>https://swayam.gov.in/nd1\_noc19\_ee48/preview</u>

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COs	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	1	1	-	-	-	1	-	1	3	1
CO2	3	2	1	-	1	1	-	-	-	1	-	1	3	1
CO3	2	1	-	-	1	1	-	-	-	1	-	1	3	1
CO4	2	1	-	-	1	1	-	-	-	1	-	1	3	1
CO5	3	3	2	1	1	1	-	-	-	1	-	1	3	1
Average	2.4	1.6	1.5	1	1	1	-	-	-	1	-	1	3	1
			-	4		~								

### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### Semester-V

#### **23BEEC5E06 3H-3C MULTIMEDIA COMPRESSION TECHNIQUES**

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To understand multimedia–graphics and compression fundamentals.
- To learn audio compression techniques. •
- To understand various predictive image compression techniques.
- To study of video compression techniques and standards. •
- To acquire knowledge on Digital Video Interactive (DVI) data compression technique.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Explain multimedia-graphics and compression techniques.
- Interpret text compression techniques.
- Illustrate audio compression techniques.
- Identify the image compression techniques
- Choose the video compression technique for given application

#### UNIT I **INTRODUCTION**

Special features of Multimedia-Graphics and Image Data Representations -Fundamental concepts in Video and Digital Audio- Storage requirements for multimedia applications -Need for Compression - Taxonomy of compression techniques - Overview of source coding, source models, scalar and vector quantization theory - Evaluation techniques-Error analysis and methodologies.

#### **UNIT II** TEXT COMPRESSION

Compaction techniques -Huffmann Coding-Adaptive Huffmann Coding-Arithmetic coding-Shannon-Fanon coding–Dictionary techniques–LZW family algorithms.

#### AUDIO COMPRESSION **UNIT III**

Audio compression techniques-µ-Lawand A-Law companding. Frequency domain and filtering-Basic sub-band coding-Application to speech coding-G.722-Application to audio coding-

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MPEG audio, progressive encoding for audio–Silence compression, speech compression techniques–Formant and CELP Vocoders.

#### UNIT IV IMAGE COMPRESSION

Predictive techniques – DM, PCM, DPCM: Optimal Predictors and Optimal Quantization – Contour based compression– Transform Coding–JPEG Standard–Sub- band coding algorithms: Design of Filter banks– Wavelet based compression: Implementation using filters –EZW, SPIHT coders –JPEG 2000standards -JBIG, JBIG2 standards.

#### UNIT V VIDEO COMPRESSION

Video compression techniques and standards – MPEG Video Coding I:MPEG–1 and 2–MPEG Video Coding II: MPEG–4 and 7– Motion estimation and compensation techniques – H.261Standard –DVI technology –PLV performance–DVI real time compression–Packet Video.

#### **SUGGESTED READINGS:**

- 1. Khalid Sayood, Introduction to Data Compression Morgan Kauffman Harcourt India, San Francisco, California -2000.
- 2. David Salomon, Data Compression-The Complete Reference Springer Verlag, NewYork,2001.
- 3. YunQ. Shiand Huifang Sun, Image and Video Compression for Multimedia, Engineering-Fundamentals, Algorithms & Standards CRC press, USA 2003.
- 4. Sads Peter Symes, Digital Video Compression, McGraw Hill Pub, New Yark 2004.

#### WEB LINKS:

- 1. https://www.cosy.sbg.ac.at/~uhl/ctmdf.pdf
- 2. https://www.youtube.com/watch?v=rC16fhvXZOo

	101	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	1	2	1
CO2	2	1	-	-	-	-	-	-	-	1	-	1	2	1
CO3	2	1	-	-	-	-	-	-	-	1	-	1	2	1
CO4	3	2	1	-	-	-	-	-	-	1	-	1	2	1
CO5	3	2	1	-	-	-	-	-	-	1	-	1	2	1
Average	2.4	1.4	-	-	-	-	-	-	-	1	-	1	2	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### **TOTAL: 45**

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<b>B.E Electronics and</b>	Communication	Engineering	

2023-2024 Semester-V

23BEEC5E07PATTERN RECOGNITION3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To make aware of various classifiers for pattern recognition
- To study of parameter estimation methods
- To introduce nonparametric techniques
- To impart knowledge on unsupervised learning
- To learn about clustering in pattern recognition

#### **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Illustrate principles of pattern recognition system
- Apply statistics for pattern recognition
- Interpret estimation techniques for different models
- Explain Non-Parametric techniques for pattern recognition.
- Classify clustering techniques

#### UNIT I INTRODUCTION

Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

#### UNIT II STATISTICAL PATTEN RECOGNITION

Bayesian Decision Theory, Minimum error rate classification, Classifiers, Discriminant function, Decision surfaces, Discriminant functions for normal density, Error bounds for normal density, Missing and noisy features, Bayesian belief networks.

#### UNIT III PARAMETER ESTIMATION METHODS

Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminate analysis, Expectationmaximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

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## WEB LINKS:

1. https://swayam.gov.in/nd1\_noc19\_ee56/preview

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO2	3	2	1	-	-	-	-	-	-	1	-	-	2	-
CO3	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO4	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO5	2	1	-	-	-	-	-	-	-	1	-	-	2	-
Average	2.2	1.2	1	-	-	-	-	-	-	1	-	-	2	-
1 L a	2			High	61 N	In Car	malati							

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#### UNIT IV **NON-PARAMETRIC TECHNIQUES**

Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

#### UNIT V **UNSUPERVISED LEARNING & CLUSTERING**

Criterion functions for clustering, Clustering Techniques: Iterative square - error partitioned clustering – K means, agglomerative hierarchical clustering, Cluster validation.

#### SUGGESTED READINGS:

- 1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
- 2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
- 3. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

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**TOTAL: 45** 

		Semester-V
23BEEC5E08	NANO ELECTRONICS	<b>3H-3</b> C
Instruction Hours/week: L:3 T:0 P:0	Marks: Internal:40 External	rnal <b>:60</b> Total <b>:100</b>
	End Semest	er Exam:3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To learn the basics of quantum mechanics.
- To understand various aspects of carbon Nano structures.
- To study about resonant tunneling diode.
- To gain knowledge on Nano-materials.
- To acquire knowledge on various Nano sensors.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Interpret the basics of Quantum Mechanics.
- Explain MOS scaling approches
- Illustrate nano electronics
- Interpret Carbon Nano Structures
- Examine the working of Nano sensor for different application.

#### UNIT I BASICS OF QUANTUM MECHANICS

Introduction to nanotechnology, meso structures, Schrodinger equation, Density of States. Particle in a box Concepts, Degeneracy. Band Theory of Solids. KronigPenny Model. Brillouin Zones.

#### UNIT II SHRINK-DOWN APPROACHES

Introduction, CMOS Scaling, the nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.).

#### UNIT III CHARACTERIZATION

Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics, Band structure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation.

#### UNIT IV CARBON NANOSTRUCTURES

Carbon molecules, Carbon Clusters, Carbon Nanotubes, Carbon Nano interconnects, carbon nano antennas, application of Carbon Nanotubes.

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#### **B.E Electronics and Communication Engineering**

2023-2024

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#### UNIT V NANOSENSORS

Introduction Sensor and Nano sensors, Order from Chaos, Characterization, Perception, Nano sensors Based On Quantum Size Effects, Electrochemical Sensors, Sensors Based On Physical Properties, Nano biosensors, Smart Dust-Sensor for the future. Applications: Injection lasers, quantum cascade lasers, single-photon sources, biological tagging, NEMS, MEMS.

#### **TOTAL: 45**

#### **SUGGESTED READINGS:**

- 1. G.W. Hanson, Fundamentals of Nano electronics, Pearson, 2009.
- 2. W. Ranier, Nanoelectronics and Information Technology (Advanced Electronic Material and Novel Devices), Wiley-VCH, 2003.
- 3. K.E. Drexler, Nano systems, Wiley, 1992.
- 4. J.H. Davies, The Physics of Low-Dimensional Semiconductors, Cambridge University Press, 1998.
- 5. C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley, 2003.
- 6. Antonio Maffucci, Sergey Maksimenko, Yuri Svirko by Carbon-Based Nano electromagnetic 2019.

#### WEB LINK:

1. https://swayam.gov.in/nd1\_noc19\_mm21/preview

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COs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	1	2	1
CO2	2	1	-	-	-	-	-	-	-	1	-	1	2	1
CO3	2	1	-	-	-	-	-	-	-	1	-	1	2	1
CO4	2	1	-	-	-	-	-	-	-	1	-	1	2	1
CO5	3	3	2	1	-	-	-	-	-	1	-	1	2	1
Average	2.2	1.4	2	1	-	-	-	-	-	1	-	1	2	1

#### CO, PO, PSO Mapping

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#### Semester-VI

#### 23BEEC6E01 APPLICATION SPECIFIC INTEGRATED CIRCUIT DESIGN 3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To understand the principles of design logic cells, I/O cells.
- To study about interconnect architecture.
- To explore the Application Specific Integrated Circuits (ASIC) design flow from the circuit and layout design point of view.
- To study about logic synthesis and placement.
- To understand high performance algorithms for ASIC.

#### **COURSE OUTCOMES:**

At the end of the course, the students will be able to

- Classify types of ASIC and logic cell
- Examine the programmable logic of ASIC
- Explain architecture of ASIC
- Illustrate logic synthesis, placement and routing
- Explain high performance algorithm for ASICs/SoCs

### UNIT I INTRODUCTION TO ASIC, CMOS LOGIC AND ASIC LIBRARY DESIGN 9

Types of ASICs - Design flow - CMOS transistors - Combinational Logic Cell – Sequential logic cell -Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance-Logical effort.

### UNIT II PROGRAMMABLE ASICS, PROGRAMMABLE ASIC LOGIC CELLS AND PROGRAMMABLE ASIC I/O CELLS 9

Anti-fuse - static RAM - EPROM and EEPROM technology - Actel ACT - Xilinx LCA –Altera FLEX - Altera MAX DC & AC inputs and outputs - Clock & Power inputs – Xilinx I/O blocks.

#### UNIT III PROGRAMMABLE ASIC ARCHITECTURE

Architecture and configuration of Spartan / Cyclone and Virtex / Stratix FPGAs – Micro-Blaze / Nios based embedded systems – Signal probing techniques.

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#### UNIT IV LOGIC SYNTHESIS, PLACEMENT AND ROUTING

Logic synthesis - ASIC floor planning- placement and routing - power and clocking strategies.

#### UNIT V HIGH PERFORMANCE ALGORITHMS FOR ASIC / SOCS

High performance algorithms for ASICS/ SoCs as case studies – Canonic Signed Digit Arithmetic, KCM, Distributed Arithmetic, High performance digital filters for sigma-delta ADC, USB controllers, OMAP.

#### **TOTAL: 45**

#### **SUGGESTED READINGS:**

- 1. Douglas J. Smith, HDL Chip Design, Madison, AL, USA: Doone Publications, 1996.
- 2. M.J.S.Smith, " Application Specific Integrated Circuits", Pearson, 2003
- 3. Mohammed Ismail and Terri Fiez, "Analog VLSI Signal and Information Processing ", McGraw Hill, Digitized 2007
- 4. Roger Woods, John McAllister, Dr. Ying Yi, Gaye Lightbod, "FPGA-based Implementation of Signal Processing Systems", Wiley, 2008
- 5. Steve Kilts, "Advanced FPGA Design," Wiley Inter-Science 2007

#### WEB LINKS:

- 1. https://www.electronics-notes.com/articles/electronic\_components/programmable-logic/whatis-an-asic-application-specific-integrated-circuit.php
- 2. https://www.tce.edu/sites/default/files/PDF/14EC770-ASIC-DESIGN-K.Kalyani.pdf

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	-	3	-
CO2	3	3	2	1	-	-	-	-	-	1	-	-	3	-
CO3	2	1	-	-	-	-	-	-	-	1	-	-	3	-
CO4	2	1	-	-	-	-	-	-	-	1	-	-	3	-
CO5	2	1	-	-	1	-	-	-	-	1	-	1	3	1
Average	2.2	1.4	2	1	1	-	-	-	-	1	-	1	3	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### 23BEEC6E02WIRELESS SENSOR NETWORKS3H-3C

Instruction Hours/week: L:3 T:0 P:0

End Semester Exam:3 Hours

Marks: Internal:40 External:60 Total:100

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To study about Wireless networks architecture and standards.
- To introduce concept of nesC.
- To understand localization techniques.
- To acquire knowledge on various protocols.
- To learn various sensor network platforms and tools.

#### **COURSE OUTCOMES:**

At the end of the course, the students will be able to

- Explain fundamentals and challenges of sensor networks
- Illustrate the sensor node architecture and operating system for sensor networks
- Interpret the localization and positioning of sensor nodes.
- Classify the networking protocols
- Analyse the programming tools for sensor networks

#### UNIT I INTRODUCTION

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks

#### UNIT II NETWORK ARCHITECTURE

Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to Tiny OS and nesC, Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.

#### UNIT III DEPLOYMENT AND CONFIGURATION

Localization and positioning, Coverage and connectivity, Single-hop and multihop localization, self-configuring localization systems, sensor management.

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# Semester-VI

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#### UNIT IV NETWORK AND ROUTING PROTOCOLS

Issues in designing MAC protocol for WSNs, Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and Zig Bee, Disseminationprotocol for large sensor network. Issues in designing routing protocols, Classification of routing protocols, Energy-efficient routing, Unicast, Broadcast and multicast, Geographic routing.

#### UNIT V SENSOR NETWORK PLATFORMS AND TOOLS

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS3 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.

#### **TOTAL: 45**

#### **SUGGESTED READINGS:**

- 1. Holger Kerl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Network", John Wiley and Sons, 2005 (ISBN: 978-0-470-09511-9)
- 2. Raghavendra, Cauligi S, Sivalingam, Krishna M., ZantiTaieb, "Wireless Sensor Network", Springer 1st Ed. 2004 (ISBN: 978-4020-7883-5).
- 3. Feng Zhao, Leonidas Guibas, "Wireless Sensor Network", Elsevier, 1st Ed. 2004 (ISBN: 13-978-1-55860-914-3)
- 4. Kazem, Sohraby, Daniel Minoli, TaiebZanti, "Wireless Sensor Network: Technology, Protocols and Application", John Wiley and Sons 1st Ed., 2007 (ISBN: 978-0-471-74300-2).
- 5. B. Krishnamachari, "Networking Wireless Sensors", Cambridge University Press.2005

#### WEB LINK:

1. https://nptel.ac.in/courses/106105160/

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	1	-	-	-	1	-	1	2	1
CO2	2	1	-	-	-	1	-	-	-	1	-	1	2	1
CO3	2	1	-	-	-	1	-	-	-	1	-	1	2	1
CO4	2	1	-	-	-	1	-	-	-	1	-	1	2	1
CO5	3	3	2	1	-	1	-	-	-	1	-	1	2	1
Average	2.2	1.4	2	1	-	1	-	-	-	1	-	1	2	1
1 - L	ow, 2	- Med	lium,	3 - Hi	gh, '-'	' - No	Corre	elation	1					

#### CO, PO, PSO Mapping

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23BEEC6E03SPEECH AND AUDIO PROCESSING3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To introduce the concept of speech coding.
- To familiarize the mathematical model of speech signal.
- To learn speech prediction and quantization.
- To inculcate the knowledge on CELP speech production model.
- To learn various speech coding standards.

#### **COURSE OUTCOMES:**

At the end of this course students will demonstrate the ability to

- Explain speech signal processing and speech coding techniques
- Interpret the concepts of linear prediction of speech.
- Explain the quantization process for speech.
- Illustrate LPC model and ITU standards.
- Identify speakers for speech and audio signal.

#### UNIT I INTRODUCTION

Speech production and modeling - Human Auditory System; General structure of speech coders; Classification of speech coding techniques – parametric, waveform and hybrid, Requirements of speech codecs –quality, coding delays, robustness. Speech Signal Processing- Pitch-period estimation, all-pole and all-zero filters, convolution; Power spectral density, period gram, autoregressive model, autocorrelation estimation.

#### UNIT II LINEAR PREDICTION OF SPEECH

Basic concepts of linear prediction; Linear Prediction Analysis of non-stationary signals – prediction gain, examples; Levinson-Durbin algorithm; Long term and short-term linear prediction models; Moving average prediction.

#### UNIT III SPEECH QUANTIZATION

Scalar quantization–uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization – distortion measures, codebook design, codebook types. Scalar Quantization of LPC- Spectral distortion measures, Quantization based on

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reflection coefficient and log area ratio, bit allocation; Line spectral frequency – LPC to LSF conversions, quantization based on LSF.

#### UNIT IV LINEAR PREDICTION CODING & SPEECH CODING STANDARDS 9

LPC model of speech production; Structures of LPC encoders and decoders; Voicing detection; Limitations of the LPC model. -An overview of ITU-T G.726, G.728 and G.729standards

#### UNIT V SPEAKER RECOGNITION

Hidden Markov Model (HMM)- training procedure for HMM- sub word unit model based on HMM Acoustic parameters for speaker verification- Feature space for speaker recognition-similarity measures- Text dependent speaker Verification-Text independent speaker verification techniques.

#### **TOTAL: 45**

#### **SUGGESTED READINGS:**

- 1. "Digital Speech" by A.M.Kondoz, Second Edition (Wiley Students" Edition), 2004.
- 2. "Speech Coding Algorithms: Foundation and Evolution of Standardized Coders", W.C. Chu, WileyInter science, 2003.

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COs	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO2	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO3	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO4	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO5	3	2	1	-	-	-	-	-	-	1	-	-	2	-
Average	2.2	1.2	1	-	-	-	-	-	-	1	-	-	2	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

**23BEEC6E04** 

**BIG DATA ANALYTICS** 

**3H-3C** 

2023-2024

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To provide inputs on various big data contents.
- To illustrate file organization and concepts of stream.
- To know about various analytical model in big data.
- To understand basic of R programming.
- To study about different representation of data.

#### **COURSE OUTCOMES:**

At the end of the course, the students will be able to

- Classify the big data contents.
- Illustrate file organization and concepts of stream.
- Apply the analytical models in big data.
- Analyze data using R language.
- Explain different representation of data.

#### UNIT I **INTRODUCTION TO BIG DATA**

Introduction to Big Data Platform - Challenges of Conventional Systems - Big Data vs Traditional Data - Intelligent data analysis - Nature of Data - Analytic Processes and Tools - Analysis vs Reporting.

#### FILE ORGANIZATION AND STREAMS CONCEPTS UNIT II

Distributed File Systems - Large-Scale File System Organization - The Hadoop Distributed File System (HDFS) concepts - Map Reduce Execution, Algorithms using Map Reduce, Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features, Matrix-Vector Multiplication Introduction to Streams Concepts - Stream Data Model and Architecture - Stream Computing Sampling Data in a Stream.

#### UNIT III **PREDICTIVE ANALYTICS**

Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.

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# Semester-VI

#### UNIT IV R PROGRAMMING BASICS

Basics, Numbers, Strings, Formulas, Data input and output- Loading & Writing data, running a script, manipulating data- Factors, Data Frames, Restructuring data, Sequential data. Statistical analysis, Scripts and functions. Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with Big R.

#### UNIT V REPRESENTATION OF DATA

Graphical Representation of Variables- visualizing your data, Advance analytics, K-mean clustering, Apriori algorithm, Logistic regression, naïve Bayesian classifier, Decision tree.

#### TOTAL: 45

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#### **SUGGESTED READINGS:**

- 1. Bill Franks Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Wiley and SAS Business Series, 2012.
- 2. R for Data Science Hadley Wickham & Garrett Grolemund- O'Reilly Media; 1 edition January 10, 2017.
- 3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
- 4. Pete Warden, "Big Data Glossary", O'Reilly, 2011.

#### WEB LINKS:

- 1. https://r4ds.had.co.nz/
- 2. https://cmdlinetips.com/2018/01/free-online-resources-books-to-learn-r-and-data-science/

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	<b>PO12</b>	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	1	3	1
CO2	2	1	-	-	-	-	-	-	-	1	-	1	3	1
CO3	3	2	1	-	-	-	-	-	-	1	-	1	3	1
CO4	3	3	2	1	3	-	-	-	-	1	-	1	3	1
CO5	2	1	-	-	-	-	-	-	-	1	-	1	3	1
Average	2.4	1.6	1.5	1	-	-	-	-	-	1	-	1	3	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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2023-2024 Semester-VII

**3H-3C** 

#### **23BEEC7E01**

#### COMPUTER ARCHITECTURE

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Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

#### End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To discuss the basic concepts and structure of computers.
- To understand concepts of register transfer logic and arithmetic operations.
- To explain different types of addressing modes and memory organization.
- To learn the different types of serial communication techniques.
- To summarize the Instruction execution stages.

### **COURSE OUTCOMES:**

At the end of the course, the students will be able to

- Explain the concepts and structure of computers.
- Illustrate register transfer logic and arithmetic operations.
- Summarize the Instruction execution stages.
- Explain the concepts of memory systems
- Interpret the organization of I/O devices

### UNIT ARCHITECTURE OF COMPUTING SYSTEMS

Functional units – Basic Operational Concepts, Bus Structures, Software Performance– Memory locations & addresses– Memory operations– Instruction and instruction sequencing– addressing modes–assembly language–Basic I/O operations–stacks and queues.

### UNIT II ARITHMETIC UNIT

Addition and subtraction of signed numbers– Design of fast adders – multiplication of positive numbers-signed operand multiplication and fast multiplication– Integer division– floating point number sand operations.

### UNIT III BASIC PROCESSING UNIT

Fundamental concepts –Execution of a complete Instruction–Multiple bus organization–Hard wired control–micro programmed control. Pipelining–Basic concepts–data hazards–instruction

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# hazards- influence on Instruction sets-Data path and control consideration-Super scalar operation.

### UNIT IV MEMORY SYSTEM

Basic concepts-semiconductor RAMs, ROMs-Speed, size and cost-cache Memories-Performance consideration –Virtual Memory-Memory Management requirements-Secondary storage.

### UNIT V I/O ORGANIZATION

Accessing I/O devices–Interrupts–Direct Memory Access–Buses–Interface Circuits–Standard I/O Interfaces (PCI, SCSI, USB).

### **TOTAL: 45**

### SUGGESTED READINGS:

- 1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, McGraw Hill, 2002
- 2. William Stalings, Computer Organization & Architecture Designing for Performance, Pearson Education, New Delhi, 2003

#### WEB LINKS:

- 1. www.webopedia.com/quick\_ref/OSI\_Layers.asp
- 2. <u>www.yale.edu/pclt/COMM/TCPIP.HTM</u>

### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO2	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO3	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO4	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO5	2	1	-	-	-	-	-	-	-	1	-	-	2	-
Average	2	1	-	-	-	-	-	-	-	1	-	-	2	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### **B.E Electronics and Communication Engineering**

Semester-VII

**23BEEC7E02** 

#### **ADVANCED EMBEDDED SYSTEMS**

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To understand various wired and wireless communication protocols.
- To study the ARM processor fundamentals.
- To outline the instruction set of ARM processor.
- To learn about memory management unit.
- To write assembly code for ARM processor.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Explain the principle of embedded system.
- Classify the instruction set for faster execution.
- Illustrate cache and MMU configuration
- Interpret the importance of transcendental functions.
- Analyze assembly code for ARM processor.

#### UNIT I PRINCIPLES OF EMBEDDEDSYSTEM

Introduction- Embedded systems description, definition, design considerations & requirements – Overview of Embedded system Architecture- Categories of Embedded Systems-Product specifications - hardware/software partitioning - iterations and implementation - hardware software integration -product testing techniques. Wired Communication Protocols: UART - Inter Integrated Circuit(I2C)- Serial Peripheral Interface (SPI)- Controller Area Network (CAN). Wireless communication Protocols: Zigbee Protocols-Bluetooth Protocols-IrDA.

#### UNIT II **ARM PROCESSOR FUNDAMENTALS**

ARM core Introduction-Registers-Current Program Status Register-Pipeline-Exception-Interrupts -Vector Table-Core Extension-Architecture Revisions-ARM Processor Families -ARM Instruction Set-Thumb Instruction set-Thumb Register Usage-ARM-Thumb Interworking-Stack Instruction-Software Interrupt Instruction.

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# **3H-3C**

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#### UNIT III CACHES AND MMU

The Memory Hierarchy and Cache Memory–Cache Architecture-Cache Policy–Co-Processor and Caches– Flushing and Cleaning Cache Memory– Cache Lock down–Caches and Software Performance. MMU: Moving from an MPU to an MMU–Virtual Memory–Details of ARM MMU– The Caches and Write Buffer–Co-Processor and MMU configuration.

#### UNIT IV OPTIMIZED PRIMITIVES

Double Precision Integer Multiplication–Integer Normalization and count Leading Zeros –Division –Square Roots –Transcendental Functions: Log, exp, sin, cos– Endian Reversal and Bit Operations– Saturated and Rounded Arithmetic– Random Number Generation

#### UNIT V INTRODUCTION TO CORTEX

Exceptions, Nested Vector interrupt controller design, Systick Timer, Cortex-M3 Programming using assembly and C language, CMSIS

# TOTAL: 45

#### **SUGGESTED READINGS:**

- 1. Andrew N. Sloss, Dominic Symes, Chris Wright ARM System Developer's Guide Morgan Kaufmann 2008
- 2. Tammy Noergaard Embedded Systems Architecture Newnes 2008
- 3. Steve Furbe ARM System-on- Chip Architecture Addison-Wesley Professional 2000.

#### WEB LINKS:

1. https://nptel.ac.in/courses/106105193/

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	1	-	-	-	-	1	-	1	3	1
CO2	2	1	-	-	1	-	-	-	-	1	-	1	3	1
CO3	2	1	-	-	1	-	-	-	-	1	-	1	3	1
CO4	2	1	-	-	1	-	-	-	-	1	-	1	3	1
CO5	3	3	2	1	3	-	-	-	-	1	-	1	3	1
Average	2.2	1.4	2	1	1.4	-	-	-	-	1	-	1	3	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**23BEEC7E03 SMART ANTENNAS 3H-3C** Marks: Internal:40 External:60 Total:100

Instruction Hours/week: L:3 T:0 P:0

End Semester Exam:3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To study about various types of smart antennas.
- To outline various Direction of Arrival (DOA) estimation fundamentals.
- To familiarize with electromagnetic radiation direction finding algorithms.
- To learn about beam forming fundamentals.
- To understand the different simulation concepts of smart antennas.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Explain the architecture of smart antennas.
- Illustrate the principle behind the estimation of signal's direction of arrival
- Examine the parameters of direction arrival of signals.
- Interpret the fundamentals of beam former
- Analyse the antenna design parameters

#### UNIT I **SMART ANTENNAS**

Introduction, need for Smart Antennas, Overview, Smart Antenna Configurations, Switched-Beam Antennas, Adaptive Antenna Approach, Space Division Multiple Access (SDMA), Architecture of a Smart Antenna System, Receiver, Transmitter, Benefits and Drawbacks, Basic Principles, Mutual Coupling Effects.

#### DIRECTION OF ARRIVAL ESTIMATION FUNDAMENTALS UNIT II 9

Introduction, Array Response Vector, Received Signal Model, Subspace-Based Data Model, Signal Auto covariance, Conventional DOA Estimation Methods, Conventional Beam forming Method, Capon's Minimum Variance Method, MUSIC Algorithm, ESPRIT Algorithm, Uniqueness of DOA Estimates.

#### **UNIT III DOA Estimation**

DOA Estimation Fundamentals: Introduction, Array Response Vector, Received Signal Model, Subspace-Based Data Model, Signal Auto Covariance Matrices, Conventional DOA Estimation

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Methods, Subspace Approach to DOA Estimation: MUSIC Algorithm, ESPRIT Algorithm. Uniqueness of DOA Estimates, Source localization problem. Joint angle and delay estimation

#### UNIT IV BEAM FORMING FUNDAMENTALS

Classical Beam former, Statistically Optimum Beam forming Weight Vectors, Maximum SNR Beam former, Multiple Side Lobe Canceller and Maximum, SINR Beam former, Minimum Mean Square Error (MMSE), Direct Matrix Inversion (DMI), Linearly Constrained Minimum Variance (LCMV), Adaptive Algorithms for Beam forming

#### UNIT V INTEGRATION AND SIMULATION OF SMART ANTENNAS

Overview, Antenna Design, Mutual Coupling, Adaptive Signal Processing Algorithms, DOA, Adaptive Beam forming, Beam forming and Diversity Combining for Rayleigh-Fading Channel, Trellis-Coded Modulation (TCM) for Adaptive Arrays, Smart Antenna Systems for Mobile Adhoc Networks (MANETs), Protocol, Simulations.

#### SUGGESTED READINGS:

- 1. Constantine A. Balanis & Panayiotis I. Ioannides, "Introduction to Smart Antennas",
- 2. Morgan & Claypool Publishers' series-2007
- 3. Joseph C. Liberti Jr., Theodore S Rappaport, "Smart Antennas for Wireless Communications:
- 4. IS-95 and Third Generation CDMA Applications", Prentice Hall PTR, 1999
- 5. T.S Rappaport, "Smart Antennas Adaptive Arrays Algorithms and Wireless Position Location",
- 6. IEEE press 1998, PTR PH publishers 1999.
- 7. Thomas Kaiser Smart Antennas: State of the Art Hindawi publishing corporation 2005

### WEB LINKS:

1. https://nptel.ac.in/courses/117107035/

### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	1	-	-	-	1	-	1	3	1
CO2	2	1	-	-	-	1	-	-	-	1	-	1	3	1
CO3	3	3	2	1	-	1	-	-	-	1	-	1	3	1
CO4	2	1	-	-	-	1	-	-	-	1	-	1	3	1
CO5	3	3	2	1	-	1	-	-	-	1	-	1	3	1
Average	2.4	1.8	2	1	-	1	-	-	-	1	-	1	3	1
1 - Low. 2	2 - Me	dium	. 3 - F	Tioh.	'-' - N	lo Coi	rrelat	ion						

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### **TOTAL: 45**

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2023-2024

#### 23BEEC7E04

#### **COMPUTER NETWORKS**

Semester-VII 3H-3C

Instruction Hours/week: L:3 T:0 P:0

End Semester Exam:3 Hours

Marks: Internal:40 External:60 Total:100

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To introduce the concept of networking.
- To introduce various types of switching in networks.
- To learn about the transport layer protocol in detail.
- To inculcate resource allocation techniques.
- To study about various routing algorithm.

#### **COURSE OUTCOMES:**

At the end of this course students will demonstrate the ability to

- Interpret the basic concepts and components of computer communication.
- Illustrate the process of switching in networks.
- Outline transport layer and its functionalities.
- Explain the process of application layer level
- Apply the congestion control and broad casting algorithm.

#### UNIT I INTRODUCTION TO COMPUTER NETWORKS AND THE INTERNET 9

Application layer: Principles of network applications, The Web and Hyper Text Transfer Protocol, File transfer, electronic mail, Domain name system, Peer-to-Peer file sharing, Socket programming, Layering concepts.

#### UNIT II SWITCHING IN NETWORKS

Classification and requirements of switches, a generic switch, Circuit Switching, Time-division switching, Space-division switching, Crossbar switch and evaluation of blocking probability, 2-stage, 3-stage and n-stage networks, Packet switching, Blocking in packet switches, Three generations of packet switches, switch fabric, Buffering, Multicasting, Statistical Multiplexing. Transport layer: Connectionless transport - User Datagram Protocol, Connection oriented transport – Transmission Control Protocol, Remote Procedure Call.

#### UNIT III TRANSPORT LAYER

Connectionless transport - User Datagram Protocol, Connection-oriented transport – Transmission Control Protocol, Remote Procedure Call.

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#### UNIT IV APPLICATION LAYER

Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

#### UNIT V CONGESTION CONTROL AND RESOURCE ALLOCATION

Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service. Network layer: Virtual circuit and Datagram networks, Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing.

#### **TOTAL: 45**

#### **SUGGESTED READINGS:**

- 1. J.F. Kurose and K. W. Ross, "Computer Networking A top down approach featuring the Internet", Pearson Education, 5th Edition.
- 2. L. Peterson and B. Davie, "Computer Networks A Systems Approach" Elsevier Morgan Kaufmann Publisher, 5th Edition.
- 3. T. Viswanathan, "Telecommunication Switching System and Networks", Prentice Hall.
- 4. S. Keshav, "An Engineering Approach to Computer Networking", Pearson Education.
- 5. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition.
- 6. Andrew Tanenbaum, "Computer networks", Prentice Hall.
- 7. D. Comer, "Computer Networks and Internet/TCP-IP", Prentice Hall.
- 8. William Stallings, "Data and computer communications", Prentice Hall.

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	1	3	2	-	-	-	-	1	3	3
CO2	3	2	2	3	1	3	2	-	-	-	-	1	3	3
CO3	3	3	3	3	2	3	2	-	-	-	-	1	3	3
CO4	3	2	3	1	3	3	2	-	-	-	-	1	3	3
CO5	2	2	2	3	3	3	2	-	-	-	-	1	3	3
Average	2.8	2.2	2.4	2.6	2.0	3.0	2.0	-	-	-	-	1.0	3.0	3.0

### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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Semester-VII

**23BEEC7E05 3H-3C** NATURAL LANGUAGE PROCESSING (NLP)

> Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hours

#### **COURSE OBJECTIVE:**

The goal of this course for students is

Instruction Hours/week: L:3 T:0 P:0

- To learn the fundamentals of language modeling.
- To understand the use of word level analysis. •
- To study syntactic analysis.
- To impart knowledge on the role of semantics of sentences and pragmatics.
- To learn programming in python. •

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Explain the fundamentals of language modelling.
- Illustrate the use of word level analysis.
- Design an innovative application using syntactic analysis.
- Summarize the role of semantics of sentences and pragmatics.
- Build programming in python. •

#### UNIT I **INTRODUCTION**

Origins and challenges of NLP - Language Modeling: Grammar-based LM, Statistical LM -Regular Expressions, Finite-State Automata - English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

#### **UNIT II** WORD LEVEL ANALYSIS

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff - Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

#### SYNTACTIC ANALYSIS **UNIT III**

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar -Dependency Grammar - Syntactic Parsing, Ambiguity, Dynamic Programming parsing -Shallow parsing - Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs -Feature structures. Unification of feature structures.

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#### UNIT IV SEMANTICS AND PRAGMATICS

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selection restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

#### UNIT V PROGRAMMING IN PYTHON

An introduction to programming in Python. Variables, numbers, strings, arrays, dictionaries, conditionals, iteration. The NLTK (Natural Language Toolkit), with demonstrations.

#### **TOTAL: 45**

#### **SUGGESTED READINGS:**

- 1. Daniel Jurafsky, James H. MartinSpeech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
- 2. Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with Pythonll, First Edition, OReilly Media, 2009
- 3. Breck Baldwin, Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
- 4. Richard M Reese, Natural Language Processing with Javall, OReilly Media, 2015.
- 5. Nitin Indurkhya and Fred J. Damerau, Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
- 6. Tanveer Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

#### WEB LINKS:

1. https://swayam.gov.in/nd1\_noc19\_cs56/preview

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO2	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO3	3	3	3	2	-	-	-	-	-	1	-	-	2	-
CO4	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO5	3	2	1	-	3	-	-	-	-	1	-	-	2	-
Average	2.4	1.6	2	2	-	-	-	-	-	1	-	-	2	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**23BEEC7E06** 

**ROBOTICS AND AUTOMATION** 

Semester-VII 3H-3C

2023-2024

Instruction Hours/week: L:3 T:0P:0

End Semester Exam:3 Hours

Marks: Internal:40 External:60 Total:100

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To study the various generations of robots and related laws.
- To learn the various power sources used in robotics.
- To identify the sensors for different fields of robotics.
- To understand the various parts of robots.
- To impart knowledge on path planning concepts for robots

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Explain the basic working of robot.
- Analyze the function of sensors in the robot.
- Design robots for different applications.
- Choose appropriate end-of-arm tool for different application.
- Value the importance of automation in various industries.

#### UNIT I BASIC CONCEPTS

Definition and origin of robotics-different types of robotics-various generations of robotsdegrees of freedom-Asimov's laws of robotics-dynamic stabilization of robots.

#### UNIT II POWER SOURCES AND SENSORS

Hydraulic, pneumatic and electric drives-determination of HP of motor and gearing ratio-variable speed arrangements-path determination – micro machines in robotics- machine vision – ranging-laser-acoustic –magnetic, fiber optic and tactile sensors.

#### UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS

Construction of manipulators- manipulator dynamics and force control -electronic and pneumatic manipulator control circuits-end effectors-U various types of grippers -design considerations.

#### UNIT IV KINEMATICS AND PATH PLANNING

Solution of inverse kinematics problem-multiple solution jacobian work envelop-hill Climbing

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Techniques- robot programming languages.

#### UNIT V AI IN ROBOTICS

Applications in unmanned systems, defense, medical, industries, etc.

#### **TOTAL: 45**

#### **SUGGESTED READINGS:**

- 1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw-Hill Singapore, 1999.
- 2. Bijoy K. Ghosh, T. J. Tarn, Ning X, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 2011.
- 3. Deb.S.R., Robotics technology and flexible Automation, John Wiley, 2010.
- 4. Asfahl C.R., Robots and manufacturing Automation, John Wiley, USA 1992.
- 5. Klafter R.D., Chimielewski T.A., Negin M., Robotic Engineering An integrated approach, Prentice Hall of India, New Delhi, 1994.
- 6. Mc Kerrow P.J. Introduction to Robotics, Addison Wesley, USA, 1991.
- 7. Issac Asimov I Robot, Ballantine Books, New York, 1986.

#### WEB LINKS:

- 1. https://doc.lagout.org/science/0\_Computer%20Science/8\_Electronics%20%26%20Robotics/R obotics%20and%20Automation%20Handbook.pdf
- 2. https://swayam.gov.in/nd1\_noc20\_me03/preview

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	<b>PO12</b>	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	1	-	1	3	1
CO2	3	3	2	1	-	-	-	-	-	1	-	1	3	1
CO3	3	2	1	-	-	-	-	-	-	1	-	1	3	1
CO4	3	2	1	-	-	-	-	-	-	1	-	1	3	1
CO5	3	2	1	-	-	-	-	-	-	1	-	1	3	1
Average	2.8	2	1.3	1	-	-	-	-	-	1	-	1	3	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

2023-2024 Semester-VII

23BEEC7E07 MICRO AND SMART SYSTEM TECHNOLOGY 3H-3C

Instruction Hours/week: L:3 T:0 P:0

End Semester Exam:3 Hours

Marks: Internal:40 External:60 Total:100

#### **COURSE OBJECTIVE:**

The goal of this course for students is

- To learn smart system concepts and application.
- To explore various micro and smart device systems.
- To understand the various controlling methods for smart system.
- To study micromachining techniques.
- To introduce various packaging methods of micro materials.

#### **COURSE OUTCOMES:**

At the end of this course students will be able to

- Identify the components and application areas of micro systems.
- Distinguish the sensors, actuators used for micro systems.
- Interpret the fabrication process of smart materials.
- Examine electronic circuits and control system for a given applications.
- Explain the packaging methods of micro materials.

#### UNIT I INTRODUCTION TO MICRO AND SMART SYSTEMS

Evolution of smart materials, structures and systems. Components of a smart system. Application areas. Commercial products. Feynman's vision. Micro machined transducers. Evolution of micro-manufacturing. Multi-disciplinary aspects.

#### UNIT II MICRO AND SMART DEVICES AND SYSTEMS

Salient features of sensors, actuators, and systems. Sensors: silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conductor metric gas sensor, fiber-optic gyroscope and surface-acoustic-wave based wireless strain sensor. Systems: micro gas turbine, portable clinical analyzer, active noise control in a helicopter cabin.

#### UNIT III MICRO MANUFACTURING AND MATERIAL PROCESSING

Silicon wafer processing, lithography, thin-film deposition, etching (wet and dry), wafer-bonding, and metallization. Silicon micromachining: surface, bulk, molding, bonding based process flows. Thick-film processing, Smart material processing.

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#### UNIT IV ELECTRONICS, CIRCUITS AND CONTROL

Carrier concentrations, semiconductor diodes, transistors, MOSFET amplifiers, operational amplifiers. Basic Op-Amp circuits. Charge-measuring circuits. Examples from micro systems. Transfer function, state-space modeling, stability, PID controllers, and model order reduction. Examples from smart systems and micro machined accelerometer or a thermal cycler.

# UNIT V INTEGRATION AND PACKAGING OF MICROELECTRO MECHANICAL SYSTEMS 9

Implementation of Controllers for MEMS & Case Studies of Integrated Microsystems. Design Methodology, PID controller, Circuit Implementation, Digital controller, Microcontroller & PLC. Case Studies of Integrated Microsystems: BEL pressure sensor, design considerations, performance parameters, and Smart Structure in vibration control.

#### **TOTAL: 45**

#### **SUGGESTED READINGS:**

- 1. Micro and Smart Systems: G.K.Ananthasuresh, K.J.Vinoy, S.Gopalakrishnan, K.N.Bhat, V.K.Aatre, Wiley India 2010.
- 2. Micro and Smart Systems by V.K. Aatre G.K. Ananthasuresh, K.J. Vinoy, S. Gopalakrishnan, K.N. Bhat ,Wiley India Pvt Ltd, 2010
- 3. Design and Development Methodogies, Smart Material Systems and MEMS: V. Varadan, K. J.Vinoy, S. Goplakrishnan, Wiley, October 2006
- 4. MEMS- NitaigourPremchandMahalik, McGraw-Hill Education (India) (January 9, 2009)

#### WEB LINKS:

1. https://swayam.gov.in/nd1\_noc20\_ee52/preview

			-											
COs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	1	-	-	2	-
CO2	3	2	1	-	-	-	-	-	-	1	-	-	2	-
CO3	2	1	-	-	-	-	-	-	-	1	-	-	2	-
CO4	3	3	2	1	-	-	-	-	-	1	-	-	2	-
CO5	2	1	-	-	-	-	-	-	-	1	-	-	2	-
Average	2.6	1.8	1.3	1	-	-	-	-	-	1	-	-	2	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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2023-2024

Semester-VI

### 23BEEC7E08 ARTIFICIAL INTELLIGENCE 3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students to:

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI.

#### **COURSE OUTCOMES:**

Upon completion of the course the student will be able to:

- Explain the basic concept of Artificial Intelligence.
- Analyze problem solving method of artificial intelligence.
- Analyze the knowledge representation of artificial intelligence.
- Explain software agents in artificial intelligence
- Design applications for NLP using Artificial Intelligence.

#### **UNITI: INTRODUCTION**

Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

#### **UNIT II: PROBLEM-SOLVING METHODS**

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games.

#### UNIT III: KNOWLEDGE REPRESENTATION

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories -Reasoning with Default Information.

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#### **UNIT IV: SOFTWARE AGENTS**

Architecture for Intelligent Agents - Agent communication - Negotiation and Bargaining -Argumentation among Agents – Trust and Reputation in Multi-agent systems.

#### **UNIT V: APPLICATIONS**

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation - Speech Recognition - Robot - Hardware -Perception – Planning – Moving.

#### **TEXTBOOKS:**

- 1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice-Hall, Third Edition, 2009.
- 2. I.Bratko, "Prolog: Programming for Artificial Intelligence", Fourth Edition, Addison-Wesley Educational Publishers Inc., 2011.

#### **REFERENCES:**

- 1. M. Tim Jones, "Artificial Intelligence: A Systems Approach(Computer Science)", Jones and Bartlett Publishers, Inc.; First Edition, 2008.
- 2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.
- 3. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.
- 4. Gerhard Weiss, "Multi Agent Systems", Second Edition, MIT Press, 2013.
- 5. David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.

#### WEBSITES:

1. https://swayam.gov.in/nd1 noc20 cs42/preview

#### PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 COs **CO1** 3 2 1 1 3 1 1 ----\_ --**CO2** 3 3 3 2 1 1 1 1 \_ \_ \_ \_ \_ \_ **CO3** 3 2 1 1 1 3 1 1 \_ --\_ -\_ **CO4** 2 1 3 1 -\_ 1 1 \_ \_ \_ \_ \_ \_ **CO5** 3 3 3 2 1 1 3 1 \_ \_ \_ \_ \_ 2.8 2.2 1.75 1.3 1 1 3 1 Average --

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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TOTAL:45

Semester-VI

#### 23BEEC7E09 MICRO ELECTRONIC MECHANICAL SYSTEM (MEMS) 3H-3C

Instruction Hours/week: L:3 T:0 P:0

End Semester Exam:3 Hours

Marks: Internal:40 External:60 Total:100

#### **COURSE OBJECTIVES:**

The goal of this course for students is

- To study the materials used for MEMS and its working principle.
- To understand the micro sensors and actuators.
- To learn the fabrication process used for MEMS.
- To know about micro systems design.
- To study the polymer and optical MEMS.

#### **COURSE OUTCOMES:**

At the end of the course, the students will be able to

- Identify the underlying working principles of MEMS.
- Explain the IC fabrication process.
- Examine the packaging steps involved for MEMS.
- Demonstrate the working of micro sensors.
- Classify the polymer and optical MEMS.

#### UNIT I INTRODUCTION TO MICROSYSTEMS

Overview of microelectronics manufacture and Micro systems technology. Definition – MEMS materials. Laws of scaling. The multi-disciplinary nature of MEMS. Survey of materials central to micro engineering. Applications of MEMS in various industries.

#### UNIT II MICRO SENSORS AND ACTUATORS

Working principle of Microsystems - micro actuation techniques - micro sensors - types - Micro actuators - types - micro pump - micro motors - micro - valves - micro grippers - micro accelerometers.

#### UNIT III FABRICATION PROCESS

Substrates - single crystal silicon wafer formation – Photolithography – Ion implantation – Diffusion – Oxidation – CVD - Physical vapor deposition - Deposition epitaxy - etching process.

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#### UNIT IV MICRO SYSTEM MANUFACTURING

Bulk Micro manufacturing - surface micro machining – LIGA – SLIGA - Micro system packaging materials - die level - device level - system level - packaging techniques – die preparation- surface bonding - wire bonding - sealing.

#### UNIT V POLYMER AND OPTICAL MEMS

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

#### **TOTAL: 45**

#### **SUGGESTED READINGS:**

- 1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalkrishnan K. N. Bhat, V. K. Aatre, Micro and Smart Systems, Wiley India, 2012.
- 2. S. E.Lyshevski, Nano-and Micro-Electromechanical systems: Fundamentals of Nano-and Microengineering (Vol. 8). CRC press, (2005).
- 3. Mems & Microsystems Design & Manufacture by Tai-Ran Hsu. Tata McGraw-Hill Publishing Company Ltd 2002.
- 4. Foundation of MEMS" by Chang Liu. Pearson Education. 2012

#### WEB LINK:

- 1. https://swayam.gov.in/nd1\_noc20\_ee52/preview
- 2. https://nptel.ac.in/courses/117105082/

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	1	-	-	3	-
CO2	2	1	-	-	-	-	-	-	-	1	-	-	3	-
CO3	3	3	2	1	-	-	-	-	-	1	-	-	3	-
CO4	2	1	-	-	-	-	-	-	-	1	-	-	3	-
CO5	2	1	-	-	-	-	-	-	-	1	-	-	3	-
Average	2.4	1.6	1.5	1	-	-	-	-	-	1	-	-	3	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**3H-3C** 

Semester-VII

#### 23BEEC7E09 SATELLITE COMMUNICATION

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

- To prepare students to excel in basic knowledge of satellite communication principles
- To provide students with solid foundation in orbital mechanics for the satellite communication
- To train the students with a basic knowledge of link budget design of satellite with a design examples.
- To provide better understanding of modulation and multiple access technology.
- To imparts a good knowledge in concepts of solar day and sidereal day.
- To familiarize the students with the drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions.

#### **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Illustrate the principle and architecture of satellite systems
- Infer the parameters of Orbit mechanics
- Illustrate satellite sub systems
- Inspect the environmental effects that affect the satellite communication
- Interpret the modulation schemes used in satellite communication

#### UNIT I INTRODUCTION TO SATELLITE COMMUNICATION

Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication.

#### UNIT II ORBITAL MECHANICS

Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.

#### UNIT III SATELLITE SUB-SYSTEMS

Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.

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#### UNIT IV TYPICAL PHENOMENA IN SATELLITE COMMUNICATION 9

Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift. Satellite link budget, Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, rafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions.

#### UNIT V MODULATION AND MULTIPLE ACCESS SCHEMES

Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.

#### TOTAL:45

9

#### SUGGESTED READINGS

- 1. Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India. 2nd edition 2002
- 2. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009
- 3. Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill,2009

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	1	-	-	-	1	-	1	3	1
CO2	2	1	-	-	-	1	-	-	-	1	-	1	3	1
CO3	2	1	-	-	-	1	-	-	-	1	-	1	2	1
CO4	3	3	2	1	-	1	-	-	-	1	-	1	3	1
CO5	2	1	-	-	-	1	-	-	-	1	-	1	3	1
Average	2.2	1.4	2	1	-	1	-	-	-	1	-	1	2.8	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### **OPEN ELECTIVES**

#### **B.** Tech Artificial Intelligence & Data Science

#### **23BTADOE01 FUNDAMENTALS OF DATA SCIENCE 3H-3C**

Instruction Hours/week: L:3 T:0 P:0

#### **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To study the basic concepts of Data Science and data life cycle
- To understand the theoretical and mathematical aspects of Data Science models
- To learn common random variables and their uses, and with the use of empirical distributions
- To obtain the knowledge in data management tools
- To explore the major techniques for data science

#### **COURSE OUTCOMES:**

Upon completion of this course, the students will be able to:

- Express the key concepts in data science and data processing.
- Describe sampling and probabilistic models to a real time application.
- Discuss about data normalization and data management tools.
- Identify the difference between supervised and unsupervised machine learning techniques.
- Illustrate the different analytics used in business intelligence.

#### **UNIT I INTRODUCTION**

The Big Picture: What is Data Science? - The data life cycle: pre-processing, analysis, postprocessing - Pre-processing: Data gathering, cleansing, visualization, and understanding (Mean, Variance, Standard Deviation. Percentiles.)-Data Storage (Relational databases, e.g. MySQL)

#### **UNIT II PROBABILISTIC MODELS**

Sampling – Probability Models for Statistical Methods: Discrete and continuous probability distributions, density functions. Random variables, expected values, variance, correlation.

#### UNIT III NORMALIZATION

Data Normalization (z-values, transforms) -Random processes -Data Management: Tools for Data Analysis, Case Study: Data analysis using Python-Arrays, Visualization.

#### UNIT IV DATA MINING

Major Techniques in Data Science: Data mining, Data warehousing, Data mining vs Data warehouse-Machine Learning- Supervised Learning, Unsupervised Learning.

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Marks: Internal:40 External:60 Total:100

End Semester Exam: 3Hours

2023-2024

#### UNIT V BUSINESS INTELLIGENCE AND ANALYTICS

Business Intelligence –Descriptive Analytics, Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics– Cloud computing-definition, Cloud services, types of clouds, some of commercial and non-commercial cloud service providers.

#### **TEXT BOOKS:**

- 1. Glenn J. Myatt, Wayne P. Johnson, Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining, John Wiley & Son Publication, Second Edition, 2014.
- 2. Saltz Jeffrey S, An Introduction to Data Science, Sage Publications Inc, Second Edition, 2019.

#### **REFERENCE BOOKS:**

- 1. Murtaza Haider, Getting Started with Data Science: Making Sense of Data with Analytics, IBM Press, First Edition, 2015.
- 2. Peter Bruce & Andrew Bruce, Practical Statistics for Data Scientists, O'Reilly Publication, First Edition, 2017.

#### **WEBLINKS:**

- 1. https://www.inferentialthinking.com/chapters/intro
- 2. https://swayam.gov.in/nd1\_noc20\_cs36/preview
- 3. https://swayam.gov.in/nd1\_noc19\_cs60/preview
- 4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-0002-introduction-to-computational-thinking-and-data-science-fall-2016/

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	PO9	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	3	3	3	2	2	2	-	-	2	-	2	2	2	2
CO2	3	3	3	3	3	2	-	-	2	I	2	2	2	2
CO3	3	3	2	2	2	2	-	-	2	I	2	2	2	2
CO4	3	3	3	3	2	2	-	-	2	I	2	2	2	2
CO5	3	3	2	2	2	2	-	-	2	-	2	2	2	2
Average	3	3	3	2	2	2	-	-	2	-	2	2	2	2

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

**TOTAL: 45** 

#### 23BTADOE02 FUNDAMENTALS ARTIFICIAL INTELLIGENCE 3H-3C

## Instruction Hours/week: L:3 T:0 P:0

Marks: Internal: 40 External:60 Total:100 End Semester Exam: 3Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To represent knowledge in solving AI problems.
- To illustrate the different ways of designing software agents
- To know the various applications of AI.

#### **COURSE OUTCOME:**

Upon completion of the course, the students will be able to:

- Identify the performance of search algorithms and its applications.
- Infer the different methods of knowledge representation.
- Discuss about Description logic and conceptional dependencies.
- Make use of strategies for optimal decision-making in the context of game-playing scenarios.
- Illustrate the properties of Markov process and the concept of transition probabilities.

### UNIT I INTRODUCTION

Introduction: Objective, scope and outcome of the course Meaning and definition of artificial intelligence, Physical Symbol System Hypothesis, production systems, Characteristics of production systems; Breadth first search and depth first search techniques. Heuristic search Techniques: Hill Climbing, Iterative deepening DFS, bidirectional search. Analysis of search methods. A\* algorithm, and their analysis. Introduction to Genetic Algorithms.

#### UNIT II KNOWLEDGE REPRESENTATION

Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, logical consequences, syntax and semantics of an expression, semantic Tableau. Forward and backward reasoning. Proof methods, substitution and unification, conversion to clausal form, normal forms, resolution, refutation, deduction, theorem proving, inferencing, monotonic and non-monotonic reasoning. Introduction to prolog.

### UNIT III NETWORK-BASED REPRESENTATION

Network-based representation and reasoning, Semantic networks, Conceptual Graphs, frames. Description logic (DL), concept language, reasoning using DL. Conceptual dependencies (CD), scripts, reasoning using CD. Introduction to natural language processing.

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#### UNIT IV GAME THEORY

Adversarial search and Game theory, classification of games, game playing strategies, prisoner's Dilemma. Game playing techniques, minimax procedure, alpha-beta cut-offs. Complexity of alpha-beta search. Automated planning, classical planning problem, forward planning, partial order planning, planning with proposal logic, hierarchical task planning, multiagent planning.

#### UNIT V FUZZY LOGIC

Reasoning in uncertain environments, Fuzzy logic, fuzzy composition relation, operations on fuzzy sets. Probabilistic reasoning, Bayes theorem, construction of Bayesian networks, belief propagation. Markov processes and Hidden Markov models.

#### **TOTAL: 45**

#### TEXTBOOKS

1. "Artificial Intelligence", Elaine Rich, Kevin Knight, Mc-GrawHill, 2020.

2. "Introduction to AI & Expert System", Dan W. Patterson, PHI,2020.

#### **REFERENCE BOOKS:**

- 1. "Artificial Intelligence" by Luger (Pearson Education),2020.
- 2. Russel Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 2020.

#### **WEBLINKS:**

1. <u>https://www.pluralsight.com/blog/data-professional/fundamentals-of-artificial-intelligence</u>

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COs	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	3	3	3	2	-	2	-	-	-	-	-	2	2	2
CO2	3	3	3	2	-	2	-	-	-	-	-	2	2	2
CO3	3	3	2	2	-	2	-	-	-	-	-	2	2	2
CO4	3	2	2	2	-	2	-	-	-	-	-	2	2	2
CO5	3	2	2	2	-	2	-	-	-	-	-	2	2	2
Average	3	3	2	2	-	2	-	-	-	-	-	2	2	2

#### CO, PO, PSO MAPPING:

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### 23BTADOE03 INTERNET PROGRAMMING 3H-3C

#### Instruction Hours/week: L:3 T:0 P:0

Marks: Internal: 40 External:60 Total:100

End Semester Exam: 3Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students:

- Recall fundamental tags used in HTML5 and CSS to create simple web application.
- Rephrase the concept to create static and dynamic webpage with validation controls and event handling methods.
- Make use of servlets and JSP tag to develop server-side scripting.
- Summarize the tags in PHP and XML to create simple php web application.
- Interview the basic concept and tags are used in web service application using ajax.

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Develop a basic website using HTML and Cascading Style Sheets.
- Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
- Examine server-side programs using Servlets and JSP.
- Model a simple web page in PHP and represent data in XML format.
- Illustrate on simple web service application using Ajax.

#### UNIT I – WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls – CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

#### **UNIT II - CLIENT-SIDE PROGRAMMING**

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects, -Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL.

#### **UNIT III – SERVER-SIDE PROGRAMMING**

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example – JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code

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#### UNIT IV – PHP AND XML

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions-Form Validation- Regular Expressions – File handling – Cookies – Connecting to Database. XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

#### UNIT V - INTRODUCTION TO AJAX AND WEB SERVICES

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.

#### TOTAL: 45

#### **TEXT BOOKS:**

- 1. Anuratha A Puntembekar," Internet Programming", Technical Publication, 2020.
- 2. John Dean, "Web Programming with HTML5, CSS and JavaScript", Jones & Part left Learning,2018.
- 3. Sriram K Vasudevan, Meenakshi Sundaram, and Chandni Suresh" Essential of Internet Programming" DreamTech Press, Willey, 2015.

#### **REFERENCE BOOKS:**

- 1. Abiket Nagane," Internet Programming II", Nirali Prakashan, 2016.
- 2. Max Bramer,"Web Programming With PHP and MySQL", A Practical guide,Springer,2015
- 3. Gopalan N.P. and Akilandeswari J., -Web Technologyl, Prentice Hall of India, 2011.
- 4. UttamK.Roy, —Web Technologiesl, Oxford University Press, 2011.

#### WEBLINKS:

- 1. <u>https://www.geeksforgeeks.org/internet-and-web-programming/</u>
- 2. http://www.eie.polyu.edu.hk/~em/it0506pdf/4%20Internet%20Programming.pdf
- 3. https://www.techopedia.com/definition/23898/web-programming
- 4. <u>https://www.tutorialspoint.com/internet\_technologies/index.htm</u>

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	3	3	3	2	2	2	-	-	2	-	-	2	3	3
CO2	3	3	3	2	2	2	-	-	2	-	-	2	3	3
CO3	3	3	3	2	2	2	-	-	2	-	-	2	3	3
CO4	3	3	3	3	2	2	-	-	2	-	-	2	3	3
CO5	3	3	2	2	2	2	-	-	2	-	-	2	3	3
Average	3	3	3	2	2	2	-	-	2	-	-	2	3	3

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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# 23BTADOE04ROBOTICS AND AUTOMATION3H-3CInstruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External:60 Total:100

End Semester Exam: 3Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To introduce the functional elements of Robotics.
- To impart knowledge on the forward and inverse kinematics.
- To interpret the manipulator differential motion and control.
- To educate on various path planning techniques.
- To understand about hydraulics system.

#### **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Apply basic concept of robotics fundamental principles, components, and applications of robotic systems.
- Discuss the dynamics of robotic systems and implications for planning and control.
- Outline the principles of state estimation, prediction, and update steps involved in the Kalman filtering process.
- Analyze the components, working principles, and applications of Pneumatic and Hydraulic system.
- Model the principles of fluidic devices and fluidic logic circuits and their applications in automation.

#### **UNIT I KINEMATICS CONCEPTS**

Introduction – Actuators – Sensors – Rigid body – coordinate systems – Kinematics – Forward Kinematics & Inverse Kinematics – Velocity Kinematics – Angular velocity – Linear velocity –Singularity – Force and torque.

#### UNIT II MOBILE ROBOTS

Dynamics – Mobile Robots – Planning and Control – Path & Trajectory planning – Probabilistic Roadmaps – Localization.

#### UNIT III PROBABILISTIC METHODS FOR ROBOTICS

Basics of probability – Kalman Filtering – Extended Kalman – Particle filter – Localization – Computer Vision – Vision Based Controls.

#### UNIT IV AUTOMATION FUNDAMENTALS AND PRINCIPLES

Automation – Basic Laws and Principles – Basic Pneumatic and Hydraulic system – Pumps and compressors – Fluid accessories.

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#### UNIT V ELECTRICAL AND ELECTRONIC CONTROLS

Cylinders and Motors – Control valves – Circuits – Pneumatic logic circuits – Fluidics – Electrical and electronic controls – Transfer devices and Feeders.

#### **TEXT BOOKS:**

- 1. "Robot Modeling and Control", Mark W.Spong, Seth Hutchinson and Vidyasagar. M, Wiley Publishers, Second Edition, 2020.
- 2. "Robot Building for Beginners", David Cook, Apress Publishers, Third Edition, 2015.

#### **REFERENCE BOOKS:**

- 1. "Industrial Automation and Robotics", Gupta. A.K and S.K Arora, University Science Press, Third Edition, 2013.
- 2. "Industrial Robotics", Groover. M.P, Weiss. M, Nageland. R.N and Odrej. N.G, Tata McGraw Hill, Singapore, Second Edition, 2017.
- 3. "Embedded Systems & Robotics", Ghoshal. S, Cengage Learning, First Edition, 2009.
- 4. "Introduction to Robotics Mechanics and Control", John J.Craig, Pearson Education, Third Edition, 2009.

#### **WEBLINKS:**

- 1. www.nptel.ac.in/courses/112/101/112101099/
- 2. www.nptel.ac.in/courses/112/101/112101098/
- 3. www.toptal.com/robotics/programming-a-robot-an-introductory-tutorial
- 4. www.cyberbotics.com/doc/guide/tutorial-1-your-first-simulation-in-webots
- 5. www.ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall-2005/

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	3	3	2	2	-	2	-	-	2	-	2	2	2	2
CO2	2	2	2	2	-	2	-	-	2	-	2	2	2	2
CO3	3	3	3	3	-	2	-	-	2	-	2	2	2	2
CO4	3	3	3	3	-	2	-	-	2	-	2	2	2	2
CO5	3	3	3	3	2	2	-	-	2	-	2	2	2	2
Average	3	3	3	3	2	2	-	-	2	-	2	2	2	2

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL: 45** 

#### 23BEEEOE01RENEWABLE ENERGY SYSTEM3H-3C

Instruction Hours/week: L:3 T:0 P:0

# Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of solar cells, photovoltaic conversion.
- To understand the basic principles of wind energy conversion.
- To gain the knowledge about hydro and ocean energy.
- To understand the basic principles of Biomass, fuel cell, Geo thermal powerplants and MHD.

#### **COURSE OUTCOMES:**

At the end of this course, students will be able to

- Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources.
- Selection, Operation and Operation of Solar PV System for different types of applications
- Selection and Operation of Wind Turbine system
- Selection and Operation of Hydroelectric Plant and Ocean Energy
- Biomass Power Generation Types, Applicability and Limitations, Selection and Operation of Fuel Cell, Geo thermal plants and MHD

#### UNIT I INTRODUCTION

Energy scenario - Different types of Renewable Energy Sources – Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

#### **UNIT II SOLAR ENERGY**

Introduction to solar energy: solar radiation, availability, measurement and estimation–Solar thermalconversion devices and storage – solar cells and photovoltaic conversion –PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

#### UNIT III WIND ENERGY

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

#### UNIT IV HYDRO ENERGY

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power

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plants. Principles of ocean wave energy conversion and tidal energy conversion.

#### **UNIT V OTHER SOURCES**

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic(MHD) energy conversion.

#### SUGGESTED READINGS

- 1. Rai.G.D, Non-conventional sources of energy Khanna publishers, 2011
- 2. Khan.B.H, Non-Conventional Energy Resources, The McGraw Hills, Second edition, 2012
- 3. John W Twidell and Anthony D Weir , Renewable Energy Resources , Taylor and Francis 3rdedition ,2015
- Fundamentals and Applications of Renewable Energy | Indian Edition, by Mehmet Kanoglu, Yunus A. Cengel, John M. Cimbala, cGraw Hill; First edition (10 December 2020), ISBN-10: 9390385636.

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COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	1	1	1	1	1	2	3	2	2	1	1	3	2	1
CO2	3	2	2	1	1	1	3	1	1	1	2	3	2	1
CO3	3	2	3	1	2	1	3	1	1	1	1	3	1	1
CO4	2	1	2	1	2	1	3	1	1	1	1	3	2	1
CO5	2	2	2	1	2	1	3	1	1	1	2	3	2	2
Average	2.2	1.6	2	1	1.6	1.2	3	1.2	1.2	1	1.4	3	1.8	1.2
1 - Low, 2	2 - M	ediun	n, 3 -	High	, <b>'-'</b> - )	No Co	orrela	ation						

#### CO, PO, PSO Mapping

**TOTAL: 45** 

23BEEEOE02 HYBRID ELECTRIC VEHICLES

Instruction Hours/week: L:3 T:0 P:0

#### **COURSE OBJECTIVES:**

- To understand the basics of electric and hybrid electric vehicles, their architecture, technologies and fundamentals.
- To familiarize the plug in hybrid electric drive- Train Topologies.
- To analyze electric drives suitable for hybrid electric vehicles.
- To discuss different energy storage technologies used for hybrid electric vehicles and their control.
- To demonstrate energy management strategies in hybrid electric vehicles.

#### **COURSE OUTCOMES**

At the end of this course, students will be able to

- Explain the basics of electric and hybrid electric vehicles, their architecture, technologies and fundamentals
- Analyze the use of train topologies in hybrid electric drive.
- Interpret electric drives suitable for hybrid electric vehicles.
- Explain the use of energy storage devices used for hybrid electric vehicles.
- Analysis the performance of Energy Management strategies in HEVs

#### UNIT I INTRODUCTION

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

#### UNIT II HYBRID ELECTRIC DRIVE-TRAINS

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

#### UNIT III ELECTRIC PROPULSION UNIT

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

#### UNIT IV ENERGY STORAGE

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

**3H-3C** 

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#### UNIT V ENERGY MANAGEMENT STRATEGIES

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

#### **TEXT BOOKS:**

- 1. C.Mi, M.A. Masrur and D.W.Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
- 2. S.Onori, L.Serrao and G.Rizzoni,"Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.
- 3. M.Ehsani, Y.Gao, S.E.Gay and A.Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
- 4. T.Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

#### **WEBLINKS:**

- 1. https://www.energy.gov/eere/electricvehicles/electric-vehicle-basics
- 2. https://swayam.gov.in/nd1\_noc20\_ee18/preview3.https://nptel.ac.in/courses/108103009/
- 3. https://nptel.ac.in/content/storage2/nptel\_data3/html/mhrd/ict/text/106105166/lecpdf
- 4. https://nptel.ac.in/courses/106105166/
- 5. https://nptel.ac.in/courses/108108098/

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COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	2	1	1	3	-	-	-	-	-	2	3
CO2	1	3	2	2	3	-	3	-	-	-	-	-	3	3
CO3	2	3	2	2	2	2	3	-	-	-	-	-	3	3
CO4	1	3	3	3	3	1	3	-	-	-	-	-	3	3
CO5	1	3	3	3	3	1	3	-	-	-	-	-	-	3
Average	1.4	3	2	2.4	1.8	1	3	-	-	-	-	-	2.2	3

#### CO PO PSO Manning

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

**TOTAL : 45** 

#### 23BEBMEOE01 HUMAN ANATOMY AND PHYSIOLOGY 3H-3C

Instruction Hours/week: L:3 T:0 P:0

#### Marks: Internal: 40 External:60 Total:100 End Semester Exam: 3Hours

#### COURSE OBJECTIVES:

The goal of this course is for students

- To discuss all the organelles of an animal cell and their function.
- To perceive structure and functions of the various types of systems of human body.
- To outline about eye, ear and Endocrine glands of human
- To learn organs and structures involving in system formation and functions.
- To infer basic understanding of the inter connection of various organ systems in human body

#### **COURSE OUTCOMES:**

Upon completion of this course, students will be able to:

- Explain basic structure and functions of cells and its organelles
- Elucidate the Nervous Control system of Heart
- Classify respiration types and its function
- Illustrate the functions of Digestion and absorption system
- Differentiate the functions of sensory organs and Endocrine glands of human.

#### UNIT I CELL

Structure of Cell– Organelles and description–Function of each component of the cell– Membrane potential–Action Potential–Generation and Conduction –Electrical Stimulation. Blood Cell–Composition –Origin of RBC–Blood Groups–Estimation of RBC, WBC and Platelet- Tissues and its functions-.Homeostasis - Tissue: Types – Specialized tissues – functions.

#### UNIT II CARDIAC AND NERVOUS SYSTEM

Heart, Major blood vessels– Cardiac Cycle – ECG-Conducting system of heart--importance of blood groups – identification of blood groups- Nervous Control of Heart-Cardiac output– Coronary and Peripheral Circulation–Structure and function of Nervous tissue–Neuron-Synapse- Reflexes-Receptors-Brain-Brainstem-Spinalcord–Reflexaction.

#### UNIT III RESPIRATORY SYSTEM AND MUSCULO SKELETAL SYSTEM

Physiological aspects of respiration–Trachea and lungs -Exchange of gases–Regulation of Respiration Disturbance of respiration function -Pulmonary function test-Types of respiration - Oxygen and carbon dioxide transport and acid base regulation-Muscles-tissue-types-structure of skeletal muscle-types of muscle and joints.

#### UNIT IV DIGESTIVE, EXCRETORY AND LYMPHATIC SYSTEM

Organisation of GI System, Digestion and absorption -Movements of GI tract-Intestine-Liver-

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Pancreas- Structure of Nephron–Mechanism of Urine formation–Urine Reflex–Skin and Sweat Gland–Temperature regulation, Lymphatic: Parts and Functions of Lymphatic systems– Types of Lymphatic organs and vessels.

#### UNIT V EYE, EAR & ENDOCRINE GLANDS

Optics of Eye–Retina–Photochemistry of Vision–Accommodation-Neurophysiology of vision–EOG, Physiology of internal ear–Mechanism of Hearing–Auditory Pathway, Hearing Tests–Endocrine- Pituitary and thyroid glands.

#### TOTAL: 45

#### **TEXT BOOKS:**

1. Textbook Equity Edition, Anatomy and Physiology : Volume 2 of 3, Lulu.com, 2014

#### **REFERENCES:**

- 1. William F. Ganong, Review of Medical Physiology, Mc Graw Hill, New Delhi, 26th Edition,2019
- 2. Arthur C. Guyton, Text book of Medical Physiology Elsevier Saunders, 12th Edition, 2011

#### WEB SITES:

- 1. https://dth.ac.in/medical/course.php
- 2. https://onlinecourses.swayam2.ac.in/cec20\_bt19/preview

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	1	1		1	2	-
CO2	2	2	2	2	-	•	-	-	1	1		1	2	-
CO3	2	2	2	2	-	•	-	•	1	1		1	2	-
CO4	2	2	2	2	-	-	-	-	1	1		1	2	-
<b>CO5</b>	2	2	2	2	-	-	-	-	1	1		1	2	-
Average	2	2	2	2	-	-	-	-	1	1		1	2	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### 23BEBMEOE02 ARTIFICIAL ORGANS AND IMPLANTS 3H-3C

Instruction Hours /week: L:3 T:0 P:0

## End Semester Exam: 3Hours

Marks: Internal:40 External:60 Total:100

2023-2024

### **COURSE OBJECTIVES:**

The goal of this course is for students

- To have an overview of artificial organs &transplants
- To describe the principles of implant design with a case study
- To explain the implant design parameters and solution
- To study about various blood interfacing implant
- To study about soft tissue replacement and hard tissue replacement

### **COURSE OUTCOMES:**

Upon completion of this course, students will be able to:

- Compare the fundamentals of Artificial organs and Transplants
- Explain the implant design parameters and solution in use
- Interpret the response of biomaterials in living system
- Choose blood interfacing implants
- Differentiate soft and hard tissue replacements

## UNIT I ARTIFICIAL ORGANS & TRANSPLANTS

ARTIFICIAL ORGANS: Introduction, Outlook for organ replacements, Design consideration – Evaluation process. TRANSPLANTS: Overview, Immunological considerations, Blood transfusions, Individual organs –kidney, liver, heart and lung, bone marrow, cornea.

### UNIT II PRINCIPLES OF IMPLANT DESIGN

Principles of implant design - body response to implants, Clinical problems requiring implants forsolution, The missing organ and its replacement, Tissue engineering, scaffolds, Biomaterials, Regenerative medicine & Stem cells.

## UNIT III IMPLANT DESIGN PARAMETERS AND ITS SOLUTION

Biocompatibility, Local and systemic effects of implants, Design specifications for tissue bonding and modulus matching, Degradation of devices, natural and synthetic polymers, corrosion, wear and tear, Implants for Bone, Devices for nerve regeneration. Limb prosthesis, Externally Powered limb Prosthesis.

## UNIT IV BLOOD INTERFACING IMPLANTS

Neural and neuromuscular implants, Heart valve implants, heart and lung assist devices, artificial heart, cardiac pacemakers, Prosthetic cardiac valves, Artificial kidney-dialysismembrane and artificial blood.

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Karpagam Academy of Higher Education (Deemed to be University), Coimbatore - 641 021

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#### UNIT V IMPLANTABLE MEDICAL DEVICES AND ORGANS

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Gastrointestinal system, Dentistry, Soft tissue replacement & Hard tissue replacement – sutures, surgical tapes, adhesive, percutaneous implants, internal fracture fixation devices, joint replacements. Maxillofacial and craniofacial replacement, Recent advancement and future directions.

#### TOTAL: 45

#### **TEXT BOOKS:**

- 1. Kopff W.J, Artificial Organs, John Wiley and sons, New York, 1st edition, 1976
- 2. Park J.B, Biomaterials Science and Engineering, Plenum Press, 2011

#### **REFERENCES**:

- 1. J D Bronzino, Biomedical Engineering handbook Volume II, (CRC Press / IEEE Press), 2000.
- 2. R S Khandpur, Handbook of Biomedical Instrumentation, Tata Mc Graw Hill, 2003
- 3. Joon B Park, Biomaterials An Introduction, Plenum press, New York, 1992.
- 4. Yannas, I. V, —Tissue and Organ Regeneration in Adults, New York, NY: Springer, 2001.
- 5. Yadin David, Wolf W. von Maltzahn, Michael R. Neuman, Joseph D, Bronzino, Clinical Engineering<sup>I</sup>, CRC Press, 1st edition, 2010.
- 6. Standard Handbook of Biomedical Engineering & Design , Myer Kutz, McGraw-Hill, 2003

#### WEB SITES:

1. https://ocw.mit.edu/courses/mechanical-engineering/2-782j-design-of-medical-devicesand- implants-spring-2006/

UU, PU, PSU Mapping														
COs	<b>PO1</b>	<b>PO2</b>	PO3	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	2	2	2	2	-	•	•	-	1	1	•	1	2	-
CO2	2	2	2	2	-	•	•	-	1	1	•	1	2	-
CO3	2	2	2	2	-	•	•	•	1	1	•	1	2	-
CO4	3	3	3	3	-	•	•	•	1	1	•	1	3	-
CO5	2	2	2	2	-	•	•	•	1	1	•	1	2	-
Average	2	2	2	2	-	-	-	-	1	1	-	1	2	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### **23BTBTOE01**

#### **BASIC BIOINFORMATICS**

**3H-3C** 

2023-2024

Instruction Hours /week: L:3 T:0

#### Marks: Internal:40 External:60Total:100 End Semester Exam:3Hours

#### **COURSE OBJECTIVE:**

The goal of this course is for students to

- Elaborate the available tools and databases for performing research in bioinformatics.
- Expose students to sequence alignment tool in bioinformatics.
- Construct the phylogenetic trees for evolution.
- Discuss the 3D structure of protein and classification.
- Acquire basic knowledge in protein secondary structure prediction.

#### **COURSE OUTCOMES:**

After completing the course, the students will be able to

- Summarize the basic concepts and importance of Bioinformatics in various sectors.
- Demonstrate the sequence alignment tool in bioinformatics.
- Outline the phylogenetic trees for evolution.
- Illustrate the protein secondary structure prediction by comparative modeling.
- Explain the micro array technology and applications of bioinformatics in various sectors.

#### UNIT I OVERVIEW OF BIOINFORMATICS

Aims and tasks of Bioinformatics - applications of Bioinformatics - challenges and opportunities. The scope of bioinformatics; bioinformatics & the internet; useful bioinformatics sites. Data acquisition: sequencing DNA, RNA & proteins; determination of protein structure; gene & protein expression data; protein interaction data. Databases – contents, structure & annotation: file formats; annotated sequence databases; miscellaneous databases.

#### UNIT II RETRIEVAL OF BIOLOGICAL DATA

Data retrieval with Entrez & DBGET/ LinkDB; data retrieval with SRS (sequence retrieval system).Searching sequence databases by sequence similarity criteria: sequence similarity searches; amino acid substitution matrices; database searches, FASTA & BLAST; sequence filters; iterative database searches & PSI-BLAST. Multiple-sequence alignment, gene & protein families: multiple-sequence alignment & family relationships; protein families & pattern databases; protein domainfamilies.

#### **UNIT III PHYLOGENETICS**

Introduction to Phylogenetics, Molecular Evolution and Molecular Phylogenetics, Phylogenetic tree, Forms of Tree Representation, Rooted and un-rooted trees, Phylogenetic Tree Construction Methods: Distance based methods- NJ, UPGMA PGMA, cladistics & ontology; building phylogenetic trees; evolution of macromolecular sequences. Sequence

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annotation: principles of genome annotation; annotation tools & resources.

#### UNIT IV STRUCTURAL BIOINFORMATICS

Protein sequence data-bases- SwissProt/ TrEMBL, PIR, Sequence motif databases -Pfam, PROSITE, Protein structure databases, Protein Data Bank-SCOP, CATH, KEGG, Chem bank, Sequence, structure and function relationship. Conceptual models of protein structure; the relationship of protein three-dimensional structure to protein function; the evolution of protein structure & function; obtaining, viewing & analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure; introduction to protein structure prediction; Protein structure prediction, modeling.

#### UNIT V MICROARRAY DATA ANALYSIS

Microarray data, analysis methods; microarray data, tools & resources; sequence sampling & SAGE. Bioinformatics in pharmaceutical industry: informatics & drug discovery; pharma informatics resources. Basic principles of computing in bioinformatics: running computer software; computer operating systems; software downloading & installation; database management.

#### **TEXT BOOKS:**

- 1. Dan E krane Michael L Rayme. (2004). Fundamental concepts of Bioinformatics. Pearson Education.
- 2. Andreas D Baxevanis B.F. Franchis Ouellette. (2004). Bioinformatics: A practical guide to the analysis of genes and proteins. Wiley-Inter science.
- 3. David W. Mount. (2004). Sequence and Genome Analysis. Cold Spring Harbor Laboratory.

#### **REFERENCE BOOKS:**

- 1. Jonathan Pevsner.(2015). Bioinformatics and functional genomics. wiley-Liss.
- 2. Rastogi, S. C., Parag Rastogi, and Namita Mendiratta(2013). Bioinformatics Methods And Applications: Genomics Proteomics And Drug Discovery. 4 th Edition, PHI Learning Pvt. Ltd.,

#### WEB SITES:

- 1. https://www.ncbi.nlm.nih.gov/pmc/
- 2. https://biology.mit.edu/faculty-and-research/areas-of-research/computational-biology/

co, ro, r	v, i v, i v mapping													
COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	<b>PO12</b>	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	1	1	-
CO2	1	1	-	-	-	-	-	-	-	-	-	1	-	1
CO3	2	-	1	-	-	-	-	-	-	-	-	-	1	1
CO4	1	-	1	-	1	1	-	-	-	-	-	1	-	-
CO5	2	-	1	-	1	1	-	-	-	-	-	1	1	-
Average	2	1	1	-	1	1	-	-	-	-	-	1	1	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL: 45** 

#### 23BTBTOE02 FUNDAMENTALS OF NANOBIOTECHNOLOGY 3H-3C

#### Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for students to

- Impart the skills in the field of nano biotechnology and its applications.
- Acquire knowledge in the nano particles and its significance in various fields.
- Extend the knowledge in types and application of nano particles in sensors.
- Define the concepts of biomaterials through molecular self-assembly.
- Equip students with clinical applications of nano devices.

#### **COURSE OUTCOMES:**

After completing the course, the students will be able to

- Develop skills in the field of nano biotechnology and its applications.
- Summarize the techniques involve in nanoparticles synthesis and characterization.
- Demonstrate the nanotechnology application in biomedical and drug delivery system.
- Outline the clinical applications of nano devices.
- Explain the socio-economic issues in nanobiotechnology.

#### **UNIT I INTRODUCTION**

Introduction to Nanotechnology and nanobiotechnology: Properties at nanoscale, Scope and Overview, Length scales , Importance of Nanoscale and Technology, History of Nanotechnology, Future of Nanotechnology: Nano Technology Revolution, ; General synthesis methods of nanoscale materials; top down and bottom up approaches; Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concept, Controversies and confusions, Understanding advanced capabilities, Nanotechnology in Different, Fields: Nanobiotechnology, Materials, Medicine, Dental care.

#### UNIT II NANO PARTICLES

Introduction, Types of Nanoparticles, Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Applications, Toxic effects of Nanomaterials, Significance of Nanoparticles Nanofabrications- MEMS/NEMS, Atomic Force Microscopy, Self-assembled monolayers/ Dip- pen Nanolithography, Soft Lithography, PDMS Molding, Nano Particles, Nano wires and Nanotubes. X-ray diffraction technique; Scanning Electron Microscopy with EDX;Transmission Electron Microscopy including high-resolution imaging;

#### UNIT III MEDICAL NANOTECHNOLOGY

Nanomedicine, Nanobiosensor and Nanofludics. Nanocrystals in biological detection, Electrochemical DNA sensors and Integrated Nanoliter systems. Nano-Biodevices and Systems. Fabrication of Novel Biomaterials through molecular self-assembly- Small scale

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systems for in vivo drug delivery- Future nanomachine. Case study on drug delivery ofgold nanoparticles against breast cancer

#### UNIT IV NANOBIOTECHNOLOGY

Nanoscale devices for drug delivery: micelles for drug delivery; targeting; bioimaging; microarray and genome chips; Clinical applications of nanodevices. Artificial neurons. Realtime nanosensors- Applications in cancer biology. Nanomedicine. Synthetic retinyl chips based on bacteriorhodopsins. High throughput DNA sequencing with nano carbontubules. Nanosurgical devices.

#### UNIT V ETHICAL ISSUES IN NANOTECHNOLOGY

Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology: With Especial Reference to Nanomedicine, Nanomedicine Applied in Nonmedical Contexts, Social Issues Relating to Nanomedicine. Social and Ethical Issues, Economic Impacts, Other Issues, Nanotechnology and Future Socio-economic challenges.

#### **TEXT BOOKS:**

- 1. Goodsell, D.S. (2004). Bionanotechnology. John Wiley and Sons, Inc.
- 2. Shoseyov, O. and Levy, I (2008).Nanobiotechnology: Bioinspired Devices andMaterials of the Future. Humana Press.

#### **REFERENCE BOOKS:**

- 1. Bhushan, B. (2017). Springer Handbook of Nanotechnology. Springer-Verlag BerlinHeidelberg.
- 2. FreitasJr R.A (2006) Nanomedicine. Landes Biosciences.
- 3. Kohler, M. and Fritzsche, W. (2008). Nanotechnology An Introduction to NanostructuringTechniques. Wiley-VCH.
- 4. Niemeyer, C. M., and CA Mirkin, C. A., (2010); NanoBiotechnology II Moreconcepts, and applications. First edition, Wiley –VCH publications

#### WEB SITES:

- 1. <u>https://mitnano.mit.edu/</u>
- 2. https://nptel.ac.in/courses/118102003

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	2	-	-	-	1	-	-	-	-	-	-	-	-	1
CO2	1	-	-	-	-	-	I	I	-	-	I	1	1	1
CO3	2	-	1	-	1	1	I	I	-	-	I	•	1	1
CO4	2	-	1	-	1	1	I	I	-	-	I	-	1	I
CO5	-	-	-	2	-	2		2	-	-	-	-	-	-
Average	2	-	1	2	1	1	-	2	-	-	-	1	1	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation



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**TOTAL: 45** 

#### 23BECEOE01HOUSING PLAN AND MANAGEMENT3H- 3C

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

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for students to

- To examine the role and tasks of basic housing policies and building bye laws
- Understand the process of integrated service delivery in the context of economic, social, environmental, and institutional factors.
- Analyze the Innovative construction methods and Materials.
- Analyze city management strategies and strengthen the urban governance through a problem-solving approach.
- To know the Importance of basic housing policies and building bye laws

#### **COURSE OUTCOMES:**

After completing the course, the students will be able to

- Know the Importance of basic housing policies and building bye laws.
- Plan and Design of Housing projects
- Examine Innovative construction methods and Materials.
- Know Housing finance and loan approval procedures.
- Understand Construction as well as managing techniques.

#### UNIT I INTRODUCTION TO HOUSING

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Byelaws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels.

#### UNIT II HOUSING PROGRAMMES

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organizations.

#### UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems).

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#### UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers - Concept, Functions and Performance Evaluation.

#### UNIT V HOUSING FINANCE AND PROJECT APPRAISAL

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems).

#### **TOTAL: 45**

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#### **TEXT BOOKS:**

- 1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 2002.
- 2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Mumbai (Bombay), 2001.

#### **REFERENCES:**

- 1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.
- 2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	PO7	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	2	-	-	2	-	2	2	1	1
CO2	3	3	3	3	3	2	-	-	2	-	2	2	1	1
CO3	3	3	2	2	2	2	-	-	2	-	2	2	1	1
CO4	3	3	3	3	2	2	-	-	2	-	2	2	1	1
CO5	3	3	2	2	2	2	-	-	2	-	2	2	1	1
Average	3	3	2.6	2.4	2.2	2	-	-	2	-	2	2	1	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### **23BECEOE02**

#### **BUILDING SERVICES**

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for students to

- Defining and identifying of engineering services systems in buildings.
- The role of engineering services systems in providing comfort and facilitating life of users of the building.
- The basic principles of asset management in a building & facilities maintenance environment
- Importance of Fire safety and its installation techniques.
- To understand Electrical system and its selection criteria

#### **COURSE OUTCOME:**

After completing the course, the students will be able to

- Machineries involved in building construction.
- Understand Electrical system and its selection criteria.
- Use the Principles of illumination & design.
- Know the principle of Refrigeration and application.
- Importance of Fire safety and its installation techniques

#### **UNIT I MACHINERIES**

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air, and electricity.

#### UNIT II ELECTRICAL SYSTEMS IN BUILDINGS

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiringsystems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations.

#### UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapor– Sub cooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapor compression cycle – Compressors – Evaporators –Refrigerant control devices – Electric motors

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Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners
Chilledwater plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems.

#### UNIT III PRINCIPLES OF ILLUMINATION & DESIGN

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilization factor – Depreciation factor – MSCP – MHCP –Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals, and house lighting. Elementary idea of specific features required, and minimum level of illumination required for physically handicapped and elderly in building types.

#### UNIT V FIRE SAFETY INSTALLATION

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Specific features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers.

#### **TOTAL: 45**

#### **TEXT BOOKS:**

- 1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 2002.
- 2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2005.

#### **REFERENCES:**

- 1. Philips Lighting in Architectural Design, McGraw-Hill, New York, 2000.
- 2. A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 2005.
- 3. National Building Code.

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	<b>PO12</b>	PSO1	PSO2
CO1	3	-	2	2	1	2	-	1	-	-	-	2	1	1
CO2	3	-	2	2	1	2	-	-	-	-	-	2	1	1
CO3	3	-	2	2	1	2	-	-	-	-	-	2	1	1
<b>CO4</b>	3	-	2	2	1	2	-	-	-	-	-	2	1	1
CO5	3	-	2	2	1	2	-	-	-	-	-	2	1	1
Average	3	-	2	2	1	2	-	-	-	-	-	2	1	1
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1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### **REPAIR AND REHABILITATION OF STRUCTURES 23BECEOE03 3H-3C**

Instruction Hours/week: L: 3 T: 0 P: 0

#### **COURSE OBJECTIVES:**

The goal of this course is for students to

- To learn various distress and damages to concrete and masonry structures
- To know the influence of corrosion in durability of structures
- To understand the importance of maintenance of structures
- To study the various types and properties of repair materials
- To learn various techniques involved in demolition of structures.

# **COURSE OUTCOME:**

After completing the course, the students will be able to

- Various distress and damages to concrete and masonry structures.
- Durability of structures and corrosion mechanism
- The importance of maintenance of structures, types, and properties of repair materials etc.
- Assessing damage of structures and various repair techniques
- the several types and properties of repair materials

# **UNIT I INTRODUCTION**

Quality assurance for concrete construction as built concrete properties strength, permeability, thermal properties, and cracking. Effects due to climate, temperature, chemicals, wear and erosion, Design, and construction errors.

# **UNIT II DURABILITY OF STRUCTURES**

Corrosion mechanism - diagnosis- causes and effects - cover thickness and cracking, measurements for corrosion - methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection.

# **UNIT III MAINTENANCE AND REPAIR STRATEGIES**

Definitions: Maintenance, repair and rehabilitation, Facets of Maintenance importance of Maintenance Preventive measures on various aspects Inspection, Assessment procedure for evaluating a damaged structure causes of deterioration - testing techniques.

# **UNIT IV MATERIALS FOR REPAIR**

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain,

Marks: Internal:40External:60 Total:100

End Semester Exam:3 Hours

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Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete. eliminators and polymers coating for rebars during repair foamed concrete, mortar and dry pack, vacuum concrete.

# UNIT V TECHNIQUES FOR REPAIR AND REPAIR OF STRUCTURES

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Non-destructive Testing Techniques, Corrosion protection techniques, Gunite and Shotcrete Epoxy injection, Mortar repair for cracks, shoring and underpinning. Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering wear, fire, leakage, marine exposure Engineered demolition techniques for dilapidated structures - case studies.

**TOTAL: 45** 

# **TEXT BOOKS:**

- 1. Denison Campbell, Allen, and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair," Longman Scientific and Technical UK, 1991.
- 2. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987
- 3. Shetty M.S., "Concrete Technology Theory and Practice," S. Chand and Company, 2008.

# **REFERENCE BOOKS:**

- 1. Ravishankar.K., Krishnamoorthy.T.S, "Structural Health Monitoring, Repair and
- 2. Rehabilitation of Concrete Structures," Allied Publishers, 2004.
- 3. Gambhir.M.L., "Concrete Technology," McGraw Hill, 2013
- 4. R. K. Rajput, Engineering Materials, S. Chand & Company Ltd., 2000.
- 5. M. S. Shetty, Concrete Technology (Theory and Practice), S. Chand & Company Ltd., 2003.
- 6. Sustainable Construction: Green Building Design and Delivery. Third Edition, Charles J.Kibert, New York: John Wiley & Sons, 2012.
- 7. Working Toward Sustainability: Ethical Decision Making in a Technological World, CJ Kibertet al, New York: John Wiley & Sons, 2011.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	2	-	-	2		1	2	-	-
CO2	3	2	2	2	1	2	-	-	2	-	1	2	-	-
CO3	3	2	2	2	1	2	-	-	2	-	1	2	-	-
CO4	3	2	2	2	1	2	-	-	2	-	1	2	-	-
CO5	3	2	2	2	1	2	-	-	2	-	1	2	-	-
Average	3	2	2	2	1	2	-	-	2	-	1	2	-	-

# CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

# 23BECEOE04 COMPUTER-AIDED CIVIL ENGINEERING DRAWING 3H- 3C

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

End Semester Exam:3 Hours

# **COURSE OBJECTIVES:**

The goal of this course is for students to

- Develop Parametric design and the conventions of formal engineering drawing
- Produce and interpret 2D & 3D drawings
- Communicate a design idea/concept graphically/ visually
- Examine a design critically and with understanding of CAD The student learns to interpret drawings, and to produce designs using a combination of 2D and 3D software.
- Get a Detailed study of an engineering artifact.

# **COURSE OUTCOMES:**

After completing the course, the students will be able to

- Develop Parametric design and the conventions of formal engineering drawing
- Produce and interpret 2D & 3D drawings
- Communicate a design idea/concept graphically/ visually
- Examine a design critically and with understanding of CAD The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.
- Get a Detailed study of an engineering artifact

# UNIT I INTRODUCTION

Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction computer aided drawing, co- ordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.

# UNIT II SYMBOLS AND SIGN CONVENTIONS

Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards.

# **UNIT III MASONRY BONDS**

English Bond and Flemish Bond – Corner wall and Cross walls - One brick wall and one and half brick wall.

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### UNIT IV BUILDING DRAWING

Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundationplan. Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity.

# **UNIT V: PICTORIAL VIEW**

Principles of isometrics and perspective drawing. Perspective view of building, Software's.

#### **TOTAL: 45**

#### **TEXT BOOKS:**

- 1. Venugopal (2007), "Engineering Drawing and Graphics + AUTOCAD", New Age International Pvt.Ltd.,
- 2. Subhash C Sharma & Gurucharan Singh (2005), " Civil Engineering Drawing", Standard Publishers

# **REFERENCE BOOKS:**

- 1. (Corresponding set of) CAD Software Theory and User Manuals.
- 2. Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd New Asian.
- 3. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria & Sons.
- 4. Ajeet Singh (2002), "Working with AUTOCAD 2000 with updates on AUTOCAD200I", Tata- Mc Graw-Hill Company Limited, New Delhi

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	2	1	2	1	-	2	-	1	2	-	1
CO2	3	2	-	2	1	2	1	-	2	-	1	2	-	1
CO3	3	2	-	2	1	2	1	-	2	-	1	2	-	1
CO4	3	2	-	2	1	2	1	-	2	-	1	2	-	1
CO5	3	2	-	2	1	2	1	-	2	-	1	2	-	1
Average	3	2	-	2	1	2	1	-	2	-	1	2	-	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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# **23BECEOE05**

**CONTRACTS MANAGEMENT** 

**3H-3C** 

2023-2024

# Instruction Hours/week: L: 3 T: 0 P: 0

# Marks: Internal:40External:60 Total:100 End Semester Exam:3 Hours

# **COURSE OBJECTIVES:**

The goal of this course is for students to

- To have developed a more detailed appreciation for construction planning and scheduling
- To apply their learned knowledge as it pertains to upper-level construction management skills and procedures.
- To evaluate the best practices associated with the development of contract parameters.
- To understand the legal aspects of acts governing the contracts
- To discuss techniques for appropriate risks and changes, monitoring and measuring the contract closure

# **COURSE OUTCOMES:**

After completing the course, the students will be able to

- Apply project Procurement management concepts in a project environment.
- Describe techniques used to procure resources within a project's scope and techniques to reduce procurement risks.
- Evaluate the best practices associated with the development of contract parameters.
- Understand the legal aspects of acts governing the contracts
- Discuss techniques for appropriate risks and changes, monitoring and measuring the contract closure

# **UNIT I CONTRACT MANAGEMENT**

Introduction, Importance of Contracts, Overview of Contract Management, Overview of Activities in Contract Management; Planning and People- Resource Management; Types of Contracts, Parties to a Contract; Contract Formation, Formulation of Contract, Contract Start-Up, Managing Relationships; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price.

# **UNIT II CONTRACT PARAMETERS**

Performance parameters; Delays, penalties, and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Notices under contracts; Conventional and Alternative Dispute Resolution methods.

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### UNIT III VARIOUS ACTS GOVERNING CONTRACTS

Contract Administration and Payments- Contract Administration, Payments; Contract Management in Various Situations- Contract Management in NCB Works, Contract Management in ICB Works Contracts, Contract of Supply of Goods- Design, Supply and Installation Contracts, Contract Management in Consultancy.

#### UNIT IV BID PROCESS AND BID EVALUATION

Bid process, important points in a tender document, and unbalanced contracts. Material covered includes: Request For Proposal and problems Different types of proposals Design Conditions and Standard Component List-Tender document - Unbalanced proposals. Exercises: Evaluating Unit Prices Premium Portion Of The Overtime Rate Handling Bid Questions.

#### UNIT V MANAGING RISKS AND CHANGE

Managing Risks, Managing Change; Contract Closure and Review- Ending a Contract, Post-Implementation Review; Legal Aspects in Contract Management- Contract Management Legal View, Dispute Resolution, Integrity in Contract Management; Managing Performance-Introduction, Monitoring and Measurement.

#### **TEXT BOOKS:**

- 1. R. K. Rajput, Engineering Materials, S. Chand & Company Ltd., 2000.
- 2. M. S. Shetty, Concrete Technology (Theory and Practice), S. Chand & Company Ltd., 2003.
- 3. Sustainable Construction: Green Building Design and Delivery. Third Edition, Charles J.Kibert, New York: John Wiley & Sons, 2012.

# **REFERENCE BOOKS:**

- 1. Working Toward Sustainability: Ethical Decision Making in a Technological World, CJ Kibertet al, New York: John Wiley & Sons, 2011.
- 2. Varghese, P.C., "Building Construction," Prentice Hall India, 2007.
- 3. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
- 4. Chudley, R., Construction Technology, ELBS Publishers, 2007.
- 5. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
- 6. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
- 7. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson EducationIndia, 2015
- 8. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

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CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	2	1	2	1	-	2	-	-	2	-	-
CO2	3	2	-	2	1	2	1	-	2	-	-	2	-	-
CO3	3	2	-	2	1	2	1	-	2	-	-	2	-	-
CO4	3	2	-	2	1	2	1	-	2	-	-	2	-	-
CO5	3	2	-	2	1	2	1	-	2	-	-	2	-	-
Average	3	2	-	2	1	2	1	-	2	-	-	2	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

# 23BECEOE06 AIR AND NOISE POLLUTION AND CONTROL 3H-3C

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

End Semester Exam:3 Hours

# **COURSE OBJECTIVES:**

The goal of this course is for students to

- To impart knowledge on the principles and design of control of indoor/ particulate / gaseous air pollutant and its emerging trends
- To induce operational considerations under the processing and control monitoring.
- To apply sampling techniques of gaseous contaminants.
- To control noise pollution by specific measurements, standard and preventive measures.
- To enable to evaluate the behavior of air pollutants.

# **COURSE OUTCOMES:**

After completion of this course, the student will be able to

- Have knowledge about appropriate control measures of air pollution.
- To apply sampling techniques and suggest suitable air pollution prevention equipment's and techniques for various gaseous and particulate pollutants.
- Have knowledge about the air pollution monitoring and modeling.
- Understand causes of air pollution and analyze different types of air pollutants.
- Evaluate air pollutant behavior in the atmosphere.

# UNIT I INTRODUCTION

Structure and composition of Atmosphere – Sources and classification of air pollutants - Effects of air pollutants on human health, vegetation & animals, Materials & Structures – Effects of air Pollutants on the atmosphere, Soil & Water bodies – Long- term effects on the planet – Global Climate Change, Ozone Holes – Ambient Air Quality and Emission Standards – Air Pollution Indices-Emission Inventories.

# UNIT II AIR POLLUTION MONITORING AND MODELLING

Ambient and Stack Sampling and Analysis of Particulate and Gaseous Pollutants -Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Transport & Dispersion of Air Pollutants – Modeling Techniques – Air PollutionClimatology.

# UNIT III CONTROL OF PARTICULATE CONTAMINANTS

Factors affecting Selection of Control Equipment – Gas Particle Interaction, – Working principle, Design and performance equations of Gravity Separators, cyclones, Fabric filters, Particulate

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Scrubbers, Electrostatic Precipitators – Operational Considerations - Process Control and Monitoring – Costing of APC equipment – Case studies for stationary and mobile sources.

# UNIT IV CONTROL OF GASEOUS CONTAMINANTS

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations - Costing of APC Equipment – Case studies for stationary and mobile sources.

# UNIT V AUTOMOBILE AND NOISE POLLUTION

Vehicular Pollution: Automobile emission- Types of emissions- Exhaust emissions, evaporative emissions, crank-case emissions- Prevention and control of vehicular pollution. Noise Pollution: Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures. Source types and control of indoor air pollutants, sick building syndrome types – Radon Pollution and its control.

# **TEXTBOOKS:**

- 1. Anjaneyulu D, "Air pollution and control technologies," Allied Publishers, Mumbai, 2002.
- 2. Khitoliya R K, "Environmental Pollution," 2/e, S. Chand Publishing, 2012.

# **REFERENCE BOOKS**:

- 1. Rao C.S, "Environmental pollution control engineering," Wiley Eastern Ltd., New Delhi, 1996.
- 2. Rao M.N, and Rao H.V.N, "Air Pollution Control" Tata-McGraw-Hill, New Delhi, 1996.
- 3. David H. F Liu, Bela G.Liptak, "Air Pollution," Lewis Publishers, 2000.
- 4. Mudakavi, J R, "Principles and Practices of Air Pollution Control and Analysis" IK International, 2010.
- 5. Air Pollution act, India, 1998.

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	3	2	-	2	1	2	1	-	2	-	2	2	1	-
CO2	3	2	-	2	1	2	1	-	2	-	2	2	1	-
CO3	3	2	-	2	1	2	1	-	2	-	2	2	1	-
CO4	3	2	-	2	1	2	1	-	2	-	2	2	1	-
CO5	3	2	-	2	1	2	1	-	2	-	2	2	1	-
Average	3	2	-	2	1	2	1	-	2	-	2	2	1	-

# CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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# 23BECYOE01 BASICS OF CYBER CRIME AND CYBER SECURITY 3H-3C

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

End Semester Exam:3 Hours

# **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To understand the fundamental concepts of cybercrime.
- To explore knowledge on cybercrimes in wireless devices.
- To infer tools used in the cyber security.
- To familiar with various Indian IT Act in cybercrime and cyber security.
- To enhance the knowledge in handheld devices and digital forensics.

# **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Illustrate basics of cyber-crime and information security.
- Apply the fundamentals concepts for identifying cyber-attacks.
- Make use of tools and methods used in cyber security.
- Analyze theoretical and cross-disciplinary approaches in Indian IT Act and in digital devices.
- Summarize the impact of cybercrime in digital devices on government, business, individual and society.

# **UNIT I INTRODUCTION**

Introduction to Cyber Crime: Cyber Crime and Information Security – Classifications of Cyber Criminals – Cyber Cri\me Legal Perspective and Indian Perspective – Cyber Crime and Indian ITA – A Global perspective on Cybercrimes – Categories of Cybercrimes – Criminal plans for attack – Social Engineering – Cyber talking – Cyber cafe and cyber criminals – Botnet – Attack vector – Cloud Computing.

# UNIT II CYBER CRIME MOBILE AND WIRELESS DEVICES

Cyber Crime Mobile and Wireless Devices: Proliferation – Trends in Mobility – Credit card frauds – Security challenges – Registry setting – Authentication service – Attacks – Security Implication for Organization – Organizational measures – Organizational Security Policies – Physical security counter measures.

# UNIT III TOOLS AND METHODS USED IN CYBER SECURITY9Tools and methods used in cyber security: Proxy servers and anonymizers – Phishing – Password

Karpagam Academy of Higher Education (Deemed to be University), Coimbatore – 641 021 Page 226

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cracking – Keyloggers and spywares – Virus and worms – Trojan horse – Stegnography – DoS and DDoS attack – SQL Injection – Buffer overflow – Attacks on wireless networks – Phishing and Identity theft.

#### UNIT IV CYBER CRIME AND LEGAL LANDSCAPE

Cyber Crime and Legal landscape – Indian IT Act – Digital Signature and Indian IT Act – Amendments to the Indian IT Act – Cybercrime and punishment. Understanding Computer Forensics: Need for computer forensics – Cyber forensics and digital evidence – Digital forensics life cycle – Network forensics – Computer forensics and steganography - Computer forensics from compliance perspective – Challenges

# UNIT V SPECIAL TOOLS AND TECHNIQUES

Special tools and techniques –Hand held devices and digital forensics. Cyber security organizational implications: Cost of cybercrimes and IPR – Web threads for organizations – Security and privacy implications – Social media marketing – Incident handling – Forensics best practices for organization.

#### **TEXT BOOKS:**

1. Nina Godbole and Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley Publisher, First Edition, 2011.

# **REFERENCE BOOKS:**

- 1. Harish Chander, Cyber Laws and IT Protection, PHI Learning, First Edition, 2012
- 2. James Graham, Ryan Olson and Rick Howard, Cyber Security Essentials, CRC Press, First Edition, CRC Press, First Edition

#### **WEBLINKS:**

- 1. www.lexology.com/library/
- 2. www.swayam.gov.in/nd2\_ugc19\_hs25/preview
- 3. www.educba.com/cyber-security-tools/
- 4. www.intaforensics.com
- 5. www.itu.int/en/ITU-D/Cybersecurity

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#### **TOTAL: 45**

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CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	2	-	-	-	-	-	2	2	2
CO2	3	3	2	2	-	2	-	-	-	-	-	2	2	2
CO3	3	3	3	3	-	2	-	-	-	-	-	2	2	2
CO4	3	3	3	3	-	2	-	-	-	-	-	2	2	2
CO5	3	3	2	2	-	2	-	-	-	-	-	2	2	2
Average	3	3	2	2	-	2	-	-	-	-	-	2	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

# 23BECYOE02BASICS OF CYBER FORENSICS3H-3C

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

### **COURSE OBJECTIVES:**

The goal of this course is for the students

- To be aware of fundamentals on cyber forensics and usage of cyber forensics tools.
- To be familiar with the file systems and challenges in the Linux and mac operating system.
- To explore knowledge on the network and different operating systems on mobile devices.
- To learn various services like FaaS and MaaS.
- To enhance the knowledge on database, email and threats in crypto currency.

#### **COURSE OUTCOMES:**

Upon completion of the course, the students will be able to:

- Infer the basic of Forensics investigation process.
- Discuss popular Linux distributions used for forensic analysis, file systems, processes, and artifacts associated with Linux systems.
- Outline challenges involved in iOS forensics and relevant data extraction procedure from iOS devices
- Analyze the challenges in cloud forensics.
- Describe Bitcoin forensics and Blockchain artifacts.

#### UNIT INTRODUCTION

Introduction to Cyber forensics: Forensics investigation process – Forensics protocol – Digital forensics standards –Digital evidence – Types of cybercrime – Notable data breaches – Case study - Challenges in Cyber security – Cyber forensics tools. Windows forensics: Digital Evidence – File systems – Time analysis – Challenges- Case Study.

#### UNIT II LINUX FORENSICS AND MAC OS FORENSICS

Linux forensics: Popular linux – File systems – Process – Artifacts – Linux distribution used for forensics analysis – Challenges – Case study. Mac OS forensics: File systems – Process – Artifacts – Information to collect Mac book forensics investigation – Case study. Anti-forensics: Data wiping and shredding – Trial obfuscation – Encryption – Data hiding – Anti-forensics detection technique.

# UNIT III NETWORK FORENSICS AND MOBILE FORENSICS9

Network forensics: OSI Model - Artifacts - ICPM Attack - Analysis tools. Mobile forensics:

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Android operating system – Mutual Extraction – Physical acquisition – Chip-off – Micro-read – Challenges – iOS operating system.

# UNIT IV CLOUD FORENSICS AND WEB ATTACK FORENSICS

Cloud forensics: Cloud computing model – Server-side forensics – Client-side forensics – Challenges – Artifacts – use – Forensics as a Service. Malware forensics: Types – Analysis – Tools – Challenges – Malware as a Service. Web attack forensics: Web attack test – Intrusion forensics – Database forensics – Log forensics – Content analysis – File metadata forensics.

# UNIT V EMAILS AND EMAIL CRIMINALS

Emails and email criminals: Protocols – Email criminals – Email forensics. Solid State device forensics: Components –Data wiping – Analysis. Bit coin forensics: Crypto currency – Block chain – Artifacts – Challenges.

# **TEXT BOOKS:**

1. Niranjan Reddy, Practical Cyber Forensics: An Incident-Based Approach to Forensic Investigations, Apress, First Edition, 2019

# **REFERENCE BOOKS:**

- 1. Marjie Britz T, Computer Forensics and Cyber Crime: An Introduction, Prentice Hall, ThirdEdition, 2013
- 2. Albert Marcella J and Frederic Guillossou, Cyber Forensics: From Data to Digital Evidence, Wiley Publisher, .First Edition, 2012.

# **WEBLINKS:**

- 1. www.swayam.gov.in/nd2\_ugc19\_hs25/preview
- 2. www.educba.com/cyber-security-tools/
- 3. www.intaforensics.com
- 4. www.cs.nmt.edu/~df/lectures.html

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	2	-	-	-	-	-	2	2	2
CO2	3	3	2	-	2	2	-	-	-	-	-	2	2	2
CO3	3	3	3	3	2	2	-	-	-	-	-	2	2	2
CO4	3	3	3	3	2	2	-	-	-	-	-	2	2	2
CO5	2	2	2	1	-	2	-	-	-	-	-	2	2	2
Average	3	3	2	2	2	2	-	-	-	-	-	2	2	2

# CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL: 45** 

# 23BECYOE03 CYBER LAWS AND INTELLECTUAL PROPERTY RIGHTS3H-3CInstruction Hours/week: L:3 T:0 P:0Marks: Internal:40 External:60 Total:100End Semester Exam:3 Hours

# **COURSE OBJECTIVES:**

- To understand the need for cyber laws and intellectual property rights.
- To acquire knowledge about the protective measures of Intellectual property such as copyright, patent, Trademark.
- To examine the criminal remedies and defensive measures.
- To provide an insight about the role of certifying authority and cryptography.
- To be aware of Indian IT Act 2000 and 2008 cyber laws.

# **COURSE OUTCOMES:**

Upon completion of the course, the students will be able to:

- Outline the fundamental concepts of cyber laws and the various intellectual property rights for criminal activities.
- Illustrate the concept of work of employment and its implications in copyright infringement cases.
- Infer civil remedies available for design infringement and their application in different infringement scenarios.
- Identify the scope and significance of cyber laws that arises from the use of technology.
- Explain Information Technology Act and its subsequent amendments in cyberspace.

# UNIT I INTRODUCTION

Intellectual Property: Introduction – Protection of Intellectual Property – Copyright related rights – Patents – Industrial designs – Trademark – Unfair competition – Information technology related intellectual property rights – Computer software and intellectual property – Copyright protection – Reproducing – Defences – Patent protection.

# UNIT II INFRINGEMENT

Ownership and enforcement of intellectual property – Defences in case of infringement copyright – Work of employment infringement – Defences for infringement – Trademarks – Rights – Protection of good will – Infringement – Passing off defences

# UNIT III IP IINTELLECTUAL PROPERTY RIGHTS AND ENFORCEMENT 9

Designs – Defences of design infringement. Enforcement of intellectual property rights – Civil remedies – Criminal remedies – Border – Security measures. Practical aspects of licensing – Benefits – Determinative factors – Important clauses – Licensing clauses.

#### UNIT IV CYBER LAW

Cyber law: Basic concepts of technology and law – Understanding the technology of internet – Scopeof cyber laws. Cyber jurisprudence law of digital contracts: The essence of digital contracts – The system of digital signatures – The role and function of certifying authorities

# UNIT V INTELLECTUAL PROPERTY ISSUES

The science of cryptography – IT Act 2000 and 2008 – Amendments in IT Act – IPC and Privacy threats in cyber law. Intellectual Property issues in cyber space: Domain names and related issues – Copyright in the digital media – Patents in the cyber world. rights of netizens and e-Governance.

#### **TEXT BOOKS:**

- 1. David I Bainbridge, Intellectual Property, Pearson Education, Eighth Edition, 2010.
- 2. Talat Fatima, Cyber Law in India, Wolters Kluwer, First Edition, 2017.

#### **REFERENCE BOOKS:**

- 1. Yatindra Singh, Guide to Cyber Laws, Universal Law, Fourth Edition, 2010
- 2. Information Technology Law and Practice- Cyber Laws and Laws Relating to E-Commerce, Universal Law, Third Edition, 2011.

#### **WEBLINKS:**

- 1. www.core.ac.uk/download/pdf/144527187.pdf
- 2. www.nptel.ac.in/courses/110/105/110105139/
- 3. www.icsi.edu/media/webmodules/FINAL\_IPR&LP\_BOOK\_10022020.pdf
- 4. www.lawshelf.com/videocoursesmoduleview/
- 5. www.lawfaculty.du.ac.in/files/course\_material/Old\_Course\_Material/

COs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	2	-	-	-	-	-	2	2	2
CO2	3	3	3	2	-	2	-	-	-	-	-	2	2	2
CO3	3	2	2	2	-	2	-	-	-	-	-	2	2	2
CO4	3	3	3	3	-	2	-	-	-	-	-	2	2	2
CO5	3	3	3	2	-	2	-	-	-	-	-	2	2	2
Average	3	3	3	2	-	2	-	-	-	-	-	2	2	2

# CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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# **TOTAL : 45**

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#### 23BECYOE04 BLOCKCHAIN AND CYBER SECURITY 3H-3C

# Instruction Hours/week: L:3 T:0 P:0

# Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

### **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To decompose a block chain system's fundamental components, how they fit together and examine a decentralization using block chain.
- To illustrate how Crypto currency works, from when a transaction is created to when it is considered part of the blockchain.
- To explain the components of Ethereum, programming languages for Ethereum and study the basics Hyperledger and Web3.
- To understand the nature of threats and cyber security management goals and technology
- To infer the landscape of hacking and perimeter defencee mechanisms

# **COURSE OUTCOMES:**

Upon completion of the course the student will be able to:

- Illustrate the technology components of Block chain and its working principles.
- Describe Ethereum model and code execution and the architectural components.
- Discuss components of a Hyperledger along with its development framework.
- Demonstrate the nature of threats and cyber security management goals and framework.
- Outline malicious software attack and wireless network attack.

# UNIT I INTRODUCTION OF BLOCKCHAIN TECHNOLOGY

History of Blockchain – Types of Blockchain – Consensus – Decentralization using Blockchain – Blockchain and Full Ecosystem Decentralization – Platforms for Decentralization. Bitcoin – Digital Keys and Addresses – Transactions – Mining – Bitcoin Networks and Payments – Wallets – Alternative Coins – Theoretical Limitations – Bitcoin Limitations – Name Coin – Prime Coin – Zcash. – Smart Contracts – Ricardian Contracts.

# UNIT II ETHEREUM NETWORK

The Ethereum Network – Components of Ethereum Ecosystem – Ethereum Programming Languages: Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols – Solidity Language.

# UNIT III FRAMEWORK FOR HYPERLEDGER FABRIC

Introduction to Web3 - Contract Deployment - POST Requests - Development frameworks -

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Hyperledger as a protocol – The Reference Architecture – Hyperledger Fabric – Distributed Ledger –Corda-Alternative Blockchains.

# UNIT IV CYBER SECURITY

Introduction – Cyberspace – Cyber Crime – Nature of Threat – Cyber security – Policy, Mission and Vision of Cyber security Program. Cyber security management system – goals, technology categories –perimeter defense and encryption.

# UNIT V WEB APPLICATION ATTACKS

Malicious Attacks, Threats, and Vulnerabilities- Malware –malicious software attack – social engineering attack – wireless network attack – web application attack –Countermeasures. Creating Mechanisms for IT Security.

# **TEXT BOOKS:**

- 1. Imran Bashir "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained" Packt Publishing, Second Edition 2018.
- 2. Arshdeep Bahga, Vijay Madisetti "Blockchain Applications: A Hands-On Approach" VPT Publications, First Edition 2017.
- 3. David Kim and Michael G. Solomon "Fundamentals of Information Systems Security" Jones &Bartl Learning, Third Edition 2018.
- 4. Peter Trim and Yang –Im Lee "Cyber Security Management- A Governance, Risk and Compliance Framework" Gower Publishing, First Edition 2014.

# **REFERENCE BOOKS:**

- 1. Andreas Antonopoulos, Satoshi Nakamoto "Mastering Bitcoin", O'Reilly Publishing, Second Edition 2017.
- 2. Alex Leverington "Ethereum Programming", Packt Publishing, First Edition 2017.
- 3. John G. Voeller "Cyber Security" John Wiley & Sons, First Edition 2014.

# WEB SITES:

- 1. www.nptel.ac.in/courses/106/104/106104220/
- 2. www.icaew.com/technical/technology/blockchain/blockchain-articles/whatisblockchain/history
- 3. www.ibm.com/topics/blockchain-security
- 4. https://blockgeeks.com/guides/ethereum/
- 5. <u>https://world101.cfr.org/global-era-issues/cyberspace-and-cybersecurity/what-are-cyberspaceand-cybersecurity</u>

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CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	-	-	-	-	-	2	2	2
CO2	3	2	2	2	2	2	-	-	-	-	-	2	2	2
CO3	3	2	2	2	2	2	-	-	-	-	-	2	2	2
CO4	3	2	2	2	2	2	-	-	-	-	-	2	2	2
CO5	3	2	2	2	2	2	-	-	-	-	-	2	2	2
Average	3	2	2	2	2	2	-	-	-	-	-	2	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### **INTERNET OF THINGS**

**3H-3C** 

Instruction Hours/week: L:3 T:0 P:0

#### Marks: Internal:40 External:60 Total:100 **End Semester Exam:3 Hours**

# **COURSE OBJECTIVES:**

**23BECSOE01** 

The goal of this course is for the students:

- To understand the basics of Internet of Things.
- To identify an idea of some of the application areas where Internet of Things can be applied.
- To infer the middleware for Internet of Things.
- To express the concepts of Web of Things .
- To examine the concepts of Cloud of Things with emphasis on Mobile cloud computing.

# **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Explain about IoT architecture and its applications.
- Identify the feasibility and potential impact of IoT solutions in different industries.
- Apply a systematic and structured approach to designing IoT solutions.
- Summarize techniques to secure the elements of an IoT device.
- Illustrate security protocols in various domains of industrial applications.

# **UNIT I INTRODUCTION TO IoT**

Introduction to IoT - IoT Architectures - Core IoT Functional Stack, Sensors and Actuators Layer, Communications Network Layer, Applications and Analytics Layer - IoT Data Management and Compute Stack, Fog Computing, Edge Computing, Cloud Computing -Sensors, Actuators, Smart Objects, Sensor networks. Middleware for IoT: Overview -Communication middleware for IoT –IoT Information Security, WSN and Sensing Model.

# UNIT II IoT COMMUNICATION

Communications Criteria - Access Technologies - IP as IoT Network Layer - Business case -Optimization - Profiles and compliances - Application Protocols - Transport Layer -Application Transport Methods.

# **UNIT III DESIGN METHODOLOGY**

Design Methodology - Case study - Basic blocks of IoT device - Raspberry Pi - Board, Interfaces, Linux, Setting up, Programming – Arduino – Other IoT Devices.

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# UNIT IV DATA ANALYTICS FOR IoT

Data Analytics for IoT – Big Data Analytics Tools and Technology – Edge Streaming Analytics – Network Analytics Applications. Security history, challenges, variations – Risk Analysis Structures – Application in Operational Environment.

# UNIT V IoT IN INDUSTRY

Manufacturing, Architecture, Security Protocols – Utilities, Grid Blocks - Smart Cities, Architecture, use cases – Transportation, Architecture, Use cases.

# **TEXT BOOKS:**

- 1. Honbo Zhou "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2013.
- 2. Dieter Uckelmann, Mark Harrison, Florian Michahelles, "Architecting the Internet of Things", Springer Berlin, 2011.
- 3. David Easley, Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.

# **REFERENCE BOOKS:**

- 1. Olivier Hersent, Omar Elloumi and David Boswarthick, "The Internet of Things: Applications to the Smart Grid and Building Automation", Wiley, 2018.
- 2. Olivier Hersent, David Boswarthick, Omar Elloumi,"The Internet of Things Key applications and Protocols", Wiley, 2019.

# **WEBLINKS:**

- 1. <u>https://www.javatpoint.com/iot-internet-of-things</u>
- 2. https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/
- 3. https://www.tutorialspoint.com/internet\_of\_things/index.htm
- 4. https://www.startertutorials.com/blog/physical-design-of-iot.html
- 5. <u>https://www.guru99.com/iot-tutorial.html</u>

# CO, PO, PSO Mapping:

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	<b>PO12</b>	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	2	-	2	2	2	2
CO2	3	3	2	2	2	-	-	-	2	-	2	2	2	2
CO3	3	3	2	2	2	-	-	-	2	-	2	2	2	2
CO4	3	2	2	2	-	-	-	-	2	-	2	2	2	2
CO5	3	2	2	2	2	-	-	-	2	-	2	2	2	2
Average	3	2	2	2	2	-	-	-	2	-	2	2	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**End Semester Exam:3 Hours** 

# 23BECSOE02 MACHINE LEARNING 3H-3C

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

#### **COURSE OBJECTIVES**

The goal of this course is for the students:

- To introduce the basic concepts and techniques of Machine Learning.
- To understand Supervised and Unsupervised learning techniques.
- To study the various probability-based learning techniques.
- To learn Dimensionality Reduction Techniques.
- To infer Evolutionary Models and Graphical models of machine learning algorithms.

# **COURSE OUTCOMES**

Upon completion of this course, the students will be able to:

- Discuss basics of machine learning concepts and its types.
- Classify machine learning techniques to solve any given problem.
- Illustrate Open-source Machine Learning libraries and its uses.
- Outline Similarity based learning for Predictive Data Analytics.
- Explain about online fraud detection and analysis.

# **UNIT I: MACHINE LEARNING BASICS**

Introduction to Machine Learning (ML) - Essential concepts of ML – Types of learning – Machine learning methods based on Time – Dimensionality – Linearity and Non linearity – Early trends in Machine learning – Data Understanding Representation and visualization.

# **UNIT II: MACHINE LEARNING METHODS**

Linear methods – Regression -Classification –Perceptron and Neural networks – Decision trees – Support vector machines – Probabilistic models —Unsupervised learning – Featurization

# UNIT III: MACHINE LEARNING IN PRACTICE

Ranking – Recommendation System - Designing and Tuning model pipelines- Performance measurement – Azure Machine Learning – Open-source Machine Learning libraries – Amazon's Machine Learning Tool Kit: Sagemaker

# UNIT IV: MACHINE LEARNING AND DATA ANALYTICS

Machine Learning for Predictive Data Analytics – Data to Insights to Decisions – Data Exploration – Information based Learning – Similarity based learning – Probability based

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learning – Error based learning – Evaluation – The art of Machine learning to Predictive Data Analytics.

# UNIT V: APPLICATIONS OF MACHINE LEARNING

Image Recognition – Speech Recognition – Email spam and Malware Filtering – Online fraud detection – Medical Diagnosis.

# **TEXT BOOKS:**

- 1. Ameet V Joshi, Machine Learning and Artificial Intelligence, Springer Publications, 2020
- 2. John D. Kelleher, Brain Mac Namee, Aoife D' Arcy, Fundamentals of Machine learning for Predictive Data Analytics, Algorithms, Worked Examples and case studies, MIT press,2015

# **REFERENCES:**

- 1. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer Publications, 2011
- 2. Stuart Jonathan Russell, Peter Norvig, John Canny, Artificial Intelligence: A Modern Approach, Prentice Hall, 2020 3. Machine Learning Dummies, John Paul Muller, Luca Massaron, Wiley Publications, 2021.

# **WEBLINKS:**

- 1. <u>https://www.tutorialspoint.com/machine\_learning/index.htm</u>
- 2. https://www.hackerearth.com/practice/machine-learning/challenges-winning-approach/ machine - learning-challenge-one/tutorial/
- 3. <u>https://www.javatpoint.com/machine-learning</u>
- 4. <u>https://www.geeksforgeeks.org/machine-learning/</u>

00,10	100	Trup	Pmb											
COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	2	-	-	-	-	-	2	2	2
CO2	3	3	3	2	-	2	-	-	-	-	-	2	2	2
CO3	3	3	2	2	-	2	-	-	-	-	-	2	2	2
CO4	3	2	2	2	-	2	-	-	-	-	-	2	2	2
CO5	3	2	1	2	-	2	-	-	-	-	-	2	2	2
Average	3	3	2	2	-	2	-	-	-	-	-	2	2	2

# CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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# 23BECSOE03BLOCKCHAIN TECHNOLOGIES3H-3C

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

# **COURSE OBJECTIVES:**

The goal of this course is for the students:

- To comprehend the importance of the Blockchain framework and its practical uses.
- To scrutinize the verification of Bitcoin transactions through the utilization of the Blockchain.
- To recognize the constituent elements of smart contracts required for achieving consensus in a Permissioned Blockchain.
- To furnish the essential infrastructure and boost the effectiveness, efficacy, and transactions of diverse business procedures by utilizing Hyperledger.
- To examine the scope of utilization of Blockchain in diverse governmental and nongovernmental entities.

# **COURSE OUTCOMES:**

Upon completion of this course the students will be able to:

- Explain block chain architecture and its applications.
- Describe the proof of work consensus algorithm used in Bitcoin and its significance in securing the network.
- Discuss consensus algorithms used in permissioned blockchains, including Raft, Byzantine fault tolerance, and Paxos.
- Infer the transaction flow in Hyperledger Fabric and validation processes.
- Illustrate security aspects and its solutions in block chain technology.

# UNIT I INTRODUCTION

Introduction – Block Structure – Architecture – Block Header – Genesis Block – Merkle Trees – Hashing - Signature & Encryption Schemes – Business Applications

# **UNIT II BITCOIN BASICS**

Bitcoin Basics – Wallet - Decentralized Consensus – Aggregate transactions - Proof of Work – Miners – Consensus Algorithms – Double Spending - Verifying Transactions – Fork – Reward

# UNIT III PERMISSIONED BLOCK CHAIN

Permissioned Block Chain – Smart Contracts - Consensus – Raft – Byzantine – Paxos – Degree of Decentralization – Asset Transfer - Enterprise Application

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# **UNIT IV FABRIC ARCHITECTURE**

Fabric Architecture – Transaction Flow – Channel – Ordering Service –Membership & Identity Management – Network Setup – Hyperledger Composer – Roles – Network Administration

# UNIT V BLOCKCHAIN USE CASES & SECURITY

Financial Services – Supply Chain – Government – Digital Identities – Land Record Registry – Security Overview – Membership & Access Control – Privacy

# **TEXT BOOKS:**

- 1. Andreas M. Antonopoulos, "Mastering Bitcoin", 2nd Edition, O'Reilly Media, 2017
- 2. Melanie Swan, "Blockchain: Blueprint for a New Economy", 1st Edition, O'Reilly Media, 2017.

# **REFERENCE BOOKS:**

- 1. Nitin Gaur, Luc Desrosiers, Et al, "Hands-On Blockchain with Hyperledger", Packt Publisher, June 2018
- 2. Imran Bashir, "Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks", Packt Publisher, March 2017.

# WEBLINKS:

- 1. https://nptel.ac.in/courses/106105184
- 2. https://www.hyperledger.org/projects/fabric
- 3. https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html
- 4. https://www.javatpoint.com/blockchain-tutorial

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	2	-	-	-	-	-	2	2	2
CO2	3	2	2	-	-	2	-	-	-	-	-	2	2	2
CO3	3	2	2	-	-	2	-	-	-	-	-	2	2	2
CO4	3	3	2	-	-	2	-	-	-	-	-	2	2	2
CO5	3	3	3	-	2	2	-	-	-	-	-	2	2	2
Average	3	2	2	-	2	2	-	-	-	-	-	2	2	2

# CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### **CLOUD COMPUTING**

**3H-3C** 

### Instruction Hours/week: L:3 T:0 P:0

# Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

# **COURSE OBJECTIVES:**

**23BECSOE04** 

The goal of this course is for the students to:

- To learn the basic concepts of cloud computing.
- To learn types of cloud services and its applications.
- To understand the key components of Amazon Web Services.
- To collaborate with real time cloud services.
- To understand the security risk and application of cloud computing.

# **COURSE OUTCOMES:**

Upon completion of this course, the students will be able to:

- Illustrate the basic concepts of cloud computing and its usage.
- Compare different types of cloud computing services.
- Outline the ways of collaborating cloud with web-based communication tools.
- Summarize the concept of virtualization and load balancing.
- Demonstrate proficiency in using Google Web Services for cloud management.

# UNIT I CLOUD INTRODUCTION

Cloud Computing Fundamentals: Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing, usage scenarios and Applications, Business models around Cloud – Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus – Open Nebula, Cloud Sim.

# UNIT II CLOUD SERVICES AND FILE SYSTEM

Types of Cloud services: Software as a Service - Platform as a Service – Infrastructure as a Service - Database as a Service - Monitoring as a Service – Communication as services. Service providers - Google App Engine, Amazon EC2, Microsoft Azure, Sales force. Introduction to MapReduce, GFS, HDFS, Hadoop Framework.

# UNIT III COLLABORATING WITH CLOUD

Collaborating on Calendars, Schedules and Task Management – Collaborating on Event Management, Contact Management, Project Management – Collaborating on Word Processing, Databases – Storing and Sharing Files- Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Collaborating via Social Networks – Collaborating via Blogs and Wikis.

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### UNIT IV ABSTRACTION AND VIRTUALIZATION

Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hyper visors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context.

### UNIT V MANAGING AND SECURING CLOUD

Managing & Securing the Cloud: Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards, Securing the Cloud, Securing Data, Establishing Identity and Presence. Case-Studies: Using Google Web Services, Using Amazon Web Services, Using Microsoft Cloud Services

# **TOTAL: 45**

# **TEXT BOOKS:**

- 1. John Ritting house & James Ransome, "Cloud Computing Implementation Management and Strategy", CRC Press, 2018.
- 2. Rao M.N., Cloud Computing, PHI Learning Private Limited, 2018.

#### **REFERENCES:**

- 1. Bloor R., Kanfman M., Halper F. Judith Hurwitz "Cloud Computing for Dummies" (Wiley India Edition), 2015.
- 2. Antohy T Velte, Cloud Computing : "A Practical Approach", McGraw Hill, 2018.

# WEBLINKS:

- 1. https://nptel.ac.in/courses/106105167/
- 2. https://www.javatpoint.com/cloud-computing

#### CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	-	-	-	-	-	2	2	2
CO2	3	3	2	2	2	2	-	-	-	-	-	2	2	2
CO3	3	3	2	2	2	2	-	-	-	-	-	2	2	2
CO4	3	2	2	2	2	2	-	-	-	-	-	2	2	2
CO5	3	2	2	2	2	2	-	-	-	-	-	2	2	2
Average	3	2	2	2	2	2	-	-	-	-	-	2	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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# 23BEECOE01REAL TIME EMBEDDED SYSTEMS3H-3C

Instruction Hours/week: L:3 T:0 P:0

#### Marks: Internal:40 External:60 Total:100

#### **End Semester Exam:3 Hours**

#### **COURSE OBJECTIVES:**

The goal of this course for students is:

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management.
- To learn about semaphore management and message passing.
- To study about memory management.

# **COURSE OUTCOMES**

At the end of the course the students will be able to

- Explain the hardware and software architecture of embedded systems.
- Outline the operating system for embedded applications.
- Analyse the tasks performed by embedded system.
- Examine the activities of multiple processes in an embedded system.
- Interpret the memory management system.

# UNIT I INTRODUCTION TO EMBEDDED SYSTEM

Introduction- Embedded systems description, definition, design considerations & requirements-Overview of Embedded System Architecture (CISC and RISC)-Categories of Embedded Systems- embedded processor selection & tradeoffs- Embedded design life cycle -Product specifications- hardware / software partitioning- iterations and implementation- hardware software integration – product testing techniques–ARM7.

# UNIT II OPERATING SYSTEM OVERVIEW

Introduction–Advantage and Disadvantage of Using RTOS–Multitasking–Tasks-Real Time Kernels – Scheduler- Non-Preemptive Kernels – Preemptive Kernels – Reentrancy- Reentrant Functions– Round Robin Scheduling- Task Priorities- Static Priorities– Mutual Exclusion– Deadlock– Inter task Communication–Message Mailboxes–Message Queues- Interrupts- Task Management–Memory Management-Time Management–Clock Ticks.

# UNIT III TASK MANAGEMENT

Introduction-µ C/OS-II Features-Goals ofµ C/OS-II-Hardware and Software Architecture-

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Kernel Structures: Tasks–Task States–Task Scheduling–Idle Task–Statistics Task–Interrupts Under µ C/OS-II–Clock Tick-µ C/OS- II Initialization. Task Management: Creating Tasks– Task Stacks–Stack Checking–Task's Priority–Suspending Task, Resuming Task. Time Management: Delaying a Task–Resuming a Delayed Task–System Time. Event Control Blocks-Placing a Task in the ECB Wait List–Removing a Task from an ECB wait List.

#### UNIT IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING

Semaphore Management: Semaphore Management Overview– Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox –Deleting Mailbox–Waiting for a Message box– Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue– Deleting a Message Queue–Waiting for a Message Queue–Sending Message to a Queue– Flushing a Queue.

# UNIT V MEMORY MANAGEMENT

Memory Management: Memory Control Blocks–Creating Partition-Obtaining a Memory Block– Returning a Memory Block. Getting Started withµ C/OS-II–Installingµ C/OS-II–Portingµ C/OS-II: Development Tools–Directories and Files– Testing a Port -IAR Workbench withµ C/OS-II-µ C/OS- II Porting on a 8051CPU– Implementation of Multitasking- Implementation of Scheduling and Rescheduling –Analyze the Multichannel ADC with help ofµ C/OS-II.

# **TEXT BOOKS:**

- 1. JeanJ. Labrosse, Micro C/OS-II The Real Time Kernel, CMPBOOKS, 2009.
- 2. David Seal, ARM Architecture, Reference Manual, Addison-Wesley, 2008.
- 3. Steve Furbe, ARM System-on-Chip, Architecture, Addison-Wesley Professional, California, 2000.
- 4. K.C. Wang, Embedded and Real-Time Operating Systems, Springer, 2017.
- 5. J<u>anez Puhan</u>, Operating systems, Embedded systems and Real-time systems, CIP Cataloging In Publication, 2015.

#### Web links

- 1. https://nptel.ac.in/courses/10810505.
- 2. https://onlinecourses.nptel.ac.in/noc21\_cs98/preview.
- 3. https://nptel.ac.in/courses/108102045.
- 4. https://archive.nptel.ac.in/courses/106/105/106105193/

#### TOTAL: 45

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# CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	-	-	3	2
CO2	3	3	3	2	2	-	-	-	-	-	-	-	3	2
CO3	3	3	2	2	2	-	-	-	-	-	-	-	2	1
CO4	3	3	2	2	2	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	-	3	3
Average	3	3	3	2	2	-	-	-	-	-	-	-	3	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### **23BEECOE02 CONSUMER ELECTRONICS 3H-3C**

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

# **COURSE OBJECTIVES:**

The goal of this course for students is:

- To study about various speakers and microphone.
- To learn the fundamental of television systems and standards.
- To learn the process of audio recording and reproduction.
- To study various telephone networks.
- To discuss about the working of home appliances.

#### **COURSE OUTCOMES:**

At the end of the course the students will be able to

- Explain working of loud speakers and Microphones
- Interpret the fundamentals of Television systems.
- Relate the audio signal and reproduce it.
- Classify telecommunication networks.
- Examine the working of home appliances.

# UNIT I LOUDSPEAKERS AND MICROPHONES

Introduction Loudspeaker, types of loud speakers, Loudspeaker characteristics, Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Introduction Microphone, Types of Microphones, Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

# UNIT II TELEVISION STANDARDS AND SYSTEMS

Introduction to TV system - Components of a TV system-Scanning - types of scanninginterlacing-Color TV Fundamentals - Additive Mixing- Subtractive Mixing- Need for Synchronization- Aspect Ratio- Video Bandwidth - Positive and Negative Transmission-Advantages of Negative Transmission- composite video signal - Color TV system- Luminance and Chrominance signal- Monochrome and Color Picture Tubes- Color TV systems- NTSC, PAL, SECAM.

# UNIT III OPTICAL RECORDING AND REPRODUCTION

Introduction to Audio disc - Audio Disc-Processing of the Audio signal-Readout from the Disc -Reconstruction of the audio signal-Introduction to Video Disc recording -video disc mastering and replication - Video disc formats- Recording Systems-Playback Systems.

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**End Semester Exam:3 Hours** 

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# UNIT IV TELECOMMUNICATION SYSTEMS

Introduction to telecommunication Systems – Modes of telecommunication system-line system characteristics – Radio system characteristics –Signaling- Station Interconnection - Telephone services-telephone networks–switching system principles–PAPX or PBX switching–Data Services - Circuit, Packet and Message Switching, Telephone Networks - LAN, MAN and WAN, Integrated Services Digital Network. Introduction to Mobile radio systems- Wireless Local Loop – the role of WLL – types of WLL - VHF/UHF radio systems- Limited range Cordless Phones –Introduction to cellular communication - cellular modems.

# **UNIT V HOME APPLIANCES**

Introduction to home appliances – types of home appliances- Microwaves - Basic principle and block diagram of microwave oven -Washing Machine- electronic controller for washing machines - washing machine hardware and software –Introduction to air conditioners and refrigerators - Components of air conditioning systems – types of air conditioning systems-Refrigeration –Refrigeration systems – types of Refrigeration systems.

# **TEXT BOOKS:**

- 1. S.P. Bali Consumer Electronics Pearson Education 2007
- 2. J.S.Chitode Consumer Electronics Technical Publications 2007
- 3. Philip Hoff, Philip Herbert Hoff Consumer Electronics for Engineers Cambridge University Press 1998
- 4. R.G.Gupta Audio & Video Systems Tata Mc Graw hill Publishing Company Ltd 2004.

# WEB LINKS

- 1. https://nptel.ac.in/courses/117105133
- 2. https://archive.nptel.ac.in/courses/117/104/117104127/
- 3. https://nptel.ac.in/courses/117102059
- 4. https://nptel.ac.in/courses/108101091

# CO, PO, PSO Mapping

COs	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	-	-	-	-	-	-	-	1	1
CO2	3	3	3	2	2	-	-	-	-	-	-	-	1	1
CO3	3	3	2	2	2	-	-	-	-	-	-	-	2	2
CO4	3	3	3	3	2	-	-	-	-	-	-	-	3	2
CO5	3	3	3	3	2	-	-	-	-	-	-	-	2	2
Average	3	3	3	3	2	-	-	-	-	-	-	-	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### 23BTFTOE01PROCESSING OF FOOD MATERIALS3H-3C

#### Instruction Hours/week: L:3 T:0 P:0

# Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES**

The goal of this course is for students to,

- To explain the milling, extraction and manufacture of tremendous products from cereals, pulses and oil seeds.
- To summarize the production and processing methods of fruits and vegetables.
- To discuss the chemical composition, processing, production, spoilage and qualityof milk and milk products.
- To outline the overall processes involved in the production of meat, poultry and fish products.
- To review the production and processing methods of plantation and spice products.

# **COURSE OUTCOMES**

Upon completion of this course, students will be able to,

- Discuss the basics of food processing.
- Demonstrate the various processing technologies involved in fruits and vegetables, dairy, cereals, meat, fish, egg and plantation products.
- Infer the basics on microbiology of food products.
- Describe the process of manufacture of various food products.
- Outline the various methods of food preservation.

# UNIT I CEREAL, PULSES AND OIL SEEDS TECHNOLOGY

Rice milling, Pulse milling, Wheat milling – Recent trends in milling process- Oil extraction – different methods in oil extraction - Methods of manufacture of Bread - different processes of manufacture - types of breads - buns, biscuits, cakes and cookies -Pasta products - Tortilla - Method of manufacture.

# UNIT II FRUITS AND VEGETABLE PROCESSING

Production of Fruits and vegetables in India, Maturity standards, Cause for heavy losses, preservation treatments - Basics of Canning, Minimal processing and Hurdle technology as applied to Vegetable and Fruit processing, Processing of fruit juices, Dehydration, Aseptic processing- Indian Food Regulation and Quality assurance Fruit Juice / pulp/ Nectar/Drinks, concentrates.

# UNIT III DAIRY PROCESSING

Basic dairy terminology, composition, General tests at reception, Dairy Processing - Method of

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manufacture of Standardized, toned and double toned milk, milk powder - Equipment's - Pasteurizers, homogenizers and pumps - Method of manufacture of dairy products - Ice-cream, Cheese, Paneer, Yoghurt - Pasteurization and microorganisms involved in spoilage of milk – Major pathogens, Plant construction, Sanitation management, Cleaning equipment.

### UNIT IV MEAT, POULTRY AND FISH PROCESSING

Meat composition from different sources, Definitions and measurements, CarcassProcessing, Meat Products, Processing of Poultry Products, Common pathogens, Sanitation management, Sanitizers for meat & poultry plants, Fish and other Marine Products Processing, Sources of sea food contamination.

# UNIT V PLANTATION PRODUCT TECHNOLOGY

Processing of Tea, Coffee and Cocoa - Outline of the methods of manufacture of - greentea, black tea, instant tea, Instant coffee, Cocoa and Chocolate. Outline of the methods of processing of Pepper, cardamom, ginger, vanilla and turmeric. By products fromplantation crops and spices.

#### **TEXT BOOKS:**

- 1. Srivastava R.P. and Kumar S. Fruit and Vegetable Preservation: Principles and Practices. International Book Distributing Co. Lucknow. 3<sup>rd</sup> Edition. 2010.
- 2. Chakraverty A., Mujumdar A.S., Raghavan G.S.V and Ramaswamy H.S. Handbook of Post- harvest Technology: Marcel Dekker Press. USA. 1<sup>st</sup> Edition. 2003.
- 3. Sukumar De. Outlines of Dairy Technology. Oxford University Press. New Delhi.23rd impression. 2016.
- 4. James G. Brennan. 2006. Food Processing Handbook. Wiley-VCH Verlag GmbH& Co. KGaA, Weinheim, Germany

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	3	2	1	-	2	2	2	-	-	-	2
CO2	1	2	1	3	2	1	-	2	2	2	-	-	-	2
CO3	1	2	1	3	2	1	-	2	-	-	-	-	-	2
CO4	1	2	1	3	2	1	-	2	-	-	2	-	-	2
CO5	1	2	1	3	2	1	-	2	-	2	-	-	-	2
Average	1	2	1	3	2	1	-	2	1	1	1	-	-	2

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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# Marks: Internal:40 External:60 Total:100 **End Semester Exam:3 Hours**

### **COURSE OBJECTIVES:**

The goal of this course is for students,

Instruction Hours/week: L:3 T:0 P:0

- To explain the basic concepts of food and nutrition.
- To define the overall classification, function, and source of carbohydrates, lipidsand • proteins.
- To summarize the availability, source, deficiency and physiological role of fat and water-soluble vitamins.
- To outline the role of health and nutritional importance of micro and macro minerals.
- To discuss the recent trends and developments in nutrition.

# **COURSE OUTCOMES:**

Upon successful completion of this, students will be able to

- Explain the basics in the area of nutritional assessment in health and disease. •
- Outline the biological functions of various macromolecules in terms of food andhealth. •
- Discuss the balanced diet for healthy life to avoid or prevent the deficiency disorders. •
- Infer an appropriate diet, products that prevent vitamin deficiency disorders. •
- Identify the proper foods rich in minerals to live a healthy life. •

# UNIT I HUMAN NUTRITION

Six classes of nutrients - Historical perspective of nutrient requirements - Assessment of nutritional status - recommended dietary allowances of macronutrients for all age groups -Assessment of protein quality - Malnutrition and related disorders -Balanced Diet. Factors influencing dietary intake: Food habits, food fads and fallacies, their influence on health and wellbeing.

# **UNIT II BIOMOLECULES**

Carbohydrates- Definition, classification, Functions, Sources of Carbohydrates, Deficiency. Lipids - Definition, classification, function, sources, Properties of fats andoils, Refined & Hydrogenated fats process. Proteins - Definitions, Classification, Function, Amino Acids, Sources of Proteins, Texturized proteins.

# **UNIT III VITAMINS**

Physiological role, bio-availability, requirements, sources and deficiency of Fat Soluble

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Vitamins: Vitamin A, Vitamin D, E & K. *f* Water soluble vitamins: Vitamin C, Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, Folic acid, Vitamin B12, VitaminB6. Stability under different food processing conditions.

# UNIT IV MINERALS AND WATER

Physiological role, bio-availability, requirements, sources and deficiency of Macro minerals: Calcium, Phosphorus Magnesium, Sodium, Potassium chloride. Micro minerals: Iron, Zinc, copper, selenium, chromium, iodine, manganese, Molybdenum and fluoride - Chemistry and physical properties of free, bounded and entrapped water, water activity, quality parameters of drinking and mineral water.

# UNIT V RECENT TRENDS IN NUTRITION

Principles of dietary management in gout, rheumatism, AIDS/HIV - Cancer-risk factors, symptoms, dietary management, role of food in prevention of Cancer. Role of functionalfoods Health foods and novel foods, organically grown foods, personalized nutrition, recent concepts in human nutrition like nutrigenomics, nutraceuticals etc.

# **TEXT BOOKS: :**

- 1. Sunetra Roday. Food Science and Nutrition. Oxford Higher Education/OxfordUniversity Press. 3<sup>rd</sup> edition 2018. (ISBN-13: 9780199489084).
- Charis Galanakis. Nutraceutical and Functional Food Components. AcademicPress, 1<sup>st</sup> Edition, 2017. (ISBN: 9780128052570).
- Ashley Martin. Nutrition and Dietetics. Syrawood Publishing House. 1<sup>st</sup> Edition, 2016. (ISBN:9781682860588).
- 4. Robert E. C. Wildman. Handbook of Nutraceuticals and Functional Foods. CRCPress, 2<sup>nd</sup> Edition, 2016. (ISBN-10: 9781498770637).
- Srilakshmi. B. Nutrition Science. New Age International Pvt. Ltd, Publishers. 6<sup>th</sup>Edition. 2017. (ISBN-13: 9789386418883).

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	3	-	-	-	2	2	2	-	-	-	-
CO2	1	2	1	3	-	-	-	2	2	2	-	-	-	-
CO3	1	2	1	3	-	-	-	2	-	-	-	-	-	-
CO4	1	2	1	3	-	-	-	2	-	-	2	-	-	-
CO5	1	2	1	3	-	-	-	2	-	2	-	-	-	-
Average	1	2	1	3	-	-	-	2	1	1	1	-	-	-

# CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**23BTFTOE03** 

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **READY TO EAT FOODS**

#### **3H-3C**

#### Instruction Hours/week: L:3 T:0 P:0

# **COURSE OBJECTIVES:**

The goal of this course is for students to,

- To outline the current status of snack food Industry.
- To describe the production, processing and marketing trends of potato and tortilla chips.
- To outline the overall processing of popcorn.
- To explain the production and processing of fruits involved in snack food preparation.
- To summarize the sensory analysis methods and packaging techniques of snack foods.

# **COURSE OUTCOMES:**

Upon completion of this course, students will be able to,

- Outline the various manufacturing process in snack food industries.
- Summarize the current production and marketing status of Snack foods.
- Explain the advantages of Sensory Evaluation.
- Describe packaging technologies in Snack Food Industries.
- Demonstrate the equipment's involved in the snack production processes.

# **UNIT I INTRODUCTION TO SNACK FOODS**

Introduction- Types – processing methods - Nutrition- Quality and standards for snack foods - GHP and GMP for snack food industries - Outline of snack food industry - Domestic Snack Food Market-Global Market.

# UNIT II POTATO AND TORTILLA CHIPS PROCESSING

Potato Production- selection and grading of potato - Potato snack Ingredients- Potato Analysis and Composition-Potato chip manufacturing process-Unit Operations-Other value added products from Potato. Tortilla chips - Raw Materials- Processing steps- Equipment involved-Reconstitution of Dry Maize Flour-Unit operations - Nutritional properties of potato and tortilla chips.

#### UNIT III POPCORN PROCESSING

Introduction- Raw popcorn selection and preparation-Popping Methods-Home preparation of Popcorn-Equipments-Industrial manufacturing process- Flavorings and Applicators-Popcorn Packaging- Relative Nutrition- Marketing.

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#### UNIT IV FRUIT BASED SNACKS

Introduction-production and processing of fruit crops – fruit purees – fruit powders – canned fruit snacks – alcoholic preservation of fruit snacks – fruit candies – fruit bars –exotic fruits – Nutritions and health benefits of fruit snacks.

# UNIT V SENSORY EVALUATION AND PACKAGING

Introduction- importance of sensory evaluation – Analytical methods -Sensory methods-Sensory Aspect of Processing- Limitations of sensory evaluation- Quality properties of Snack Foods and Packaging Materials-Automated Bag- Pouch Packaging- Cartoning Case Packing-Labelling requirements - Current Issues in Snack Foods Packaging.

# **TEXT BOOKS:**

- 1. Lusas, E. W and Rooney, L. W. Snack Foods Processing. CRC Press,1st Edition2001.
- 2. Panda, H. The Complete Technology Book on Snack Foods, National Institute ofIndustrial Research, Delhi. 2<sup>nd</sup> Edition 2013.
- 3. Sergio O Serna-Saldivar, Industrial Manufacture of Snack Foods, KennedysBooksLtd. 2008.
- 4. Lusas, E. W and Rooney, L. W. Snack Foods Processing. CRC Press,1st Edition2001.
- 5. Panda, H. The Complete Technology Book on Snack Foods, National Institute ofIndustrial Research, Delhi. 2<sup>nd</sup> Edition 2013.
- 6. Sergio O Serna-Saldivar, Industrial Manufacture of Snack Foods, KennedysBooksLtd. 2008.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	3	-	-	-	2	2	2	-	1	-	-
CO2	1	2	1	3	-	-	-	2	2	2	-	1	-	-
CO3	1	2	1	3	-	-	-	2	-	-	-	1	-	-
CO4	1	2	1	3	-	-	-	2	-	-	2	1	-	-
CO5	1	2	1	3	-	-	-	2	-	2	-	1	-	-
Average	1	2	1	3	-	-	-	2	1	1	1	1	-	-

# CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### 23BTFTOE04 AGRICULTRAL WASTE AND BYPRODUCTS UTILIZATION 3H-3C

#### Instruction Hours/week: L:3 T:0 P:0

# Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for students,

- To categorize the types of agricultural wastes.
- To outline the production and utilization of biomass.
- To explain the various parameters considered to be important in the designing ofbiogas units.
- To discuss the methods employed in the production of alcohol from agriculturalwastes / byproducts.
- To summarize the overall aspects involved in the production of paperboards and particleboards from agricultural wastes.

# **COURSE OUTCOMES:**

Upon successful completion of this, students will be able to,

- Outline the types of agricultural wastes.
- Illustrate the collection and generation of value-added products from agricultural wastes
- Demonstrate the techniques involved in the production and utilization of biomass.
- Discuss the various parameters considered to be important in the designing of biogas units.
- Illustrate the various methods employed in the production of alcohol from the byproducts of agricultural wastes.

# UNIT I TYPES OF AGRICULTURAL WASTES

Introduction and Background Agricultural Waste, Crop Waste, Agricultural Residues (annual crops), Technical terms, properties of agricultural waste- storage and handling- rice by-products utilization-rice bran and germ, rice bran oil, economic products from agriculture waste/by-products.

#### UNIT II BIOMASS PRODUCTION AND UTILIZATION

Biomass – types – production and utilization Technology used for the utilization of agricultural wastes: Biomass Gasifier, Nimbkar Agricultural Research Institute (NARI)Gasifier, Rice-Husk Based Gasifier, Heat and Steam from Sugarcane Leaf and Bagasse.

# UNIT III BIOGAS DESIGN AND PRODUCTION

Biogas: Definition, composition, history of biogas, Production of biogas - factors affecting the

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efficiency; types of biogas plant (floating drum type and fixed dome type) and their components (inlet, outlet, stirrer, slanting pipe, digester, gas holder and gas outer pipe), Selection and Design of biogas plant.

## UNIT IV PRODUCTION OF ALCOHOL FROM WASTE MATERIALS

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Production of Alcohol from waste materials: Introduction, Production methods, Cellulolysis (biological approach): Pretreatment, Cellulolytic processes (Chemical and Enzymatic hydrolysis), Microbial fermentation, Gasification process (thermochemical approach).

#### UNIT V PRODUCTION OF PAPERBOARD AND PARTICLEBOARDS FROM AGRICULTURAL WASTE 9

Biodegradable packing materials: merits and demerits, Production and testing of Paperboards and Particleboards from Agricultural Waste: Introduction, History, Terminology and classification, Raw materials, Production steps- Pulping, Classifications of pulp, Bleaching, Plies, Coating, Grades.

# **TEXT BOOKS: :**

## TOTAL: 45

- Efthymia Alexopoulou. Bioenergy and Biomass from Industrial Crops on Marginal Lands. Elsevier, 1<sup>st</sup> Edition, 2020. (ISBN: 9780128188644).
- 2. Navanietha Krishnaraj Rathinam, Rajesh Sani. Biovalorisation of Wastes to Renewable Chemicals and Biofuels. Elsevier, 1<sup>st</sup> Edition, 2019. (ISBN:9780128179529).
- 3. Simona Ciuta, Demetra Tsiamis, Marco J. Castaldi. Gasification of Waste Materials. Academic Press, 1<sup>st</sup> Edition, 2017. (ISBN: 9780128127162).
- Nicholas E. Korres, Padraig O'Kiely, John A.H. Benzie, Jonathan S. West. Bioenergy Production by Anaerobic Digestion: Using Agricultural Biomass and Organic Wastes. Routledge, 1<sup>st</sup> Edition, 2013. (ISBN-13: 9780415698405).
- Albert Howard, Yashwant Wad. The Waste Products of Agriculture. BenedictionClassics, 1<sup>st</sup> Edition, 2011. (ISBN-13: 9781849025).

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	3	-	1	3	2	2	2	-	-	1	2
CO2	1	2	1	3	-	1	3	2	2	2	-	-	1	2
CO3	1	2	1	3	-	1	3	2	-	-	-	-	1	2
CO4	1	2	1	3	-	1	3	2	-	-	2	-	1	2
CO5	1	2	1	3	-	1	3	2	-	2	-	-	1	2
Average	1	2	1	3	-	1	3	2	1	1	1	-	1	2

# CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### **23BTFTOE05 DESIGN OF FOOD PROCESS EQUIPMENT 3H-3C**

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

#### **End Semester Exam:3 Hours**

#### **OURSE OBJECTIVE:**

The goal of this course is for students to,

- To illustrate the types of materials used in the food processing equipment's.
- To discuss the materials and designing of different storage vessel.
- To explain the importance of reaction vessel and their deskinning techniques.
- To explain the materials and designing of heat exchanger and evaporators.
- To discuss the importance of dryers in food processing industries.

#### **COURSE OUTCOME:**

Upon completion of this course, students will be able to,

- Outline the materials suitable for the construction of equipment's.
- Summarize the vessels used for food storage in the industries.
- Classify types of reaction vessel used for different purposes.
- Discuss the importance of heat exchanger in the designing of food processing equipment's.
- Infer the significance of dryers in food processing.

#### **UNIT I MATERIALS**

Metals and non-metals, design of pressure vessels – cylindrical shell –internal and external pressure - under continued loadings. Materials for fabrication, mechanical properties, ductility, hardness, corrosion, protective coatings, corrosion prevention linings equipment, choice of materials, material codes Numerical problem and design of pressure vessel.

#### **UNIT II STORAGE VESSELS**

Design of storage vessels – Rectangular Tank without stiffeners – with stiffeners – shelldesign – Numerical problem and design. Design of agitators and baffles. Designconsiderations: Stresses created due to static and dynamic loads, combined stresses, design stresses and theories of failure, safety factor, temperature effects, radiation effects, effects of fabrication method, economic considerations.

#### UNIT III REACTION VESSELS

Design of Reaction vessels - materials -classification - jackets-Design of vessel shell with half

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coil – Design of vessel shell with jacket – Numerical problem and design. Hazards in process industries, analysis of hazards, safety measures, safety measures in equipment design, pressure relief devices.

#### UNIT IV HEAT EXCHANGERS

Design of Heat exchangers – types – materials – Design pressure and temperature- shelldesign – tubes - Numerical problem. -Design of Equipment. Evaporator: Materials of concentration – types – design- consideration – Design of agitators – power requirements – Design based on Torque – critical speed.

#### UNIT V DRYERS

Types - General considerations – Design of Tray dryer, Rotary Dryer, fluidized bed dryer, spray dryer, vacuum dryer, microwave dryer – Material Balance, Thermal energy Requirements, electrical energy Requirements, Performance Indices

#### **TEXT BOOKS: :**

- 1. Maroulis Z.B. and Saravacos G.D. Food Process Design, Marcel Dekker Inc.ISBN-0824743113, 2003.
- 2. Joshi M.V, "Process Equipment Design", Macmillan India Ltd., 1985.
- 3. Coulson, J.M. and Richardson, J. F, "Chemical Engineering "Butterworth-Heinemnn Elsevier, ISBN-0750644451, 2002.

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	3	-	1	-	2	2	2	-	-	2	2
CO2	1	2	1	3	-	1	-	2	2	2	-	-	2	2
CO3	1	2	1	3	-	1	-	2	-	-	-	-	2	2
CO4	1	2	1	3	-	1	-	2	-	-	2	-	2	2
CO5	1	2	1	3	-	1	-	2	-	2	-	-	2	2
Average	1	2	1	3	-	1	-	2	1	1	1	-	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

# TOTAL: 45

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#### 23BEMEOE01BATTERY MANAGEMENT SYSTEM3H-3C

#### Instruction Hours/week: L:3 T:0 P:0

# Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

# **COURSE OBJECTIVE:**

The goal of the course is:

- To learn various energy storage systems used for Hybrid Electric Vehicle (HEV) and Electric Vehicle (EV).
- To learn about design and operation of solid-state Li-ion battery.
- To gain knowledge on the high temperature application of battery.
- To learn various technology for recycling used batteries.
- To understand the battery electrical and thermal management systems using active and passive cooling system.

# **COURSE OUTCOMES**

At the end of the course the student would be able:

- To understand the performance and driving cycles of EVs.
- To apply their knowledge to manufacture various types of Li-ion batteries.
- To apply knowledge on use of Li-ion battery in large scale grid and space crafts.
- To understand Techno-economic aspects of battery recycling and environmental safety.
- To understand battery cooling system and safety precautions for high voltage battery.

# UNIT I ENERGY STORAGE SYSTEMS

General background on alternative energy sources and sustainability, Introduction to electricbased transportation, Overview of on-road vehicle electrification, EVs configuration, Energy and power requirements for various HEVs and EVs Vehicle performance and driving cycles.

# UNIT II LITHIUM BATTERIES

Li-ion batteries - Principle of operation, Battery components and design Electrode, cell and battery fabrications, Building block cells, battery modules and packs and applications. All solid-state batteries and future developments, Li-Sulphur battery, Li-Air battery, Sodium-battery, Magnesium battery, Aluminium battery, Silicon battery.

# UNIT III HIGH TEMPERATURE BATTERIES FOR BACK-UP APPLICATIONS 9

Advance Ni-MH batteries for transportation, Future prospects of Ni-MH batteries vs. lithium ion batteries, Zebra cell, Li-iron sulphide cells, Vanadium and iron-based batteries, Semi-fluid flow batteries for large scale grid application, Ni-H<sub>2</sub> cells for space applications.

# Karpagam Academy of Higher Education (Deemed to be University), Coimbatore – 641 021

#### UNIT IV FUEL CELLS AND BATTERY RECYCLING TECHNOLOGY

Introduction to fuel cells, Proton-exchange membrane and alkaline fuel cells for transportation, Solid oxide fuel cells, Technology and economic aspects of battery recycling, Environmental effect and controlling of poisonous chemicals contamination.

#### UNIT V BATTERY MANAGEMENT

Fundamentals of battery management systems and controls, Battery Thermal Management - Passive cooling, Active cooling -Liquids & air systems.

Regulations and Safety Aspects of High Voltage Batteries, Code and Standards, Safe handling of Lithium Batteries, Safety of high voltage battery.

#### **TEXT BOOKS:**

- 1. Gerardus Blokdyk, Battery Management System A Complete Guide, Springer, 2019 Edition.
- 2. Reiner Korthauer, Lithium-Ion Batteries: Basics and Applications, 1st Edition. Springer, 2018
- 3. Alfred Rufer, Energy Storage: Systems and Components, 1st Edition, CRC Press, 2017.
- 4. Arno Kwade and Jan Diekmann, Recycling of Lithium-Ion Batteries: The LithoRec Way (Sustainable Production, Life Cycle Engineering and Management), 1st Edition. Springer, 2018.

#### **WEB REFERENCES:**

1. <u>https://nptel.ac.in/courses/108/103/108103009/</u>

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	2	-	-	-	-	-	1	1
CO2	3	3	2	-	-	-	-	-	2	-	2	-	1	1
CO3	3	3	2	-	2	-	-	-	2	-	-	2	1	1
CO4	-	-	-	-	-	-	-	-	-	-	-	2	1	1
CO5	3	3	2	2	2	2	2	2	2	2	2	2	1	1
Average	2	2	1	1	1	1	1	1	1	1	1	1	1	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL: 45** 

#### **23BEMEOE02** INDUSTRIAL SAFETY AND ENVIRONMENT **3H-3C**

Instruction Hours/week: L:3 T:0 P:0

# Marks: Internal:40 External:60 Total:100 **End Semester Exam:3 Hours**

# **COURSE OBJECTIVES:**

- To recognize and evaluate occupational safety and health hazards in the workplace.
- To determine appropriate hazard controls following the hierarchy of controls.
- To analyses the effects of workplace exposures, injuries and illnesses, fatalities.
- To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
- To teach student the concept of Industrial Safety & provide useful practical knowledge for workplace safety.

# **COURSE OUTCOMES:**

At the end of the course, student will be able to

- Recognize and evaluate occupational safety and health hazards in the workplace.
- Determine appropriate hazard controls following the hierarchy of controls.
- Analyze the effects of workplace exposures, injuries and illnesses, fatalities.
- Prevent incidents using the hierarchy of controls, effective safety and health management systems and task- oriented training.
- Understand the concept of Industrial Safety & provide useful practical knowledge for workplace safety.

# **UNIT I CONCEPTS**

Evolution of modern safety concept- Safety policy - Safety Organization - line and staff functions for safety- Safety Committee- budgeting for safety.

# **UNIT II TECHNIQUES**

Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit.

# UNIT III ACCIDENT INVESTIGATION AND REPORTING

Concept of an accident, reportable and non-reportable accidents, unsafe act and condition principles of accident prevention, Supervisory role- Role of safety committee - Accident causation models - Cost of accident. Overall accident investigation process - Response to accidents, India reporting requirement, Planning document, Planningmatrix, Investigators Kit, functions of investigator, four types of evidences, Records of accidents, accident reports.

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#### UNIT IV SAFETY PERFORMANCE MONITORING

Reactive and proactive monitoring techniques - Permanent total disabilities, permanent partial disabilities, temporary total disabilities -Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety "t" score, safety activity rate – problems.

#### UNIT V SAFETY EDUCATION AND TRAINING

Importance of training-identification of training needs-training methods – programme, seminars, conferences, competitions – method of promoting safe practice - motivation – communication - role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training.

#### TOTAL: 45

## **TEXT BOOKS:**

- 1. Accident Prevention Manual for Industrial Operations, 3<sup>rd</sup> edition, N.S.C. Chicago, 2010(digital).
- 2. Heinrich H.W. "Industrial Accident Prevention", 2<sup>nd</sup>edition, Tata McGraw-Hill Company, NewYork, 1941.
- 3. Krishnan N.V, Safety Management in Industry, 1<sup>st</sup> edition, Jaico Publishing House, Bombay, 1997.
- 4. John R Ridley, Safety at Work,3<sup>rd</sup> edition, Elsevier,2014
- 5. Roland P. Blake, Industrial Safety, 2<sup>nd</sup>edition, Prentice Hall, Inc., New Jersey, 1973
- 6. L M Deshmukh, Industrial safety management, 1<sup>st</sup>edition, TATA McGraw Hill, 2005.

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COs	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	2	2	2	1	1	-	-	2	-	-
CO2	3	1	2	1	2	2	2	1	1	-	-	2	-	-
CO3	3	1	2	1	2	2	2	1	1	-	-	2	-	-
CO4	3	1	2	1	2	2	2	1	1	-	-	2	-	-
CO5	3	1	2	1	2	2	2	1	1	-	-	2	-	-
Average	3	1	2	1	2	2	2	1	1	-	-	2	-	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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# 23BEMEOE03NON-DESTRUCTIVE TESTING3H-3C

Instruction Hours/week: L:3 T:0 P:0

# Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

## **COURSE OBJECTIVE:**

- The main objectives of this course are to introduce the concept of non-destructive testing among the students and make them understand various types of non-traditional practices available for manufacturing industry.
- To provide in-depth knowledge on various techniques of non-destructive testing.
- To provide an overview of destructive and non-destructive tests and state their applications
- To study the features of NDT techniques for various products and to understand the established NDE techniques and basic familiarity of emerging NDE techniques.
- To expose students to skills needed for selection of appropriate NDT technique(s) for new inspection jobs.
- To facilitate the understanding of standard application area of NDET

# **COURSE OUTCOME:**

Student will be able to

- Understand the codes, standards and specifications related to NDT.
- Classify the destructive and non-destructive tests and state their applications.
- Develop NDT techniques for various products.
- Acquire skills needed for selection of appropriate NDT technique(s) for new inspection jobs
- Acquire sound knowledge of established NDE techniques and basic familiarity of emerging NDE techniques.
- Make use of standards application area of NDET

# UNIT I INTRODUCTION

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Properties of Engineering Materials – Types of Defects – Surface and Sub-Surface of a component – Characteristics of Ferrous, Non-ferrous and Alloys. Classification of Destructive testing and Non-Destructive testing – Uses and applications. Codes, Standards and Specifications of NDT (ASME, ASTM, AWS etc.). Importance and Scope of NDT, Non-destructive testing methods

# UNIT II PENETRANT TESTING AND MAGNETIC PARTICLE INSPECTION 9

Introduction to Penetrant Testing – Liquid Penetrants and Dye Penetrants - Apparatus required for LPT - An Illustration of Penetrant Testing, Application, Advantages and Disadvantages of

Penetrants Testing. Introduction to Magnetic Particle Inspection – MPT equipment's and devices - An Illustration of Magnetic Particle Inspection, Application, Advantages and Disadvantages of Magnetic Particle Crack Detection.

# UNIT III ULTRASONIC FLAW DETECTION AND RADIOGRAPHY INSPECTION 9

Introduction to Ultrasonic Flaw Detection, UT equipment and devices, An Illustration of Ultrasonic Flaw Detection, Application, Advantages and Disadvantages of Ultrasonic Flaw Detection.

Principle of Radiography Inspection, RT equipment and devices Radiation sources, uses of x-rays and gamma rays Attenuation in the specimen, Radiographic imaging, Inspection Techniques, Application and limitations, Safety from Radiation.

# UNIT IV EDDY CURRENT TESTING AND VISUAL TESTING METHODS

Introduction to Eddy Current Testing. ECT equipment and devices, An Illustration of Eddy Current Testing Equipment, Application, Advantages and Disadvantages of Eddy Current Testing. Introduction to visual testing method, Equipment required for VT - An Illustration of visual testing method, Application, Advantages and Disadvantages of visual testing method.

# UNIT V NON-DESTRUCTIVE INSPECTION(NDI) AND ITS APPLICATIONS 9

Inspection of Raw Products, Inspection for In-Service Damage, Power Plant Inspection, Storage Tank Inspection, Automobile component Inspection, Jet Engine Inspection, Pressure Vessel Inspection, Bridge Inspection, Pipeline Inspection.

**TOTAL: 45** 

9

# **TEXT BOOKS:**

- 1. Sadashiva.M Non Destructive Testing Paperback 15 July 2021.
- 2. Ramachandran.S and Anderson.A Non-Destructive Testing Kindle Edition 2018
- 3. J. Prasad and C. G. Krishnadas Nair Non-Destructive Test and Evaluation of Materials Hardcover 1 July 2017.
- 4. Lari and Kumar Basics of Non Destructive Testing Paperback 1 January 2013.
- 5. Ravi Prakash Non Destructive Testing Techniques Hardcover 1 January 2010.
- 6. Louis Cartz Non destructive Testing 1st Edition, ASM International, Almere, Netherland, 2007(digital).

# CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	2	2	-	-	2	-	2	2	-	-
CO2	3	2	2	1	2	2	-	-	2	-	2	2	-	-
CO3	3	2	2	1	2	2	-	-	2	-	2	2	-	-
CO4	3	2	2	1	2	2	-	-	2	-	2	2	-	-
CO5	3	2	2	1	2	2	-	-	2	-	2	2	-	-
Average	3	2	2	1	2	2	-	-	2	-	2	2	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### Instruction Hours/week: L:3 T:0 P:0

#### **COURSE OBJECTIVE:** To provide knowledge and training in finding optimal solutions under limited resources

- for the engineering and business problems. • To study and acquire knowledge on engineering and Managerial solutions in Assignment and scheduling problems.
- To give exposure to inventory in industry.
- To make the student acquire sound knowledge on sequences to perform operation among various alternatives.
- To provide an overview of various tools in various sections of industries like marketing, material handling etc.

## **COURSE OUTCOME:**

At the end of the course, student will be able to

- Understand the concepts of Linear programming technique.
- Apply LPP technique of Transportation models.
- Understand the techniques of scheduling and sequencing.
- Acquire knowledge in Inventory control and Queuing theory.
- Perform network analysis for a project.

#### UNIT I INTRODUCTION TO OPERATIONS RESEARCH

Operations research and decision-making - types of mathematical models and constructing the model - Roleof computers in operations research -Linear Programming Techniques: Formulation of linear programming problem, applications and limitations, graphical method, simplex method – The Big –M method – the two–phase method.

#### **UNIT II TRANSPORTATION PROBLEMS**

Least cost method, North west corner rule, Vogel's approximation method, modified distribution method, unbalance and degeneracy in transportation model, shortest route algorithm- dijkestra algorithm.

# UNIT III ASSIGNMENT MODELS AND SCHEDULING

Assignment models - Hungarian algorithm, unbalanced assignment problems - maximization case inassignment problems, traveling salesman problem. Scheduling - processing n jobs through two machines, processing n jobs through three machines, processing two jobs through 'm' machines, processing n jobs through m machines.

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**3H-3C** 

**End Semester Exam:3 Hours** 

Marks: Internal:40 External:60 Total:100

#### Karpagam Academy of Higher Education (Deemed to be University), Coimbatore – 641 021

#### UNIT IV INVENTORY CONTROL AND QUEUING THEORY

Variables in inventory problems, inventory models with penalty, shortage and quantity discount, safety stock, multi item deterministic model.

Queuing Models: Queues–Notation of queues, performance measures, The M/M/1 queue, TheM/M/m queue, batch arrival queuing system, queues with breakdowns.

#### UNIT V PROJECT MANAGEMENT AND REPLACEMENT MODELS

Basic terminologies, constructing a project network, network computations in CPM and PERT, cost crashing Replacement Models: Replacement of Items due to deterioration with and without time value of Money, Group replacement policy, Staff replacement

TOTAL:45

#### **TEXT BOOKS:**

1. Kanti Swarup, Operations Research, 12<sup>th</sup> edition, Sultan Chand and Sons, New Delhi, 2010.

- 2. Viswanathan N and Narahari Y, Performance Modeling of Automated Manufacturing Systems, 2<sup>nd</sup> edition, Prentice Hall of India,New Delhi, 2005
- 3. Prem kumar Gupta and Hira D.S, Operation Research, 1<sup>st</sup> edition, S Chand and Company Limited, New Delhi, 2017

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	-	-	2	-	2	2	-	-
CO2	3	3	3	2	3	3	-	-	2	-	2	2	-	-
CO3	3	2	3	3	3	3	-	-	2	-	2	2	-	-
CO4	2	2	3	3	3	2	-	-	2	-	2	2	-	-
CO5	3	3	2	2	2	2	-	-	2	-	2	2	-	-
Average	2.8	2.6	2.6	2.6	2.6	2.4	-	-	2	-	2	2	-	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### 9

#### **23BESHOE01**

Instruction Hours/week: L:3 T:0 P:0

#### **COURSE OBJECTIVES:**

On completion of the course, student will be able to

- Outline the basic concepts of communication and its types.
- Extend the knowledge with process of mass communication and their relevance.

MASS COMMUNICATION

- Explain the functions of mass communication with real time experience.
- Utilize the mass communication theories in media communication.
- Plan research proposals using international concepts in mass communication.

#### **COURSE OUTCOMES:**

On completion of the course, student will be able to

- Identify the process and types of human communication.
- Recognize the function and characteristics of mass communication.
- Describe correlation and culture of mass communication.
- Replicate the concepts of mass communication theories in real life situation.
- Explain the impact of media theory in international communication.

#### **UNIT 1: BASIC CONCEPTS OF COMMUNICATION**

Communication: Nature and process of human communication, functions of communication, verbal and non-verbal communication, intra-personal, inter-personal, small group, public and mass communication.

#### **UNIT 2: MASS COMMUNICATION**

Nature and process of mass communication, media of mass communication, characteristics and typology of audiences. Social Functions of Mass Communication, Scope of Mass Communication.

#### **UNIT 3: FUNCTIONS OF MASS COMMUNICATION**

Functions of Mass Communications – Surveillance, Correlation, Cultural transport, Marketing Mass Culture- Evaluate the impact of issues of media monopoly.

#### **UNIT 4: MEDIA THEORY**

Communication Theories: Authoritarian; Libertarian; Socialistic; social-responsibility; Normative theories; Development media theory; Democratic participation media theory.

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

**3H-3C** 

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# UNIT 5: FOLK MEDIA AND INTERNATIONAL COMMUNICATION THEORY 9

Folk media and Electronic Media; International Communication Theories: World Systems, Dependency and Structural Media Monopoly – Cross Media Ownership.

# TOTAL:45

#### **TEXT BOOKS:**

1. Mass Communication in India – By Keval J. Kumar, 1994

2. Mass Communication Theory: Foundations, Ferment and Future – By Stanley J.

Baran and Dennis K. Devis, 2015.

3. Introduction to Communication Studies – By John Fiske, 2010.

4. Mcquail's Mass Communication Theory – By Denis Mcquail, 2010.

## CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	2	3	-	2	-	-
CO2	-	-	-	-	-	-	-	1	2	3	-	2	-	-
CO3	-	-	-	-	-	-	-	1	2	3	-	2	-	-
CO4	-	-	-	-	-	-	-	1	2	3	-	2	-	-
CO5	-	-	-	-	-	-	-	1	2	3	-	2	-	-
Average	-	-	-	-	-	-	-	1	2	3	-	2	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### **3H-3C**

2023-2024

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

**FUZZY MATHEMATICS** 

# **COURSE OBJECTIVES:**

The goal of this course is for students :

- To understand basic knowledge of fuzzy sets and fuzzy logic
- To apply basic knowledge of fuzzy operations.
- To know the basic definitions of fuzzy relations
- To apply basic fuzzy inference and approximate reasoning
- To know the applications of fuzzy Technology.

# **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- To gain the main subject of fuzzy sets.
- To understand the concept of fuzziness involved in various systems and fuzzy set theory.
- To gain the methods of fuzzy logic.
- To comprehend the concepts of fuzzy relations.
- The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

# UNIT I FUZZY SETS

Fuzzy Sets: Basics Classical sets vs Fuzzy Sets – Need for fuzzy sets – Definition and Mathematical representations – Level Sets – Fuzzy functions - Zadeh's Extension Principle

# UNIT II OPERATIONS ON FUZZY SETS

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, to norms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

# UNIT III FUZZY RELATIONS

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

# UNIT IV FUZZY MEASURES

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures vs Possibility Measures

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#### **UNIT V FUZZY INFERENCE**

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference –Compositional rule of Inference - Efficiency of Inference – Hierarchical.

#### **TEXT BOOKS:**

- 1. George J Klir and Bo Yuan, (2003) Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall of India, New Delhi.
- 2. Zimmermann H.J. (2001) Fuzzy Set Theory and its Applications, Kluwer Academic publishers, USA.
- 3. Michal Baczynski and Balasubramaniam Jayaram, (2008) Fuzzy Implications, Springer Verlag publishers, Heidelberg.
- 4. Kevin M Passino and Stephen Yurkovich, (1998) Fuzzy Control, Addison Wesley Longman publishers, USA.

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	-	-	-	-	-	-	-	-	1	1	1
CO2	2	2	-	1	-	-	-	-	-	-	-	1	1	1
CO3	2	2	1	1	-	-	-	-	-	-	-	1	1	1
CO4	2	2	-	-	-	-	-	-	-	-	-	1	1	1
CO5	2	2	1	1	-	-	-	-	-	-	-	1	1	1
Average	2	2	1	1	-	-	-	-	-	-	-	1	1	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

**TOTAL: 45** 

# 23BESHOE03MATERIAL SCIENCES3H-3C

Instruction Hours/week: L:3 T:0 P:0

# Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

- To inculcate the fundamental principles and concepts of magnetic materials for different engineering applications.
- To impart basic knowledge of superconductivity and associated applications.
- To serve the fundamental concepts of dielectric materials for diverse applications in energy engineering.
- To divulge the basics of crystals, their structures and different crystal growth techniques.
- To make the students familiar in the fundamentals of ceramics, composites and nonmaterial.

## **COURSE OUTCOMES:**

Upon the successful completion of this course

- students accumulate the knowledge on the basics of magnetic materials and its applications.
- Gain knowledge on the concepts of superconductivity, devices and their applications.
- Clarity on the concepts of dielectric properties of materials and their applications in engineering field
- Understand the basics of crystals, their structures and different crystal growth techniques.
- Clear idea of ceramics, composites and nanomaterials.

# UNIT I MAGNETIC MATERIALS

Origin of magnetic moment; Bohr magneton; comparison of Dia, Para and Ferro magnetism; Langevin theory of diamagnetism and paramagnetism; Quantum theory of paramagnetism; Curie-Weiss law; Temperature dependence of saturation magnetization; Domain theory; Hysteresis; soft and hard magnetic materials; antiferromagnetic materials; Ferrites and its applications.

#### UNIT II SUPERCONDUCTING MATERIALS

Superconductivity, properties; Meissner effect; Type I and Type II superconductors; London equation; BCS theory of superconductivity (Qualitative), Flux quantization; High Tc superconductors; Josephson superconductor tunnelling, DC and AC Josephson effect; Applications of superconductors, SQUID, cryotron, magnetic levitation.

#### UNIT III DIELECTRIC MATERIALS

Electrical susceptibility, dielectric constant; electronic, ionic, orientational and space charge polarization; frequency and temperature dependence of polarization; internal field; Clausius -

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Mossotti relation (derivation); dielectric loss; dielectric breakdown, uses of dielectric materials (capacitor and transformer); ferroelectricity and applications.

# UNIT IV CRYSTAL PHYSICS

Lattice, Unit cell, Bravais lattice; Lattice planes; Miller indices; d spacing in cubic lattice; Calculation of number of atoms per unit cell, Atomic radius, Coordination number, Packing factor for SC, BCC, FCC and HCP structures; Crystal imperfections; Crystal growth techniques; solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative).

# UNIT V NEW MATERIALS

Ceramics; types and applications; composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics; metallic glasses: types, glass forming ability of alloys, melt spinning process, applications; shape memory alloys: phases, shape memory effect, applications; nanomaterials: preparation (bottom up and top-down approaches), properties and applications.

# **TEXT BOOKS:**

- 1. C. Kittel, Introduction to Solid State Physics, 7th Edition, Wiley Eastern, New Delhi, 2006.
- 2. A. J. Dekker, Solid State Physics, Published by Macmillan India, 2000
- 3. William D CallisterJr, "Materials Science and Engineering An Introduction", John Wiley and Sons Inc.,7th edition, New York, 2006
- 4. S.O. Pillai, Solid State Physics. New Age International(P) Ltd., publishers, 2009
- 5. M.A. Wahab, Solid State Physics: Structure and Properties of Materials. Narosa Publishing House, 2009.
- 6. M. Arumugam, Materials Science. Anuradha publishers, 2010.

# JOURNALS:

- 1. Nature Physics
- 2. Journal of Applied Mechanics (ASME)
- 3. Journal of Electronic Materials (IEEE/TMS)
- 4. Applied Thermal Engineering (Elsevier)
- 5. Physical Review B (American Physical Society).
- 6. Nature Nanotechnology

# WEBLINKS:

- 1. https://nptel.ac.in/courses/122/103/122103011/
- 2. https://nptel.ac.in/courses/113/104/113104081/
- 3. https://nptel.ac.in/courses/108/108/108108122/
- 4. http://hyperphysics.phy-astr.gsu.edu/hbase/optmod/lascon.html

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**TOTAL: 45** 

# CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO5	3	-	1	-	-	-	-	-	-	-	-	1	-	-
Average	3	1	1	-	-	-	-	-	-	-	-	1	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### **23BTSHOE04**

#### **GREEN CHEMISTRY**

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course for students is

Instruction Hours/week: L:3 T:0 P:0

- To make the students conversant about the green chemistry
- To make the student acquire sound knowledge of the atom efficient process and synthesis elaborately.
- To acquaint the student with concepts of green technology.
- To develop an understanding of the basic concepts of renewable energy resources.
- To acquaint the students with the basics information on catalysis.

#### **COURSE OUTCOMES:**

After completion of this course, students will be able to

- Outline the basic principles of green chemistry. •
- Explain the chemical synthesis in terms of atom efficiency.
- Relate the concepts of green chemistry in biotechnology.
- Illustrate the importance of renewable feedstocks.
- Extend the phenomena of catalysis in green synthesis.

#### UNIT I INTRODUCTION TO GREEN CHEMICAL PRINCIPLES

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

#### **UNIT II ATOM EFFICIENT PROCESSES**

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

#### UNIT III BIOTECHNOLOGY AND GREEN CHEMISTRY

Bio technology and its applications in environmental protection - Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

2023-2024

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**3H-3C** 

#### UNIT IV RENEWABLE RESOURCES

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

## UNIT V CATALYSIS IN GREEN CHEMISTRY

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

#### Total: 45

## **TEXT BOOKS:**

- 1. Sanjay K. Sharma, Ackmez Mudhoo (2010) Green Chemistry for Environmental Sustainability CRC Press , London
- 2. Chandrakanta Bandyopadhyay (2019) An Insight into Green Chemistry, Books and Allied (P) Ltd, Kolkata.
- Ahluwalia V. K. (2018) Green Chemistry A Textbook 4<sup>th</sup> Reprint Narosa Publishing House Pvt. Ltd, New Delhi.
- 4. Ahluwalia V. K. and M.Kidwai (2007) New Trends in Green Chemistry 2<sup>nd</sup> edition Anamaya publishers., New Delhi.
- 5. Dr. Sunita Ratan (2012) A Textbook of Engineering Chemistry S.K. Kataria and Sons., New Delhi
- 6. Mukesh Doble. Ken Rollins, Anil Kumar (2007) Green Chemistry and Engineering, 1<sup>st</sup> edition Academic Press, Elesevier., New Delhi.
- 7. Desai K. R. (2005) Green Chemistry Himalaya Publishing House, Mumbai.

#### WEBLINKS

- 1. http://www.organic-chemistry.org/topics/green-chemistry.shtm
- 2. http://www.essentialchemicalindustry.org/processes/green-chemistry.html
- 3. <u>http://www.chm.bris.ac.uk/webprojects2004/vickery/green\_solvents.html</u>
- 4. <u>http://www.epa.gov/research/greenchemistry/</u>
- 5. http://www.amazon.in/Green-Chemistry-Catalysis

#### PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PSO1 PSO2 COs 2 **CO1** 1 1 1 1 ------1 --**CO2** 2 1 1 1 1 1 --------CO3 2 1 1 1 1 1 \_ -----\_ \_ **CO4** 2 1 1 1 1 1 --------**CO5** 2 1 1 1 1 1 --------1 1 1 1 1 Average 2 -\_ \_ 1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

# CO, PO, PSO Mapping

#### 23BP804ET PHARMACEUTICAL REGULTORY SCIENCE THORY 3H-3C

#### Instruction Hours/week: L:3 T:0 P:0

# Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

- This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other countries like US, EU, Japan, Australia, UK etc.
- It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products.
- To know the process of drug discovery, development and generic product development
- To understand the regulatory approval process and registration procedures for API and drug products in various countries
- To learn the basic understanding of regulations of India with other global regulated markets

## **COURSE OUTCOMES:**

On successful completion of the course the student will

- Explain the process of drug discovery, development and generic product development
- Describe the regulatory approval process and registration procedures for API and drug products in various countries.
- Understand the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals in India and other global regulated markets.
- Explain basic understanding of developing clinical trial protocols
- Understand the concept of pharmacovigilance and its significance.

#### UNIT I NEW DRUG DISCOVERY AND DEVELOPMENT

Stages of drug discovery, Drug development process, pre- clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.

#### UNIT II REGULATORY APPROVAL PROCESS

Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA. **Regulatory authorities and agencies:** Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)

# UNIT III REGISTRATION OF INDIAN DRUG PRODUCT IN OVERSEAS MARKET 10

Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document

10

(eCTD), ASEAN Common Technical Document (ACTD)research.

## **UNIT IV CLINICAL TRIALS**

Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials.

## **UNIT V REGULATORY CONCEPTS**

Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book.

## **TEXT BOOKS:**

- 1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
- 2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berr y and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185. Informa Health care Publishers.
- 3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol. 190.
- 4. Guidebook for drug regulatorysubmissions / Sandy Weinberg. By John Wiley & Sons. Inc.
- 5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics edited by Douglas J. Pisano, David Mantus.
- 6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143.
- 7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams.
- 8. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene.
- 9. Drugs: From Discoveryto Approval, Second Edition By Rick Ng.

#### CO, PO, PSO Mapping

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1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL :45** 

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23BP809ET COSMETIC SCIENCE- THEORY

**3H-3C** 

# Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVE:**

• To know the cosmetics in day to day life.

Instruction Hours/week: L:3 T:0 P:0

- To understand the formulation characteristics of cosmetic preparations
- To understand the role of herbs in cosmetic science
- To Demonstrate the evaluation procedures in the formulation of cosmetics
- To Identify the problems encountered during the usage of cosmetics

#### **COURSE OUTCOMES**:

On successful completion of the course the student will

- Discover the cosmetics in day-to-day life.
- Formulation's Development and characteristics of various cosmetic products.
- Understand about principles and building blocks of skin and hair care products.
- Understand the role of herbs in cosmetic science
- Understand the principles of cosmetic evaluation including various parameters

#### UNIT I

10

Classification of cosmetic and cosmeceutical products definition of cosmetics as per Indian and EUregulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs **Cosmetic excipients:** Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application.

**Skin:** Basic structure and function of skin.

Hair: Basic structure of hair. Hair growth cycle.

Oral Cavity: Common problem associated with teeth and gums.

# UNIT II PRINCIPLES OF FORMULATION AND BUILDING BLOCKS OF SKIN CARE PRODUCTS 10

Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of theseproducts in formulation of cosmeceuticals. **Antiperspants & deodorants**- Actives & mechanism of action. **Principles of formulation and building blocks of Hair care products:** Conditioning shampoo, Hair conditioner, anti-dandruff shampoo. Hair oils. Chemistry and formulation of Para-phylene diamine-based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

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Sun protection, Classification of Sunscreens and SPF. Role of herbs in cosmetics: Skin Care: Aloe and turmeric Hair care: Henna and amla. Oral care: Neem and clove. Analytical cosmetics: BIS specification and analytical methods for shampoo, skin- cream andtoothpaste.

# **UNIT IV**

**UNIT III** 

Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps, and syndet bars. Evolution and skinbenefits.

## UNIT V

Oily and dryskin, causes leading to dryskin, skin moisturisation. Basic understanding of the termscomedogenic, dermatitis. Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and Deodorants- Actives and mechanism of action.

# **TOTAL :45**

## **TEXT BOOKS:**

- 1. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
- 2. Cosmetics Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
- 3. Text book of cosmelicology by Sanju Nanda & Roop K. Khar, Tata Publishers.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Average	-	-	1	-	-	-	-	-	-	-	-	-	-	-

# CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### **23MBAPOE301 ORGANIZATIONAL BEHAVIOUR 3H-3C**

#### Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

# **COURSE OBJECTIVES:**

- To understand the basic concepts of organizational behavior.
- To analyze the individual behavior traits required for performing as an individual or • group.
- To obtain the perceiving skills to judge the situation and communicate the thoughts and ideas.
- To understand how to perform in group and team and how to manage the power, politics and conflict.
- To recognize the importance of organizational culture and organizational change.

# **COURSEOUTCOMES:**

- Analyze organizational behavior issues in the context of the organizational behavior theories and concepts.
- Assess the behavior of the individuals and groups in organization and manage the stress.
- Manage team, power, politics and conflict arising between the members.
- Explain how organizational change and culture affect the working relationship within organizations.
- Understand and exhibit the communication skills to convey the thoughts and ideas of case analysis to the individuals and group.

# **UNIT I ORGANIZATION BEHAVIOUR: INTRODUCTION**

Organization Behavior: Meaning and definition - Fundamental concepts of OB - Contributing disciplines to the OB field - OB Model - Significance of OB in the organization success -Challenges and Opportunities for OB.

# **UNIT II BEHAVIOUR AND PERSONALITY**

Attitudes - Sources - Types - Functions of Attitudes. Values - Importance - Types of Values. Personality - Determinants of personality- Theories of Personality - psycho-analytical, social learning, job-fit, and trait theories.

# **UNIT III PERCEPTION**

Perception – factors influencing perception - Person Perception – Attribution Theory –

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Frequently Used Shortcuts in Judging Others- Perceptual Process- Perceptual Selectivity - Organization Errors of perception – Linkage between perception and Decision making.

## UNIT IV GROUP AND STRESS MANAGEMENT

Foundation of Group Behavior - Types of Groups - Stages of Group Development - Group Norms - Group Cohesiveness – Stress – Causes of stress – Effects of Occupational Stress-Coping Strategies for Stress.

## UNIT V ORGANIZATION CULTURE AND CHANGE

Organizational culture- Characteristics of Culture- Types of Culture – Creating and Maintaining an Organizational Culture. Organizational change – Meaning - Forces for Change - Factors in Organizational Change - Resistance to change- Overcoming resistance to change.

# TOTAL :45

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#### **TEXT BOOKS:**

- 1. Fred Luthans. (2017). Organizational Behavior: An Evidence Based Approach, 12thedition, Mcgraw Hill Education, NewDelhi.
- 2. Steven Mcshane and Mary Ann VonGlinow (2017), Organizational Behavior, 6th edition, McGraw Hill Education, NewDelhi
- 3. Robbins, S. P., and Judge, T.A. (2016). Organizational Behaviour.(16<sup>th</sup> edition).New Delhi: Prentice Hall of India.
- 4. Laurie J. Mullins (2016), Management and Organisationalbehaviour, 10thedition, Pearson Education, NewDelhi
- 5. Robbins, S. P., and Judge, T.A. (2016). Essentials of Organizational Behavior.13 edition, Pearson Education.

#### **E- RESOURCES:**

1. https://nptel.ac.in/courses/110/105/110105033/

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	2	3	-	-	-	-	-	-
CO2	-	-	-	-	-	2	1	3	-	-	-	-	-	-
CO3	-	-	-	-	-	2	1	3	-	-	-	-	-	-
CO4	-	-	-	-	-	2	2	3	-	-	-	-	-	-
CO5	-	-	-	-	-	-	1	3	-	-	-	-	-	-
Average	-	-	-	-	-	-	-	3	-	-	-	-	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Karpagam Academy of Higher Education (Deemed to be University), Coimbatore - 641 021

#### 23PHPOE301MATERIAL CHARACTERIZATION3H-3C

# Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

## **COURSE OBJECTIVES:**

- To Study materials is always important, for any application, including fabrication of satellites.
- To introduce various methods available for characterizing the materials. The characterization of materials specifically addresses that portfolio with which researchers and educators must have working familiarity.
- To provide an introduction to materials characterization and its importance
- To discuss different types of characterization techniques and their uses.
- To introduce the students to the principles of optical and electron microscopy, X-ray diffraction and various spectroscopic techniques Introduction:

# **COURSE OUTCOMES:**

After completing the course, the students will / can able to

- Handle with X-ray, thermal, microscopic, and electrical methods of characterization.
- Understand and describe the fundamental principles behind the methods of characterization which are included in the curriculum
- Analyze, interpret and present observations from the different methods.
- Evaluate the uncertainty of observations and results from the different methods.
- Understand the history of materials science with basic understanding of metals, binary alloys, magnetic materials, dielectric materials and polymers

# UNIT I

X-ray techniques for materials characterization X-ray diffraction: Principle, measuring system and applications for characterization of powdered materials. X-ray diffraction profile and analysis: FWHM and line broadening, Crystallite size effect and Scherrer formula, Effect of strain (tensile vs compressive, uniform vs. non-uniform) Introduction to Extended X-ray absorption fine structure (EXAFS), Surface extended X-ray absorption (SEXAFS).

#### UNIT II

Microscopic techniques Principles, instrumentations and applications of Optical microscope, Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM) for characterization of different samples. Energy dispersive X-ray microanalysis (EDS) - Basic aspects of atomic force microscopy (AFM).

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Analysis (TGA), Differential Temperature Analysis (DTA) and Differential Scanning

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#### TOTAL:45

# on experience on operation of CV and data analysis.

**UNIT III** 

**UNIT IV** 

UNIT V

#### **TEXT BOOKS:** 1. Theory and Applications of UV Spectroscopy, H.H.Jaffe and M.Orchin, IBH-Oxford.

2. Inorganic spectroscopic methods, A.K. Brisdon, Oxford Chem. Primers, 1997, New York.

Spectroscopic methods Principle, instrumentation and applications of UV-Visible Diffuse Reflectance (UV-Vis DRS) spectroscopy, Ft-Ir, Raman and Fluorescence spectroscopy. Hand of

Thermo analytical Methods Principle, instrumentation and applications of Thermogravimetric

Electroanalytical Techniques Voltammetric principles, hydrodynamic voltammetry, stripping voltammetry, cyclic voltammetry, criteria of reversibility of electrochemical reactions, quasi-reversible and irreversible processes, qualitative and quantitative analysis current-potential relation applicable for Linear Sweep Voltammetry (LSV) and Cyclic Voltammetry (CV), interpretation of cyclic voltammograms and parameters obtainable from voltammograms. Hand

experience on operation of UV-Vis-DRS, FT-IR, Raman and data analysis.

on experience of operation of TG/DSC and data analysis.

- 3. Applied Electron Spectroscopy for Chemical Analysis Ed. H. Windawi and F.L.Ho, Wiley Inter science.
- 4. Introduction to Spectroscopy, Pavia, Brooks/Cole Cenage, 4th edition, 2009, Belmont.
- 5. Introduction to Photoelectron Spectroscopy, P.K.Ghosh, John Wiley.
- 6. Fundamental of Molecular Spectroscopy, C. N. Banwell and E. McCash, Tata McGraw Hill, 4th edition, 1994, New Delhi.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	2	-	-	-	-	-	2	-	-	-	-
CO4	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	-	3	-	-	-	-	-	-	-	-	-	-	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Karpagam Academy of Higher Education (Deemed to be University), Coimbatore - 641 021

# Calorometry (DSC). Factors affecting the TGA/DTA/DSC results and their interpretations. Hand

# 23PHPOE302NUMERICAL METHODS AND PROGRAMMING3H-3CInstruction Hours/week: L:3 T:0 P:0Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

# **COURSE OBJECTIVES**

- Computational physics may be broadly defined as 'the science of using computers to assist in the solution of physical problems, and to further physics research.
- To equip the students of M.Sc. Physics with knowledge of programming in C, roots of equation, interpolation, curve fitting, numerical differentiation, numerical integration, solution of ordinary differential equations
- To introduce students to computational methods for simulating physical systems and solving problems arising in physics and astronomy, as well as in other related fields
- Computers now play a role in almost every branch of physics like large scale quantum mechanical calculations in nuclear, atomic, molecular and condensed matter physics, large scale calculations in such fields as hydrodynamics, astrophysics, plasma physics, meteorology and geophysics etc.
- The huge increase in the power of computers in recent years has made an impact on the role of computational physics.
- This paper gives idea about different types of computations involved in Physics, like curve fitting, interpolation, extrapolation, numerical calculations etc.

#### **COURSE OUTCOMES (COS)**

After completing the course the students will/able to

- Programme numerical methods and their implementation like applying to problem in
- physics, including modeling of classical physics to quantum system as well as data analysis (Linear and non linear).
- Analysis techniques for propagating error, representing data graphically. Create, solve and interpret basic mathematical tool.
- Program independently computers using leading-edge tools,
- formulate and computationally solve a selection of problems in physics,
- Use the tools, methodologies, language and conventions of physics to test and Communicate ideas and explanations.

#### UNIT I

Errors, different type of errors. Representation of numbers in computer, computer arithmetic, zero in floating point number.

#### UNIT II

Operators –finite differences, average, differential, etc., their inter-relations. Difference of polynomials. Difference equation. Interpolation. Lagrange's methods, error terms. Uniqueness of interpolating polynomial.

# UNIT III

Newton's fundamental interpolation. Forward, backward and central difference interpolations. Interpolation by iteration. Spline interpolation, comparison with Newton's interpolation. Hermite's interpolation. Bivariate interpolation, Lagrange and Newton's methods. Inverse interpolation.

# UNIT IV

Approximation of function. Least square method. Use of orthogonal polynomials. Approximation by Chebyshev polynomials, Max-min principle. Economization of power series.

## UNIT V

Python Programming –Loops- Conditional statements- Functions- Object-oriented programming- Array computing- 2 and 3d visualizations

# TOTAL:45

# **TEXT BOOKS: :**

- E. Balagurusamy, "Numerical Methods", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1999
- 2. W.H. Press, B.P. Flannery et al., "Numerical Recipes: Art of Scientific Computing", 3rd Edition, Cambridge Press, 2007.
- 3. J. M. Mathews and K. Fink, "Numerical Methods using MATLAB ", 4rd Edition, Prentice Hall Publication, 2004
- 4. Dr. B.S. Grewal, "Numerical Methods in Engineering and Science ", Khanna Publication.
- 5. Robert J schilling, Sandra l harries, " Applied Numerical Methods for Engineers using MATLAB and C.", Thomson Brooks/cole.
- 6. Richard L. Burden, J. Douglas Faires, "Numerical Analysis", Thomson / Brooks/cole
- 7. John. H. Mathews, Kurtis Fink ,"Numerical Methods Using MATLAB" ,Prentice Hall publication
- 8. JAAN KIUSALAAS, "Numerical Methods in Engineering with MATLAB", Cambridge Publication
- 9. https://archive.nptel.ac.in/content/

# CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	-	-	-	-	-	-	-	-	1	-	-
CO2	1	1	-	-	-	-	-	-	-	-	-	1	-	-
CO3	1	-	-	-	1	-	-	-	-	-	-	1	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	1	-	-
Average	1	1	-	-	1	-	-	-	-	-	-	1	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

#### 23CAPOE301ROBOTICS PROCESS AUTOMATION3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

- Learn the concepts of RPA, its benefits, types and models
- Gain the knowledge in application of RPA in Business Scenarios
- Identify measures and skills required for RPA
- Adopt to the implementations of Automation
- Able to process information and draw inference

#### **COURSE OUTCOMES (COS)**

- Demonstrate the benefits and ethics of RPA K1, K2
- Understand the Automation cycle and its techniques K2
- Draw inferences and information processing of RPA K3, K4
- Understand the Automation concepts
- Implement & Apply RPA in Business Scenarios K5

#### **UNIT I - INTRODUCTION**

Introduction to RPA - Overview of RPA - Benefits of RPA in a business environment - Industries & domains fit for RPA - Identification of process for automation - Types of Robots - Ethics of RPA & Best Practices - Automation and RPA Concepts - Different business models for implementing RPA - Centre of Excellence – Types and their applications - Building an RPA team - Approach for implementing RPA initiatives.

#### **UNIT II - AUTOMATION**

Role of a Business Manager in Automation initiatives - Skills required by a Business Manager for successful automation - The importance of a Business Manager in automation - Analyzing different business processes - Process Mapping frameworks - Role of a Business Manager in successful implementation – Part 1 - Understanding the Automation cycle – First 3 automation stages and activities performed by different people

#### **UNIT III - AUTOMATION IMPLEMENTATION**

Evaluating the Automation Implementation Detailed description of last 3 stages and activities performed by different people - Role of a Business Manager in successful completion – Part 2 - Activities to be performed post-implementation - Guidelines for tracking the implementation

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success - Metrics/Parameters to be considered for gauging success - Choosing the right licensing option - Sending emails - Publishing and Running Workflows

#### UNIT IV – ROBOT

Ability to process information through scopes/systems - Understand the skill of information processing and its use in business - Leveraging automation - Creating a Robot - New Processes. Establish causality by variable behavior - Understand the skill of drawing inference or establishing causality by tracking the behavior of a variable as it varies across time/referenced variable - Leveraging automation for this skill - Robot & new process creation.

#### **UNIT V – ROBOT SKILL**

Inference from snapshots of curated terms – Omni-source data curation - Multisource trend tracking - Understand the skill of drawing inference from the behavior of curated terms by taking snapshots across systems in reference to time/variable(s) - Leveraging automation for this skill – Robot creation and new process creation for this skill.

#### **TEXT BOOKS:**

- 1. Tom Taulli, February 2020. "The Robotic Process Automation Handbook" Apress, Reference Books 1 Steve Kaelble" Robotic Process Automation" John Wiley & Sons, Ltd.
- 2. Alok Mani Tripathi, March 2018. "Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool", Packet Publishing Limited.

#### WEB LINKS:

- 1. <u>https://www.tutorialspoint.com/uipath/uipath\_robotic\_process\_automation\_introduction.ht</u> <u>m</u>
- 2. https://www.javatpoint.com/rpa 3 https://onlinecourses.nptel.ac.in/noc19\_me74/preview

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-		-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	3	2	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	-	-	-	-	2	-	-	-	-	-
Average	3	3	3	2	-	-	-	-	2	-	-	-	-	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL :45** 

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#### **23BCPOE301**

#### **NUTRITION AND DIETETICS**

**3H-3C** 

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

The goal of this course is for students to understand the

- Fundamentals of food, nutrients and their relationship to health
- Respect to deriving maximum benefit from available food resources
- Consequences of vitamin and mineral deficiency/excess of vitamin •
- Nutrition deficiency diseases and their consequences •
- Food adulteration and prevention of food adulteration •

#### **COURSE OUTCOMES:**

After successful completion, the students will understand

- The fundamentals of nutrition and their relationship to health
- To derive maximum benefits from available food resources •
- The consequences of vitamin and mineral deficiency/excess of vitamin •
- Nutrition deficiency diseases and their consequences
- The sources of food adulteration and measures to prevent it.

#### UNIT I

Basic concepts in food and nutrition-Understanding relationship between food, nutrition and health, Functions of food-Physiological, psychological and social. Dietary guidelines for Indians food pyramid. Junk foods and its causes.

#### **UNIT II**

Nutrients- Functions, dietary sources and clinical manifestations of deficiency/ excess of the following nutrients: Carbohydrates, lipids and proteins, Fat soluble vitamins-A, D, E and K, Water soluble vitamins - thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C, Minerals-calcium, iron and iodine

#### **UNIT III**

Adult nutrition Physiological changes, RDA, nutritional guidelines, nutritional concerns and healthy food choices-Adult, Pregnant woman, Lactating mother, Elderly. Nutrition during childhood-Growth and development, nutritional guidelines, nutritional concerns and healthy food choices-Infants, Preschool children, School children, Adolescents. Nutritional needs of nursing mothers and infants, determinants of birth weight and consequences of low birth weight,

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Breastfeeding biology, Breastfeeding support and Counselling, Infant and young child feeding and care-Current feeding practices and nutritional concerns, guidelines for infant and young child feeding, Breastfeeding, weaning and complementary feeding. Assessment and management of moderate and severe malnutrition among children, Micronutrient malnutrition among preschool children. Child health and morbidity, neonatal, infant and child mortality.

#### UNIT IV

Introduction to Nutritional deficiency diseases -Causes, symptoms, treatment, prevention of the following: Protein Energy Malnutrition (PEM), Vitamin A Deficiency (VAD), Iron Deficiency Anaemia (IDA), Iodine Deficiency Disorders (IDD), Zinc Deficiency, Flurosis Nutritional needs during pregnancy, common disorders of pregnancy (Anaemia, HIV infection, Pregnancy induced hypertension), relationship between maternal diet and birth. Maternal health and nutritional status, maternal mortality and issues relating to maternal health.

#### UNIT V

**Dietetics :** Diet for diabetes mellitus-Nutrition recommendations for patient with diabetes, Meal planning, Exchange list of different food groups, Glycemic index based formulation of diet for diabetic individual, Diabetic diets menu wise. Diet for Cardiovascular Diseases -Dietary management and general guidelines for coronary heart disease, Dietary recommendations of WHO. Diet for Acute cardiac diseases. Influence of diet on carcinogenesis, Dietary risk factors and cancers at various sites in the human body, diet therapy, diet for cancer patients, managing eating problems during treatment. Hormonal imbalance-Poly cystic ovarian syndrome, hypogonadism, cushing syndrome. Causes of hormonal imbalance. Treatment- Dietary and stress management protocols to be followed.

#### **TEXT BOOKS:**

- 1. Gordon M, Wardlaw and Paul M. (2012). Perspectives in Nutrition: U.S.A. McGraw Hill Publishers. 9rd Edition. New Delhi
- Srilakshmi.B. (2014) Nutrition Science: New Age International (P) Ltd. Publishers. 4th Edition. New Delhi.
- Srilakshmi.B. (2015) Food Science: New Age International (P) Ltd. Publishers. 6nd Edition., New Delhi
- 4. Darshan Sohi (2012). A Comprehensive Textbook of Nutrition & Therapeutic Diets. Jaypee Brothers Medical Publishers Pvt. Ltd.

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	2	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO4	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO5	2	1	-	-	-	-	-	-	-	-	1	-	-	-
Average	2	1	-	-	-	-	-	-	-	-	1	-	-	-

#### 23CSPOE301

**CYBER FORENSICS** 

#### **3H-3C**

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

#### End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

- To understand about computer forensics and investigations.
- To know about digital evidence and crime.
- To analyse and validate forensics data.
- To know about e-mail investigation.
- To understand about Mobile device forensics.

#### **COURSE OUTCOMES:**

At the end of this course, students will be able to

- Define, understand and explain various investigation procedures and summarize duplication of digital evidence.
- Apply the knowledge of digital evidences.
- Design and develop various forensics tools and analyse the network forensics.
- Demonstrate the systematic study of high-tech forensics
- Understand the importance of reports.

#### UNIT I COMPUTER FORENSICS AND INVESTIGATIONS

Computer forensics and investigations as a profession – Preparing for computer investigations – Taking a systematic approach–Procedures for corporate high-tech investigations–Data recovery work stations and software– Conducting an investigation.

#### UNIT II DATA ACQUISITION

Data acquisition – Storage formats for digital evidence – Validating data acquisitions – Processing crime and incident scenes–Identifying digital evidence–Collecting evidence in private sector incident scenes – Preparing for search-seizing digital evidence at the scene-storing digital evidence –Reviewing a case.

#### **UNIT III COMPUTER FORENSICS TOOLS**

Current computer forensics tools–Software tools–Hardware tools–The Macintosh file structure and boot process – Computer forensics analysis and validation – Addressing data –Hiding techniques.

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#### **UNIT IV NETWORK FORENSICS**

Virtual machines – Network forensics – Developing standard procedures – Live acquisitions – email investigations – Investigating e-mail crimes and violations – Understanding e-mail servers – Cell phone and mobile device forensics.

#### **UNIT V MOBILE DEVICE FORENSICS**

Understanding mobile device forensics – Acquisition procedures –Report writing for high-tech investigations – Importance of reports – Guidelines for writing reports –Expert testimony in high-tech investigations.

#### **TEXT BOOKS:**

- 1. Bill Nelson, Amelia Phillips and Christopher Steuart. (2018). Computer Forensics and Investigations, Cengage Learning, 5<sup>th</sup> Edition.
- Eoghan Casey. (2017). "Handbook of Digital Forensics and Investigation", Academic Press, 1<sup>st</sup> Edition,
- 3. John R Vacca, (2016). "Computer Forensics", Cengage Learning, 2<sup>nd</sup> Edition.

#### WEB LINKS:

- 1. www.cps.brockport.edu/~shen/cps301/figures/figure1.pdf
- 2. www.forensicsguru.com/devicedataextractionsimcell.php
- 3. www.nptel.ac.in/courses/106101060
- 4. www.samsclass.info/121/ppt/ch11.ppt
- 5. www.garykessler.net/library/role\_of\_computer\_forensics.html
- 6. <u>www.ukessays.com/essays/information-technology/computer-forensics-and-crime</u> investigations-information-technology-essay.php

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	-	2	1	1
CO2	3	3	3	-	-	-	-	-	-	-	-	2	1	1
CO3	3	2	2	2	-	-	-	-	-	-	-	2	1	1
<b>CO4</b>	2	2	2	2	-	-	-	-	-	-	-	2	1	1
CO5	1	1	1	1	-	-	-	-	-	-	-	2	1	1
Average	2.2	2.2	2.2	1.75	-	-	-	-	-	-	-	2	1	1

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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**TOTAL:36** 

### 23CMPOE301 PERSONAL FINANCE AND PLANNING 3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

- To familiarize with regard to the concept of Investment Planning and its methods
- To examine the scope and ways of Personal Tax Planning;
- To analyse Insurance Planning and its relevance
- To develop an insight into retirement planning and its relevance.
- To construct an optimal portfolio in real life situations

#### **COURSE OUTCOMES:**

- Familiarize with regard to the concept of Investment Planning and its methods
- Examine the scope and ways of Personal Tax Planning;
- Analyze Insurance Planning and its relevance
- Develop an insight in to retirement planning and its relevance.
- Construct an optimal portfolio in real life situations

#### UNIT I

**Introduction to Financial Planning -** Financial goals, Time value of money, steps in financial planning, personal finance/loans, education loan, car loan & home loan schemes. Introduction to savings, benefits of savings, management of spending & financial discipline, Net banking and UPI, digital wallets, security and precautions against Ponzi schemes and online frauds such as phishing, credit card cloning, skimming.

#### UNIT II

**Investment Planning** - Process and objectives of investment, Concept and measurement of return & risk for various asset class, Measurement of port folio risk and return, Diversification & Portfolio formation. Gold Bond; Real estate; Investment in Green field and brown field Projects; Investment in fixed income instruments-financial derivatives & Commodity market in India. Mutual fund schemes including SIP; International investment avenues.

#### **UNIT III**

**Personal Tax Planning -**Tax Structure in India for personal taxation, Scope of Personal tax planning, Exemptions and deductions available to individuals under different heads of income and gross total income, Special provision u/s115BAC vis-à-vis General provisions of the Income-taxAct, 1961.Tax avoidance versus tax evasion.

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#### UNIT IV

**Insurance Planning -** Need for Protection planning. Risk of mortality, health, disability and property. Importance of Insurance: life and non-life insurance schemes. Deductions available under the Income-tax Act for premium paid for different policies.

#### UNIT V

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**Retirement Benefits Planning -** Retirement Planning Goals, Process of retirement planning, Pension plans available in India, Reverse mortgage, New Pension Scheme. Exemption available under the Income-tax Act, 1961 for retirement benefits.

#### TOTAL:45

#### **TEXT BOOKS:**

- 1. Indian Institute of Banking & Finance. (2017). Introduction to Financial Planning. New Delhi: Taxmann Publication.
- 2. Pandit, A. (2014). The Only Financial Planning Book that You Will Ever Need. Mumbai: Network Publications Ltd.
- 3. Sinha, M. (2008). Financial Planning: A Ready Reckoner. New York: McGraw Hill Education.
- 4. Halan, M. (2018). Let's Talk Money: You've Worked Hard for It, Now Make It Work for You. New York: HarperCollins Publishers.
- 5. Tripathi, V. (2017). Fundamentals of Investment. New Delhi: Taxmann Publication

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	<b>PO12</b>	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	2	2	3	1	-	-
CO2	-	-	-	-	-	-	-	1	2	2	3	1	-	-
CO3	-	-	-	-	-	-	1	1	2	2	3	1	-	-
CO4	-	-	-	-	-	-	1	1	2	3	3	2	-	-
CO5	-	-	-	-	-	-	1	1	2	2	3	2	-	-
Average	-	-	-	-	-	-	1	1	2	2	3	1	-	-

#### CO, PO, PSO Mapping

**3H-3C** 

#### 23CHEOE301 CHEMISTRY IN EVERYDAY LIFE

Marks: Internal:40 External:60 Total:100

Instruction Hours/week: L:3 T:0 P:0

#### End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

- Gain knowledge in the importance of chemistry in food industry.
- Understand the chemistry of medicines and cosmetics.
- Evaluate the solar energy utilization and its storage.
- Knowledge about the production of electricity by a nuclear reactor.
- Know about the chemistry of soaps, detergents and textiles.

#### **COURSE OUTCOMES:**

On the completion of this course, students will be able to

- Know the importance of chemistry in food industry.
- Understood the chemistry of medicines and cosmetics.
- Evaluate the solar energy utilization and its storage.
- Understood the production process of electricity by a nuclear reactor.
- Know about the chemistry of soaps, detergents and textiles.

#### UNIT I IMPORTANCE OF CHEMISTRY IN FOOD

Chemicals in food, colouring agents, artificial preservatives, flow stabilizers, binding substance, flavours and sweeteners, antioxidants, minerals, vitamins. Chemistry at the breakfast table, raising agents- gluten, the taste maker- glutamic acid, stimulants-Caffeine, chemistry of onion, garlic and curcumin.

#### UNIT II CHEMISTRY IN MEDICINES AND COSMETICS

Elements in the human body, drugs and their classification, drug-target interaction, action of different classes of drugs, antiseptics and disinfectants.

Cosmetics: Chemistry behind the lotions, fragrances, talcum powder, sunblock and sunscreen, toothpaste, lipsticks, nail polishes.

#### UNIT III CHEMISTRY IN ENERGY

Solar energy - fuel from sun light - splitting of water - hydrogen from sunlight - hydrogen economy - fuel cells - batteries - photovoltaics - stealing the sun - nuclear energy - nuclear fission and fusion - production of electricity by a nuclear reactor - radioactivity and the hazards of radioactivity - living with nuclear power.

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# UNIT IV IMPORTANCE OF CHEMISTRY IN SOAPS, DETERGENTS AND TEXTILES 9

Detergents and soaps, types of soaps and detergents, saponification, cleansing action of soaps and detergents, perfumes used in soaps.

Textiles: Chemistry behind wool, silk, jute, cotton, glass fibre, polyester, acrylic, nylon, and other raw materials.

#### UNIT V CHEMISTRY OF POLYMERS, FUEL AND AGRICULTURE

Polymers, types, polyethylene, plastics, disposal of plastics, degradation of polymers and plastics using nano materials. Petrochemistry, petrol, diesel, LPG, CNG, kerosene, oils, and other fuels. Agriculture: fertilizers, herbicides, insecticides, and fungicides.

#### TOTAL:45

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#### **TEXT BOOKS:**

- 1. Tripathy, S. N., &Sunakar Panda (2004). *Fundamentals of Environmental Studies* (II Edition). New Delhi: Vrianda Publications Private Ltd.
- 2. Arvind Kumar (2004). A Textbook of Environmental Science. New Delhi: APH Publishing Corporation.
- 3. Anubha Kaushik, C. P., & Kaushik (2004). *Perspectives in Environmental Studies*. New Delhi: New Age International Pvt. Ltd. Publications.
- 4. Seymour R. B., & Charles, E. (2003). *Seymour's Polymer Chemistry: An Introduction*. Marcel Dekker, Inc.
- 5. Stocchi. E, (1990). Industrial Chemistry (Vol-I). UK: Ellis Horwood Ltd.
- 6. Jain, P. C., & Jain, M. (2004). *Engineering Chemistry*. Delhi: Dhanpat Rai & Sons.
- 7. Sharma, B. K., & Gaur, H. (1996). *Industrial Chemistry*. Meerut :Goel Publishing House.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	-	2	2	-	-	-	-	1	-	-
CO2	2	1	1	-	-	2	2	-	-	-	-	1	-	-
CO3	2	1	1	-	-	2	2	-	-	-	-	1	-	-
CO4	2	1	1	-	-	2	2	-	-	-	-	1	-	-
CO5	2	1	1	-	-	2	2	-	-	-	-	1	-	-
Average	2	1	1	-	-	2	2	-	-	-	-	1	-	-

#### CO, PO, PSO Mapping

#### 23MBPOE301 FERMENTATION TECHNOLOGY 3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVE:**

- To encompass the use of microorganisms in the manufacture of food or industrial products on the basis of employment.
- Get equipped with a theoretical and practical understanding of industrial microbiology
- Appreciate how microbiology is applied in the manufacture of industrial products
- Know how to source microorganisms of industrial importance from the environment
- Know about the design of bioreactors, factors affecting growth and production, heat transfer, oxygen transfer

#### **COURSE OUTCOMES:**

Students will be able to

- Provides knowledge in the large scale production of industrial product, and teaches the modern employment trends to cater the needs of industry.
- Students will differentiate the types of fermentation processes
- Understand the biochemistry of various fermentations
- Identify techniques applicable for Improvement of microorganisms based on known biochemical pathways and regulatory mechanisms
- Comprehend the techniques and the underlying principles in downstream processing

#### **UNIT I - BASICS OF FERMENTATION PROCESSES**

Definition, scope, history, and chronological development of the fermentation industry. Component parts of the fermentation process. y. Component parts of fermentation process. Microbial growth kinetics, batch and continuous, direct, dual or multiple fermentations; scaleup of fermentation, comparison of batch and continuous culture as investigative tools, examples of the use of fed batch culture.

#### UNIT II ISOLATION AND PRESERVATION

Isolation, preservation, and strain improvement of industrially important microorganisms. Use of recombination system (Parasexual cycle, protoplast fusion techniques), application of recombinant strains, and the development of new fermentation products.

#### UNIT III –SCREENING AND INOCULUM DEVELOPMENT

Screening (primary and secondary screening); detection and assay of fermentation products

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(Physico-chemical assay, biological assays). Inoculum development, criteria for transfer of inoculum, development of inoculum: Bacteria, Fungi and Yeast.

#### UNIT IV-MICROBIAL PRODUCTION

Fermentation type reactions (Alcoholic, bacterial, mixed acid, propionic acid, butanediol and acetone-butanol). Microbial production of enzymes (amylases, Proteases, cellulases, pectinases and lipases) primary screening for producers, large scale production. Immobilization methods.

#### **UNIT V – ALCOHOLS AND BEVERAGES**

Fermentative production of industrial alcohol, production of beverages. Production of organic acids: citric acid, aminoacids: glutamic acid, production of vitamins. fungal enzymes and Single cell protein.

#### TOTAL:45

#### **TEXT BOOKS:**

- 1. Casida, L.E.2007. Industrial microbiology, New age international (P) Ltd., New Delhi.
- 2. Clark, D.P and Pazdernik, N.J.2009. Biotechnology applying the genetic revolution, Elsevier Academic Press, UK.
- 3. Glazer, A and Nikaido.1995. Microbial biotechnology fundamentals of applied microbiology, W.H.Freemn and company, USA.
- 4. Glick, B.R and Pasternak, J.J.2003. Molecular Biotechnology Principles and Applications of Recombinant DNA, 3rd edition, ASM Press, USA.
- 5. Harider, S.I. and Ashok, A. 2009. Biotechnology, A Comprehensive Training Guide for the Biotechnology Industry, CRC Press, New York.
- 6. Sridhar, S.2010. Industrial Microbiology, Dominant Publishers, New Delhi.
- 7. Tanuja.S and Purohit, S.S. 2008. Fermentation Technology, Agrobios Publication, Jodhpur, India.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	2	1	2	-	-	-	-	-	-	-	1	1	-	-
CO3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO4	2	1	2	-	-	-	-	-	-	-	1	1	-	-
CO5	1	-	-	-	-	-	-	-	-	-	1	1	-	-
Average	2	1	2	-	-	-	-	-	-	-	1	1	-	-

#### CO, PO, PSO Mapping

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

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#### 23EGPOE301 ENGLISH FOR COMPETITVE EXAMINATIONS 3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

- To train learners to crack competitive exams
- To know of various tools that is essential for Competitive Exams
- To enhance their ability to speak in English and face an interview.
- To make the student apply, prepare and clear the competitive exams.
- To prepare the student to concentrate, stay positive and confident.

#### **COURSE OUTCOMES**

At the end of this course, students will be able to

- The student may settle in life with a government job.
- The student may develop various skills
- The successful student may guide other students to success.
- Analyse logical reasoning questions, error analysis, and correct usage of words.
- Develop the knowledge of grammatical system of English language.

#### UNIT I GRAMMAR

Number-Subject, Verb and Agreement-Articles-Sequences of Tenses-Common Errors

# UNIT II WORD POWER9Idioms and Phrases-One word substitution-Synonyms-Antonyms-Words often confusedUNIT III PARAGRAPH9Expansion of an idea9UNIT IV WRITING9

Essay- Letters-Memos-Agenda-Resume writing

#### UNIT V SPEAKING

Public Speaking-Group discussion-Interview-Spoken English

#### SUGGESTED BOOKS

V. Saraswathi, Maya K. Mudbhatkal (2014). English for Competitive Examinations. Emerald: Chennai.

**TOTAL:45** 

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#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	1	2	-	1	-	-
CO2	-	-	-	-	-	-	-	-	1	2	-	1	-	-
CO3	-	-	-	-	-	-	-	-	1	2	-	1	-	-
CO4	-	-	-	-	-	-	-	-	1	2	-	1	-	-
CO5	-	-	-	-	-	-	-	-	1	2	-	1	-	-
Average	-	-	-	-	-	-	-	-	1	2	-	1	-	-

#### SERICULTURE

**3H-3C** 

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

#### **COURSE OBJECTIVES:**

**23BTPOE301** 

- To apply knowledge and skills of seribiotechnology for development new mulberry variety and silkworm breeds suitable for varied agro-climatic zones.
- To apply tools and techniques of biostatics for critical analysis and interpretation of data accrueded.
- To use bioinformatics tools and techniques for the analysis and interpretation of bimolecular data for better understating mulberry and silkworm.
- To demonstrate communication skills, scientific writing, data collection and interpretation abilities in all the fields of seribiotechnology.
- Thorough knowledge and application of good laboratory and good manufacturing practices in sericulture and biotech industries.

#### **COURSE OUTCOMES :**

On completion of the course, students are able to

- Know the different components and chain link of sericulture industry.
- Understand concepts of sericulture industry and demonstrate interdisciplinary skills acquired in mulberry plant cultivation and silkworm rearing.
- Demonstrating the Laboratory and field skills in mulberry cultivation and
- Silkworm rearing with an emphasis on technological aspects.
- To transfer the knowledge and technical skills to the Seri-farmers.

#### **UNIT I**

Introduction to Sericulture - History of Sericulture - Sericulture organization in India, By products of silk industry. Mulberry and non - mulberry silkworm types-Morphology and Life cycle of Bombyxmori,

#### **UNIT II**

Mulberry Cultivation: Mulberry Varieties - Methods of Irrigation - Nutrient Management and Weed control. Pruning and Harvesting - Crop improvement - Me chanism in Moriculture - Pest and Disease, deficiencies and symptoms in Mulberry.

#### **UNIT III**

Rearing of silkworm – Rearing Appliances – rearing operation. Harvesting and marketing of

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cocoons. Cocoon processing and reeling - Appliances used for reeling. Pre reeling process – Cocoon boiling. Reeling technology – re-reeling technology.

#### UNIT IV

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Non – Mulberry Sericulture Scope of Non-mulberry Sericulture - Non-mulberry silk varieties and fauna, tasar, muga, eri – Silk Production and Marketing – Tropical tasar / muga – Morphology, anatomy grainage

#### UNIT V

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Diseases of silkworm –Pebrine Protozoan, Flacherie bacterial, Nuclear Poly hedrosisviral and Muscardine fungal diseases. Pests of Silkworm.

#### **TEXT BOOKS:**

- 1. Krisnamoorthy S., Improved Method of Rearing Young Age Silk Worms: Reprinted by CSB, Bangalore, 1986.
- 2. Tanaka Y., Sericology, CSB, Pub., Bangalore, 1964.
- 3. Ullal S.R., and Narasimhan M.N., Hand Book of Practical Sericulture, CSB, Bangalore, 1987.

#### **REFERENCE BOOKS:**

- 1. HisaoAruga, Principles of sericulture, Oxford and IBH Publishing Company, 1994.
- 2. Hrccrama Reddy, G. 1998. Silkworm Breeding, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
- 3. Otsuki el.al. 1987. Silkworm Egg Production (Translated from Japanese Language), Oxford wild IBH Publishing Co. Pvt. Ltd., New Delhi.
- 4. Yasuji Hamamura, 2001 Silkworm Rearing on Artificial Diet (Translated from Japanese Language), Oxford wild IBH Publishing Co. Pvt. Ltd., New Delhi.
- 5. Mahadevappa, D. Halliyal, V.G., Sankar, D.G and Bhandiwad, R. 2000. Mulberry Silk Reeling Technology, Oxford wild IBH Publishing Co. Pvt. Ltd., New Delhi.
- 6. Dandin, S.B et.al. 2003. Advances in Tropical Sericulture, National Academy of Sericulture Sciences India, Central Silk Board, Bangalore, India.
- 7. Ganga G., Sulochanachetty. J. An Introduction of Sericulture. Oxford, New Delhi 1977.
- 8. Johnson M., and Kesary M., Sericulture, CSI Press, Marthandam, 2008.
- 9. Text Book of Tropical Sericulture, Pub., Japan Overseas Volunteers, 1975

#### CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO3	2	1	1	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	1	-	-	-	-	1	-	-
CO5	2	1	-	2	-	-	1	-	-	-	-	-	-	-
Average	2	1	1	2	-	-	1	-	-	-	-	1	-	-