

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Established Under Section 3 of UGC Act 1956) Eachanari post, COIMBATORE 641 021, INDIA

DEGREE OF BACHELOR OF ENGINEERING / TECHNOLOGY REGULATIONS 2015 CREDIT SYSTEM

These regulations are effective from the academic year 2015-2016 and applicable to the candidates admitted to B. E. / B. Tech. during 2015-2016 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) (Academic Stream) prescribed by the Government of Tamil Nadu with Mathematics, Physics and Chemistry as three of the four subjects of study under Part-III or any similar examination of any other University or authority accepted by the Karpagam Academy of Higher Education as equivalent thereto.

(**OR**)

Should have passed the Higher Secondary Examination of Vocational stream (Vocational groups in Engineering / Technology) as prescribed by the Government of Tamil Nadu.

1.2 Candidates seeking admission to the first semester of the eight semesters B. Tech. (Bio-Technology) Degree Programme:

Should have passed the Higher Secondary Examination (10+2) (Academic Stream) prescribed by the Government of Tamil Nadu with Mathematics, Physics and Chemistry (or) Physics, Chemistry and Biology as three of the four subjects (or) Physics, Chemistry, Botany and Zoology as subjects of study under Part-III or any similar examination conducted by any other authority accepted by the Karpagam Academy of Higher Education as equivalent thereto.

(**OR**)

Should have passed the Higher Secondary Examination of Vocational stream (Vocational groups in Engineering / Technology) as prescribed by the Government of Tamil Nadu.

1.3 Lateral Entry Admission

Candidates who possess Diploma in Engineering / Technology (10+3 or 10+2+2) awarded by the Directorate of Technical Education, Tamil Nadu or its equivalent and candidates who possess Bachelor Degree in Science (10+2+3) with Mathematics as one of the subjects, awarded by any University or its equivalent 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^{rd} and 4^{th} semester as prescribed by the Karpagam Academy of Higher Education. Eligibility criteria are given in the table below.

S. No.	Programme	Eligibility criteria	
1.	B. Tech. Aerospace Engineering	Diploma in Mechanical Engg./ Metallurgy/Automobile Engg./ Mechanical and Rural Engg. / Machine Tool Maintenance and Repairs / Machine Design and Drafting / Refrigeration and Air-conditioning / Production Engg. / Tool and Die Design.	
2.	B. E. Automobile Engineering	Diploma in Automobile Engg./ Mechanical Engg / Metallurgy/ Mechanical and Rural Engg. / Machine Tool Maintenance and Repairs / Machine Design and Drafting / Refrigeration and Air-conditioning / Production Engg. / Tool and Die Design.	
3.	B. E. Civil Engineering	Diploma in Civil Engg./ Sanitary Engg. / Civil and Rural Engg.	
4.	B. E. Computer Science and Engineering	Diploma in Computer Engg. / Electrical Engg./ Electronics Engg. / Electrical & Electronics Engg. / Electronics & Communication Engg. / Electronics & Telecommunication Engg./ Information Technology/ Computer Science / Instrumentation & Control Engg. / Electronics & Instrumentation.	
5.	B. E. Electrical and Electronics Engineering	Diploma in Electrical Engg./ Electronics Engg. / Electrical & Electronics Engg. / Electronics & Communication Engg. / Electronics & Telecommunication Engg./ Information Technology/ Computer Science / Instrumentation & Control Engg. / Electronics & Instrumentation.	
6.	B. E. Electronics and Communications Engineering	Diploma in Electronics Engg. / Electronics & Communication Engg. / Electrical Engg. / Instrument Technology / Electronics with specialization in Instrumentation / Electrical & Electronics Engg./ Information Technology/ Computer Science/ Instrumentation & Control Engg./ Electronics & Telecommunication Engg.	
7.	B. E. Mechanical Engineering	Diploma in Mechanical Engg./ Metallurgy/Automobile Engg./ Mechanical and Rural Engg. / Machine Tool Maintenance and Repairs / Machine Design and Drafting / Refrigeration and Air-conditioning / Production Engg. / Tool and Die Design.	

1.4 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 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 of 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 Karpagam Academy of Higher Education as given below.

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

1. B. E. Automobile Engineering

- 2. B. E. Bio-Engineering
- 3. B. E. Civil Engineering
- 4. B. E. Computer Science and Engineering
- 5. B. E. Electrical and Electronics Engineering
- 6. B. E. Electronics and Communications Engineering
- 7. B. E. Fire and Safety Engineering
- 8. B. E. Mechanical Engineering
- 9. B. Tech. Aerospace Engineering
- 10. B. Tech. Bio-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 Karpagam Academy of Higher Education.

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 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 has been in vogue.** Number of electives have been increased to eight. One among the elective is an open elective being offered by other than the parent department.
- **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 periods of Value added course per week	:1
No. of credits for 3 weeks of in-plant training during	
semester vacations	:1

4.3 In every semester, curriculum shall normally have a blend of theory courses not exceeding 6 and practical courses not exceeding 3. However, the total number of courses per semester shall not exceed 8.

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.	185 - 190

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. (H. Sc. 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 an y.

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 weightage 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 meaningfull y 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 them 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:

THEORY COURSES:

S. No.	CATEGORY	MAXIMUM MARKS
1.	Seminar*	5
2.	Attendance	5
3.	Test – I	8
4.	Test – II	8

S. No.	CATEGORY	MAXIMUM MARKS
5.	Test – III – Model Exam	14
Continu	ious Internal Assessment : TOTAL	40

*Evaluation shall be made by a committee.

PATTERN OF TEST QUESTION PAPER (Test I & II)

INSTRUCTION	REMARKS	
Maximum Marks	50 marks for all Tests	
Duration	2 Hours	
Part - A	14 Objective type Questions, uniformly covering the two and half units of the syllabus. All the 14 Questions are to be answered.	
	$(14 \times 1 = 14 \text{ Marks}).$	
Part- B	Question 15 to 17 will be of either or choice, covering two and half units of the syllabus. $(3 \times 12 = 36 \text{ Marks}).$	

PATTERN OF MODEL EXAM (Test III)

INSTRUCTION	REMARKS		
Maximum Marks	100		
Duration	3 Hours		
Dort A	Part A will be online examination of Objective		
rait-A	type Questions. Questions No. 1 to 20, covering		
	all the 5 units. (20 x 1 = 20 Marks).		
Dowt B	5 Sixteen mark Questions.		
ran-b	Totally 10 Questions with either or type		
	covering all the units. Students has to answer 5		
	questions. (5 x 16 = 80 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
Continuou	s Internal Assessment: TOTAL	40

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

10.3 ATTENDANCE Marks Distribution for Attendance

S. No.	Attendance %	Marks
1	91 and above	5.0
2	86-90	4.0
3	81-85	3.0
4	75-80	2.0
5	Less than 75	0

10.4 PROJECT WORK:

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 with a turn over about Rs. 50 crore, the student may be permitted to do his/her project work in institution/research organization/industry.

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, which consists of 100 marks, later scaled down to 60 marks.

PATTERN OF ESE QUESTION PAPER:

INSTRUCTION	REMARKS			
Maximum Marks	100 marks for all Semester Examinations.			
Duration	3 Hours			
Part - A	Part A will be online examination of Objective type Questions. Question			
	No. 1 to 20, covering all the 5 units. $(20 \times 1 = 20 \text{ Marks})$.			
Port_R	5 Sixteen mark Questions			
Tart-D	Totally 5 Questions with either or type covering all the units. One			
	question from each units. 5 Questions will correspond to 5 unit. Student			
has to answer 5 questions. ($5 \times 16 = 80$ Marks).				

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 100 marks. There will be two tests, of which one will be class test 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 exam 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 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 exam 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 test at the end of the semester conducted in the course subsequently.

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
А	71-80	8	VERY GOOD
B+	66-70	7	GOOD
В	61 - 65	6	ABOVE AVERAGE
С	55 - 60	5	AVERAGE
Р	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.

<u>Sum of [C * GP]</u>

GPA = 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

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 exams, Practical exams, Technical Seminars, In-plant Training and Project Work.

14.4 TRANSPARENCY AND GRIEVANCE COMMITTEE

Revaluation and Re-totaling is allowed on representation. Student may get the Photostat copy of the answer script on payment of prescribed fee, if he/she wishes. The students 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 Karpagam Academy of Higher Education), HOD of the Department concerned, the faculty of the course and Dean from other discipline nominated by the Karpagam Academy of Higher Education 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 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 Candidates are eligible to register for BE (Honors) degree, provided he/she should maintain an average of 75% marks in the first appearance till the VI semester. Candidates registering for honors degree should study one additional course in VII semester and VIII semester each and should maintain 75% from I semester to VIII semester. However if he/she fails in additional subjects, they are not eligible for honors 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 16.1 and 16.2) 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 VIII semester.
- 17.5 Withdrawal from the ESE is NOT applicable to arrear exams.
- **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 Clause 16). 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' (Clause 17 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 disciplined and decorous behavior both inside and outside the Karpagam Academy of Higher Education and not to indulge in any activity which will tend to bring down the prestige of the Karpagam Academy of Higher Education. The erring student will be referred to the Disciplinary Committee constituted by the Karpagam Academy of Higher Education, to enquire into acts of indiscipline and recommend to the Karpagam Academy of Higher Education 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 Karpagam Academy of Higher Education from time to time.

22. REVISION OF REGULATION AND CURRICULUM

The Karpagam Academy of Higher Education 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.

B. E. ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM AND SYLLABI 2015

Department of Electronics and Communication Engineering FACULTY OF ENGINEERING



KARPAGAM ACADEMY OF HIGHER EDUCATION

(Established Under Section 3 of UGC Act 1956)

Eachanari post, COIMBATORE 641 021, INDIA

ELECTRONICS AND COMMUNICATION ENGINEERING COURSE OF STUDY AND SCHEME OF EXAMINATIONS

SUB. CODE SUB. C	(2015 onwards)										
THEORY: 15BECC101 15BECC102 15BECC103 15BECC104 15BECC105 PRACTICALS: 15BECC111 15BEEC112 15BEEC113 Value added Course	TITLE OF THE COURSE	L	Т	Р	C	CIA	ESE	TOTAL			
THEORY: 15BECC101 15BECC102 15BECC103 15BECC104 15BEEC105 PRACTICALS: 15BEEC111 15BEEC112 15BEEC113	SEMESTER	I									
15BECC101 15BECC102 15BECC103 15BECC104 15BEEC105 PRACTICALS : 15BEEC111 15BEEC112 15BEEC113 Value added Course											
15BECC102 15BECC103 15BECC104 15BEEC105 PRACTICALS : 15BEEC111 15BEEC112 15BEEC113 Value added Course	Communicative English –I	3	0	0	3	40	60	100			
15BECC103 15BECC104 15BEEC105 PRACTICALS : 15BECC111 15BEEC112 15BEEC113	Engineering Mathematics – I	3	2	0	4	40	60	100			
15BECC104 15BEEC105 PRACTICALS : 15BECC111 15BEEC112 15BEEC113 Value added Course	Engineering Physics	3	0	0	3	40	60	100			
15BEEC105 PRACTICALS : 15BECC111 15BEEC112 15BEEC113 Value added Course	Engineering Chemistry	3	0	0	3	40	60	100			
PRACTICALS : 15BECC111 15BEEC112 15BEEC113 Value added Course	Computer Fundamentals and C Programming	3	0	0	3	40	60	100			
15BECC111 15BEEC112 15BEEC113 Value added Course											
15BEEC112 15BEEC113	Engineering Physics and Chemistry Laboratory	0	0	3	2	40	60	100			
15BEEC113	Computer Practice and Programming Laborator y	0	0	3	2	40	60	100			
Value added Course	Engineering Graphics	1	0	4	3	40	60	100			
Value added Course	TOTAL	16	2	10	23	320	580	900			
Value added Course	Total Contact hours	30						I			
value auueu Course											
15BECC151	Human values	1	1	0	1	100	0	100			
	SEMESTER	П			1 1						
THEORY:											
15BECC201	Communicative English –II	3	0	0	3	40	60	100			
15BECC202	Engineering Mathematics – II	3	2	0	4	40	60	100			
15BECC203	Materials Science	3	0	0	3	40	60	100			
15BECC204	Environmental Studies	3	0	0	3	40	60	100			
15BEEC205	Electron Devices	3	2	0	4	40	60	100			
15BEEC206	Basic Electrical Engineering	3	0	0	3	40	60	100			
PRACTICAL :	6 6 8										
15BEEC211	Engineering practice Laboratory	0	0	3	2	40	60	100			
15BEEC212	Electron Devices Laboratory	0	0	3	2	40	60	100			
	TOTAL	18	4	6	24	320	580	900			
	Total Contact hours	30									
Value added Course					1 1						
15BECC251	Elementary Biology	1	1	0	1	100	0	100			
	SEMESTER	ш			1 1						
THEORY:											
15BECC301	Methods of Applied Mathematics	3	2	0	4	40	60	100			
15BEEC302	Circuit Theory	3	2	0	4	40	60	100			
15BEEC303	Digital Electronics	3	0	0	3	40	60	100			
15BEEC304	Electromagnetic Theory and Waveguides	3	1	0	4	40	60	100			
15BEEC305	Signals and Systems	3	1	0	4	40	60	100			
PRACTICAL :			-			- ~					
15BEEC311	Electric Circuits Laboratory	0	0	3	2	40	60	100			
15BEEC312	Digital Electronics Laboratory	0	0	2	2	40	60	100			
IJDEECJ12	Digital Electronics Laboratory		U	5		40	00	100			

15BEEC313	Electrical Machines Laboratory	0	0	3	2	40	60	100
	TOTAL	15	6	9	24	320	580	900
	Total Contact hours	30						
Value added Cours	e							
15BEEC351	Yoga/NSS/NCC	1	1	0	1	0	100	100
	SEMESTER	IV						
THEORY:								
15BEEC401	Electronic Circuits	3	2	0	4	40	60	100
15BEEC402	Control s ystems	3	0	0	3	40	60	100
15BEEC403	Linear Integrated Circuits	3	0	0	3	40	60	100
15BEEC404	Transmission lines and Networks	3	2	0	4	40	60	100
15BEEC405	Communication Theory	3	0	0	3	40	60	100
PRACTICAL :								
15BEEC411	Electronic Circuits and Simulation lab	0	0	3	2	40	60	100
15BECC412	Scientific Computing Laboratory	2	0	2	3	40	60	100
15BEEC413	Linear Integrated Circuits Laborator y	0	0	3	2	40	60	100
	TOTAL	17	3	10	24	320	580	900
	Total Contact hours	30						
Value added Cours	e							
15BEEC451	Life skills / Technical Seminar	1	1	0	1	100	0	100
15BEEC452	Foreign Language(German,			0		100	0	100
	Japanese)/Hindi	I	I	0	1	100	0	100
	SEMESTER	V						
THEORY:	1	1			, , , , , , , , , , , , , , , , , , ,		TT	
15BEEC501	Microprocessors and Microcontrollers	3	0	0	3	40	60	100
15BEEC502	Digital Communication	3	0	0	3	40	60	100
15BEEC503	Digital Signal Processing	3	1	0	4	40	60	100
15BEEC504	Antennas and Wave Propagation	3	2	0	4	40	60	100
15BEEC5E	Department Elective-I	3	1	0	4	40	60	100
PRACTICAL :		1					L	
15BEEC511	Digital Signal Processing Laborator y	0	0	3	2	40	60	100
15BEEC512	Microprocessor and Microcontroller	0	0	3	2	40	60	100
15BEEC513	Communication Systems Laboratory	0	0	3	2	40	60	100
TODELCOTO	TOTAL	15	4	11	24	320	580	900
	Total Contact Hours	30			· - ·		200	200
Value added Cours	e	50						
15BEEC551	In plant Training	0	0	0	1	100	0	100
15BEEC552	Mini Project	0	0	2	1	100	0	100
	SEMESTER	VI	-		1 - 1			
THEORY:								

15BEEC601	Microwave Engineering	3	2	0	4	40	60	100
15BEEC602	Computer Networks	3	0	0	3	40	60	100
15BEEC603	Mobile Communication	3	2	0	4	40	60	100
15BEEC604	Engineering Economics and Financial Management	3	0	0	3	40	60	100

15BEEC6E	Department Elective_II	3	0	0	3	40	60	100	
15BEEC6E	Department Elective-III	3	0	0	3	40	60	100	
PRACTICAL :									
15BEEC611	Networks Laborator y	0	0	3	2	40	60	100	
15BEEC612	Microwave Laborator y	0	0	3	2	40	60	100	
	TOTAL	18	4	8	24	320	580	900	
	Total Contact Hours	30							
Value added Cours	se								
15BEEC651	Analog s ystem design using ASLK PRO/ ARM Cortex M4/ Mixed Signal Microcontroller	1	1	0 1		100	0	100	
15BEEC652	Communication skills and development	1	1	0 1		100	0	100	
	SEMESTER	VII		<u> </u>					
THEORY:					-				
15BECC701	Professional Ethics	3	0	0	3	40	60	100	
15BECC702	VLSIDesign	3	2	0	4	40	60	100	
15BECC703	Optical Communication	3	2	0	4	40	60	100	
15BEEC7E	Department Elective-IV	3	0	0	3	40	60	100	
15BE7OE	Open Elective-I	3	0	0	3	40	60	100	
PRACTICAL :									
15BEEC711	VLSI Design Laboratory	0	0	3	2	40	60	100	
15BEEC712	Electronic system design Laboratory	0	0	3	2	40	60	100	
15BEEC713	Optical Laboratory	0	0	3	2	40	60	100	
	TOTAL	15	4	9	23	320	480	800	
	Total Contact Hours	28							
Value added Cours	se								
15BEEC751	Real Time controller / VLSIDesign using Cadence tool	1	1	0	1	100	0	100	
	SEMESTER	VIII	1	T				1	
	THEORY:	_							
15BEEC8E	Department Elective-V	3	0	0	3	40	60	100	
15BEEC8E	Department Elective-VI	3	0	0	3	40	60		

								100
15BEEC8E	Department Elective-VII	3	0	0	3	40	60	100
	PRACTICALS:							
15BEEC891	Project Work and Viva Voce	0	0	24	12	120	180	300
	TOTAL	9	-	24	21	240	360	600
	Total Contact Hours	33						

Total Credits earned: 23+24+24+24+24+24+23+21 = 187

DEPARTMENT ELECTIVES

against the specified range -[180-190 Credits]

Note: 1. Credits for value added course are not counted for computation of CGPA

- 2. Interested students can opt for one self study course in VIII Semester from open
 - electives which will be reflected in the mark sheet only if he/she passes the course.

LISTOFELECTIVES										
	V Seme	ester								
SUB. CODE	TITLE OF THE COURSE	L	Т	P	С	CIA	ESE	TOTAL		
15BEEC5E01	Measurements and Instrumentation	3	0	0	3	40	60	100		
15BEEC5E02	Medical Electronics	3	0	0	3	40	60	100		
15BEEC5E03	Advanced Electronic system design	3	0	0	3	40	60	100		
15BEEC5E04	Data Structures and algorithms	3	0	0	3	40	60	100		
15BEEC5E05	Probability and Random Process	3	0	0	3	40	60	100		
15BEEC5E06	Telecommunication Switching and Networks	3	0	0	3	40	60	100		
	VI Sem	ester	•							
15BEEC6E07	Remote Sensing	3	0	0	3	40	60	100		
15BEEC6E08	Television and Video Engineering									
15BEEC6E09	Computer Architecture	3	0	0	3	40	60	100		
15BEEC6E10	Electromagnetic Interference and Compatibility	3	0	0	3	40	60	100		
15BEEC6E11	Operating S ystems	3	0	0	3	40	60	100		
15BEEC6E12	Advanced Microprocessors	3	0	0	3	40	60	100		
15BEEC6E13	Digital logic design using CPLD'S and HDL	3	0	0	3	40	60	100		
15BEEC6E14	Sensors and Transducers	3	0	0	3	40	60	100		
	VII Semester									

IST OF FL FOTIVES

	X7 (1 X) ()							
15BEEC7E15	using Lab View	3	0	0	3	40	60	100
15BEEC7E16	Wireless networks	3	0	0	3	40	60	100
15BEEC7E17	Optoelectronic devices	3	0	0	3	40	60	100
15BEEC7E18	Telecommunication System Modeling and Simulation	3	0	0	3	40	60	100
15BEEC7E19	Speech Processing	3	0	0	3	40	60	100
15BEEC7E20	Satellite Communication	3	0	0	3	40	60	100
15BEEC7E21	Radar and Navigational Aids	3	0	0	3	40	60	100
15BEEC7E22	Embedded S ystems	3	0	0	3	40	60	100
15BEEC7E23	Total Quality Management	3	0	0	3	40	60	100
	VIII Sen	neste	r					
15BEEC8E24	Cellular Mobile Communication	3	0	0	3	40	60	100
15BEEC8E25	ASIC Design	3	0	0	3	40	60	100
15BEEC8E26	Artificial Intelligence	3	0	0	3	40	60	100
15BEEC8E27	Disaster Management	3	0	0	3	40	60	100
15BEEC8E28	Power Electronics	3	0	0	3	40	60	100
15BEEC8E29	Digital Image processing	3	0	0	3	40	60	100
15BEEC8E30	Computer Hardware and Interfacing	3	0	0	3	40	60	100
15BEEC8E31	High Speed Networks	3	0	0	3	40	60	100
15BEEC8E32	Advanced digital signal processing	3	0	0	3	40	60	100
15BEEC8E33	Photonics	3	0	0	3	40	60	100
15BEEC8E34	Artificial Neural Networks	3	0	0	3	40	60	100
15BEEC8E35	FPGA Design	3	0	0	3	40	60	100
15BEEC8E36	Internet and java	3	0	0	3	40	60	100
15BEEC8E37	Nano Electronics	3	0	0	3	40	60	100

L: Lecture Hour

T: Tutorial Hour P: Practical hour C: Credit

CIA: Continuous Internal Assessment **ESE: End Semester Examination**

COURSES OFFERED TO OTHER DEPARTMENTS

Electronics & Communication Engineering									
15BFFC70F01	Real Time Embedded	3	0	0	3	40	60	100	
15DLLC/OL01	S ystems	5	U	V	5	-10	00	100	
15BEEC7OE02	Consumer Electronics	3	0	0	3	40	60	100	
15BEEC7OE03	Fundamentals of	3	0	0	3	40	60	100	
15DLLC/0L05	Nanotechnology	5	v	V	5	10	00	100	
15BEEC7OE04	Image &Video Processing	3	0	0	3	40	60	100	
15BEEC7OE05	VLSITechnology	3	0	0	3	40	60	100	

LIST OF OPEN FLECTIVES

15BEEC7OE06	Fundamentals of MEMS	3	0	0	3	40	60	100
15BEEC7OE07	Neural Networks and its Applications	3	0	0	3	40	60	100
15BEEC7OE08	Fuzzy Logic and its Applications	3	0	0	3	40	60	100

COURSES OFFERED BY OTHER DEPARTMENTS

Science & Humanities										
SUB. CODE	TITLE OF THE COURSE	L	Т	Р	С	CIA	ESE	TOTAL		
15BESH7OE01	Industrial Mathematics I	3	0	0	3	40	60	100		
15BESH7OE02	Industrial Mathematics II	3	0	0	3	40	60	100		
15BESH7OE03	Probability and Random Process	3	0	0	3	40	60	100		
15BESH7OE04	Probability and Statistical Methods	3	0	0	3	40	60	100		
15BESH7OE05	Probabiliy and Queuing Theory	3	0	0	3	40	60	100		
15BESH7OE06	Fuzzy Mathematics	3	0	0	3	40	60	100		
15BESH7OE07	Mathematical Physics	3	0	0	3	40	60	100		
15BESH7OE08	Advanced Engineering Mathematics	3	0	0	3	40	60	100		
15BESH7OE09	Linear Algebra	3	0	0	3	40	60	100		
15BESH7OE10	Transforms and partial differential equations	3	0	0	3	40	60	100		
15BESH7OE11	Technical Writing	3	0	0	3	40	60	100		
15BESH7OE12	Geoph ysics	3	0	0	3	40	60	100		
15BESH7OE13	Engineering Acoustics	3	0	0	3	40	60	100		
15BESH7OE14	Alternate Fuels and Energy S ystems	3	0	0	3	40	60	100		
15BESH7OE15	Solid Waste Management	3	0	0	3	40	60	100		
15BESH7OE16	Green Chemistry	3	0	0	3	40	60	100		
15BESH7OE17	Applied Electrochemistry	3	0	0	3	40	60	100		
15BESH7OE18	Industrial Chemistry	3	0	0	3	40	60	100		
	Computer Scienc	e Eng	gine	erin	g					
15BECS7OE01	Python Programming	3	0	0	3	40	60	100		
15BECS7OE02	Internet Programming	3	0	0	3	40	60	100		
15BECS7OE03	Multimedia and Animation	3	0	0	3	40	60	100		
15BECS7OE04	PC hardware and Trouble shooting	3	0	0	3	40	60	100		
15BECS7OE05	Game Programming	3	0	0	3	40	60	100		
	Electrical & Electronics Engineering									
15BEEE7OE01	Electric Hybrid Vehicles	3	0	0	3	40	60	100		

LIST OF OPEN ELECTIVES

15BEEE7OE02	Energy Management & Energy Auditing	3	0	0	3	40	60	100	
15BEEE7OE03	Sensors & Transducers	3	0	0	3	40	60	100	
15BEEE7OE04	Programmable Logic Controller	3	0	0	3	40	60	100	
15BEEE7OE05	Renewable Energy Resources	3	0	0	3	40	60	100	
15BEEE7OE06	Advanced Control Systems	3	0	0	3	40	60	100	
Bio Technology									
15BTBT7OE01	Bioreactor Design	3	0	0	3	40	60	100	
15BTBT7OE02	Food Processing and Preservation	3	0	0	3	40	60	100	
15BTBT7OE03	Molecular Modeling	3	0	0	3	40	60	100	
15BTBT7OE04	Bioremediation	3	0	0	3	40	60	100	
15BTBT7OE05	Bioph ysics	3	0	0	3	40	60	100	
15BTBT7OE06	Basic Bioinformatics	3	0	0	3	40	60	100	
15BTBT7OE07	Fundamentals of Nano Biotechnology	3	0	0	3	40	60	100	
Mechanical Engineering									
15BEME7OE01	Introduction to MEMS	3	0	0	3	40	60	100	
15BEME7OE02	Robotics	3	0	0	3	40	60	100	
	Industrial Safet y &	3	0	0	3	40	60	100	
15BEME7OE03	Environment	5	Ŭ		U		00	100	
15BEME7OE03 15BEME7OE04	Environment Transport phenomena	3	0	0	3	40	60	100	
15BEME7OE03 15BEME7OE04 15BEME7OE05	Environment Transport phenomena Introduction to Bio Mechanics	3 3	0 0	0	3 3	40 40	60 60	100 100 100	
15BEME7OE03 15BEME7OE04 15BEME7OE05	Environment Transport phenomena Introduction to Bio Mechanics Automobile E	3 3 ngine	0 0 eerin	0 0 1g	3	40 40	60 60	100 100	
15BEME7OE03 15BEME7OE04 15BEME7OE05 15BEAE7OE01	Environment Transport phenomena Introduction to Bio Mechanics Automobile Engineering	3 3 ngino 3	0 0 eerin 0	0 0 1g 0	3 3 3	40 40 40	60 60 60	100 100 100 100	
15BEME7OE03 15BEME7OE04 15BEME7OE05 15BEAE7OE01 15BEAE7OE02	Environment Transport phenomena Introduction to Bio Mechanics Automobile Engineering Basics of two and three wheelers	3 3 3 ngino 3 3	0 0 eerin 0 0	0 0 g 0 0	3 3 3 3 3	40 40 40 40 40	60 60 60 60 60	100 100 100 100 100	
15BEME7OE03 15BEME7OE04 15BEME7OE05 15BEAE7OE01 15BEAE7OE02 15BEAE7OE03	Environment Transport phenomena Introduction to Bio Mechanics Automobile Engineering Basics of two and three wheelers Automobile Maintenance	3 3 ngino 3 3 3 3	0 0 eerin 0 0 0	0 0 1 9 0 0 0	3 3 3 3 3 3	40 40 40 40 40 40	60 60 60 60 60	100 100 100 100 100 100	
15BEME7OE03 15BEME7OE04 15BEME7OE05 15BEAE7OE01 15BEAE7OE02 15BEAE7OE03 15BEAE7OE04	Environment Transport phenomena Introduction to Bio Mechanics Automobile Engineering Basics of two and three wheelers Automobile Maintenance Introduction to Modern Vehicle Technology	3 3 3 3 3 3 3 3	0 0 eerin 0 0 0 0	0 0 0 0 0 0 0	3 3 3 3 3 3 3	40 40 40 40 40 40 40 40	60 60 60 60 60 60 60	100 100 100 100 100 100 100	
15BEME7OE03 15BEME7OE04 15BEME7OE05 15BEAE7OE01 15BEAE7OE02 15BEAE7OE03 15BEAE7OE04	Environment Transport phenomena Introduction to Bio Mechanics Automobile Engineering Basics of two and three wheelers Automobile Maintenance Introduction to Modern Vehicle Technology Civil Engin	3 3 3 3 3 3 3 3 9	0 0 eerin 0 0 0 0 0 0	0 0 0 0 0 0 0	3 3 3 3 3 3 3	40 40 40 40 40 40 40	60 60 60 60 60 60 60 60 60 60 60 60 60 60 60 60 60 60 60	100 100 100 100 100 100	

15BECE7OE02	Building Services	3	0	0	3	40	60	100
15BECE7OE03	Coastal Zone Management	3	0	0	3	40	60	100
15BECE7OE04	Experimental method and model anal ysis	3	0	0	3	40	60	100
15BECE7OE05	Management of Irrigation systems	3	0	0	3	40	60	100
15BECE7OE06	Computer aided design of structures	3	0	0	3	40	60	100
15BECE7OE07	Pavement Engineering	3	0	0	3	40	60	100
15BECE7OE08	Rock Engineering	3	0	0	3	40	60	100
15BECE7OE09	Storage structures	3	0	0	3	40	60	100
15BECE7OE10	WindEngineering	3	0	0	3	40	60	100
15BECE7OE11	Advanced construction technology	3	0	0	3	40	60	100

L: Lecture Hour	T: Tutorial Hour	P: Practical hour	C : Credit
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CIA: Continuous Internal Assessment ESE: End Semester Examination

Ka	Karpagam Academy of Higher Education			
Category	No. of credits	Percentage		
Science and Humanities	35 Credits	18.63%		
Core Engineering	86 Credits	45.74%		
Allied Engineering& Management	33 Credits	17.55%		
Project	12 Credits	6.38%		
Department Electives	22 Credits	11.70%		
Total Credits	188 Credits	100		

SEMESTER I

15BECC101 COMMUNICATIVE ENGLISH – I OBJECTIVES:

- To help students acquire their ability to speak effectively in real life situations.
- □ To inculcate the habit of reading and to develop their effective reading skills.
- □ To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

INTENDED OUTCOMES:

Students undergoing this course will be able to

- Use English language for communication: written & spoken.
- □ Enrich comprehension and acquisition of speaking & writing ability.
- Gain confidence in using English language in real life situations.
- Improve word power: lexical, grammatical and communication competence

Unit I

Listening – Types of listening - Listening to class reading - Video tapes/ audio tapes. Speaking – Introduction on self - Introduction on one's friend. Reading - Reading for comprehension – Reading different kind of passages like descriptive, narrative, objective, conversational and argumentative. Writing – Free writing on any topic –M y favorite place, hobbies, dreams, goals, etc- Writing short messages - To fill in different application forms. Grammar – Articles- WH questions –Yes/No Question - Subject Verb agreement. Vocabulary - Word Formation – Word expansion (Root word) - Prefix and Suffix.

Unit II

Listening – Understanding the passage in English –Pronunciation Practice. **Speaking** – Asking and answering questions - Telephone etiquette. **Reading** – Critical Reading – Finding key information in a given text (Skimming - scanning). **Writing** – Coherence and cohesion in writing – Short paragraph writing – Letters to the Editor. **Grammar** – Parts of Speech – Noun – Verb – Adjectives - Adverbs. **Vocabulary** – Compound Nouns/Adjectives – Irregular verbs.

Unit III

Listening – Listening for specific task – Fill in the gaps. Speaking – Phonemes – Syllables – Role play

Conversation Practice. Reading – Reading and Comprehension. Writing - Autobiographical writing – Biographical writing - Instruction Writing. Grammar – Preposition – Infinitive – Gerund – Tenses.
 Vocabulary – Foreign words used in English – British and American usage.

Unit IV

Listening – Responding to questions – Reading in class for complete understanding and for better pronunciation. **Speaking** – Debate, Presentations in seminars. **Reading** – Making inference from the reading passage – Predicting the content of reading passages. **Writing** - Interpreting visual materials (tables, graphs, charts, etc) – Formal and Informal letters. **Grammar** – Sentence Pattern – Voice (active and passive voice). **Vocabulary** – One word substitution.

Unit V

Listening - Listening to different accents, speeches/presentations. **Speaking**- Extempore talk –Just-aminute talk. **Reading**-Reading strategies–Intensive reading – Text analysis. **Writing** - Creative writing – Writing circulars and notices – Writing proposal. **Grammar** – Direct and Indirect speech – Conditional sentences - Auxiliary verbs. **Vocabulary** – Abbreviations & Acron yms.

Note: Students to have hands on experience in the language lab at two periods per unit.

TEXT BOOKS:

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATIO
1	Sangeeta Sharma , Meenakshi Raman	Technical Communication: Principles And Practice 2 nd Edition	OUP	2015

REFERENCES:

S.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAROF
NO.		BOOK		PUBLICATIO
1	Rizvi Ashraf, M	Effective Technical	Tata McGraw-Hill,	2007
		Communication	New Delhi.	
2	Rutherford Andrea, J.	Basic	Pearson Education, New	2006
		Communication	Delhi.	
		Skills for		
		Technology		
3	Lakshminara yanan,	Communication	SCITECH Publications,	2008
	K.R. & Murugavel, T.	Skills for Engineers	Chennai	

WEBSITES:

 www.learnerstv.com

 www.usingenglish.com

 www.englishclub.com

 www.ispeak youspeak.blogspot.com

 www.teachertube.com

 www.Dictionary.com

15BECC102

OBJECTIVES:

- To develop analytical skills for solving different engineering problems.
- To understand the concepts of Matrices, sequences and series.
- To solve problems by applying Differential Calculus and Differential equations.

INTENDED OUTCOMES:

The student will be able to

- apply advanced matrix knowledge to Engineering problems.
- improve their ability in solving geometrical applications of differential calculus problems
- solve engineering problems involving hyperbolic functions, Beta and Gamma functions
- \Box expose the concept of sequences and series

UNIT I MATRICES

Review of Matrix Algebra - Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Cayle y-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction to canonical form through orthogonal reduction.

UNIT II DIFFERENTIAL CALCULUS

Overview of Derivatives - Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes- Evolutes as Envelope of normals – Maxima and Minima of functions of two or more Variables – Method of Lagrangian Multipliers

UNIT III SEQUENCES AND SERIES

Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparision test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional eonvergence.

UNIT IV HYPERBOLIC FUNCTIONS, BETA AND GAMMA FUNCTIONS

Hyperbolic functions: Hyperbolic functions and Inverse Hyperbolic functions – Identities – Real and imaginary parts – solving problems using hyperbolic functions.

Beta And Gamma Functions : Definitions – Properties – Relation between beta and gamma integrals – Evaluation of definite integrals in terms of beta and gamma functions.

UNIT V DIFFERENTIAL EQUATIONS

Linear Differential equations of second and higher order with constant coefficients - Euler's form of Differential equations – Method of variation parameters.

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Hemamalini. P.T	Engineering Mathematics	McGraw Hill Education (India) Private Limited, New Delhi	2014
2	Sundaram, V. Lakhminara yan,K.A. & Balasubramanian,R.	Engineering Mathematics for first year.	Vikas Publishing Home, New Delhi	2006

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
2	Grewel. B. S.	Higher Engineering Mathematics	Khanna Publications, New Delhi.	2011
3	Bhaskar Rao. P. B, Sri Ramachar y SKVS, Bhujanga Rao. M	Engineering Mathematics I	BS Publications	2008
4	Shahnaz Bathul	TextbookofEngineeringMathematics(SpecialFunctionsandComplex Variables)	PHI Publications	2009
5	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2006

WEBSITES:

- 1. www.efunda.com
- 2. www.mathcentre.ac.uk
- 3. www.intmath.com/matrices-determinants

15BECC103ENGINEERING PHYSICSOBJECTIVE:

□ To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology

INTENDED OUTCOME:

□ The students will have the knowledge on the basics of physics related to properties of matter, fiber optics, quantum, crystal physics and that knowledge will be used by them in different engineering and technology applications

UNIT I PROPERTIES OF MATTER AND THERMODYNAMICS

Three types of modulus of elasticit y – basic definitions, relation connecting the modulii (Derivation), poison ratio- Torsional pendulum- bending of beams- bending moment – basic assumption of moment – uniform and non uniform bending

Concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

UNIT II LASER AND FIBER OPTICS

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER - CO₂, Semiconductor LASER Applications of LASER in industry and Medicine.

Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (Block diagram)

UNIT III QUANTUM PHYSICS

Introduction to quantum theory – Compton effect- dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – physical significance of wave function, Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box. Scanning electron microscope.

UNIT IV CRYSTAL PHYSICS

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures-crystal defects – point, line and surface defects

UNIT V ULTRASONICS AND NUCLEAR PHYSICS

Production of Ultrasonics by piezo electric method-Non destructive testing-Pulse echo-system through transmission and reflection modes-A, B and C scan displays, medical Applications-Sonogram.

Introduction – basics about nuclear fission and fusion, nuclear composition –Radiation detectors –semi conductor detector. Reactors –essentials of nuclear reactor- power reactor.

TEXT BOOK:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Ganesan.S and Baskar.T	Engineering Physics I	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of
				Publication
1	Serway and Jewett	Physics for Scientists	Thomson	2007
		and Engineers with	Brooks/Cole, Indian	
		Modern Physics	reprint, New Delhi	
2	Gaur, R.K. and	Engineering Physics	Dhanpat Rai	2003
	Gupta, S.C		Publications,New	
			Delhi.	

WEBSITES:

- 1. www.nptel.ac.in
- www.physicsclassroom.com
 www.oyc.yale.edu
 www.physics.org

15BECC104 OBJECTIVES:

- □ To understand about the water technology.
- □ To get the information on electrochemical cells, batteries, fuels and combustion.
- □ To study about the corrosion and protective coatings.
- □ To gain knowledge on adsorption phenomena.

INTENDED OUTCOME:

□ This course will create an impact on the students and make them to realize the modern utility on electrochemical cells, batteries, fuels and combustion process, corrosion and adsorption methods.

UNITI WATER TECHNOLOGY

Characteristics – Alkalinity – Types of alkalinity and determination – Hardness – Types and estimation by EDTA method (problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination and Reverse osmosis.

UNIT II ELECTROCHEMISTRY AND STORAGE DEVICES

Electrochemical cells – Reversible and irreversible cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes –Standard Hydrogen electrode - Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox - $Fe^{2+}vs$ dichromate) –Batteries- Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery.

UNIT III FUELS AND ROCKET PROPELLANTS

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method -Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer gas, An introduction to Fuel Cell, H₂-O₂ Fuel Cell -Rocket engines-Types of rocket engines, Basic principles, Mass fraction.

UNIT IV CORROSION SCIENCE

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings - Paints - Constituents and functions -- Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating and Hot dipping.

UNIT V SURFACE CHEMISTRY

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm-Industrial

adsorbent materials- Role of adsorbents in catalysis and water softening-Emulsion-Types-water/oil, oil/water- Applications of adsorption.

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Dr.S.Vairam	Engineering chemistry	Gems publishers	2014
2.	Ravikrishnan, A	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company Private Ltd., Chennai.	2012

REFERENCE BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Kuriakose, J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5 th edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010
2.	Sharma, B. K	Engineering Chemistry	Krishna Prakasam Media (P) Ltd., Meerut	2001
3.	Raman sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., NewDelhi,3 rd reprint.	2013
4.	Dara, S.S	Text book of Engineering Chemistry.	S.Chand & Co.Ltd., New Delhi	2008
5.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009

WEBSITES:

- 1. http://www.studynotes.ie/leaving-cert/chemistry/
- 2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html
- 3. http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
- 4. https://www.sophia.org/subjects/chemistr y
- 5. http://ocw.mit.edu/courses/#chemistry

15BEEC105 COMPUTER FUNDAMENTALS AND C PROGRAMMING 3 0 0 3 100

INTENDED OUTCOMES:

- Identify and understand the working of key components of a computer system.
- □ Identify and understand the various kinds of input-output devices and different types of storage media commonly associated with a computer
- □ Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure
- □ Study, analyze and understand logical structure of a computer program, and different construct to develop a program in 'C' language

UNIT I: OVERVIEW OF COMPUTER

What is computer- Computer Components-Generation of Computers- Memory Organization-Memory Types-Input and Output Devices- Concepts of Hardware and Software- What is OS-Windows and Unix OS- Programming Languages- Basics of Computer Networks- LAN, WAN-Concept of Internet- ISP-Basics of word processing- Basics of spreadsheet – Basics of presentation Software

UNIT II: OVERVIEW OF 'C'

Algorithms-Representation of Algorithms-Flowchart-Introduction to programming Languages-What is C- C Character set- Constants, Variables and Keywords-General form of C Program-The First C Program-Data types-Arithmetic Instructions- Type conversions- Relational and Logical Operators-Hierarchy and associativity

UNIT III: SELECTION AND ITERATION

Selection Structures- If and nested if - Loops-Definition and types-While loop-for loop- do-while loopbreak and continue- Nested loops- Advantages of iteration-Menu driven programs-Switch Case

UNIT IV: FUNCTIONS

Functions- Definition-types-Functions without arguments- Functions with Input arguments- Functions with output parameters-local and global variables- advantages of functions- Call by value and Call by reference- Recursion-Function as an argument

UNIT V:ARRAYS AND STRINGS

Arrays-definition- Declaring and referencing arrays- Array initialization- Using for loops for accessing arrays-Passing array elements as function arguments-2D Array - Matrix Addition and multiplication-Introduction to Strings- declaration and Initialization--String constant -Strings as Array of Characters

TEXT BOOK:

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Balagurusam y, E	Computing Fundamentals and C Programming	Tat McGrawHill Company Ltd. New Delhi.5 th Edition	2014

REFERENCES:

S.NO	Author(s) Name	Title of the book	Publisher	Year of publicat ion
1	H. M. Deitel and D. J. Deitel,	C: How to Program'	Prentice Hall India, New Delhi 7 th Edition	2012
2	E. Balagurusam y	Programming in ANSIC	Tata McGrawHill Company Ltd., New Delhi	6 th edition, 2012
3	Yashavant kanetkar. C	Let Us C	BPB Publishers, Chennai. 13 th Edition	2013

Websites:

1. <u>https://scratch.mit.edu/</u> for Programming in Scratch

15BECC111 ENGINEERING PHYSICS AND CHEMISTRY LABORATORY 0032100

OBJECTIVE:

To develop basic laboratory skills and demonstrating the application of physical principles.

INTENDED OUTCOME:

□ The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.

LIST OF EXPERIMENTS – PHYSICS

- 1. Determination of velocity of sound and compressibility of liquid Ultrasonic interferometer.
- 2. Determination of wavelength of mercury spectrum spectrometer grating.
- 3. Determination of Young's modulus of the material Non uniform bending or Uniform bending.
- 4. Determination of Viscosity of liquid Poiseuille's method.
- 5. Spectrometer Dispersive power of a prism.
- 6. Torsional pendulum Determination of Rigidity modulus.
- 7. Particle size determination using Diode Laser
- 8. Determination of Laser parameters Wavelength, and angle of divergence.
- 9. Determination of acceptance angle in an optical fiber.
- 10. Determination of thickness of a thin wire Air wedge method
- 11. Determination of Band Gap of a semiconductor material.
- 12. Determination of Specific resistance of a given coil of wire Carey Foster Bridge

OBJECTIVE:

□ To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

INTENDED OUTCOME:

□ The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.

LIST OF EXPERIMENTS - CHEMISTRY

- 1. Estimation of alkalinity of Water sample
- 2. Estimation of hardness of Water by EDTA
- 3. Estimation of Chloride in Water sample (Argentometric method)
- 4. Determination of corrosion rate by weight loss method.
- 5. Determination of molecular weight and degree of polymerization using viscometry.
- 6. Conductometric Titration (Simple acid base).
- 7. Conductometric Titration (Mixture of weak and strong acids).
- 8. Conduct metric Titration using BaCl₂ vs Na₂ SO₄.
- 9. pH Titration (acid & base).

- 10. Potentiometric Titration (Fe²⁺ / KMnO₄ or K₂Cr₂O₇).
 11. Determination of water of crystallization of a crystalline salt (Copper sulphate).
 12. Estimation of Ferric ion by spectrophotometr y.
 13. Determination of Chemical Ox ygen Demand.
15BEEC112 COMPUTER PRACTICES AND PROGRAMMING LABORATORY 0 0 3 2 100

INTENDED OUTCOMES:

- □ To know the correct and efficient ways of solving problems
- □ To learn to develop algorithm for simple problem solving
- \Box To learn to program in C

LIST OF EXERCISES

- 1. Working with word Processing, Spreadsheet and presentation software in Linux
- 2. Programming in Scratch:

Practicing fundamental concepts of programming like sequence, selection decision statements, working of loops and event driven programming

3. C Programming:

Practicing programs to get exposure to basic data types, algebraic expressions, Conditional statements, Input and Output Formatting, Decision Statements, Switch Case, Control structures, arrays, Strings and functions

15BEEC113

ENGINEERING GRAPHICS

INTENDED OUTCOMES

- 1. To introduce the basic concepts and the use of engineering drawing in the design and manufacturing field.
- 2. To develop graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings

UNIT I INTRODUCTION

Introduction to Engineering Drawing, 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.

UNIT II SCALES AND PLANE CURVES

SCALES: Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

UNIT III 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 – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT IV PROJECTION OF POINTS, LINES AND PLANE SURFACES

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT V PROJECTION OF SOLIDS

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

Introduction to Drafting Software/Package (Not for Exam):

Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

TEXT BOOKS

- 1. Venugopal K and Prabhu Raja V, "Engineering Graphics", New Age International Publishers, 2007.
- 2. VTU, "A Primer on Computer Aided Engineering Drawing" Belgaum, 2006.

REFERENCES

- 1. Kumar M S, "Engineering Graphics", D D Publications, Chennai, Ninth Edition, 2007.
- 2. Bureau of Indian Standards, "Engineering Drawing Practices for Schools and Colleges SP 46-2003", BIS, New Delhi, 2003.
- 3. Luzadder W J, "Fundamentals of Engineering Drawing", Prentice Hall Book Co., New York, 1998.

WEB REFERENCES

- 1. IS 10711 2001: Technical products Documentation Size and lay out of drawing sheets.
- 2. IS 9609 (Parts 0 and 1) 2001: Technical products Documentation Lettering.
- 3. IS 10714 (Part 20) 2001 and SP 46 2003: Lines for technical drawings.
- 4. IS 11669–1986 and SP 46–2003: Dimensioning of Technical Drawings.
- 5. IS 15021 (Parts 1 to 4) 2001: Technical drawings Projection Methods.

HUMAN VALUES

To educate the values and meaning of life in the young minds and to transform them as responsible citizens

UNIT - I : Human life on Earth - Concept of Human Values - Value Education - Aim of education and

value education - Types of values - Components of values - Attitudes - types of attitudes

UNIT - II : Self Development : Self analysis - Goal Setting - Thought Analysis - Guarding against

Anger - Respect to age, experience, maturity, family members, neighbors, co-workers

 $UNIT-III: Individual \ Qualities-Truthfulness-Constructivity-Sacrifice-Sincerity-Self \ Control-Constructivity-Sacrifice-Sincerity-Self \ Control-Constructivity-Self \ Control-Constructivity-Sacrifice-Sincerity-Self \ Control-Constructivity-Sacrifice-Sincerity-Self \ Control-Constructivity-Sacrifice-Sincerity-Self \ Control-Constructivity-Self \ Constructivity-Self \ Control-Constructivity-Self \ Constructivity-Self \ Constructivity-Self \ Control-Constructivity-Self \ Constructivity-Self \ Construc$

Altruism – Tolerance - Scientific Vision – Regulating Desire

UNIT - IV: Mind Culture - Modern Challenges of Adolescent - Emotions and behavior - Sex and

spirituality - Adolescent Emotions - Meditation

UNIT - V: Body and Mind Fitness: (a) Physical Exercises (b) Activities: (i) Moralization of Desires

(ii) Neutralization of Anger (iii) Eradication of Worries (iv) Benefits of Blessings

S.No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Subramanian. R	Professional Ethics	Ox ford, New Delhi	2013
2	Govindarajan. M, Natarajan. S, Senthil Kumar. V.S	Engineering Ethics	Prentice Hall of India, New Delhi	2004
3	Tripathi. A.N	Human Values	New Age International	2009
4	Pope. G. U.	Thirukkural with English Translation	Uma Publication, Thanjavur.	2002

Reference Books

- □ To motivate learners to acquire listening & speaking skills in both formal and informal context.
- □ To focus on question forms & to make them understand the importance of using question tags and also the functional use of transformation of sentences.
- □ To improve their reading habit and to train them in critical and analytical reading.
- □ To equip them to write for academic as well as work place context.
- □ To enable students to face interviews.

INTENDED OUTCOMES:

Students undergoing this course will be able to

- □ Acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- Enhance them reading texts critically and analytically.
- Develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Enrich the ability to face interviews with confidence.

UNIT-1

Listening - Difference between Hearing & Listening –Listening to informal conversation. **Speaking** - Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., **Reading** – Extensive and Intensive reading. **Writing** – Report writing - Writing a Covering letter. **Grammar** – Regular & Irregular verbs - Kinds of sentence - Question tags. **Vocabulary** – Homonyms and Homophones.

UNIT-II

Listening – Note Taking- Improving grasping ability. Speaking – Welcome Address - Vote of thanks - Master of ceremon y. Reading – Active and Passive reading - Reading for vocabular y- Reading for a purpose. Writing - Writing a review (Film review) - Summar y of a story. Grammar - Modal verbs – Conjunction - Expression of cause and effect. Vocabulary - Phrasal verbs - Idioms.

UNIT – III

Listening - Barriers to listening (Physical, Psychological, Linguistic & Cultural). **Speaking** – Stress, Pause and Intonation. **Reading** – Rapid Reading – Skimming, Scanning and Surveying. (SQ3R)**Writing**

- Essay writing -Minutes of Meeting - Agenda – **Grammar** - Active and Passive voice - Purpose Expression. **Vocabulary** - Same words used as noun and verb - often misspelt and confused words.

UNIT-IV

Listening – Listening to telephone conversation - Viewing model interviews. Speaking – Group Discussion - Correlation between verbal & non - verbal communication. Reading – Reading Comprehension (short & long text) - Reading job advertisements and profile of a compan y. Writing – Job Application - Resume Writing - Checklist Preparation. Grammar - Numerical Expressions – Collocations - Vocabulary - Singular and Plural (Nouns)

UNIT-V

Listening – Types of Listening- Improving listening comprehension. **Speaking** - Oral presentation - Vocal communication techniques - voice, quality, volume, pitch etc., **Reading** -Note Making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation Writing – Short Essa ys Writing- **Grammar**- Transformation of sentences (Simple, Compound & Complex). **Vocabulary** - Collection of Technical Vocabulary with their meanings. Note: Students to have hands on experience in the language lab at two periods per unit.

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO
1	<u>Sangeeta</u>	Technical Com	OUP	2015
	<u>Sharma</u> ,	munication:		
	Meenakshi	Principles And		
	Raman	Practice		
		2 nd Edition		

REFERENCES:

S.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
NO.		BOOK		PUBLICATIO
1	Rizvi Ashraf, M	Effective	Tata McGraw-Hill,	2007
		Technical	New Delhi.	
		Communication		
2	Rutherford Andrea, J.	Basic	Pearson Education,	2006
		Communication	New Delhi.	
		Skills for		
		Technology		
		2 nd Edition		
3	Lakshminara yanan,	Communication	SCITECH Publications,	2008
	K.R. & Murugavel, T.	Skills for	Chennai	
		Engineers		

WEBSITES:

www.learnerstv.com www.usingenglish.com www.englishclub.com

www.ispeakyouspeak.blogspot.com

www.teachertube.com

www.Dictionary.com

15BECC202 ENGINEERING MATHEMATICS II

OBJECTIVES:

- To understand the concepts and applications of partial differential equations
- To have knowledge in integral calculus and Vector calculus
- □ To expose to the concept of Analytical function and Complex integration.

INTENDED OUTCOMES:

The student will be able to

- solve problems in Fluid Dynamics, Theory of Elasticity, heat and mass transfer etc.
- find the areas and volumes using multiple integrals
- improve their ability in Vector calculus
- expose to the concept of Analytical function.
- apply Complex integration in their Engineering problems

UNIT-I PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT-II MULTIPLE INTEGRALS

Double integral – Cartesian coordinates – Polar coordinates – Change of order of integration – Triple integration in Cartesian co-ordinates – Area as double integrals.

UNIT-III VECTOR CALCULUS

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem, Gauss divergence theorem and Stoke's theorems (Statement Only)- Surfaces : hemisphere and rectangular parallelopipeds.

UNIT-IV ANALYTIC FUNCTIONS

Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms – Sufficient condition for an analytic function (Statement Only) - Properties of analytic functions – Constructions of an analytic function - Conformal mapping: w = z+a, az, 1/z, z^2 and bilinear transformation.

UNIT-V COMPLEX INTEGRATION

Complex Integration - Cauchy's integral theorem and integral formula (Statement Only) – Ta ylor series and Laurent series - Residues – Cauchy's residue theorem (Statement Only) - Applications of Residue theorem to evaluate real integrals around unit circle and semi circle (excluding poles on the real axis).

TEXT BOOK:

S. No.	Author(s) Name	Title of the book	Publisher	Year of
				Publication
1	Hemamalini. P.T	Engineering	McGraw-Hill Education	2014
		Mathematics I & II	Pvt.Ltd, New Delhi	
2	Grewal, B.S.	Higher Engineering	Khanna Publishers, Delhi.	2011
		Mathematics		

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Erwin Kreyszig	Advanced Engineering Mathematics.	John Wiley & Sons. Singapore	2011
2	Venkataraman, M. K.	Engineering Mathematics.	The National Publishing Company, Chennai	2004
3	Narayanan. S, Manicavachagam pillay.T.K and Ramaniah.G	Advanced Mathematics for Engineering Students.	Viswanathan S.(Printers and Publishers) Pvt. Ltd. Chennai.	2002
4	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2006

WEBSITES:

- 1. www. maths-dur.ac
- 2. www.efunda.com
- 3. <u>www.mathcentre.ac.uk</u>
 4. www.sosmath.com/diffeq/laplace/basic/basic.html

15BECC203

OBJECTIVE:

To enrich the understanding of various types of materials and their applications in engineering and technology

INTENDED OUTCOME:

The students will have the knowledge on different types of materials and that knowledge will be used by them in different engineering and technology applications

UNIT I CONDUCTING MATERIALS

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS

Origin of magnetic moment – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications. Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Temperature superconductors – Applications of superconductors – magnetic levitation.

UNIT IV DIELECTRIC MATERIALS

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – Applications of dielectric materials – ferroelectricity and applications.

UNIT V ADVANCED MATERIALS

Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application.Composite materials, Aircraft materials and non-metallic materials.Nano materials: synthesis – Physical and chemical vapour deposition – ball milling - properties of nanoparticles and applications. Carbon nanotubes: structure – properties and applications.

TEXT BOOK:

S.No	Author(s) Name	Title of the book	Publisher	Year of
				Publication
1	Ganesan.S and	Engineering Physics II	GEMS Publisher,	2 nd Edition-
	Baskar.T		Coimbatore-641 001	2015

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	William D Callister Jr	Material Science and Engineering-An Introduction	John Wiley ans Sons Inc., , New York,	6 th Edition 2003
2	James F Shackelford	Introduction to materials Science for Engineers	Macmillan Publication Company, New York	6 th Edition 2004
3	Charles Kittel	Introduction to Solid State Physics	John Wiley & sons, Singapore.	7 th Edition 2007

WEBSITES:

- 1. www.nptel.ac.in
- www.nptointeinii
 www.physicsclassroom.com
 www.oyc.yale.edu
 www.physics.org

- To give a comprehensive insight into natural resources, ecosystem and biodiversity.
- To educate the ways and means of the environment
- □ To protect the environment from various types of pollution.
- □ To impart some fundamental knowledge on human welfare measures.

INTENDED OUTCOME:

□ Students will prepare themselves to go ecofriendly and help preserving the nature and environment.

UNITI INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

Definition, Scope and Importance – Need for public awareness -Forest resources: Use and overexploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sourcesrole of an individual in conservation of natural resources.

UNIT II ECOSYSTEM

Chemistry and Environment-Environmental segments, Composition and Structure of atmosphere-Concept of an ecosystem-Structure, components and function of an ecosystem Energy flow in the ecosystem – Food chain, food web and ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marine ecosystem)

UNIT III BIODIVERSITY

Introduction to biodiversity, Definition- Genetic diversity, species diversity and ecosystem diversity, Biogeographical classification of India, Importance of biodiversity-Value of biodiversity-Hot Spots of biodiversity-Threats to biodiversity-Endangered and endemic Species of India – 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, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-.Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution–Disaster management:-earthquake, tsunami, cyclone and landslides.

UNIT V SOCIAL ISSUES AND ENVIRONMENT

From Unsustainable to Sustainable development, Urban problems related to energy sources, Water conservation, Rain water harvesting and watershed management, Resettlement and rehabilitation of people, its problems and concerns, Environmental ethics- Issues and possible solutions- Climate change- Green house effect and global warming, acid rain, ozone layer depletion, Wasteland reclamation- Environment Protection Act- Human Rights- Value Education, Role of Information Technology in Environment and human health-Population growth, variation of population among nations-Population explosion.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Ravikrishnan, A	Environmental Science	Sri Krishna Hi tech Publishing Company Private Ltd., Chennai	2012
2.	Anubha kaushik C.P. Kaushik	Environmental Science and Engineering	New Age International (p) Ltd., New Delhi.	2010

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Linda D. Williams	Environmental Science Demystified	Tata Mc Graw -Hill Publishing Company Limited, New Delhi.	2005
2.	Tyler Miller G. Jr	Environmental Science	Thomson & Thomson Publishers, New Delhi.	2004
3.	William P.Cunningham	Principles of Environmental Science	Tata Mc Graw -Hill Publishing Company, New Delhi.	2008
4.	Bharucha Erach	Environmental Science Demystified	Mapin Publishing Private Limited, Ahmadabad	2005
5.	Trivedi, R.K. and Goel, P.K	Introduction to Air Pollution	Techno-Science Publications.	2003

WEBSITES:

- 1. http://people.eku.edu/ritchisong/envscinotes1.html
- 2. http://nptel.ac.in/courses.php?disciplineId=120
- 3.www.newagepublishers.com/samplechapter/001281.
- 4.<u>www.unesco.org/ext/field/beijing/scienceb.htm,www.infinitepower.org/education.htm</u>
- 5. http://www.sciencedaily.com/news/top/environment/

ELECTRON DEVICES

15BEEC205 OBJECTIVES

- □ To understand the operational characteristics of a Semiconductor in Equilibrium and Non-Equilibrium conditions.
- To understand the working of PN junction diodes and special purpose diodes.
- □ To understand the basic working physics of BJT and FET both in ideal and non-ideal conditions.
- □ To understand the working of Rectifiers and Voltage regulators.
- □ To understand the fabrication process of Monol ythic ICs

INTENDED OUTCOMES

- □ Understand the fundamental concepts
- □ Logically analyze any electronic circuit
- □ Apply the logic in any application

UNIT I-SEMICONDUCTOR DIODES AND SPECIAL PURPOSE DIODES

Overview on Physics and Properties of Semiconductors: Intrinsic semiconductor – extrinsic semiconductor – Fermi level in an intrinsic semiconductor – conductivity of a metal, intrinsic semiconductor and extrinsic semiconductor – drift – diffusion – recombination – carrier life time.

Semiconductor diodes : Formation of PN junction – working principle – VI characteristics – PN diode currents – diode current equation – diode resistance – transition and diffusion capacitance – diode models – voltage breakdown in diodes.

Special purpose diodes : Zener diode – point-contact diode – backward diode – varactor diode – step-recovery diode – schottky diode, PNPN diode – RF diode.

UNIT II-BIPOLAR TRANSISTORS

Bipolar Transistors: Construction – working – transistor currents –transistor configurations and inputoutput characteristics – Early effect (base width modulation) – Ebers Moll model – transistor as an amplifier –Transistor as a switch.

UNIT III-FIELD-EFFECT TRANSISTORS

Field-Effect Transistors: construction, working and VI characteristics of JFET – comparison of BJT and JFET – MOSFET – enhancement MOSFET, depletion MOSFET, their working principle and VI characteristics, comparison of MOSFET with JFET, comparison of D MOSFET with E MOSFET, CMOS, MESFET, CCD.

UNIT IV-DC POWER SUPPLIES

Rectifiers and Filters: Block schematic of a typical DC power supply, single phase HWR, FWR, full-wave bridge rectifier, power supply filters (ripple factor and efficiency analysis), bleeder resistor, voltage dividers.

Voltage regulators: voltage regulation, Zener diode shunt regulator, transistor series regulator, transistor shunt regulator, switching regulators, design of complete DC power supply circuit.

UNIT V-INTEGRATED CIRCUIT FABRICATION

Integrated circuit – advantages and drawback of ICs – scale of integration –classification of ICs – definition of linear IC and digital IC with examples –manufacturing process of monolithic ICs – fabrication of components (diode, capacitor, bipolar transistor and resistor) on monolithic IC – comparison of MOS ICs and bipolar ICs.

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Millman and Halkias	Electronic devices and Circuits	Tata McGraw Hill International	2010
2	David A.Bell	Fundamental of electronic devices and circuits	Oxford press	2009

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Street Man	Solid State Electronic Devices'	Prentice Hall Of India,6 th edition	2005
2	Mathur Kulshrestha and Chadha	Electron devices and Applications and Integrated circuits'	Umesh Publications	2005
3	Thomas L. Floyd	Electron Devices	Charles and Messil Publications	2012
4	G.K.Mithal	Electronic Devices and Circuits	Khanna Publishers	2013
5	Robert L. Bo ylestad and Louis Nashelsk y	Electronic Devices and Circuit Theory	Pearson Education, 9th Edition,	2009.
6	B. Somanathan Nair	Electronic Devices and Applications	PHĻ	2006

15BEEC206BASIC ELECTRICAL ENGINEERING3 0 0 3 100INTENDED OUTCOMES3 0 0 3 100

 \Box To enable the students to understand the basic concepts in DC (circuit) and AC (circuit) Fundamentals.

- \Box To enable the students to understand the basic principles of electromagnetic fields.
- □ To understand the basic concepts of DC and AC machines.
- □ To understand the basic concepts of Transformers.

UNIT I DC CIRCUITS

Definition of voltage, current - Ohm's Law – Kirchoff's Laws – Stead y State Solution of DC Circuits – Magnetic field - Magneto motive force - Magnetic field strength – Reluctance - Laws of magnetic circuits - Faraday's laws of electromagnetic induction – Lenz law - Fleming's rules.

UNIT II AC CIRCUITS

Introduction to AC Circuits – Waveforms and RMS Values - Power and Power factor- R,L,C circuits – Power triangle - Transient response of RL, RC and RLC Circuits for DC and AC input - Resonance – Series and parallel resonance –Phasor diagram - frequency response – Q-factor and Bandwidth

UNIT III DC MACHINES (Qualitative Treatment Only)

Construction, Principle of Operation, Emf Equations, Types, Characteristics, Applications of DC Generators and DC Motors.

UNIT IV TRANSFORMER AND SINGLE PHASE INDUCTION MOTOR

Construction, Principle of Operation, Basic Equations, Types and Applications of Single phase Transformer and Induction Motor

UNIT V AC MACHINES

Construction, Principle of Operation, Basic Equations, and Applications of Three phase induction motors, Synchronous Generator and Synchronous Motor.

TEXT BOOKS:

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Mittle, V.M	Basic Electrical Engineering	Tata McGraw Hill Edition, New Delhi	2004
2	Mehta, V K	Principles of Electrical Engineering	S.Chand & Company Ltd, New Delhi.	2003

REFERENCES:

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Soni, M.L., Gupta, J.C. and Gupta, P.V	A Course in Electrical Circuits and Fields	Dhanpat Rai and Sons, New Delhi	1998
2	Rajput, R.K	Basic Electrical Engineering	Dhanpat Rai and Sons, New Delhi	2007
3	Nagsarkar, T. K. and Sukhija, M. S	Basics of Electrical Engineering	Oxford press	2006
4	Mahmood Nahvi and Joseph A. Edminister	Electric Circuits Schaum Outline Series	McGraw Hill, New Delhi	2006

15BEEC211 ENGINEERING PRACTICE LABORATORY

INTENDED OUTCOMES:

- 1. To provide exposure to the students with hands on experience on various basic Engineering practices in Civil and Mechanical Engineering
- 2. To provide exposure to the students with hands on experience on various basic Engineering practices in Electrical and Electronics Engineering.

PART – A (CIVIL & MECHANICAL)

1. WELDING

i. Preparation of arc welding of butt joints, lap joints and tee joints.

2. BASIC MACHINING

- i. Simple Turning and Taper turning
- ii. Drilling and Tapping

3. SHEET METAL WORK

i. Model making – Trays, funnels, etc.

4. DEMONSTRATION ON

- i. Smithy operations
- ii. Foundry operations
- iii. Plumbing Works
- iv. Carpentary Works

PART-B (ELECTRICAL & ELECTRONICS)

5. ELECTRICAL ENGINEERING

- i. Study of electrical symbols and electrical equipments.
- ii. Construct the wiring diagram for Stair case wiring and Fluorescent lamp wiring.
- iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energy meter.
- iv. Measurement of electrical quantities voltage, current, power & power factor in R load.
- v. Measurement of energy using single phase energy meter.

6. ELECTRONICS ENGINEERING

- i. Study of Electronic components-Resistor (color coding), capacitors and inductors.
- ii. Soldering practice Components Devices and Circuits Using general purpose PCB.
- iii. Study of logic gates AND, OR, NOT, NOR and NAND.
- iv. Study of HWR and FWR.

REFERENCES

- 1. Jeyachandran, K., Natarajan, S. and Balasubramanian, S, "A Premier on Engineering Practices Laboratory", Anuradha Publications, Kumbakonam, 2007.
- 2. Jeyapoovan, T., Saravanapandian, M, "Engineering Practices Lab Manual", Vikas Puplishing House Pvt. Ltd, Chennai, 2006.
- 3. Bawa, H.S, "Workshop Practice", Tata McGraw Hill Publishing Company Limited, New Delhi, 2007.

15BEEC212 ELECTRON DEVICES LABORATORY 0 0 3 2 100

OBJECTIVES

- 1. To study experimentally the characteristics of diodes, BJT's and FET's.
- 2. To verify practically, the response of various special purpose electron devices.

INTENDED OUTCOMES:

- □ Familiarize the electronic devices and basic electronic components.
- □ Familiar with basic electronic design.
- □ Gain in-depth core knowledge in the design of electronic devices
- Gain knowledge in verifying the characteristics of electronic devices by simulation.

LIST OF EXPERIMENTS

- 1. Characteristics of PN junction and Zener diode.
- 2. Input, Output and Transfer characteristics of CE Configuration.
- 3. Input, Output and Transfer characteristics of CC Configuration
- 4. Characteristics of LDR, Photo-diode and Photo transistor.
- 5. Transfer characteristics of JFET.
- 6. Transfer characteristics of MOSFET (with depletion and enhancement mode)
- 7. Characteristics of LED with three different wavelengths.
- 8. Half wave rectifier, Full wave rectifier and Full wave Bridge rectifier with and without

Capacitive filter

- 9. Series voltage Regulator
- 10. Simulation experiments 1,2,3,5,6 using PSPICE or Multisim.

15BECC251ELEMENTARY BIOLOGYINTENDED OUTCOMES

To understand the basics of biomolecules, human anatomy and physiology To have better understanding of advancements in biology

UNIT-I BASICS OF CELL BIOLOGY

History, Cell theory, Cell Structure-Prokaryotic and Eukaryotic cells, Animal and Plant Cell. Cell cycle, Mitosis, Meiosis and Reproductive cycle.

UNIT-II BIOMOLECULES

Carboh ydrates-Classification, Qualitative tests for sugars, Lipids-Definition, Classification; Proteins- classification and functions; Nucleic acids-basic structure; Hormones-definition, importance; Vitamins.

UNIT-III HUMAN ANATOMY AND PHYSIOLOGY

Levels of Structural organization, the eleven systems of human body, central nervous system- cardiovascular system and immune system.

UNIT-IV GENETICS AND GENETIC DISORDERS

History of genetics-Scope and Importance of genetics, Mendel and his work, DNA stores genetic information- gene mutation, disorders due to mutant genes.

UNIT-V TECHNOLOGICAL ADVANCES IN BIOLOGY

Biopharmaceuticals, Gene therapy, genetically modified crops, probiotics.

TEXT BOOK

S.No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Verma, P. S., Agarwal, V. K.	Cell Biology, Genetics, Molecular Biology, Evolution and Ecology	S. Chand & Compan y Ltd.,	2006

REFERENCE BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Nelson, D. L and Cox, M. M	LehningerPrinciples of Biochemistry 4 th Edition	Freeman, W. H. & Company	2004
2	Tortora, G. J., Derrickson, B	Principles of Anatom y and Physiology, 11 th Editioh	John Wiley & Sons	2006

WEBSITE

1. http://www.biotechonweb.com/Application-of-biotech-in-Medical.html

SEMESTER III

15BEEC301 METHODS OF APPLIED MATHEMATICS 3 2 0 4 100

OBJECTIVES:

To hone the analytical skills in the minds of Engineers.

- □ To provide sound foundation in the mathematical fundamentals necessary to formulate, solve and analyze Engineering problems.
- To study the basic principles of different transforms and Partial Differential Equations.

INTENDED OUTCOMES:

- The students will have a lucid idea about Laplace, Fourier and Z-transforms.
- The Learners can equip themselves in the transform techniques.
- □ Better understanding in problems related to Heat conduction, communication systems, electro optics and electromagnetic theory, using the techniques will be learnt in this course.

UNIT-I LAPLACE TRANSFORM

Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals – Initial and final value theorems. Inverse Laplace transforms – Convolution theorem (statement onl y) – Solution of Ordinary Differential Equations with constant coefficients using Laplace transforms – Transform of periodic functions

UNIT-II FOURIER SERIES

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT-III FOURIER TRANSFORM

Fourier integral theorem (Statement Only) – Fourier transform pair –Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity – Relation between Fourier and Laplace transforms

UNIT-IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded)

UNIT- V Z-TRANSFORM AND DIFFERENCE EQUATIONS

Z-transform - Elementary properties – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

TEXT BOOK:

S.	Author(s)	Title of the book	Publisher	Year of
No.	Name			Publication
1	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2011
2	Erwin Kreyszig	Advanced Engineering Mathematics.	John Wiley & Sons. Singapore	2011

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venkateswarlu S	Engineering Mathematics, Vol I	Anuratha Agencies and Publishers, Kumbakonam.	2003
2	Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G	Advanced Mathematics for Engineering Students. Volumes II and III,	Viswanathan S Printers and Publishers Pvt. Ltd. Chennai.	2002
3	Bali N P.	A text book of Engineering Mathematics	Lax mi Publications Pvt. Ltd.	1986
4	Ramana B V	Higher Engineering Mathematics	Tata Mc Graw Hil Publishing Co. Ltd. New Delhi.	2007

WEBSITES:

- 1. www.sosmath.com
- 2. http://mathworld.wolfram.com/FourierSeries.html
- 3. <u>http://www.math.umn.edu/~olver/pdn.html</u>
- 4. http://tutorial.math.lamar.edu/classes/DE/IntroPDE.aspx

15BEEC302

CIRCUIT THEORY

OBJECTIVES

- □ To understand the concept of circuit elements lumped circuits, waveforms, circuit laws and network reduction. To solve the electrical network using mesh and nodal analysis by applying network theorems.
- □ To understand the concept of active, reactive and apparent powers, power factor and resonance in series and parallel circuits
- □ To know the basic concepts of coupled circuits, three phase loads and power measurement.
- □ To analyze the transient response of series and parallel A.C. circuits and to solve problems in time domain using Laplace Transform

INTENDED OUTCOMES:

- To become familiar with various network theorems
- \Box To analyze circuits
- □ To understand various resonant, coupled circuits and transient response

UNIT-I DC CIRCUIT ANALYSIS

Basic components and electric circuits – Charge – Current – Voltage and Power–Voltage and Current Sources – Ohms Law – Voltage and Current laws – 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 – Basic Nodal and Mesh analysis – Nodal analysis – Mesh analysis.

UNIT-IINETWORK THEOREM AND DUALITYUsefulCircuitAnalysistechniques – Linearity and superposition – Thevenin and NortonEquivalentCircuits –Maximum PowerTransfer – Delta – W ye Conversion – Duality – Dual circuits.Dual circuits.

UNIT –III SINUSOIDAL STEADY STATE ANALYSIS Sinusoidal Steady – State analysis – Characteristics of Sinusoids– The Complex Forcing Function– The Phasor– Phasor relationship for R– L – C – impedance and Admittance – Nodal and Mesh 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 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 COUPLED CIRCUITS AND TOPOLOGY Magnetically coupled circuits – Mutual inductance – the Linear Transformer – the Ideal Transformer – An introduction to Network Topology – Trees and General Nodal analysis – Links and Loop analysis.

TEXT BOOKS :

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	William .H.Hayt,Jack. Jr , Kemmerly. E, Steven .Durbin .M.	Engineering Circuit Analysis.	Tata McGraw-Hill, New Delhi.	2006
2	David .A. Bell.	Electric Circuits.	PHI, New Delhi.	2006

REFERENCES :

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Nilson,Reidal.	Electric Circuits.	Pearson Education.	2008
2	Charles .K. Alex ander & Mathew,N.O.Sadiku.	Fundamentals of Electric Circuits.	McGraw- Hill.	2003
3	Sudhakar and Shyammohan .S. Palli.	Electric Circuits.	Tata Mc Graw – Hill.	2007
4	Cunningham .D.R., Stuller .J.A.	Basic Circuit Analysis.	Jaico Publishing House.	2002
5	David.E.Johnson, John y .R. Johnson, John.L.Hilburn.	Electric Circuit Analysis.	Prentice-Hall.	2012

15BEEC303

DIGITAL ELECTRONICS

OBJECTIVES

- □ To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- □ To introduce the methods for simplifying Boolean expressions
- □ To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- \Box To introduce the concept of memories and programmable logic devices.
- □ To illustrate the concept of synchronous and asynchronous sequential circuits

INTENDED OUTCOMES:

- Understand number systems and codes
- Understand basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- Understand the methods for simplifying Boolean expressions
- Understand the formal procedures for the analysis and design of combinational circuits and sequential circuits
- Understand the concept of memories and programmable logic devices.

UNIT-I NUMBER SYSTEMS AND BOOLEAN ALGEBRA

Binary, Octal, Decimal, Hexadecimal-Number base conversions – complements – signed Binary numbers. Binar y Arithmetic- Binar y codes: Weighted –BCD-2421-Gra y code-Excess 3 code-ASCII – Error detecting code – conversion from one code to another-Boolean postulates and laws –De-Morgan's Theorem- Principle of Duality- 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 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 – code converters. Implementation of combinational logic using MUX.

UNIT-III 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 –As ynchronous / Ripple counters – S ynchronous 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 MEMORY DEVICES

Classification of memories –RAM organization – Write operation –Read operation – Memory cycle -Timing wave forms – Memory decoding – memory expansion – Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell –Dynamic RAM cell –ROM organization - PROM –EPROM –EEPROM – EAPROM –Programmable Logic Devices –Programmable Logic Array (PLA)- Programmable Array Logic (PAL)-Field Programmable Gate Arrays (FPGA). Implementation of combinational logic using ROM, PAL and PLA

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Morris Mano.M	Digital Design	Prentice Hall of India Pvt. Ltd., New Delhi	2003
2	John M . Yarbrough	Digital Logic Applications and Design	Thomson- Vikas publishing house, New Delhi	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Salivahanan.S and Arivazhagan.S	Digital Circuits and Design	Vikas Publishing House Pvt. Ltd, New Delhi	2004
2	Charles H.Roth	Fundamentals of Logic Design	Thomson Publication Company, New Delhi.	2003
3	Donald P.Leach and Albert Paul Malvino	Digital Principles and Applications	Tata McGraw Hill Publishing Compan y Limited, New Delhi	2003
4	Jain.R.P	Modern Digital Electronics	Tata McGraw–Hill publishing compan y limited, New Delhi	2003
5	Thomas L. Floyd	Digital Fundamentals	Pearson Education, New Delhi	2003

WEBSITES:

http://www.allaboutcircuits.com/vol_2/chpt_9/2.html	
http://www.educypedia.be/electronics/digital.html	

15BEEC304 ELECTROMAGNETIC THEORY AND WAVEGUIDES 3 1 0 4 100

OBJECTIVES

- □ Understand the basic concepts of electric field and magnetic field
- □ Compare between field and circuit theory
- □ Need for impedance matching and different impedance matching techniques
- □ Different types of waveguides

INTENDED OUTCOMES:

- □ Knowledge on the basic concepts of electric and magnetic fields.
- □ Knowledge about Maxwell's equations and Poynting theorem
- □ Knowledge about the Wave propagation in between parallel plates.
- □ Knowledge about the significance of different types of waveguides.

UNIT I-STATIC ELECTRIC FIELDS

Introduction to co-ordinate s ystem – Rectan gular C ylindrical and Spherical – The experimental law of Coulomb. Electric Field Intensity – field of line charge, sheet charge, continuous volume charge distribution – Streamline and sketches of fields - Electric flux density – Gauss Law – Applications of Gauss Law - Some s ymmetrical charge distributions – Differential volume element– Concept of divergence. Definition of Electric potential, work, Energy potential difference – Potential field of different types of charges – Potential gradient – The dipole and field due to a dipole. Energy density in the electric field.

UNIT II-STEADY MAGNETIC FIELDS

Biot Savart Law – Applications of Biot Savart Law - Ampere's circuital law - Applications circuital law – Curl – Stoke's Theorem - Magnetic flux and magnetic flux density – The scalar and vector magnetic potentials – Derivation of the steady magnetic field laws.

UNIT III-TIME VARYING FIELDS AND MAXWELLS EQUATIONS

Farada y's law – Displacement current –Maxwell's equations in point form and integral form for stead y fields and time varying fields – Retarted potentials - Comparison of field and circuit theory - Poynting vector and Poynting Theorem.

UNIT IV-GUIDED WAVES

Waves between parallel planes: Transverse electric waves-Transverse magnetic waves-Characteristic of TE and TM waves-TEM waves. Velocity of propagation-Attenuation in parallel plane guides-Wave impedance

UNIT V-WAVEGUIDE THEORY

Rectangular wave guides: TE waves and TM waves in Rectangular waveguides – Dominant mode – cutoff frequency in wave guides – Impossibility of TEM waves in waveguides.

Circular wave guides: Wave impedance and characteristic impedance – Power flow in wave guides – Attenuation factor and Q of wave guides – Transmission line analogy for wave guides

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	William H.Ha yt,Jr and John A.Buck	Engineering Electromagnetics	Tata McGraw-Hill Publishing Ltd, 8 th Edition	2012
2	John. D. Kraus	Electromagnetics	McGraw Hill book Company, New York, Fourth Edition	1991

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Edward Jordan and KG Balmain	Electromagnetic Waves and Radiating Systems	Pearson education, 2 nd Edition	2001
2	Matthew N. O. Sadiku.,	Elements of Electromagnetics	Ox ford University Press, 3 rd Edition, First Indian Edition	2006
3	G.S.N.Raju.	Electromagnetic Field Theory and Transmission Lines	Pearson Education, First Indian print	2005

15BEEC305

SIGNALS AND SYSTEMS

OBJECTIVES

- □ To study the properties and representation of discrete and continuous signals.
- □ To study the sampling process and analysis of discrete systems using z-transforms.
- \Box To study the analysis and synthesis of discrete time systems.

INTENDED OUTCOMES:

- □ Knowledge about the properties and representation of discrete and continuous signals.
- □ Knowledge about the sampling process and analysis of discrete systems using z-transforms
- □ Knowledge about the analysis and synthesis of discrete time systems.

UNIT-I REPRESENTATION OF SIGNALS

Classification of Signals – Periodic, aperiodic, even, odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – periodicity – unit impulse – unit step impulse functions – Transformation in independent variable of signals: time scaling, time shifting. Determination of Fourier series representation of continuous time and discrete time periodic signals – Explanation of properties of continuous time and discrete time Fourier series.

UNIT-II ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS

Continuous time Fourier Transform and Laplace Transform analysis with examples – properties of the Continuous time Fourier Transform and Laplace Transform basic properties, Parseval's relation, and convolution in time and frequency domains. Basic properties of continuous time systems: Linearity, Causality, time invariance, stability of frequency response of LTIs ystems -Analysis and characterization of LTIs ystems using Laplace transform: Computation of impulse response and transfer function using Laplace transform.

UNIT-III SAMPLING THEOREM AND Z-TRANSFORMS

Sampling theorem – Reconstruction of a Signal from its samples, aliasing – sampling of band pass signals. Basic principles of z-transform - z-transform definition – Region of Convergence – Properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion, Relationship between z-transform and Fourier transform.

UNIT-IV DISCRETE TIME SYSTEMS

Computation of Impulse response & Transfer function using Z Transform. DTFT Properties and examples - LTI-DT systems - Characterization using difference equation - Block diagram representation - Properties of convolution and the interconnection of LTI S ystems - Causality and stability of LTI S ystems.

UNIT-V FILTER REALIZATION STRUCTURES

Realization structures – Direct Form – I, Direct Form – II, Cascade, Parallel and Transpose forms.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	AlanV.Oppenheim, Alan S.Willsky and Hamid Nawab.S	Signals and Systems	Pearson Education, New Delhi	2003
2	Roberts.M.J	Signals and S ystems Analysis using Transform method and MATLAB	TMH, New Delhi	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	John G.Proakis and Dimitris G.Manolakis	Digital Signal Processing, Principles, Algorithms and Applications	PHI, New Delhi	2000
2	Simon Haykin and Barry Van Veen	Signals and Systems	John Wiley, New York	2002
3	Lindner.K	Signals and Systems	McGraw Hill International, New York	2001
4	Moman .H. Ha ys	Digital Signal Processing	Tata McGraw-Hill Co Ltd., New Delhi	2004
5	Ashok Amhardar	Analog and Digital Signal Processing	PHI,New Delhi	2002

WEBSITES:

www.relisoft.com www.astro.berkele y.edu www.dspguide.com

15BEEC311 ELECTRIC CIRCUITS LABORATORY

LIST OF EXPERIMENTS

- 1. Verification of Kirchoff's voltage and Current Laws
- 2. Verification of Superposition Theorem
- 3. Verification of Thevenin's Theorem & Norton's Theorem
- 4. Verification of Maximum Power Transfer Theorem
- 5. Verification of Tellegen's and Reciprocity Theorem
- 6. Time domain response of RL Transient Circuit.
- 7. Time domain response of RC Transient Circuit.
- 8. Series RLC Resonance Circuits (Frequency response & resonant frequency)
- 9. Parallel RLC Resonance Circuits (Frequency response & resonant frequency)
- 10. Simulation experiments using PSPICE or MultiSim.

15BEEC312 DIGITAL ELECTRONICS LABORATORY 0 0 3 2 100

OBJECTIVES

- To verify operation of logic gates and flip-flops.
- To design and construct digital circuits

LIST OF EXPERIMENTS

- 1. Study of Gates & Flip-flops.
- 2. Half Adder and Full Adder.
- 3. Magnitude Comparator (2-Bit).
- 4. Encoders and Decoders.
- 5. Multiplexer and Demultiplexer.
- 6. Code Converters.
- 7. Implementation of combinational logic functions using standard ICs
- 8. Synchronous Counters.
- 9. Ripple Counter.
- 10. Mod N Counter.
- 11. Shift Registers and Shift Register Counters.
- 12. Implementation of sequential logic functions using standard ICs.
- 13. Simulation Experiments using Logisim/PSPICE/multisim

15BEEC313 ELECTRICAL MACHINES LABORATORY 0 0 3 2 100

LIST OF EXPERIMENTS

- 1. Open circuit and load characteristics of separately excited and self excited D.C. generator.
- 2. Load test on D.C. shunt motor.
- 3. Load test on D.C. series motor.
- 4. Swinburne's test and speed control of D.C. shunt motor.
- 5. Load test on single phase transformer and open circuit and short circuit test on single phase transformer
- 6. Regulation of three phase alternator by EMF and MMF methods.
- 7. Load test on three phase induction motor.
- 8. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
- 9. Load test on single-phase induction motor.
- 10. Study of D.C. motor and induction motor starters.

15BEEC351 VALUE ADDED COURSE-Yoga/ NCC

SEMESTER IV15BEEC401ELECTRONIC CIRCUITS

3 2 0 4 100

OBJECTIVES

At the end of this course the students will learn and apply

- □ Operating point calculations and working of basic amplifiers.
- □ Working of different types of feedback amplifiers & oscillators.
- \Box Frequency response and design of tuned amplifiers.
- □ Basic working & design of wave shaping circuits.

INTENDED OUTCOMES:

- The purpose of this course is to introduce to the students
- □ The basics of biasing transistor circuits, feedback amplifiers, large signal amplifiers, tuned amplifiers, oscillators, wave shaping circuits, and to design and analyze various electronic circuits and systems

UNIT I-BIASING CIRCUITS AND SMALL SIGNAL MODELS

Biasing circuits: DC load line and Q point – BJT biasing circuits – FET biasing circuits-Bias Stabilization. Small-signal models : AC load line, BJT models and parameters – h ybrid equivalent model, H ybrid π model, FET small-signal model and parameters.

UNIT II-SMALL-SIGNAL AMPLIFIERS - ANALYSIS AND FREQUENCY RESPONSE

BJT amplifiers: CE, CB and CC amplifiers – multistage amplifiers -differential amplifier. Frequency response: low frequency response of BJT and FET amplifiers –Miller effect capacitance – high frequency response of BJT and FET amplifiers.

UNIT III-FEEDBACK AND OSCILLATOR CIRCUITS

Feedback circuits: concept of feedback – effects of negative feedback – Types of negative feedback topologies Oscillator circuits: oscillator principles – LC oscillators – RC oscillators – crystal oscillators.

UNIT IV-POWER AMPLIFIERS AND TUNED AMPLIFIERS

Power amplifiers : Class A amplifier – Class B and Class AB push-pull amplifiers – Class C amplifiers – Amplifier distortions – heat sink.

Tuned amplifiers : need for tuned circuits – single tuned – double tuned –Stagger based circuits–video amplifier (CA3040).

UNITV-SOLID STATE SWITCHING CIRCUITS

Transistor switching times – multivibrators – astable multivibrator – monostable multivibrator – bistable multivibrator – Schmitt trigger .Oscillator-Sweep generators.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	David A Bell,	Fundamentals of Electronic Devices and Circuits	Ox ford University Press	2009
2	Jacob Millman, Christos C Halkias, Satyabrata Jit	Electron Devices and Circuits	Tata McGraw Hill	2010

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Thomas L. Floyd	Electronic Devices	9th edition, Pearson Education,	2011.
2	Albert P. Malvino David J. Bates	Electronic Principles	7th edition, Tata McGraw Hill	2007
3	Robert L. Bo ylestad and Louis Nashelsk y	Electronic Devices and Circuit Theory	Pearson Education, 9 th Edition	2009
4	David A. Bell	Solid State Pulse Circuits	Oxford University Press	2007

CONTROL SYSTEMS

15BEEC402 OBJECTIVES

- □ To understand the open loop and closed loop (feedback) systems
- □ To understand time domain and frequency domain analysis of control systems required for stability analysis.
- To understand the compensation technique that can be used to stabilize control systems

INTENDED OUTCOMES:

- Understand the open loop and closed loop (feedback) systems
- Understand time domain and frequency domain analysis of control systems required for stability analysis.
- Understand the compensation technique that can be used to stabilize control systems

UNIT-I CONTROL SYSTEM MODELLING

S ystem concept, differential equations and transfer functions. Modeling of electric systems, translational and rotational mechanical systems, Simple electromechanical systems.

Block diagram representation of systems – Block diagram reduction methods – Closed loop transfer function, determination of signal flow graph. Mason's gain formula – Examples.

UNIT-II TIME DOMAIN ANALYSIS

Test signals – time response of first order and second order s ystems – time domain specifications – types and order of s ystems – generalized error co-efficient – steady state errors – concepts of stability – Routh-Hurwitz stability – root locus. Analysis using MATLAB

UNIT-III FREQUENCY DOMAIN ANALYSIS

Introduction – correlation between time and frequency response – stability analysis using Bode plots, Polar plots, Nichols chart and Nyquist stability criterion – Gain margin – phase margin., Analysis using MATLAB.

UNIT-IV COMPENSATORS

Realization of basic compensators – cascade compensation in time domain and frequency domain and feedback compensation – design of lag, lead, lag-lead compensator using Bode plot and Root locus. Introduction to P, PI and PID controllers. Analysis using MATLAB.

UNIT-V CONTROL SYSTEM COMPONENTS AND APPLICATION OF CONTROL SYSTEMS

Stepper motors – AC servo motor – DC servo motor – Synchronous – sensors and encoders – DC tacho generator – AC tacho generator – Hydraulic controller – Pneumatic controller – Typical application of control system in industry.
TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Benjamin.C.Kuo	Automatic Control Systems	Prentice Hall of India, New Delhi	2002
2	Nagrath & Gopal	Control S ystem Engineering	New Age International Edition, New Delhi.	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Gopal.M	Control Systems	Tata McGraw-Hill, New Delhi	1997
2	Ogata.K	Modern Control Engineering	Prentice Hall of India, New Delhi	2003

WEBSITES:

http://www.tigoe.net/pcomp/code/motors http://www.patentstorm.us/patents/7281372/claims.html http://www.allaboutcircuits.com/vol_2/chpt_13/5.html

15BEEC403LINEAR INTEGRATED CIRCUITSOBJECTIVES

- □ To introduce the basic building blocks of linear integrated circuits.
- □ To teach the linear and non-linear applications of operational amplifiers.
- □ To introduce the theory and applications of analog multipliers and PLL.
- □ To introduce the concepts of waveform generation and introduce some special function ICs.
- \Box To teach the theory of ADC and DAC

INTENDED OUTCOMES:

- □ Knowledge about the basic building blocks of linear integrated circuits.
- □ Knowledge about the linear and non-linear applications of operational amplifiers.
- □ Knowledge about the theory and applications of analog multipliers and PLL.
- □ Knowledge about the theory of ADC and DAC
- □ Knowledge about a few special function integrated circuits

UNIT I-OPERATIONAL AMPLIFIER CHARACTERISTICS

Op-amp s ymbol, terminals, packages and specifications - Block diagram Representation of op-amp-Ideal op-amp & practical op-amp - Open loop & closed loop configurations – DC & AC performance characteristics of op-amp – Frequency compensation - Noise – Differential amplifiers – General Description, Manufacturer's Specification, Electrical Characteristics and internal schematic of 741 op amps.

UNIT II-OP-AMP APPLICATIONS

Basic op-amp circuits: Inverting & Non-inverting voltage amplifiers -Voltage follower - Summing, scaling & averaging amplifiers - AC amplifiers.Linear Applications: Instrumentation Amplifiers-V-to-I and I-to-V converters-Differentiators and Integrators.

Non-linear Applications: Precision Rectifiers – Wave Shaping Circuits (Clipper and Clampers) – Log and Antilog Amplifiers – Analog voltage multiplier circuit and its applications – Operational Trans-Conductance Amplifier (OTA) - Comparators and its applications – Sample and Hold circuit.

UNIT III-WAVEFORM GENERATORS AND PLL

W aveform Generators: Sine-wave Generators – Square / Trian gle / Sawtooth Wave generators. IC 555 Timer: Monostable operation and its applications, Astable operation and its applications PLL: Operation of the Basic PLL-Closed loop analysis of PLL-Voltage Controlled Oscillator-PLL applications.

UNIT IV-ACTIVE FILTERS & VOLTAGE REGULATOR

Filters: Comparison between Passive and Active Networks-Active Network Design – Filter Approximations-Design of LPF, HPF, BPF and Band Reject Filters – State Variable Filters – All Pass Filters – Switched Capacitor Filters.

Voltage Regulators: Basics of Voltage Regulator – Linear Voltage Regulators using Op-amp – IC Regulators (78xx, 79xx, LM 317, LM 337, 723)-Switching Regulators.

UNIT V-DATA CONVERSION DEVICES

Digital to Analog Conversion: DAC Specifications – DAC circuits – Weighted Resistor DAC-R-2R Ladder DAC-Inverted R-2R Ladder DAC Monolithic DAC

Analog to Digital conversion: ADC specifications-ADC circuits-Ramp Type ADC-Successive Approximation ADC-Dual Slope ADC-Flash Type ADC-Monolithic ADC.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Roy Choudhury and Shail Jain	Linear Integrated Circuits	New Age International Publishers	2003
2	Ramakant A.Ga yakwad	Op-Amps and Linear Integrated Circuits	Prentice Hall of India, New Delhi	2000

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Robert F. Coughlin, Frederick F. Driscoll	Operational- Amplifiers and Linear Integrated Circuits	Prentice Hall of India, New Delhi	2001
2	Sergio Franco	Design with operational amplifier and analog integrated circuits	McGraw Hill	2015

15BEEC404TRANSMISSION LINES AND NETWORKS3 2 0 4 100

OBJECTIVES

- □ To become familiar with propagation of signals through lines.
- □ Calculation of various line parameters by conventional and graphical methods.
- □ Need for impedance matching and different impedance matching techniques.
- Design of different types of filters, equalizer and attenuators.

INTENDED OUTCOMES:

- **Familiar with propagation of signals through lines.**
- □ Gain knowledge about calculation of various line parameters by conventional and graphical methods.
- □ Gain knowledge about Need for impedance matching and different impedance matching techniques.
- □ Ability to design of different types of filters, equalizer and attenuators.

UNIT I-TRANSMISSION LINE THEORY

General theory of Transmission lines - the transmission line – general solution– The infinite line – Wavelength, velocity of propagation – Waveform distortion – the distortionless line - Loading and different methods of loading– Line not terminated in ZO – Reflection coefficient – calculation of current, voltage, power delivered and efficiency of transmission – Input and transfer impedance - Open and short circuited lines – reflection factor and reflection loss.

UNIT II-HIGH FREQUENCY TRANSMISSION LINES

Transmission line equations at radio frequencies – Line of Zero dissipation – Voltage and current on the dissipationless line, Standing Waves, Nodes, Standing Wave Ratio – Input impedance of the dissipationless line - Open and short circuited lines – Power and impedance measurement on lines – Reflection losses – Measurement of VSWR and wavelength.

UNIT III-IMPEDANCE MATCHING IN HIGH FREQUENCY LINES

Impedance matching: Quarter wave transformer – Impedance matching by stubs – Single stub and double stub matching – Smith chart – Solutions of problems using Smith chart – Single and double stub matching using Smith chart.

UNIT IV-PASSIVE FILTERS

Characteristic impedance of symmetrical networks – filter fundamentals. Design of filters: Constant K, Low Pass, High Pass, Band Pass, Band Elimination, m-derived sections and composite.

UNIT V-ATTENUATORS AND EQUALIZERS

Attenuators: T, \Box , Lattice Attenuators, Bridged – T attenuator, L-Type Attenuator. Equalizers: inverse network, series, full series, shunt, full shunt, constant resistance T, constant resistance \Box , constant resistance lattice and bridged T

network.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Ryder.J.D	Networks , Lines and Fields	PHI, New Delhi.	2009
2	E.G.Jordan & balmain	Electromagnetic Waves and Radiating Systems, 2nd Edition,	Prentice-Hall of India,	2000

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Umesh Sinha	Transmission Lines and Network	Sat ya Prakashan Publishing Compan y, New Delhi	2012
2	Sudhakar. A, Shyammohan S Palli	Circuits and Networks – Analysis and S ynthesis	Tata McGraw Hill, 4 th Edition	2010

15BEEC405 COMMUNICATION THEORY

OBJECTIVES

- □ To provide various Amplitude modulation and demodulation systems.
- □ To provide various Angle modulation and demodulation systems.
- □ To provide some depth analysis in noise performance of various receiver.
- \Box To study some basic information theory with some channel coding theorem.

INTENDED OUTCOMES:

□ Knowledge on various Amplitude modulation and demodulation systems.

- Knowledge on various Angle modulation and demodulation systems.
- Knowledge on some depth analysis in noise performance of various receiver.
- □ Knowledge on some basic information theory with some channel coding theorem.

UNIT-I AMPLITUDE MODULATION

Generation and demodulation of AM, DSB-SC, SSB-SC, VSB Signals, Filtering of sidebands, Comparison of Amplitude modulation systems, Frequency translation, Frequency Division multiplexing, AM transmitters – Superhetrodyne receiver, AM receiver.

UNIT-II ANGLE MODULATION

Angle modulation, frequency modulation, Narrowband and wideband FM, transmission bandwidth of FM signals, Generation of FM signal – Direct FM – indirect FM, Demodulation of FM signals, FM stereo multiplexing, PLL – Nonlinear model and linear model of PLL, Non-linear effects in FM systems, FM Broadcast receivers, FM stereo receives.

UNIT-III NOISE PERFORMANCE OF DSB, SSB RECEIVERS

Noise – Shot noise, thermal noise, White noise, Noise equivalent Bandwidth, Narrowband noise, Representation of Narrowband noise in terms of envelope and phase components, Sine wave plus Narrowband Noise, Receiver model, Noise in DSB-SC receiver, Noise in SSB receiver

UNIT-IV NOISE PERFORMANCE OF AM AND FM RECEIVERS

Noise in AM receivers threshold effect, Noise in FM receivers capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and de-emphasis in FM, Comparison of performance of AM and FM systems.

UNIT-V INFORMATION THEORY

Uncertainty, Information and entropy, Source coding theorem, Data compaction, Discrete memory less channels, mutual information, channel capacity, channel coding theorem, differential entropy, and mutual information for continuous ensembles, information capacity theorem, implication of the information capacity theorem, rate distortion theory, Compression of information.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Simon Haykin	Communication S ystems	John Wiley & sons, New Jersy.	2001
2	Wayne Tomasi	Electronic Communication theory systems	PearsonEdition, New Jersy	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Roddy and Coolen	Electronic communication	PHI, New Delhi.	2003
2	Taub and Schilling	Principles of communication systems	TMH, New Delhi	2008

WEBSITES:

http://williamson-labs.com/480_mod.htm www.mit.edu http://www.sfu.ca/~truax/fmtut.html

15BEEC411 ELECTRONIC CIRCUITS AND SIMULATION LABORATORY

OBJECTIVES

0032100

To study experimentally the working of amplifiers, regulators and analyze their behavior by plotting graphs.

LIST OF EXPERIMENTS

- 1. Series and Shunt feedback amplifiers: Frequency response, Input and output impedance calculation
- 2. Design of RC Phase shift oscillator: Design Wein Bridge Oscillator
- 3. Design of Hartle y and Colpitts Oscillator
- 4. Tuned Class C
- 5. Integrators, Differentiators, Clippers and Clampers
- 6. Design of Astable, Monostable and Bistable multivibrators

SIMULATION USING PSPICE:

- 7. Differentiate amplifier
- 8. Active filter : Butterworth IInd order LPF
- 9. Astable, Monostable and Bistable multivibrator Transistor bias
- 10. D/A and A/D converter (Successive approximation)
- 11. Analog multiplier
- 12. CMOS Inventor, NAND and NOR

15BEEC412 SCIENTIFIC COMPUTING LABORATORY 2 0 2 3 100

<mark>OBJECTIVES:</mark>

- To introduce the scientific computing, covering some important aspects of solving
- algebraic equations, IVP, BVP.
- □ To implement the methods using the spread sheet in Excel

INTENDED OUT COMES:

- □ To develop analytical skills for solving different engineering problems.
- □ To understand the concepts of Matrices, sequences and series.
- **To solve problems by applying Differential Calculus and Differential equations.**

LIST OF EXPERIMENTS

- 1. Finding solution of Transcendental equation
 - i) Newton Raphson Method
 - ii) Bisection method
 - iii) Iterative method by reducing the equation to the form x = f(x)
- 2. Finding the dominant eigenvalue and eigenvector by power method
- 3. Numerical integration
 - i) Gauss 2 point and 3 point formulae
 - ii) Trapezoidal method
 - iii) Simpson's 1/3 rule
- 4. Solution of initial value problems governed by ODE
 - i) Runge Kutta 4th order method
 - ii) Modified Euler's method
 - iii) Milne's method
 - iv) Adam Bashforth method

5. Solution of BVP governed by PDE

- i) Laplace Equation
- ii) One dimensional heat equation
 - a) Explicit method : Bender Schmidt's method
 - b) Implicit method : Crank Nicolson's method
- iii) One dimensional wave equation

Implicit method

REFERENCE BOOKS:

<mark>S.</mark> No.	Author(s) Name	Title of the book	Publisher	<mark>Year of</mark> Publication
1	Curtis F. Gerald and Patrick O. Wheatley	Applied Numerical Analysis	Pearson Education, South Asia	<mark>2009</mark>
2	Steven C. Chapra, Raymond P. Canale	Numerical Methods for Engineers	McGraw - Hill Pub. Co. Ltd	<mark>2014</mark>

15BEEC413 LINEAR INTEGRATED CIRCUITS LABORATORY 0 0 3 2 100

LIST OF EXPERIMENTS

- 1. Inverting, Non inverting and Differential amplifiers.
- 2. Integrator and Differentiator.
- 3. Instrumentation amplifier.
- 4. Active low pass, high pass and Band pass filter.
- 5. Astable, Monostable multivibrators and Schmitt Trigger using op-amp.
- 6. Phase shift and Wien bridge oscillator using op-amp.
- 7. Astable and Monostable using NE555 Timer.
- 8. PLL characteristics and Frequency Multiplier using PLL.
- 9. Design of ADC and DAC using discrete components.
- 10. Study of DC power supply using LM317 and LM723 and SMPS control IC SG3524 / SG3525.
- 11. Simulation of Experiments 1,2,3,4,5 using PSpice/MultiSim

15BEEC451 VALUE ADDED COURSE-Life skills/Technical Seminar

15BEEC452 VALUE ADDED COURSE- Foreign language(German/Japanese), Hindi

SEMESTER V

15BEEC501 MICROPROCESSORS AND MICROCONTROLLERS 3003100

OBJECTIVES

- \Box To introduce the h/w architecture, instruction set and programming of 8086 microprocessor.
- □ To introduce the peripheral interfacing g of microprocessors.
- \Box To introduce the h/w architecture of ARM processor
- □ To introduce the h/w architecture, instruction set, programming and interfacing of 8051 microcontroller.

INTENDED OUTCOMES:

Adequate knowledge about the architecture and programming of 8085 microprocessor.
 Adequate knowledge about the architecture of ARM processor
 Adequate knowledge about the architecture and programming of 8086 microprocessor.
 Adequate knowledge about the architecture, programming and interfacing of 8051 micro controller.

UNIT I-MICROPROCESSOR- 8086

Review of 8085- Introduction to 8086 -Register Organization -Architecture-Signals-Memory Organization-Bus Operation-I/O Addressing-Minimum Mode-Maximum Mode-Timing Diagram-Interrupts - Service Routines – I/O and Memory Interfacing concepts.

UNIT II-OVERVIEW OF ARM PROCESSOR

Review of ARM v7 core and its architecture, Introduction to Advanced ARM CORTEX M4 architecture, Peripherals overview, Advantages of using Cortex M4, Instruction set implementation, CPU timers introduction.

UNIT III-PROGRAMMING OF 8086

Addressing Modes-Instruction format-Instruction set-Assembly language programs in 8086. RISC architecture – introduction to ARM Programming-register configuration and instruction set – sample program.

UNIT IV-MICROCONTROLLER-8051

Register Set-Architecture of 8051 microcontroller- I/O and memory addressing-Interrupts-Instruction set- Addressing modes.

UNIT V-PROGRAMMING AND INTERFACING OF 8051

Timer-Serial Communication-Interrupts Programming-Interfacing to External Memory-Interfacing to ADC, LCD, DAC, Keyboard and stepper motor.

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	K. Ray and K. M. Bhurchandi,	Advanced Microprocessors and Peripherals – Architectures, Programming and Interfacing	Indian edition. Tata McGraw Hill, New Delhi	2001 Reprint
2	Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay	The 8051 Microcontroller and Embedded S ystems	Pearson Education, New Jersy.	2008

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Krishna Kant	Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096	PHI, New Delhi.	2007
2	Kenneth J.A yala	The 8051 Microcontroller	Thompson Delmar Learning, New Delhi	2007
3	Ray.A.K, Bhurchandi.K.M	Advanced Microprocessor and Peripherals	Tata McGraw-Hill, New Delhi	2007
4	Barry B.Brey	The Intel Microprocessors Architecture, Programming and Interfacing	Pearson Education, New Delhi	2007
5	Ramesh S.Goankar	Microprocessor Architecture, Programming, and Applications with the 8085	PHI, New Delhi.	2002
6	Douglas V.Hall	Microprocessor and Interfacing, Programming and Hardware	Indian edition. Tata McGraw Hill, New Delhi	2007
7	Jonathan W Valvan o	Introduction to Arm(r) Cortex -M Microcontrollers	Create space Independent Publisher	2012

15BEEC502

DIGITAL COMMUNICATION

OBJECTIVES

To learn and understand

- □ Pulse modulation and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals
- □ Base band pulse transmission which deals with the transmission of pulse amplitude modulated signals in their base band form
- □ Pass band data transmission methods
- □ To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.

INTENDED OUTCOMES:

- Gain knowledge in pulse modulation and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- Gain adequate knowledge in baseband pulse transmission, which deals with the transmission of pulse-amplitude, modulated signals in their baseband form.
- Gain adequate knowledge in M-ary signaling and spread spectrum Technique.

UNIT I-SAMPLING AND QUANTIZATION

Sampling Process – Aliasing – Instantaneous sampling – Natural Sampling – Flat Sampling – Quantization of signals – sampling and quantizing effects – channel effects – SNR for quantization pulses – data formatting techniques – Time division multiplexing.

UNIT II-DIGITAL MODULATION SYSTEMS

PCM S ystems – Noise Considerations in PCM s ystem – Overall Signal-to- noise ratio for PCM s ystem – Threshold effect – Channel Capacity – Virtues, Limitations & Modification of PCM s ystem – PCM Signal Multiplexing – Differential PCM – Delta Modulation – Noise Considerations in Delta Modulation – SNR Calculations – Comparison of PCM, DPCM & DM.

UNIT III-BASE BAND PULSE TRANSMISSION

Maximum likelihood receiver structure – Matched filter receiver – Probabilit y error of the Matched filter – Intersymbol interference – Nyquist criterion for distortionless baseband transmission – Correlative coding – Eye pattern.

UNIT IV-PASS BAND DATA TRANSMISSION

Pass Band Transmission Model – Generation, Detection, Signal Space Diagram, Probability of Error for BFSK, BPSK, QPSK, DPSK, and Schemes–Comparison.

UNIT V-M-ARY SIGNALING AND INTRODUCTION TO SPREAD SPECTRUM TECHNIQUES

M-ary signaling, vectoral view of MPSK and MFSK signaling, symbol error performance of M-ary systems – Introduction – Discrete Sequence Spread Spectrum technique – Use of Spread Spectrum with CDMA-Ranging Using Discrete Sequence Spread Spectrum – Frequency Hopping Spread Spectrum – Generation & Characteristics of PN Sequence.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Simon Haykins	Communication Systems	John Wiley PHI, New Delhi	2001
2	Taub & S chilling	Principles of Digital Communication	Tata McGraw- Hill, New Delhi	2003

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Sam K.Shanmugam	Analog & Digital Communication	John Wiley Publication, New Delhi	2007
2	John G.Proakis	Digital Communication	McGraw Hill, Inc, 5 th Edition	2008
3	Singh, R.P. & Sapre, S.D	Communication Systems: Analog & Digital	Tata McGraw-Hill, 5 th reprint	2000

15BEEC503DIGITAL SIGNAL PROCESSINGOBJECTIVES

- □ To study DFT and its computation
- □ To study the design techniques for digital filters
- □ To study the finite word length effects in signal processing
- □ To study the fundamentals of digital signal processors

INTENDED OUTCOMES:

Understand the structures of Discrete time signals and systems
Understand Frequency response and design of FIR and IIR filters.
Understand Finite word length effect
Understand DSP Processor-TMS320C5X.

UNIT I-REVIEW OF DISCRETE TIME SIGNALS AND SYSTEMS

Overview of signals and systems – DFT–FFT using DIT and DIF algorithms – Inverse DFT-FFT using DIT and DIF algorithms – Applications – Circular convolution – MATLAB programs for DFT and FFT.

UNIT II-DESIGN AND IMPLEMENTATION OF IIR FILTERS

Design of analog filters using Butterworth and Chebyshev approximations – IIR digital filter design from analog filter using impulse invariance technique and bilinear transformations – Matlab programs for IIR filters.

UNIT III-DESIGN AND IMPLEMENTATION OF FIR FILTERS

Linear phase response – Design techniques for FIR filters – Fourier series method and frequency sampling method –Design of Linear phase FIR filters using windows: Rectangular, Hanning and Hamming windows – Matlab programs for FIR filters.

UNIT IV-FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS

Fixed point arithmetic – effect of quantization of the input data due to Finite word length. Product round off – need for scaling – Zero input limit cycle oscillations - Limit cycle oscillations due to overflow of adders – Table look up implementation to avoid multiplications.

UNIT V-PROCESSOR FUNDAMENTALS

Features of DSP processors – DSP processor packaging(Embodiments) – Fixed point Vs floating point DSP processor data paths – Memory architecture of a DSP processor (Von Neumann – Harvard) – Addressing modes – pipelining – TMS320 family of DSPs (architecture of C6x).

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Alan V Oppenheim, Ronald W Schafer, John R Back	Discrete Time Signal processing	PHI, New Delhi.	2000
2	Venkataramani B & M. Bhaskar	Digital Signal Processor Architecture, Programming and Application	TMH, New Delhi	2003

REFERENCES:

S NO	Author(c) Nomo	Title of the book	Dublishor	Year of
5.110.	Autior(s) Name	The of the book	I ublisher	publication
1	John G Proakis, Dimtris G Manolakis	Digital Signal Processing Principles, Algorithms and Application	Pearson Education, Fourth edition.	2007
2	Avtar singh, Srinivasan.S,	DSP Implementation using DSP microprocessor with Examples from TMS32C54XX	Thamson / Brooks cole Publishers, New Delhi	2003
3	M.H.Ha yes	Digital Signal Processing	Tata McGraw-Hill, New Delhi	2009
4	Johny R.Johnson	Introduction to Digital Signal Processing	Prentice Hall, New York	2001
5	Sanjit Mitra	Digital Signal Processing- A Computer based approach	Tata McGraw-Hill, New Delhi	2011

WEBSITES:

www.cnx.org www.dspguide.com http://mathworld.wolfram.com/Z-Transform.htm 1

15BEEC504ANTENNAS AND WAVE PROPAGATION3 2 0 4 100OBJECTIVES

- □ To study various antennas, arrays and radiation patterns of antennas.
- □ To learn the basic working of antennas
- □ To understand various techniques involved in various antenna parameter measurements.
- □ To understand the propagation of radio waves in the atmosphere

INTENDED OUTCOMES:

- Gain knowledge in various antennas, arrays and radiation patterns of antennas.
- \Box Gain knowledge in the basic working of antennas.
- □ Understand various techniques involved in various antenna parameter measurements.
- □ Understand the propagation of radio waves in the atmosphere.

UNIT I-ANTENNA FUNDAMENTALS AND RADIATION

Definition and function of antennas – Antenna theorems-Antenna parameters – Radiation Mechanism – Antenna field zones – Radiation from a small current element – Power radiated by a small current element and its radiation resistance – Hertzian dipole – Half wave dipole – Monopole – Current distributions.

UNIT II-ANTENNA ARRAYS AND SYNTHESIS

Linear arra ys – Anal ysis of linear arra ys – Phased arra ys – Binomial arra ys – Pattern multiplication – Method of excitation of antennas – Impedance matching techniques. S ynthesis methods: Schelkunoff pol ynomial – Fourier transform – Wooden Lawson method.

UNIT III-SPECIAL PURPOSE ANTENNAS

Travelling wave – Loop – small loop – Dipole and Folded dipole antennas – Horn antenna – Reflector antenna – Yagi – Uda antenna – Log periodic antenna – Helical and Micro strip antennas. Introduction to CAD tools used for antenna modeling.

UNIT IV-ANTENNA MEASUREMENTS

Drawbacks in measurements of antenna parameters – Methods to overcome drawbacks in measurements –Measurement ranges – Impedance – Gain – Radiation pattern – Beam width – Radiation resistance – Antenna efficiency- Directivity-Polarization and Phase Measurements.

UNITV-RADIO WAVE PROPAGATION

Basics of propagation-Ground wave propagation – Space wave propagation-Considerations in space wave propagation – Super refraction – Ionospheric wave propagation – Structure of ionosphere – Mechanism of ionospheric propagation – Effect of earth's Magnetic field on Radio wave propagation – Virtual height – MUF – Skip distance – OWF – Ionosphere abnormalities.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	John D Kraus, Ronald J Marhefka, Ahmad S KhaN	Antenna and Wave Propagation	Tata McGraw Hill, 4 th Edition	2010
2	R.E.Collins	Antenna and Wave Propagation	McGraw-Hill,	1998

REFERENCES:					
S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication	
1	Constantine A. Balanis	Antenna Theor y: Anal ysis and Design	Third Edition, John Wiley and Sons	2012	
2	G.S.N. Raju	Antennas and wave propagation	1 st Edition, Pearson Education	2012	
3	Robert S. Elliott	Antenna Theory and Design	John Wiley and Sons, Revised Edition	2007	
4	R.L.Yadava	Antennas and Wave Propagation	PHI	2011	

15BEEC5E__DEPARTMENT ELECTIVE-I3 0 0 3 100

15BEEC511 DIGITAL SIGNAL PROCESSING LABORATORY 0 0 3 2 100

OBJECTIVES

- □ To implement the processing techniques using the instructions of TMS320C5X
- □ To implement the IIR and FIR filter using MATLAB.

LIST OF EXPERIMENTS

USING TMS320C5X

- 1. Study of various addressing modes of DSP using simple programming examples
- 2. Sampling of input signal and display
- 3. Implementation of FIR filter
- 4. Calculation of FFT

USING MATLAB

- 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. Calculation of FFT of a signal

15BEEC512 MICROPROCESSOR AND MICROCONTROLLER LABORATORY

0032100

OBJECTIVES

To understand and gain knowledge about

- \Box Microprocessor (8085/8086)
- \square Microcontroller (8051)
- □ Interfacing circuits

LIST OF EXPERIMENTS

Minimum 12 Experiments to be conducted

- 1. Programs for 8/16 bit Arithmetic operations (Using 8085 and 8086).
- 2. Programs for Sorting and Searching (Using 8086).
- 3. Programs for String manipulation operations (Using 8086).
- 4. Programs for Digital clock and Stop watch (Using 8086).
- 5. Programs on Subroutines (Using 8086)
- 6. Interfacing ADC and DAC(Using MSP 430 CONTROLLER).
- 7. 8255 PPL
- 8. Transfer data serially between two kits (8253/8251).
- 9. 8279 Keyboard & display
- 10. Temperature control.
- 11. Traffic Control Using MSP 430 CONTROLLER.
- 12. 8259 Programmable Interrupt Controller.
- 13. Interfacing and Programming of DC Motor Speed control(Using MSP 430 CONTROLLER)
- 14. Interfacing and Programming of Stepper Motor and (8051).
- Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051microcontroller.

15BEEC513 COMMUNICATION SYSTEMS LABORATORY 0 0 3 2 100

OBJECTIVES

To carry out experiments on various digital communication modulation schemes using Trainer kits.

LIST OF EXPERIMENTS

- 1 Radiation pattern of Half wave dipole Antenna
- 2. Radiation pattern of Yagi Antenna
- 3. Radiation pattern of loop Antenna
- 4. Characteristics of AM receiver (Selectivity & Sensitivity)
- 5. Characteristics of FM receiver (Selectivity & Sensitivity)
- 6. Signal Sampling & Time division multiplexing
- 7. Pulse modulation and demodulation- PAM / PWM / PPM
- 8. Pulse code modulation & demodulation
- 9. Line Coding & Decoding
- 10. Delta modulation & demodulation
- 11. Digital modulation & demodulation –ASK, PSK, FSK
- 12. Simulation of hardware mentioned above using Lsim software

15BEEC551 VALUE ADDED COURSE – In plant training

15BEEC552 VALUE ADDED COURSE – Mini Project

SEMESTER VI

15BEEC601MICROWAVE ENGINEERING3 2 0 4 100

OBJECTIVES

- □ To study passive microwave components and their S-Parameters.
- □ To study Microwave semiconductor devices & applications.
- □ To study Microwave sources and amplifiers.

INTENDED OUTCOMES:

Gain Knowledge in passive microwave components and their S-Parameters.
Gain Knowledge in Microwave semiconductor devices & applications.
Gain Knowledge in Microwave sources and amplifiers.

UNIT-I INTRODUCTION

Microwave Frequencies, Microwave Devices, Microwave Systems, Microwave Units of Measure, Microwave Hybrid Circuits, Waveguide Tees, Magic Tees (Hybrid Trees), Hybrid Rings (Rat-Race Circuits), Waveguide Corners, Bends and Twists, Directional Couplers, Two-Hole Directional Couplers, Z & ABCD Parameters- Introduction to S parameters, S Matrix of a Directional Coupler, Hybrid Couplers, Circulators and Isolators, Microwave Circulators, Microwave Isolators.

UNIT-II TRANSFERRED ELECTRON DEVICES (TEDs) and AVALANCHE TRANSIT-TIME DEVICES

Introduction, Gunn-Effect Diodes – GaAs Diode, Background, Gunn Effect, Ridely-Watkins-Hilsun (RWH) Theory, Differential Negative Resistance, Two-Valley Model Theory, High-Field Domain, Modes of Operation, LSA Diodes, InP Diodes, CdTe Diodes, Microwave Generation and Amplification, Microwave Generation, Microwave Amplification, Avalanche Transit-Time Devices, Introduction, Read Diode, Physical Description, Avalanche Multiplication, Carrier Current $I_o(t)$ and External Current $I_e(t)$, Output Power and Quality Factor, IMPATT Diodes, Physical Structures, Negative Resistance, Power Output and Efficiency, TRAPATT Diodes, Physical Structures, Principles of Operation, Power Output and Efficiency, BARITT Diodes, Physical Description, Principles of Operation, Microwave Performance, Parametric Devices, Physical Structures, Nonlinear Reactance and Manle y – Rowe Power Relations, Parametric Amplifiers, Applications.

UNIT-III MICROWAVE LINEAR-BEAM TUBES (O TYPE) AND MICROWAVE CROSSED-FIELD TUBES (M-TYPE)

Klystrons, Reentrant Cavities, Velocity-Modulation Process, Bunching Process, Output Power and Beam Loading, State of the Art, Multicavity Klystron Amplifiers, Beam-Current Density, Output Current Output Power of Two-Cavity Klystron, Output Power of Four-Cavity Klystron, Reflex Klystrons, Velocity Modulation, Power Output and Efficiency, Electronic Admittance, Helix Traveling-Wave Tubes (TWTs), Slow-Wave structures, Amplification Process, Convection Current, Axial Electric Field, Wave Modes, Gain Consideration, Microwave Crossed-Field Tubes , Magnetron Oscillators, Cylindrical Magnetron, Coaxial Magnetron, Tunable Magnetron, Ricke diagram.

UNIT-IV STRIP LINES AND MONOLITHIC MICROWAVE INTEGRATED CIRCUITS Introduction, Microstrip Lines, Characteristic Impedance of Microstrip Lines, Losses in Microstrip Lines, Quality Factor Q of Microstrip Lines, Parallel Strip Lines, Distributed Lines, Characteristic Impedance, Attenuation Losses, Coplanar Strip Lines, Shielded Strip Lines, References, Problems, Monolithic Microwave Integrated Circuits, Introduction, Materials, Substrate Materials, Conductor Materials, Dielectric Materials, Resistive Materials, Monolithic Microwave Integrated-Circuit Growth, MMIC Fabrication Techniques, Fabrication Example.

UNIT-V MICROWAVE MEASUREMENTS

Slotted line VSWR measurement, VSWR through return loss measurements, power measurement, impedance measurement insertion loss and attenuation measurements- measurement of scattering parameters – Measurement of 1 dB, dielectric constant measurement of a solid using waveguide

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Samuel.Y.Liao	Microwave Devices and Circuits	Prentice Hall of India	2003
2.	Annapurna Das and Sisir K.Das	Microwave Engineering	Tata McGraw-Hill	2000

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Collin.R.E	Foundations for Microwave Engineering	IEEE Press, New Delhi	2002
2.	David M.Pozar	Microwave Engineering	John Wiley & Sons, New York	2003
3.	Rizzi.P.A	Microwave Engineering	PHI, New Delhi	2000

15BEEC602 COMPUTER NETWORKS

OBJECTIVES

- \Box To introduce the students the functions of different layers.
- □ To introduce IEEE standard employed in computer networking.
- □ To make students to get familiarized with different protocols and network components.

INTENDED OUTCOMES:

- Adequate knowledge about the functions of different layers.
- Adequate knowledge about IEEE standard employed in computer networking.
- □ Familiarize with different protocols and network components.

UNIT I DATA COMMUNICATIONS

Components – Direction of Data flow – networks – Components and Categories – types of Connections – Topologies – Protocols and Standards – ISO / OSI model – Transmission Media – Coaxial Cable – Fiber Optics – Line Coding – Modems – RS232 Interfacing sequences-Real time applications.

UNIT II DATA LINK LAYER

Error – detection and correction – Parity – LRC – CRC – Hamming code – Flow Control and Error control: stop and wait – go back N ARQ – selective repeat ARQ- sliding window techniques – HDLC.LAN: Ethernet IEEE 802.3, IEEE 802.4, and IEEE 802.5 – IEEE 802.11–FDDI, SONET – Bridges. Real time applications.

UNIT III NETWORK LAYER

 $\label{eq:linear} Internetworks - Packet Switching and Datagram approach - IP addressing methods - IP4 and IP6 - Subnetting - Routing - Distance Vector Routing - Link State Routing - Routers- Real time applications.$

UNIT IV TRANSPORT LAYER

Duties of transport layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QOS) – Integrated Services- Real time applications.

UNIT V APPLICATION LAYER

Domain Name Space (DNS) – SMTP, FTP, HTTP, WWW, Email, Search engines - POP server – Security – Cryptography- Real time applications.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Behrouz A. Foruzan	Data communication and Networking	Tata McGraw-Hill, New Delhi	2004
2	William Stallings	Data and Computer Communication	Pearson Education, New Delhi	2000

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	James .F. Kurouse &.Rouse.W	Computer Networking: A Top down Approach Featuring	Pearson Education, New Jersy	2001
2	Larry L.Peterson & Peter S.Davie	Computer Networks	Harcourt Asia Pvt. Ltd, New Delhi	2000
3	Andrew S. Tannenbaum	Computer Networks	PHI, New Delhi	2003

15BEEC603MOBILE COMMUNICATION3 2 0 4 100OBJECTIVES

□ To learn the fundamental cellular radio concepts

- □ To learn radio propagation models
- □ To provide ideas about analog and digital modulation techniques used in mobile communication
- □ To learn various coders and multiple access techniques used in mobile communication
- □ To study the architectures of AMPS, GSM, WLL, Bluetooth, DECT, GPRS

INTENDED OUTCOMES:

- Gain adequate knowledge in the fundamentals of cellular radio concepts
- □ Gain adequate knowledge in radio propagation models
- □ Ability to provide ideas about analog and digital modulation techniques used in mobile communication

UNIT-I CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS

Introduction to wireless communication: Evolution of mobile communications, mobile radio systems-Examples, trends in cellular radio and personal communications.

Cellular Concept: Frequency reuse, channel assignment, hand off, Interference and system capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems.

UNIT-II MOBILE RADIO PROPAGATION

Free space propagation model, reflection, diffraction, scattering, link budget design, Outdoor Propagation models, Indoor propagation models, Small scale Multipath propagation, Impulse model, Small scale Multipath measurements, parameters of Mobile multipath channels, types of small scale fading, statistical models for multipath fading channels.

UNIT-III MODULATION TECHNIQUES AND EQUILISATION

Modulation Techniques: Minimum Shift Keying, Gauss ion MSK, M-ary QAM, M-ary FSK, Orthogonal Frequency Division Multiplexing, Performance of Digital Modulation in Slow-Flat Fading Channels and Frequency Selective Mobile Channels. Equalization: Survey of Equalization Techniques, Linear Equalization, Non-linear Equalization, Algorithms for Adaptive Equalization. Diversity Techniques, RAKE receiver.

UNIT-IV CODING AND MULTIPLE ACCESS

Coding:

Vocoders, Linear Predictive Coders, Selection of Speech Coders for Mobile Communication, GSM Codec, RS codes for CDPD. Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Capacity of Cellular CDMA and SDMA.

UNIT V WIRELESS SYSTEMS ANTENNAS AND STANDARDS AMPS, GSM, WLL, Bluetooth, IS-95 and DECT - RFID antennas – Mobile Antennas - GPRS

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Rappaport.T.S	Wireless Communications: Principles and Practice	Pearson Education/ Prentice Hall of India, New Delhi	2003
2	Jochen Schiller	Mobile Communication	PHI, New Delhi.	2003

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Roy Blake	Wireless Communication Technology	Thomson Delmar, New Delhi.	2003
2	Lee.W.C.Y	Mobile Communications Engineering: Theory and applications	McGraw-Hill International, New York	1998
3	Stephen G. Wilson	Digital Modulation and Coding	Pearson Education, New Delhi	2003

15BECC604 ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT 3 0 0 3 100

INTENDED OUTCOMES:

 $\hfill\square$ To know the fundamentals of cost analysis and economics.

- □ To learn about the basics of economics and cost analysis related to engineering so as to take economically sound decisions.
- To make the students to understand capital market, break even point analysis and depreciation

UNIT- I FUNDAMENTALS OF ENGINEERING ECONOMICS

Introduction to Engineering Economics – Definition and Scope – Significance of Engineering Economics- Demand and supply analysis-Definition – Law of Demand – Elasticity of Demand – Demand Forecasting. Supply – Law of supply – Elasticity of Supply.

UNIT-II FINANCIAL MANAGEMENT

Objectives and functions of financial management – financial statements, working capital management – factors influencing working capital requirements – estimation of working capital. Capital budgeting - Need for Capital Budgeting – Project Appraisal Methods - Payback Period – ARR – Time Value of Mone y.

UNIT-III CAPITAL MARKET

Stock Exchanges – Functions – Listing of Companies – Role of SEBI – Capital Market Reforms. Money and banking - Money – Functions –Inflation and deflation – Commercial Bank and its functions – Central bank and its functions.

UNIT- IV NEW ECONOMIC ENVIRONMENT

National Income – concepts – methods of calculating national income - Economic systems, Economic Liberalization – Privatization – Globalization. An overview of International Trade – World Trade Organization – Intellectual Property Rights.

UNIT- V COST ANALYSIS AND BREAK EVEN ANALYSIS

Cost analysis - Basic cost concepts – FC, VC, TC, MC – Cost output in the short and long run. Depreciation - meaning – Causes – Methods of computing Depreciation (simple problems in Straight Line Method, Written Down Vale Method). Meaning – Break Even Analysis - Managerial uses of BEA.

TEXT BOOKS:

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Ramachandra Ar yasri .A, and V. V.Ramana Murth y	Engineering Economics & Financial Accounting	Tata McGraw Hill,–,New Delhi	2007
2	Varshney R. L., and K. L Maheshwari	Managerial Economics	Sultan Chand & Sons, New Delhi	2001

REFERENCE BOOKS:

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	M.L.Jhingan	Principles of Economics	Konark Publications	2010
2	Prasanna Chandra	Fundamentals of Financial Management	Tata McGraw Hill, New Delhi.	2007
3	D.M.Mithani	Money, Banking, International Trade & Public Finance	Himalaya Publishing House	2004

WEBSITES:

- 1. http://economictimes.indiatimes.com
- 2. <u>http://www.economist.com/</u>
- 3. http://www.managementstudyguide.com/financial-management.htm

15BEEC6E__ DEPARTMENT ELECTIVE-II

15BEEC6E__ DEPARTMENT ELECTIVE-III

15BEEC611

OBJECTIVES

To study the communication networks characteristics and to analyze various routing layer Protocols.

LIST OF EXPERIMENTS

- PC to PC Communication
 Parallel Communication using 8 bit parallel cable
 Serial communication using RS 232C
- 2. Ethernet LAN protocol

To create scenario and study the performance of CSMA/CD protocol ethrol simulation

Token bus and token ring protocols
 To create scenario and study the performance of token bus and token ring protocols through

simulation

4. Wireless LAN protocols

To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.

- 5. Implementation and study of stop and wait protocol
- 6. Implementation and study of Go back-N and selective ret protocols
- 7. Implementation of distance vector routing algorithm
- 8. Implementation of Link state routing algorithm
- 9. Implementation of Data encryption and decryption
- 10. Transfer of files from PC to PC using Windows / Unix socket processing
- 11. Simulation of Experiments using NS-2

13BEEC612 MICROWAVE LABORATORY

OBJECTIVES

To have a detailed practical study on microwave equipments

LIST OF EXPERIMENTS

- 1. VSWR Measurements Determination of terminated impedance
- 2. Determination of guide wavelength, frequency measurement.
- 3. Radiation Pattern of Horns, Paraboloids.
- 4. Microwave Power Measurement.
- 5. Characteristics of Gunn diode Oscillator
- 6. Study of Magic Tee
- 7. Study of attenuators(fixed and variable)
- 8. Conduct an experiment using microwave test bench.
- 9. Study of resonant cavity
- **10.** Simulation using CAD tools.

15BEEC651 VALUE ADDED COURSE – Analog system design using ASLK Pro /ARM Cortex M4/Mixed signal Microcontroller

15BEEC652 VALUE ADDED COURSE- Communication skills and development

SEMESTER VII

15BECC701 PROFESSIONAL ETHICS

3 0 0 3 100

INTENDED OUTCOMES:

- □ Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations.
- □ After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling.
- □ To create an awareness and practice through Engineering Ethics and Human Values.

UNIT I 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 – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Stud y

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal

UNIT IV RESPONSIBILITIES AND RIGHTS

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V GLOBAL ISSUES

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Charles E Harris, Michael S. Protchard and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, New Delhi	2000
2.	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw-Hill, NewYork	2005

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1	Charles D Fleddermann,	Engineering Ethics	Prentice Hall, New Mexico	1999
2.	John R Boatright	Ethics and the Conduct of Business	Pearson Education	2003
3.	Edmund G Seebauer and Robert L Barr y	Fundamentals of Ethics for Scientists and Engineers	Oxford University Press	2001
4.	David Ermann and Michele S Shauf,	Computers, Ethics and Societ y	Oxford University Press,	2003
5.	Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "	Business Ethics – An Indian Perspective	Biztantra, New Delhi	, 2004.

VLSI DESIGN

15BEEC702 OBJECTIVES

- □ To learn the basic MOS Circuits.
- \Box To learn the MOS process technology
- □ To learn the concepts of modeling a digital system using Hardware Description Language.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing VLSI subsystems.

INTENDED OUTCOMES:

- Gain knowledge in the basic MOS Technology.
- \Box Gain knowledge in the MOS Process Technology and its second order effect.
- ☐ Gain knowledge in the concepts of modeling a digital system using Hardware Description Language.
- □ Gain knowledge in basic concept of VLSI implementation strategies based on CMOS and FPGA.

UNIT I-MOS TECHNOLOGY

Chip Design Hierarchy – IC Layers – Photolithograph y and Pattern Transfers

- Basic MOS Transistors - CMOS Fabrication: n-well - p-well - twin tub - Latch up and prevention - La yout design rules, physical design-basic concepts, CAD tool sets, physical design of logic gates-Inverter, NAND, NOR.

UNIT II-MOS CIRCUIT DESIGN PROCESS

Introduction to MOSFET: Symbols, Enhancement mode-Depletion mode transistor operation – Threshold voltage derivation – body effect – Drain current Vs voltage derivation – channel length modulation. NMOS and CMOS inverter – Determination of pull up to pull down ratio –Stick diagrams – VLSI Circuit Design Flow.

UNIT III-CMOS LOGIC GATES & OTHER COMPLEX GATES

Gate dela ys – Logical Effort - CMOS Static Logic – Transmission Gate Logic – Tri-State Logic – Pass Transistor Logic – Dynamic CMOS Logic – Domino CMOS Logic, NORA CMOS Logic, True Single Phase Clock (TSPC) Dynamic Logic

UNIT IV-VERILOG HDL

Hierarchical modeling concepts – Basic concepts: Lexical conventions – Data types – Modules and ports. Gate level modeling – Dataflow modeling – Behavioral modeling – Design examples of Combinational and Sequential circuits – Switch level modeling – Functions – UDP concepts.

UNIT V-VLSI IMPLEMENTATION STRATEGIES

Introduction – Design of Adders: carr y look ah ead-carr y select-carr y save. Design of multipliers: Arra y – Braun arra y – Baugh-Woole y Arra y. Introduction to FPGA – Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Douglas A. Pucknell	Basic VLS I Systems and Circuits	Prentice Hall of India, 3 rd Edition, reprint	2008
2.	John P. Uyemura,	Introduction to VLSI Circuits and S ystems	John Wiley & Sons, Reprint	2009

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Smith.M.J.S	Application Specific integrated circuits	Pearson Education, New York	2008
2.	Weste & Eshraghian,	Principles of CMOS VLSI Design	Addison Wesley, 2nd Edition	2008
3.	John P Uyemura	Chip Design for Submicron VLSI: CMOS layout and simulation	Thomson India Edition	2010
4	Samir Palnitkar,	Verilog HDL – Guide to Digital Design and S ynthesis	Pearson Education, 3 rd Edition	2003
15BEEC703 OPTICAL COMMUNICATION3 0 0 3 100OBJECTIVES

- □ To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the different kind of losses, signal distortion in optical wave guides and other
- signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
- □ To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
- □ To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

INTENDED OUTCOMES:

- Gain knowledge in basic elements of optical fiber transmission link, fiber modes configurations and structures.
- Gain knowledge in different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
- Gain knowledge in the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
- Gain knowledge in the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
- Gain knowledge in fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

UNIT-I INTRODUCTION TO OPTICAL FIBERS

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations – Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes – Single Mode Fibers-Graded Index fiber structure.

UNIT-II SIGNAL DEGRADATION OPTICAL FIBERS

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination –Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT-III FIBER OPTICAL SOURCES AND COUPLING

Direct and indirect Band gap materials-LED structures –Light source materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition –Rate equations –External Quantum efficiency –Resonant frequencies –Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers- Power Launching and coupling, Lencing schemes, Fibre –to- Fibre joints, Fibre splicing – Energy efficiency of LASER.

UNIT-IV FIBER OPTICAL RECEIVERS

PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation – preamplifiers, Error Sources –Receiver Configuration –Probability of Error – Quantum Limit.

UNIT-V DIGITAL TRANSMISSION SYSTEM

Point-to-Point links S ystem considerations – Link Power budget – Rise - time budget – Noise Effects on S ystem Performance-Operational Principles of WDM, Solitons-Erbium-doped Amplifiers. Basic on concepts of SONET/SDH Network.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Gerd Keiser	Optical Fiber Communication	McGraw Hill International, Singapore	2000
2	Senior.J	Optical Communication Principles and Practice	Prentice Hall of India New Delhi	2001

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Gower.J	Optical Communication S ystem	Prentice Hall of India, New Delhi	2001

WEBSITES:

www.cnx.org	
www.dspguide.com	

15BEEC7E	DEPARTMENT ELECTIVE -IV	3 0 0 3 100
15BE7OE	OPEN ELECTIVE -I	3 0 0 3 100

OBJECTIVES

To gain expertise in design and development and simulation of digital circuits with VHDL.

LIST OF EXPERIMENTS

All the experiments must be implemented using Cadence tool

- 1. Study of Simulator tools
- 2. Study of Synthesis tools
- 3. Place and Root and Back annotation for FPGAs
- 4. Study of development tool for FPGAs for schematic entry and verilog
- 5. Design of traffic light controller using verilog and above tools
- Design and simulation of pipelined serial and parallel adder to add/ subtract 8 number of size,
 13 bits each in 2's complement
- Design and simulation of back annotated verilog files for multiplying two signed, 8 bit numbers in 2's complement. Design must be pipelined and completely RTL compliant
- 8. Study of FPGA board and testing on board LEDs and switches using verilog codes
- 9. Testing the traffic controller design developed in SL NO.5 on the FPGA board
- Design a Real-time Clock (2 digits, 7 segments LED displays each for HRS., MTS, and SECS.) and demonstrate its working on the FPGA board. An expansion card is required for the displays.

15BEEC712ELECTRONIC SYSTEM DESIGN LABORATORY0032100

LIST OF EXPERIMENTS

- DC power supply design using buck boost converters
 Design the buck-boost converter for the given input voltage variation, load current and output voltage. Plot the regulation characteristics.
- DC power supply design using fly back converter (Isolated type)
 Design the fly back converter using ferrite core transformer for the given input voltage variation load current and output voltage.
 Plot the regulation characteristics.
- 3. Design of a 4-20mA transmitter for a bridge type transducer. Design the Instrumentation amplifier with the bridge type transducer (Thermistor or any resistance variation transducers) and convert the amplified voltage from the instrumentation amplifier to 4 - 20 mA current using op-amp. Plot the variation of the temperature Vs output current.
- 4. Design of AC/DC voltage regulator using SCR Design a phase controlled voltage regulator using full wave rectifier and SCR, vary the conduction angle and plot the output voltage.
- 5. Design of process control timer Design a sequential timer to switch on & off at least 3 relays in a particular sequence using timer IC.
- 6. Design of AM / FM modulator / demodulator
 - i. Design AM signal using multiplier IC for the given carrier frequency and modulation index and demodulate the AM signal using envelope detector.
 - ii. Design FM signal using VCO IC NE566 for the given carrier frequency and demodulate the same using PLL NE 565.
- Design of Wireless data modem.
 Design a FSK modulator using 555 and convert it to sine wave using filter and transmit the same using IR LED and demodulate the same PLL NE 565.
- 8. PCB layout design using CAD Drawing the schematic of simple electronic circuit and design of PCB layout using CAD
- 9. Microcontroller based systems design Design of microcontroller based system for simple applications like security systems combination lock etc. using 89c series flash micro controller.

DSP based system design Design a DSP based system for simple applications like echo generation, etc. using TMS 320 DSP kit.

15BEEC713 OPTICAL LABORATORY

OBJECTIVES

To study the optical devices and to use in the appropriate application **LIST OF EXPERIMENTS**

- 1. Numerical aperture determination for fibers and Attenuation Measurement in Fibers.
- 2. Mode Characteristics of Fibres SM Fibres.
- 3. Study of Coupling Fibers to Semi-Conductor Sources Connectors & Splices.
- 4. Fiber optic communication links.
- 5. LED & Photo Diode Characteristics.
- 6. Microwave experiments
- 7. VSWR Measurements Determination of terminated impedance
- 8. Determination of guide wavelength, frequency measurement.
- 9. Radiation Pattern of Horns, Paraboloids.
- 10. Microwave Power Measurement.
- 11. Characteristics of Gunn diode Oscillator.
- 12. Simulation using Globosim /Optnet

15BEEC751 VALUE ADDED COURSE – Real time controller/VLSI Design using Cadence tool.

VIII SEMESTER

15BEEC8E	DEPARTMENT ELECTIVE -V	3 0 0 3 100
\ 15BEEC8E	DEPARTMENT ELECTIVE -VI	3 0 0 3 100
15BEEC8E	DEPARTMENT ELECTIVE -VII	3 0 0 3 100
15BEEC891	PROJECT WORK – VIVA VOCE	0 0 24 12 300

LIST OF ELECTIVES FOR V SEMESTER B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

15BEEC_E01 MEASUREMENTS AND INSTRUMENTATION 3 0 0 3 100

OBJECTIVES

To learn

- □ Basic measurement concepts
- □ Concepts of electronic measurements
- □ Importance of signal generators and signal analysers in measurements
- □ Relevance of digital instruments in measurements
- □ The need for data acquisition systems
- □ Measurement techniques in optical domains.

INTENDED OUTCOMES:

- Ability to understand the basic measurement concepts
- Ability to understand the concepts of electronic measurements
- Gain adequate knowledge in the importance of signal generators and signal analyzers in measurements
- Ability to understand the need for data acquisition systems
- Ability to understand measurement techniques in optical domains.

UNIT-I BASIC MEASUREMENT CONCEPTS

Measurement systems – Static and dynamic characteristics – units and standards of measurements – error analysis – moving coil, moving iron meters – multimeters – True RMS meters – Bridge measurements – Maxwell, Hay, Schering, Anderson and Wien bridge.

UNIT-II BASIC ELECTRONIC MEASUREMENTS

Electronic multimeters - Cathode ray oscilloscopes - block schematic - applications - special oscilloscopes - Q meters - Vector meters - RF voltage and power measurements - Carbon microphone - Loud speaker.

UNIT-III SIGNAL GENERATORS AND ANALYZERS

Function generators – RF signal generators – Sweep generators – Frequency synthesizer – wave analyzer – Harmonic distortion analyzer – spectrum analyzer.

UNIT-IV DIGITAL INSTRUMENTS

Comparison of analog and digital techniques – digital voltmeter – multimeters – frequency counters – measurement of frequency and time interval – extension of frequency range – measurement errors.

UNIT-V DATA ACQUISITION SYSTEMS AND FIBER OPTIC MEASUREMENTS

Elements of a digital data acquisition system – interfacing of transducers – multiplexing –computer controlled instrumentation – IEEE 488 bus – fiber optic measurements for power and system loss – optical time domains reflectometer.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Albert D.Helfrick and William D.Cooper,	Modern Electronic Instrumentation and Measurement Techniques	Prentice Hall of India, New Delhi	2003
2	Joseph J.Carr	Elements of Electronics Instrumentation and Measurement	Pearson education, New Delhi	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Alan S Morris	Principles of Measurements and Instrumentation	Prentice Hall of India, New Delhi	2003
2	Ernest O. Doebelin	Measurement Systems- Application and Design	Tata McGraw-Hill, New Delhi	2004

WEBSITES:

http://mechatronics.mech.northwestern.edu/design_ref/tools/multimeter.html http://www.radio-electronics.com/info/t_and_m/generators/radio-frequency-rf-signal-generator.php www.physics.sc.edu/~hoskins/Demos/CathodeRay.html

MEDICAL ELECTRONICS

15BEEC_E02 OBJECTIVES

- \Box To study the methods of recording various biopotentials
- To study how to measure biochemical and various physiological information
- To understand the working of units which will help to restore normal functioning
- □ To understand the use of radiation for diagnostic and therapy
- □ To understand the need and technique of electrical safety in Hospitals

INTENDED OUTCOMES:

- Gain knowledge about the methods of recording various Biopotential
- Gain knowledge about how to measure biochemical and various physiological information
- Gain knowledge about the working of units which will help to restore normal functioning
- Gain knowledge about the use of radiation for diagnostic and therapy
- Gain knowledge about the need and technique of electrical safety in Hospitals

UNIT-I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING

The origin of Bio-potentials; Biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT-II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT

PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

UNIT-III ASSIST DEVICES AND BIO-TELEMETRY

Cardiac pacemakers, DC Defibrillator, Telemetry principles, frequency selection, Bio-telemetry, radiopill and tele-stimulation.

UNIT-IV RADIOLOGICAL EQUIPMENTS

Ionizing radiation, Diagnostic x-ray equipments, use of Radio Isotope in diagnosis, Radiation Therapy.

UNIT-V RECENT TRENDS IN MEDICAL INSTRUMENTATION

Thermograph, endoscopy unit, Laser in medicine, Diathermy units, Electrical safety in medical equipment.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Leislie Cromwell	Biomedical instrumentation and measurement	Prentice Hall of India, New Delhi.	2002
2.	Khandpur, R.S.	Handbook of Biomedical Instrumentation	Tata McGraw-Hill, New Delhi.	1997

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Joseph J.Carr and John M.Brown	Introduction to Biomedical equipment Technology	John Wiley and Sons, New York	1997

15BEEC_E03ADVANCED ELECTRONIC SYSTEM DESIGN 3003100OBJECTIVES

- □ To study RF component such as resonator, filter, transmission lines, etc...
- □ To learn design of RF amplifiers using transistors.
- □ To study modern Power Supplies using SCR and SMPS technology
- To learn about signal shielding & grounding techniques and study of A/D and D/A Converters.
- □ To learn knowledge about fabrication of PCBs using CAD.

INTENDED OUTCOMES:

- Gain knowledge in RF component such as resonator, filter, transmission lines, etc...
- Gain knowledge in design of RF amplifiers using transistors.
- Gain knowledge in Power Supplies using SCR and SMPS technology
- □ Gain knowledge about signal shielding & grounding techniques and study of A/D and D/A Converters.
- Gain knowledge about fabrication of PCBs using CAD.

UNIT-I INTRODUCTION TO RF DESIGN

RF behaviour of passive components, Chip components and circuit board considerations, Review of transmission lines, Impedance and admittance transformation, Parallel and series connection of networks, ABCD and scattering parameters, Analysis of amplifier using scattering parameter. RF filter – Basic resonator and filter configurations – Butterworth and Chebyshev filters. Implementation of microstrip filter design. Band pass filter and cascading of band pass filter elements.

UNIT-II RF TRANSISTOR AMPLIFIER DESIGN

Impedance matching using discrete components. Microstrip line matching networks. Amplifier classes of operation and biasing networks – Amplifier power gain, Unilateral design($S_{13}=0$) – Simple input and output matching networks – Bilateral design - Stability circle and conditional stability, Simultaneous conjugate matching for unconditionally stable transistors. Broadband amplifiers, High power amplifiers and multistage amplifiers.

UNIT-III DESIGN OF POWER SUPPLIES

DC power supply design using transistors and SCRs, Design of crowbar and foldback protection circuits, Switched mode power supplies, Forward, flyback, buck and boost converters, Design of transformers and control circuits for SMPS.

UNIT-IV DESIGN OF DATA ACQUISITION SYSTEMS

Amplification of Low level signals, Grounding, Shielding and Guarding techniques, Dual slope, quad slope and high speed A/D converters, Microprocessors Compatible A/D converters, Multiplying A/D converters and Logarithmic A/D converters, Sample and Hold, Design of two and four wire transmitters.

UNIT-V DESIGN OF PRINTED CIRCUIT BOARDS

Introduction to technology of printed circuit boards (PCB), General lay out and rules and parameters, PCB design rules for Digital, High Frequency, Analog, Power Electronics and Microwave circuits, Computer Aided design of PCBs.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Reinhold Ludui g and Pavel Bretchko	RF Circuit Design – Theory and Applications	Pearson Education, New York	2000
2.	Sydney Soclof	Applications of Analog Integrated Circuits	Prentice Hall of India, New Delhi	2003

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Keith H.Billings	Handbook of Switched Mode Supplies	McGraw-Hill Publishing Co, New York	1989
2.	Michael Jaacob	Applications and Design with Analog Integrated Circuits	Prentice Hall of India, New Delhi	2004
3.	Otmar Kigenstein	Switched Mode Power supplies in Practice	John Wiley and Sons,Chennai	1989
4.	Muhammad H.Rashid	Power Electronics – Circuits, Devices and Applications	Prentice Hall of India New Delhi	2004
5.	Walter C.Bosshart	Printed circuit Boards – Design and Technology	TATA McGraw- Hill, New Delhi	2002

15BEEC_E04DATA STRUCTURES AND ALGORITHMS3003100OBJECTIVES

- \Box To learn the systematic way of solving problems
- \Box To understand the different methods of organizing large amounts of data
- \Box To learn to program in C
- □ To efficiently implement the different data structures
- □ To efficiently implement solutions for specific problems

INTENDED OUTCOMES:

Gain adequate knowledge about the systematic way of solving problems
Gain adequate knowledge about the different methods of organizing large amounts of
data
Gain adequate knowledge to program in C
Gain adequate knowledge to implement the different data structures
Gain adequate knowledge about to implement solutions for specific problems

UNIT-I PROBLEM SOLVING

 $\label{eq:problem} Problem \ solving - \ Top-down \ Design - \ Implementation - \ Verification - \ Efficiency - \ analysis - \ Sample \ algorithms.$

UNIT-II LISTS, STACKS AND QUEUES

Abstract Data Type (ADT) – The List ADT – The Stack ADT – The Queue ADT

UNIT-III TREES

Preliminaries – Binary Trees – The Search Tree ADT – Binary Search Trees – AVL Trees – Tree Traversals – Hashing – General Idea – Hash Function – Separate Chaining – Open Addressing – Linear Probing – Priority Queues (Heaps) – Model – Simple implementations – Binary Heap

UNIT-IV SORTING

Preliminaries – Insertion Sort – Shell sort – Heap sort – Merge sort – Quick sort – External Sorting

UNIT-V GRAPHS

Definitions – Topological Sort – Shortest-Path Algorithms – Unweighted Shortest Paths – Dijkstra's Algorithm – Minimum Spanning Tree – Prim's Algorithm – Applications of Depth-First Search – Undirected Graphs – Bi connectivity – Introduction to NP-Completeness

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Drome y.R.G	How to Solve it by Computer	Prentice-Hall of India, New Delhi.	2002
2	Weiss.M.A	Data Structures and Algorithm Anal ysis in C	Pearson Education Asia, New Delhi	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Langsam.Y Augenstein.M.J and Tenenbaum.M	Data Structures using C	Pearson Education, Asia, New Delhi	2004
2	Richard.F. Gilberg, Behrouz A and Forouzan.A	Data Structures – A Pseudocode Approach with C	Thomson Brooks / COLE, New York	1998
3	Aho.J.E.Hopcroft and Ullman.J.D	Data Structures and Algorithms	Pearson education, Asia, New Delhi	2007

WEBSITES:

http://www.cs.auckland.ac.nz/software/AlgAnim/trees.html http://www.itl.nist.gov/div897/sqg/dads/HTM L/graph.html

15BECC_E05PROBABILITY AND RANDOM PROCESS3 0 0 3 100

OBJECTIVES

- □ To acquire knowledge about probability and random variables.
- □ To gain knowledge on 2-D random variables.
- □ To gain knowledge about correlation functions.
- □ To learn about the applications of fourier transforms like spectral density and others.
- □ To expose the concepts of random process

INTENDED OUTCOMES:

- Gain knowledge about probability and random variables.
- □ Gain knowledge on 2-D random variables.
- □ Gain knowledge about correlation functions.
- □ Gain knowledge about the applications of fourier transforms like spectral density and others.
- Gain knowledge about the concepts of random process

UNIT I-PROBABILITY DISTRIBUTIONS

Random Variables - Moments - Moment generating function - Binomial, Poisson, Geometric, Exponential and Normal distributions - Functions of Random Variables.

UNIT II-TWO DIMENSIONAL RANDOM VARIABLES

Two dimensional Random Variables - Marginal and conditional distributions – Transformation of Random Variables - central limit theorem - simple problems.

UNIT III-RANDOM PROCESSES

Classification of Random processes - Stationarity - WSS and SSS processes - Poisson Random process - Renewal Process - Markov Chain and transition probabilities.

UNIT IV-CORRELATION FUNCTIONS

Autocorrelation function and its properties - Cross Correlation function and its properties - Linear System with Random inputs - Ergodicit y.

UNIT V-SPECTRAL DENSITY

Power spectral Density Function - Properties - System in the form of convolution - Unit Impulse Response of the System - Einstein - Weiner-Khinchine Relationship - Cross Power Density Spectrum - Properties.

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Veerarajan,T.	Probabilitiy, Statistics and Random processes	3 rd Edition,Tata McGraw Hill Publications, New Delhi	2008

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Sivaramakrishna Das P. and Vija yakumari.C.	A text book of Engineering Mathematics-III	Viji's Academ y	,2010.
2	Trivedi K S	Probability and Statistics with reliability, Queueing and Computer Science Applications	Prentice Hall of India,2nd revised edition,,New Delhi	2002

WEBSITES:

1.<u>www.</u>cut-theknot.org/probabilit y.shtml

- 2. www.ece.uah.edu/courses/ee420-500
- $3.\ http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT \ \% 20 Guwahati/probabilityrp/index.\ htm$
- 4. www.mhhe.com/engcs/electrical/popoulis
- 5. http://hmdc.harvard.edu/projects/SPSS_Tutorial/spsstut.shtml

15BEEC_E06 TELECOMMUNICATION SWITCHING AND NETWORKS

OBJECTIVES

- □ To introduce the concepts of Frequency and Time division multiplexing.
- To introduce digital multiplexing and digital hierarchy namely SONET / SDH
- To introduce the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.

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- To introduce the need for network synchronization and study synchronization issues. To outline network control and management issues.
- To study the enhanced local loop systems in digital environment. To introduce ISDN, DSL/ ADSL, and fiber optic systems in subscriber loop.
- To introduce statistical modeling of telephone traffic. To study blocking system characteristics and queuing system characteristics.
- To characterize blocking probability holding service time distributions for in speech and data networks.

INTENDED OUTCOMES:

- □ Knowledge about the concepts of Frequency and Time division multiplexing.
- □ Knowledge about digital multiplexing and digital hierarchy namely SONET / SDH
- □ Knowledge about the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.
- □ Knowledge about the need for network synchronization and study synchronization issues. To outline network control and management issues.
- □ Knowledge about the enhanced local loop systems in digital environment. Knowledge about ISDN, DSL/ADSL, and fiber optic systems in subscriber loop.
- □ Knowledge about statistical modeling of telephone traffic. Knowledge about blocking s ystem characteristics and queuing s ystem characteristics.
- □ Knowledge about characterize blocking probability holding service time distributions for in speech and data networks.

UNIT-I MULTIPLEXING

Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings.

SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats, SONET Operations, Administration and Maintenance, Payload Framing and Frequency Justification, Virtual Tributaries, DS3 Payload Mapping, E4 Payload Mapping, SONET Optical Standards, SONET Networks. SONET Rings: Unidirectional Path-Switched Ring, Bidirectional Line-Switched Ring.

UNIT-II DIGITAL SWITCHING

Switching Functions, Space Division Switching, Time Division Switching, two-dimensional Switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SSN07 signaling.

UNIT-III NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT

Timing: Timing Recovery: Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S. Network Synchronization, Network Control, Network Management.

UNIT-IV DIGITAL SUBSCRIBER ACCESS

ISDN: ISDN Basic Rate Access Architecture, ISDN U Interface, ISDN D Channel Protocol. High-Data-Rate Digital Subscriber Loops: As ymmetric Digital Subscriber Line, VDSL. Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next-Generation Digital Loop Carrier, Fiber in the Loop, Hybrid Fiber Coax Systems, Voice band Modems: PCM Modems, Local Microwave Distribution Service, Digital Satellite Services.

UNIT-V TRAFFIC ANALYSIS

Traffic Characterization: Arrival Distributions, Holding Time Distributions, Loss Systems, Network Blocking Probabilities: End-to-End Blocking Probabilities, Overflow Traffic, Delay Systems: Exponential service Times, Constant Service Times, Finite Queues.

TEXTBOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Bellamy John	Digital Telephon y	John Wily & Sons, Inc Chennai	2000
2.	Viswanathan.T	Telecommunication Switching System and Networks	Prentice Hall of India Ltd, New Delhi	1994

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	P.Gnanasivam	Telecommunication Switching System and Networks	New Age International	2007

LIST OF ELECTIVES FOR VI SEMESTER B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

15BEEC_E07 OBJECTIVES

REMOTE SENSING

 $3 \ 0 \ 0 \ 3 \ 100$

- □ To understand the basic concepts of Remote Sensing
- □ To understand the concepts of optical and microwave remote sensing
- □ To understand the concepts of geometric information systems

INTENDED OUTCOMES:

- □ Understand the basic concepts of Remote Sensing
- Understand the concepts of geometric information systems

UNIT-1 REMOTE SENSING

Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body - Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Receptivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR, Thermal IR and Microwave – Black Body Radiation – Planck's law – Stefan-Boltzman law.

UNIT-II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS

Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces- Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface: Imaging spectrometry and spectral characteristics.

UNIT-III OPTICAL AND MICROWAVE REMOTE SENSING

Satellites - Classification – Based on Orbits and Purpose – Satellite Sensors - Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Landsat, SPOT, IRS series – Current Satellites - Radar – Speckle - Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics ; Sonar remote sensing systems.

UNIT-IV GEOGRAPHIC INFORMATION SYSTEM

GIS – Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection - Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters

UNIT-V MISCELLANEOUS TOPICS

Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications-Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems. Global positioning system – an introduction.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Srinivas.M.G.	Remote Sensing Applications	Narosa Publishing House, New Delhi	2001
2.	Anji Reddy	Remote Sensing and Geographical Information S ystems	BS Publications, New Delhi	2001

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Jensen, J.R	Remote sensing of the environment	Prentice Hall	2000
2.	Kang-Tsung Chang	Introduction to Geograhic Information S ystems	TMH.	2002
3.	Lillesand T.M. and Kiefer R.W	Remote Sensing and Image Interpretation	John Wiley and Sons, Inc, New York	1987
4.	Burrough P A, "Principle of GIS for land resource assessment", Ox ford Mischael Hord	Remote Sensing Methods and Applications	John Wiley & Sons, New York	1986.
5.	Singal	Remote Sening	Tata McGraw-Hill, New Delhi	1990

WEBSITES:

http://www.research.umbc.edu/

http://rst.gsfc.nasa.gov/st art.html

IEEE Transactions on Geo-science and Remote sensing.

Manual of Remote Sensing – American society of photogrammetry & remote sensing, 1993.

15BEEC_E08TELEVISION AND VIDEO ENGINEERING3 0 0 3 100OBJECTIVES

- □ To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver Picture Tubes and Television Camera Tubes
- To study the principles of Monochrome Television Transmitter and Receiver systems.
- To study the various Color Television systems with a greater emphasis on PAL system.
- To study the advanced topics in Television systems and Video Engineering

INTENDED OUTCOMES:

Gain adequate knowledge about the analysis and synthesis of TV Pictures,
Composite Video Signal, Receiver Picture Tubes and Television Camera Tubes
Gain adequate knowledge about the principles of Monochrome Television
Transmitter and Receiver systems.
Gain adequate knowledge about the various Color Television systems with a greater

emphasis on PAL s ystem.
 Gain adequate knowledge about the advanced topics in Television systems and Video Engineering

UNIT-I FUNDAMENTALS OF TELEVISION

Geometry form and Aspect Ratio - Image Continuity - Number of scanning lines - Interlaced scanning -Picture resolution - Camera tubes- Image orthicon - vidicon-plumbicon-silicon diode array vidiconsolid state image scanners- monochrome picture tubes- composite video signal-video signal dimensionhorizontal sync. Composition- vertical sync. Details – functions of vertical pulse train – scanning sequence details. Picture signal transmission – positive and negative modulation – VSB transmission sound signal transmission – standard channel bandwidth.

UNIT-II MONOCHROME TELEVISION TRANSMITTER AND RECEIVER

TV transmitter – TV signal propagation – Interference – TV transmission Antennas – Monochrome TV receiver – RF tuner – UHF, VHF tuner- Digital tuning techniques- AFT-IF subsystems - AGC – Noise cancellation- Video and sound inter carrier detection- vision IF subsystem- video amplifiers requirements and configurations - DC re-insertion - Video amplifier circuits- S ync separation – typical sync processing circuits- Deflection current waveform – Deflection Oscillators – Frame deflection circuits – requirements- Line Deflection circuits – EHT generation – Receiver Antennas.

UNIT-III ESSENTIALS OF COLOUR TELEVISION

Compatibility – colour perception- Three colour theory- luminance, hue and saturation-colour television cameras- values of luminance and colour difference signals- colour television display tubesdelta – gun-precision – in-line and Trinitron colour picture tubes- purity and convergence- purity and static and dynamic convergence adjustments- pincushion correction techniques- automatic degaussing circuit- gre y scale tracking – colour signal transmission- bandwidth- modulation of colour difference signals – weighting factors- Formation of chrominance signal.

UNIT-IV COLOUR TELEVISION SYSTEMS

NTSC colour TV s ystem - NTSC colour receiver - limitations of NTSC s ystem – PAL colour TV s ystem – cancellation of phase errors - PAL –D colour system - PAL coder – Pal-Decolour receiver - chromo signal amplifier - separation of U and V signals - colour burst separation – Burst phase Discriminator –

ACC amplifier- Reference Oscillator- Ident and colour killer circuits- U and V demodulators- Colour signal matrixing – merits and demerits of the PAL s ystem – SECAM system – merits and demerits of SECAM system.

UNIT-V ADVANCED TELEVISION SYSTEMS

Satellite TV technology- Cable TV – VCR- Video Disc recording and playback- Tele Text broadcast receiver – digital television – Transmission and reception- projection Television – Flat panel display TV receiver – Stereo sound in TV - 3D TV - EDTV - Digital equipments for TV studios.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Gulati,R.R.	Monochrome Television Practice, Principles, Technology and servicing	New age International Publishes, New Delhi	2004
2.	R.R.Gulati	Monochrome and colour television	New age International Publisher, New Delhi	2003

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Dhake .A.M.	Television and Video Engineering	TMH, New Delhi	2003
2.	S.P.Bali	Colour Television, Theory and Practice	TMH,New Delhi	1994

15BEEC_E09COMPUTER ARCHITECTUREOBJECTIVES

To have a thorough understanding of the basic structure and operation of a digital computer.

3 0 0 3 100

- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study in detail the different types of control and the concept of pipelining.
- □ To study the hierarchical memory system including cache memories and virtual memory.
- □ To study the different ways of communicating with I/O devices and standard I/O interfaces.

INTENDED OUTCOMES:

- Thorough knowledge about the basic structure and operation of a digital computer.
- Understand the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- Detailed exposure about the different types of control and the concept of pipelining.
- Detailed exposure about the hierarchical memory system including cache memories and virtual memory.
- Detailed exposure about the different ways of communicating with I/O devices and standard I/O interfaces.

UNIT-I 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 numbers and operations.

UNIT-III BASIC PROCESSING UNIT

Fundamental concepts – Execution of a complete Instruction – Multiple bus organization – Hardwired control – microprogrammed control. Pipelining – Basic concepts – data hazards – instruction hazards – influence on Instruction sets – Data path and control consideration – Superscalar 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).

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Carl Hamacher, Zvonko Vranesic and Safwat Zak y	Computer Organization	McGraw Hill	2002
2	William Stallings	Computer Organization & Architecture – Designing for Performance	Pearson Education, New Delhi	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	David A.Patterson and John L.Henness y	Computer Organization & Design, the hardware / software interface	Morgan Kaufmann, New York.	2002
2	John P.Hayes	Computer Architecture & Organization	McGraw-Hill, New York	1998

WEBSITES:

www.webopedia.com/quick_ref/OS I_Layers.asp www.yale.edu/pclt/COMM/TCP IP.HTM

15BEEC_E10 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY 3 0 0 3 100

OBJECTIVES

- □ To understand EMI Sources, EMI problems and their solution methods in PCB level / Subsystem and s ystem level design.
- □ To measure the emission. immunity level from different systems to couple with the prescribed EMC standards

INTENDED OUTCOMES:

- Thorough knowledge about EMI Sources, EMI problems and their solution methods in PCB level / Subsystem and system level design.
- Thorough knowledge to measure the emission, immunity level from different systems to couple with the prescribed EMC standards

UNIT-I BASIC CONCEPTS

Definition of EMI and EMC with examples, Classification of EMI/EMC - CE, RE, CS, RS, Units of Parameters, Sources of EMI, EMI coupling modes - CM and DM, ESD Phenomena and effects, Transient phenomena and suppression.

UNIT-II EMIMEASUREMENTS

Basic principles of RE, CE, RS and CS measurements, EMI measuring instruments- Antennas, LISN, Feed through capacitor, current probe, EMC analyzer and detection t6echnique open area site, shielded anechoic chamber, TEM cell.

UNIT-III EMC STANDARD AND REGULATIONS

National and Intentional standardizing organizations- FCC, C ISPR, ANS I, DOD, IEC, CENEEC, FCC CE and RE standards, CISPR, CE and RE Standards, IEC/EN, CS standards, Frequency assignment - spectrum conversation.

UNIT-IV EMI CONTROL METHODS AND FIXES

Shielding, Grounding, Bonding, Filtering, EMI gasket, Isolation transformer, opto isolator.

UNIT-V EMC DESIGN AND INTERCONNECTION TECHNIQUES

Cable routing and connection, Component selection and mounting, PCB design- Trace routing, Impedance control, decoupling, Zoning and grounding

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Prasad Kodali.V.	Engineering Electromagnetic Compatibility	S.Chand&Co, New Delhi	2000
2.	Clayton R.Paul	Introduction to Electromagnetic compatibility	Wiley & Sons , New Delhi	1992

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Bernhard E. Keiser	Principles of Electromagnetic Compatibility	Artech House	1994

15BEEC_E11

OBJECTIVES

- □ To have an overview of components of an operating systems
- □ To have a thorough knowledge of Process management, Storage management, I/O and File Management.
- □ To have an understanding of a distributed operating systems.

INTENDED OUTCOMES:

- Understand the overview of components of an operating systems
- Gain thorough knowledge of Process management, Storage management, I/O and File Management.
- Understand the distributed operating systems.

UNIT-I OPERATING SYSTEMS – AN OVERVIEW

Introduction to OS - Mainframe s ystems – Desktop S ystems – Multiprocessor S ystems – Distributed S ystems – Clustered S ystems – Real Time S ystems – Handheld S ystems. Computer-S ystem Operation – VO Structure – Storage Structure – Storage Hierarch y – Hardware Protection – Network Structure. S ystem Components – Operating-S ystem Services – S ystem Calls – S ystem Programs – S ystem Structure – Virtual Machines – S ystem Design and Implementation – S ystem Generation.

UNIT-II PROCESS MANAGEMENT

Process Concept – Process Scheduling – Operations on Processes – Cooperating Process – Interprocess Communication – Communication in client-server systems. Threads – Overview – Multithreading models – Threading issues- CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling – Process Scheduling Models. The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors – Atomic transactions. System Model – Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlock.

UNIT-III STORAGE MANAGEMENT

Storage Management – Background – Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging. Virtual Memory – Background – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing. File System Implementation – File Concept – Access Methods – Directory Structure – File – System Mounting – File Sharing – Production. File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management – Efficiency and Performance – Recovery.

UNIT-IV I/O SYSTEMS

I/O Hardware – Application I/O Interface – Kernel I/O Subsystem – Transforming I/O to Hardware Operations – Streams – Performance. Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management – RAID Structure – Disk Attachment – Stable – Storage Implementation – Tertiary Storage Structure.

UNIT-V DISTRIBUTED SYSTEMS

Background – Topology – Network Types – Communication – Communication Protocols – Robustness – Design Issues. Naming and Transparency – Remote File Access – Stateful Versus Stateless Service – File Replication. Event Ordering – Mutual Exclusion – Atomicity – Concurrency Control – Deadlock Handling – Election Algorithms – Reaching Agreement.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne	Operating S ystem Concepts, Windows XP Update	John Wiley & Sons (ASIA) Pvt. LTD, New Delhi	2003
2.	Harvey M. Deitel	Operating S ystems	Pearson Education Pvt. Ltd, New Delhi	2002

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Andrew S. Tanenbaum	Modern Operating Systems	Prentice Hall of India Pvt. LTD, New Delhi	2003
2.	William Stallings	Operating System	Prentice Hall of India, New Delhi	2003

15BEEC_E12 ADVANCED MICROPROCESSORS

OBJECTIVES

- □ To introduce the concepts in internal programming model of Intel family of microprocessors.
- □ To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the basic architecture of Pentium family of processors.
- To introduce the architecture programming and interfacing of 16 bit microcontrollers.
- To introduce the concepts and architecture of **RISC** processor and **ARM**.

INTENDED OUTCOMES:

- Gain knowledge about the concepts in internal programming model of Intel family of microprocessors.
- Gain knowledge about the programming techniques using MASM, DOS and BIOS function calls.
- Gain knowledge about the basic architecture of Pentium family of processors.
- Gain knowledge about the architecture programming and interfacing of 16 bit microcontrollers.
- Gain knowledge about the concepts and architecture of RISC processor and ARM.

UNIT-I ADVANCED MICROPROCESSOR ARCHITECTURE

Internal Microprocessor Architecture-Real mode memory addressing – Protected Mode Memory addressing –Memory paging - Data addressing modes – Program memory addressing modes – Stack memory addressing modes – Data movement instructions – Program control instructions- Arithmetic and Logic Instructions.

UNIT-II MODULAR PROGRAMMING AND ITS CONCEPTS

 $Modular\ programming\ -Using\ ke\ yboard\ and\ Video\ display\ -Data\ Conversions\ -Disk\ files\ -Interrupt\ hooks\ -using\ assembly\ languages\ with\ C/\ C++$

UNIT-III PENTIUM PROCESSORS

Introduction to Pentium Microprocessor – Special Pentium registers- Pentium memory management – New Pentium Instructions –Pentium Processor –Special Pentium pro features – Pentium 4 processor

UNIT-IV 16-BIT MICRO CONTROLLER

8096/8097 Architecture-CPU registers –RALU-Internal Program and Data memory Timers-High speed Input and Output –Serial Interface-I/O ports –Interrupts –A/D converter-Watch dog timer –Power down feature –Instruction set- External memory Interfacing –External I/O interfacing.

UNIT-V RISC PROCESSORS AND ARM

The RISC revolution – Characteristics of RISC Architecture – The Berkeley RISC – Register Windows – Windows and parameter passing – Window overflow – RISC architecture and pipelining – Pipeline bubbles – Accessing external memory in RISC systems – Reducing the branch penalties – Branch prediction – The ARM processors – ARM registers – ARM instructions – The ARM built-in shift mechanism – ARM branch instructions – sequence control – Data movement and memory reference instructions.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Barry B.Bre y	The Intel Microprocessors 8086/8088, 80, 86, 80286, 80386 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and interfacing	Prentice Hall of India Private Limited, New Delhi,.	2003
2.	John Peatman	Design with Microcontroller	McGraw Hill Publishing Co Ltd, New Delhi	1997

REFERENCE

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Rajkamal	The concepts and feature of micro controllers 68HC11, 8051 and 8096	S Chand Publishers, New Delhi.	2000
2.	Alan Clements	The principles of computer Hardware	Ox ford University Press, Ox ford.	2003

15BEEC_E13 DIGITAL LOGIC DESIGN USING CPLD'S AND HDL 3 0 0 3 100

OBJECTIVES

- □ To describe the features of system-level design options
- □ To describe basic structures and features of cell-based ASICs, gate array ASICs, programmable logic devices (PLDs), field-programmable gate arrays (FPGAs), Complex PLD (CPLDs)
- □ To understand how to model combinational circuits and sequential circuits using PLDs, Complex PLDs

To understand how to model combinational circuits and sequential circuits using VHDL

INTENDED OUTCOMES:

- Gain knowledge about the features of system-level design options
 - Gain knowledge about the basic structures and features of cell-based ASICs, gate array ASICs , programmable logic devices (PLDs), field-programmable gate arrays (FPGAs), Complex PLD (CPLDs)
- Gain knowledge about how to model combinational circuits and sequential circuits using PLDs, Complex PLDs
- Gain knowledge about how to model combinational circuits and sequential circuits using VHDL

UNIT I-ADVANCED TOPICS IN BOOLEAN ALGEBRA

Shannon's Expansion theorem and its application ,Consensus theorem, ReedMuller Expansion technique, Multiplexer logic as function generators, Implementation of Multiple output logic functions, Static and Dynamic hazards, Design of static hazard-free and dynamic hazard-free logic circuits.

UNIT II-Sequential Circuit Design

Mealy and Moore machines, clocked synchronous sequential circuit design procedure-state diagramsstate table-state reduction-state assignment, Incompletely Specified Sequential Machines.

UNIT III-Design with Programmable Logic Devices

Basic concepts, PROM as PLD, Programmable Array Logic (PAL), Programmable Logic Array (PLA), Design of combinational and sequential circuits using PLD's, Complex PLD (CPLD), Introduction to Field Programmable Gate Arrays (FPGA), Xilinx FPGAs-Xilinx 3000 series and 4000 series FPGA.

UNIT IV-Introduction to VHDL

VHDL Description of combination circuits, VHDL Modules- entity and architecture description, Sequential statements and VHDL processes, VHDL Data types and Operators, Concurrent and Sequential Assignment Statements(All types), Different types of Modeling in VHDL – Behavioral, dataflow and structural modeling, Variables, Signals and Constants in VHDL, Package in VHDL.

UNIT V-Digital Design with VHDL

Combinational Circuit Design using Structural, behavioral and data flow modeling (Circuits like Arithmetic circuits, decoders, encoders, multiplexers, demultiplexers, code converters, 4-bit binary adders, BCD adder, comparator, ALU etc.,), Design of Sequential Elements, Registers, Counters and Synchronous Sequential Circuits using VHDL.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Charles. H. Roth, Jr	Digital Systems Design using VHDL	CENGAGE Learning, Third Indian Reprint	2010
2.	Zwolinski	Digital System Design With VHDL	Pearson Education India	2004

REFERENCE

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
<mark>1.</mark>	<mark>Ian Grout</mark>	Digital Systems Design with FPGAs and CPLDs	Newness	<mark>2011</mark>

15BEEC_E14 SENSORS AND TRANSDUCERS 3 0 0 3 100

OBJECTIVES

- □ To study basic concepts of various sensors and transducers.
- □ To develop knowledge in selection of suitable sensor based on requirement and application.

INTENDED OUT COMES:

- Understand basic concepts of various sensors and transducers.
- □ Gain thorough knowledge in selection of suitable sensor based on
 - requirement and application.

UNIT I-NTRODUCTION

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 ELECTROMECHANICAL 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 -t ype thermometric sensors, thermo emf sensors, junction semiconductor t ypes, Thermal radiation sensors, spectroscopic thermometry

Radiation Sensors: Photo detectors, photovoltaic and photo junction cells, photo sensitive cell, photo FETs and other devices.

UNIT IV-MAGNETIC AND ELECTROANALYTICAL SENSOR

Magnetic Sensors: Force and displacement measurement, magneto resistive sensors, Hall Effect sensor, Inductance and eddy current sensors, Angular/rotary movement transducer, Electro magnetic flow meter, squid sensor.

Electro analytical Sensors: Electro chemical cell, cell potential, sensor electrodes, electro ceramics in gas media, chemFET.

UNIT V-SENSORS AND THEIR APPLICATIONS

Automobile sensor, Home appliance sensor, Aerospace sensors, sensors for manufacturing, medical diagnostic sensors, environmental monitoring.

TEXT BOOK:

<mark>S.NO.</mark>	Author(s) Name	Title of the book	Publisher	<mark>Year of</mark> publication
<mark>1</mark>	Patranabis D	Sensor and Actuators	Prentice Hall of India (Pvt)Ltd	<mark>2006</mark>

2	Ian Sinclair	Sensor and Transducers	Elsevier India Pvt Ltd, 3 rd Edtion	<mark>2011</mark>
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<mark>S.NO.</mark>	Author(s) Name	Title of the book	Publisher	Year of publication
1	A.K. Sawhney, Puneeth sawhney	A Course in Electrical and Electronic Measurements and Instrumentation	Dhanpat Rai Publications	2012
2	Ernest O. Doeblin	Measurement S ystem, Application and Design	Tata McGraw Hill Publishing Compan y Ltd., 5 th Edition	<mark>2008</mark>

LIST OF ELECTIVES FOR VILSEMESTER B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

15BEEC_E15 VIRTUAL INSTRUMENTATION USING LAB VIEW 3 0 0 3 100 OBJECTIVES

- \Box To understand the basic needs of VI.
- \Box To learn Lab VIEW software basics.
- □ To understand data acquisition techniques.
- □ To learn different interfacing techniques.
- □ To design some real time application using Lab VIEW software.

INTENDED OUTCOMES:

- □ The students will be able to familiarize the basics and need of VI.
- \Box The students will be able to learn LabVIEW software basics.
- □ To get better understanding of data acquisition techniques.
- □ The students can have an exposure to different interfacing techniques.
- \Box The students can able to design some real time application using LabVIEW software.

UNIT I-VIRTUAL INSTRUMENTATION

Historical perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II-VI PROGRAMMING TECHNIQUES

VIS and sub-VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes, local and global variable, string & file input.

UNIT III-DATA ACQUISITION BASICS

Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses.ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation, Simple applications using NIMyDAQ and NIELVIS.

UNIT IV-LabVIEW IN SIGNAL PROCESSING

Waveform Generation, Sampling, Quantization, Aliasing, Signal Reconstruction. Fourier transforms, Power spectrum, Correlation methods, windowing & filtering. DIgital Filter Design, IIR/FIR Filtering system Design, Adaptive Filter design.

UNIT V-FREQUENCY DOMAIN PROCESSING

Discrete Fourier Transform and Fast Fourier Transform, STFT, Wavelet Transform, Signal Processing applications.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Sumathi & P.Surekha	LabVIEW based Advanced Instrumentation	Springer	2007
2	Jovitha Jerome	Virtual Instrumentation Using LabVIEW	PHI Learning Pvt. Ltd	2010

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Sanjay Gupta, Joseph John	Virtual Instrumentation using LabVIEW	2nd Edition, Tata McGraw Hill Education Private Limited	2010
2	Gary W. Johnson, Richard Jennings	LabVIEW Graphical Programming	Fourth Edition, McGraw-Hill publications	2006

WIRELESS NETWORKS

15BEEC_E16 OBJECTIVES

- □ To understand physical as wireless MAC layer alternatives techniques.
- □ To learn planning and operation of wireless networks.
- $\hfill\square$ To study various wireless LAN and WAN concepts.
- □ To understand WPAN and geo-location systems.

INTENDED OUTCOMES:

- Gain knowledge about physical as wireless MAC layer alternatives techniques.
- Gain knowledge about planning and operation of wireless networks.
- Gain knowledge about various wireless LAN and WAN concepts.
- Gain knowledge about WPAN and geo-location systems.

UNIT-I PHYSICAL AND WIRELESS MAC LAYER ALTERNATIVES

Wired transmission techniques: design of wireless modems, power efficiency, out of band radiation, applied wireless transmission techniques, short distance base band transmission, VWB pulse transmission, broad Modems for higher speeds, diversity and smart receiving techniques, random access for data oriented networks, integration of voice and data traffic.

UNIT-II WIRELESS NETWORK PLANNING AND OPERATION

Wireless networks topologies, cellular topology, cell fundamentals signal to interference

ratio calculation, capacity expansion techniques, cell splitting, use of directional antennas for cell sectoring, micro cell method, overload cells, channels allocation techniques and capacity expansion FCA, channel borrowing techniques, DCA, mobility management, radio resources and power management securities in wireless networks.

UNIT-III WIRELESS WAN

Mechanism to support a mobile environment, communication in the infrastructure, IS-95 CDMA forward channel, IS – 95 CDMA reverse channel, pallert and frame formats in IS – 95, IMT – 2000; forward channel in W-CDMA and CDMA 2000, reverse channels in W-CDMA and CDMA-2000, GPRS and higher data rates, short messaging service in GPRS mobile application protocols.

UNIT-IV WIRELESS LAN

Historical overviews of the LAN industry, evolution of the WLAN industry, wireless home networking, IEEE 802.11. The PHY Layer, MAC Layer, wireless ATM, HYPER LAN, HYPER LAN – 2.

UNIT-V WPAN ANDGEOLOCATION SYSTEMS

IEEE 802.15 WPAN, Home RF, Bluetooth, interface between Bluetooth and 802.11, wireless geolocation technologies for wireless geolocation, geolocation standards for E.911 service.
TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Kaveh Pahlavan, Prashant Krishnamoorth y	Principles of Wireless Networks	Pearson Education, New Delhi	2002
2.	Jochen Schiller	Mobile Communications	Person Education, New Delhi	2003

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Wang.Xand Poor.H.V	Wireless Communication S ystems	Pearson education, New Delhi	2004
2.	Mallick.M	Mobile and Wireless design essentials	Wiley Publishing Inc, New Delhi	2003
3.	Nicopolitidis.P, Obaidat.M.S, Papadimitria.G.I, Pomportsis.A.S	Wireless Networks	John Wiley & Sons, New Jersy	2003

OPTO ELECTRONIC DEVICES

15BEEC_E17 OBJECTIVES

- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To learn the principle of optical detection mechanism in different detection devices.
- To understand different light modulation techniques and the concepts and applications of optical switching.
- To study the integration process and application of opto electronic integrated circuits in
- transmitters and receivers.

INTENDED OUTCOMES:

- Thorough knowledge in the basics of solid state physics and characteristics of light.
- □ Knowledge in different methods of luminescence, display devices and laser types and their applications.
- Adequate knowledge about the principle of optical detection mechanism in different detection devices.
- Adequate knowledge about different light modulation techniques and the concepts and applications of optical switching.
- Adequate knowledge about the integration process and application of opto electronic integrated circuits in transmitters and receivers.

UNIT-I ELEMENTS OF LIGHT AND SOLID STATE PHYSICS

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.

UNIT-II DISPLAY DEVICES AND LASERS

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications.

UNIT-III OPTICAL DETECTION DEVICES

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT-IV OPTOELECTRONIC MODULATOR

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acoustoptic devices, Optical, Switching and Logic Devices.

UNIT-V OPTOELECTRONIC INTEGRATED CIRCUITS

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.

TEXTBOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Wilson.J, and Haukes.J	Opto Electronics – An Introduction	Prentice Hall of India Pvt. Ltd., New Delhi	1998

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Bhattachar ya	Semiconductor Opto Electronic Devices	Prentice Hall of India Pvt., Ltd, New Delhi	1996
2.	Jasprit Singh	Opto Electronics – As Introduction to materials and devices	McGraw-Hill International Edition, New York	1998

15BEEC_E18 TELECOMMUNICATION SYSTEM MODELING AND SIMULATION

3 0 0 3 100

OBJECTIVES

- **To learn simulation of random variables and random process**
- **To learn modeling of radio communication channels**
- □ To understand various simulation techniques
- To understand simulation methodologies and performance evaluation
- To analyze some digital communication optical communication and satellite communication techniques as case studies through simulation.

INTENDED OUTCOMES:

- Gain knowledge in simulation of random variables and random process
- Gain knowledge in modeling of radio communication channels
- Gain knowledge in various simulation techniques
- Gain knowledge in simulation methodologies and performance evaluation
- Gain knowledge to analyze some digital communication optical communication and satellite communication techniques as case studies through simulation.

UNIT-I SIMULATION OF RANDOM VARIABLES RANDOM PROCESS

Generation of random numbers and sequence, Gaussian and uniform random numbers Correlated random sequences, Testing of random numbers generators, Stationary and uncorrelated noise, Goodness of fit test.

UNIT-II MODELING OF COMMUNICATION SYSTEMS

Radio frequency and optical sources, Analog and Digital signals, Communication channel and models, Free space channels, Multipath channel and discrete channel noise and interference.

UNIT-III ESTIMATION OF PERFORMANCE MEASURE FOR SIMULATION

Quality of estimator, Estimation of SNR, Probability density function and bit error rate, Monte Carlo method, Importance sampling method, Extreme value theory.

UNIT-IV SIMULATION AND MODELING METHODOLOGY

Simulation environment, Modeling considerations, Performance evaluation techniques, error source simulation, Validation.

UNIT-V CASE STUDIES

Simulations of QAM digital radio link in environment, Light wave communication link and satellite system.

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Jeruchim.M.C, Balaban.P and Sam K. Shanmugam	Simulation of communication S ystems: Modeling, Methodology and Techniques	Plenum press, New York	2001

TEXTBOOK:

2.	Averill.M.Law and.David Kelton.W	Simulation Modeling and Analysis	McGraw-Hill Inc, New York	2000
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S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Geoffre y Gorden	System Simulation	Prentice Hall of India New Delhi	1992
2.	Turin.W	Performance Analysis of Digital Communication Systems	Computer Science Press, New York	1990
3.	Jerry banks and John S.Carson	Discrete Event System Simulation	Prentice Hall of India, New Delhi	1984

SPEECH PROCESSING3 0 0 3 100

15BEEC_E19 OBJECTIVES

- □ To introduce the models for speech production
- □ To develop time and frequency domain techniques for estimating speech parameters
- □ To introduce a predictive technique for speech compression
- **To understand speech recognition**, synthesis and speaker identification.

INTENDED OUTCOMES:

- Gain knowledge about the models for speech production
- Gain knowledge about time and frequency domain techniques for estimating speech parameters
- Gain knowledge about predictive technique for speech compression
- Gain knowledge about speech recognition, synthesis and speaker identification.

UNIT-I NATURE OF SPEECH SIGNAL

Speech production mechanism, Classification of speech, sounds, nature of speech signal, models of speech production.

Speech signal processing: purpose of speech processing, digital models for speech signal, Digital processing of speech signals, Significance, short time analysis.

UNIT-II TIME DOMAIN METHODS FOR SPEECH PROCESSING

Time domain parameters of speech, methods for extracting the parameters, Zero crossings, Auto correlation function, pitch estimation.

UNIT-III FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING Short time Fourier analysis, filter bank analysis, spectrographic analysis, Format extraction, pitch extraction, Analysis - synthesis systems.

UNIT-IV LINEAR PREDICTIVE CODING OF SPEECH

Formulation of linear prediction problem in time domain, solution of normal equations, Interpretation of linear prediction in auto correlation and spectral domains.

UNIT-V HOMOMORPHIC SPEECH ANALYSIS

Central analysis of speech, format and pitch estimation, Applications of speech processing - Speech recognition, Speech synthesis and speaker verification.

TEXTBOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Rabiner.L.R and Schafer.R.E	Digital processing of speech signals	Prentice Hall, New Delhi	1978
2.	Flanagan.J.L	Speech Analysis Synthesis and Perception	Sprenger Vertag, New York	1972

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Witten.I.H	Principles of Computer Speech	Academic press, New Delhi	1983

SATELLITE COMMUNICATION

15BEEC_E20 OBJECTIVES

- Overview of satellite systems in relation to other terrestrial systems.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards.

INTENDED OUTCOMES:

- Gain knowledge in the overview of satellite systems in relation to other terrestrial systems.
- Gain adequate knowledge in satellite orbits and launching.
- Gain adequate knowledge in earth segment and space segment components
- Gain adequate knowledge in satellite access by various users.
- Gain adequate knowledge in DTH and compression standards.

UNIT-I OVERVIEW OF SATELLITE SYSTEMS, ORBITS AND LAUNCHING METHODS

Introduction – Frequency Allocations for Satellite Services – Intelsat – U.S.Domsats – Polar Orbiting Satellites – Problems – Kepler's First Law – Kepler's Second Law – Kepler's Third Law – Definitions of Terms for Earth-orbiting Satellites – Orbital Elements – Apogee and Perigee Heights – Orbital Perturbations – Effects of a Nonspherical Earth – Atmospheric Drag – Inclined Orbits – Calendars – Universal Time – Julian Dates – Sidereal Time – The Orbital Plane – The Geocentric-Equatorial Coordinate System – Earth Station Referred to the JJK Frame – The Top centric-Horizon Co-ordinate System – The Sub-satellite Point – Predicting Satellite Position.

UNIT-II GEOSTATIONARY ORBIT & SPACE SEGMENT

Introduction – Antenna Look Angels – The Polar Mount Antenna – Limits of Visibility – Near Geostationary Orbits – Earth Eclipse of Satellite – Sun Transit Outage – Launching Orbits – Problems – Power Supply – Attitude Control – Spinning Satellite Stabilization – Momentum Wheel Stabilization – Station Keeping – Thermal Control – TT&C Subsystem – Transponders – Wideband Receiver – Input Demultiplexer – Power Amplifier – Antenna Subsystem – Morelos – Anik-E – Advanced Tiros-N Spacecraft

UNIT-III EARTH SEGMENT & SPACE LINK

Introduction – Receive-Only Home TV S ystems – Outdoor Unit – Indoor Unit for Analog (FM) TV – Master Antenna TV S ystem – Community Antenna TV S ystem – Transmit-Receive Earth Stations – Problems – Equivalent Isotropic Radiated Power – Transmission Losses – Free-Space Transmission – Feeder Losses – Antenna Misalignment Losses – Fixed Atmospheric and Ionospheric Losses – Link Power Budget Equation – S ystem Noise – Antenna Noise – Amplifier Noise Temperature – Amplifiers in Cascade – Noise Factor – Noise Temperature of Absorptive Networks – Overall S ystem Noise Temperature – Carrier-to-Noise Ratio – Uplink – Saturation Flux Density – Input Back Off – The Earth Station HPA – Downlink – Output Back off – Satellite TWTA Output – Effects of Rain – Uplink rainfade margin – Downlink rain-fade margin – Combined Uplink and Downlink C/N Ratio – Intermodulation Noise.

UNIT-IV SATELLITE ACCESS

Single Access – Preassigned FDMA, Demand-Assigned FDMA, SPADE System. Bandwidth-limited a Power-limited TWT amplifier operation, FDMA downlink analysis.

TDMA : Reference Burst; Preamble and Postamble, Carrier recovery, Network synchronization, unique word detection, Traffic Date, Frame Efficiency and Channel capacity, Preassigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction, Downlink analysis for Digital transmission. Companion of uplink Power requirements for FDMA & TDMA. On-board signal Processing for TDMA / FDMA operation, Satellite switched TDMA. Code-Division Multiple Access – Direct-Sequence spread spectrum – code signal c(t) – autocorrelation function for c(t) – Acquisition and trackling – Spectrum spreading and dispreading – CDMA throughput – Problems – Network Layers – TCP Link – Satellite Links and TCP – Enhancing TCP Over Satellite Channels Using Standard Mechanisms (RFC-2488) – Requests for comments – Split TCP connections – As ymmetric Channels – Proposed S ystems.

UNIT-V DIRECT BROADCAST SATELLITE SERVICES

Introduction – Orbital Spacings – Power Rating and Number of Transponders – Frequencies and Polarization – Transponder Capacity – Bit Rates for Digital Television – MPEG Compression Standards – Forward Error Correction – Home Receiver Outdoor Unit (ODU) – Home Receiver Indoor Unit (IDU) – Downlink Analysis – Uplink -Problems - Satellite Mobile Services – VSATs – Radarsat – Global Positioning Satellite System – Orbcomm.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Dennis Rodd y	Satellite Communications	McGraw-Hill Publication, New York.	2001
2	Timothy Pratt – Charles Bostian & Jeremy Allmuti	Satellite Communications	John Willy & Sons (Asia) Pvt. Ltd	2004

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Wilbur L. Pritchars Henri G.Suyder Hond Robert A.Nelson	Satellite Communication S ystems Engineering	Pearson Education Ltd.,	2003
2	M.Richharia	Satellite Communication S ystems - Design Principles	Macmillan Press Ltd.	2003

15BEEC_E21 RADAR AND NAVIGATIONAL AIDS OBJECTIVES

- □ To study RADAR theor y.
- □ To study and learn different types of RADAR and their working principle.
- □ To study RADAR signal detection methods.
- □ To study an overview of RADAR Navigation.
- □ To learn about RADAR systems and components.

INTENDED OUTCOMES:

- □ Gain adequate knowledge about RADAR theor y.
- □ Gain adequate knowledge about different types of RADAR and their working principle.
- □ Gain adequate knowledge about RADAR signal detection methods.
- □ Gain adequate knowledge about RADAR Navigation.
- □ Gain adequate knowledge about RADAR systems and components.

UNIT I-RADAR EQUATIONS

RADAR Block Diagram & operation – RADAR Frequencies – RADAR Equation – Detection of signals in Noise – RADAR cross section of targets – RADAR cross section fluctuations – transmitter power – pulse repetition frequency – system losses and propagation effects.

UNIT II-MTI AND PULSE DOPPLER RADAR

Introduction to Doppler & MTIRADAR – Delay Line canceller – Moving Target Detector – Pulse Doppler RADAR – Non-Coherent MTI – CW RADAR – FMCW RADAR – Tracking RADAR – Monopulse Tracking – Conical Scan and Sequential Lobing.

UNIT III-RADAR SIGNAL DETECTION AND PROPAGATION ON WAVES Detection criteria – automatic detection – constant false alarm rate receiver – Ambiguit y diagram – pulse compression – introduction to clutter – surface clutter RADAR equation – anomalous propagation and diffraction.

UNIT IV-RADIO NAVIGATION

Adcock directional finder – automatic directional finder – Decca Navigation System – Tactical Air Navigation – Instrument Landing System – Ground Controlled Approach.

UNIT V-RADAR TRANSMITTER AND RECEIVER

Linear beam power tubes – Solid state RF power sources – solid state devices used in RADAR – Magnetron- crossed field amplifiers – other aspects of radar transmitter – RADAR Receiver – Receiver noise figure – super heterod one receiver – donamic range – RADAR Displays.

TEXTBOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Merrill I. Skolnik	Introduction to Radar Systems	Tata McGraw-Hill, New Delhi	2003
2.	N.S. Nagaraja	Elements of Electronic Navigation	Tata Mc-Graw Hill, 2 nd Edition	1993

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Nadav Levanon	RADAR Principles	John Wiley and Sons	1989
2.	Brookner	RADAR Technology	Artech House	1986
3.	Mark, A. Richards	Fundamentals of radar signal processing	Mc- Graw Hill, Electronic Engineering, 1 st Edition	2005
4.	V.S.Bagad	Radar Systems	Technical publications, 1 St edition	2008

EMBEDDED SYSTEMS3 0 0 3 100

15BEEC_E22 OBJECTIVES

- □ To introduce students to the embedded systems, its hardware and software.
- □ To introduce devices and buses used for embedded networking.
- To develop knowledge on ARM v7 core and ARM CORTEX M4 architecture.
- To develop knowledge on Floating Point Unit
- To develop knowledge on Motion Control

INTENDED OUTCOMES:

Gain adequate knowledge about devices and buses used for embedded networking.
Gain adequate knowledge about ARM v7 core and ARM CORTEX M4
architecture.
Gain adequate knowledge about Floating Point Unit

Gain adequate knowledge about Motion Control

UNIT-I INTRODUCTION TO EMBEDDED SYSTEMS

Definition and Classification – Overview of Processors and hardware units in an embedded system – Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits

UNIT-II DEVICES AND 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 - '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses.

UNIT-III Overview of Architecture

Review of ARM v7 core and its architecture, Introduction to Advanced ARM CORTEX M4 architecture, Peripherals overview, Advantages of using Cortex M4, Instruction set implementation, CPU timers introduction.

UNIT-IV Floating Point Unit

Introduction to Floating Point Architecture, Advantages of FPU, Need for FPU, IEEE Standards for implementing FPU, Various FPU Modules in Cortex M4 Processors, Software flow for FPU implementation.

UNIT-V Motion Control

Introduction to motion control, advantages for using motion control modules, Implantation of motion control overview, introduction to PWM Modules, PWM Concepts for Motion Control, Configuration of PWM Modules, Introduction to encoders, types of encoders, QEP Module.

TEXTBOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Rajkamal	Embedded S ystems Architecture, Programming and Design	TATA McGraw- Hill, First reprint, New York	2013

2.	Jonathan W Valvan o	Introduction to Arm(r) Cortex –M3 Microcontrollers	Createspace Independent Publisher	2012
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S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Andrew Sloss, Dominic S ymes, Chris Wright	ARM S ystem Developer's Guide	Elsevier/ Morgan Kaufman	2004

15BEEC_E23 TOTAL QUALITY MANAGEMENT

INTENDED OUTCOMES:

- □ To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- □ To understand the statistical approach for quality control.
- □ To create an awareness about the ISO and QS certification process and its need for the industries.

UNIT 1 INTRODUCTION

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT 2 TQM PRINCIPLES

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT 3 STATISTICAL PROCESS CONTROL (SPC)

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT 4 TQM TOOLS

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT 5 QUALITY SYSTEMS

Need for ISO 9000 and Other Quality S ystems, ISO 9000:2000 Quality S ystem – Elements, Implementation of Quality S ystem, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits.

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Dale H.Besterfiled	Total Quality Management	Pearson Education	2003
2.	James R.Evans & William M.Lidsa y	The Management and Control of Quality	South-Western (Thomson Learning)	2002

TEXT BOOKS :

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Feigenbaum.A.V.	Total Quality Management	McGraw Hill	1991
2.	Oakland.J.S	Total Quality Management	Butterworth – Hcinemann Ltd., Ox ford	1989
3.	Narayana V. and Sreenivasan, N.S	Quality Management – Concepts and Tasks	New Age International	1996

LIST OF ELECTIVES FOR VII SEMESTER B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

15BEEC_E24CELLULAR MOBILE COMMUNICATION3 0 0 3 100OBJECTIVES

- □ To learn the fundamental cellular radio concepts
- **To learn about mobility management**
- **To learn about GSM architecture**
- **To learn about WAP**

INTENDED OUT COMES:

- Gain knowledge about the fundamental cellular radio concepts
- Gain knowledge about mobility management
- Gain knowledge about GSM architecture
- Gain knowledge about WAP, Bluetooth, WLL

UNIT I INTRODUCTION

The cellular concept – Frequency reuse – Interference and system capacity – Trunking and Grade of service – Improving coverage and capacity in cellular systems Advanced Mobile Phone service-Global system for mobile communication-EIA/T IA IS136 Digital cellular system - EIA/T IA IS-95 Digital cellular system - cordless telephony and low tier TCS - Third generation wireless system

UNIT-II MOBILITY MANAGEMENT

Handoff - Roaming management - Handoff detection – channel Assignment techniques - Radio link transfer IS-41 Network signaling – Intersystem handoff and Authentication - PACS Network Signaling - cellular digital packet data

<mark>UNIT-III GSM</mark>

GSM Network signaling - GSM Mobility management GSM short message service - International roaming for GSM - GSM operation, Administration and maintenance Mobile number-Mobile number portability's, VoIP service for Mobile networks.

UNIT-IV WIRELESS APPLICATION PROTOCOL

WAP model - WAP Gateway - WAP Protocol, WAP UAProf and caching - Wireless bearer for WAP - WAP developer tool kits – Mobile station application execution environment.

UNIT-V SPECIAL TOPICS

Third generation mobile services - Wireless local loop – Wireless enterprise networks - Bluetooth technology.

TEXT BOOKS :

<mark>S.NO.</mark>	Author(s) Name	Title of the book	Publisher	Year of the publication
<mark>1.</mark>	Yi-Bing Lin and Imrich chlantae	Wireless and Mobile Network Architecture	John Wile y	<mark>2006</mark>
<mark>2.</mark>	T. S. Rappaport	Wireless and Mobile Communication	Pearson Education	<mark>2008</mark>

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
1.	Kauch Pahlavan and Prahant Krishna moorth y	Principles of Wireless Networks	PHILearning	2007

15BEEC_E25

ASIC DESIGN

OBJECTIVES

- To give basic knowledge of ASIC internals.
- To impart knowledge on ASIC types.
 - To give basic understanding of tools used.

INTENDED OUT COMES:

- Understand basic knowledge of ASIC internals.
- □ Gain knowledge on types of ASIC.
- Gain knowledge about the tools used in ASIC design

UNIT I-INTRODUCTION TO ASICS

Introduction to ASICs : Full-custom and Semi -custom ASIC – CMOS logic – ASIC library design.

UNIT II-PROGRAMMABLE ASICS

Programmable ASICs – Anti fuse – static RAM – EPROM and technology –Actel ACT – Xilinx LCA – Altera flex – Altera MAX Logic cells – I/O cells – Interconnects – Low level design entry. Schematic entry.

UNIT III-SIMULATION AND SYNTHESIS

Logic synthesis: A comparator MUX, Inside a logic synthesizer, VHDL and logic synthesis, FSM synthesis, memory synthesis – Simulation: Types of simulation – logic systems – how logic simulation works.

UNIT IV-ASIC TESTING

Boundary scan test – Faults – Fault simulation – Automatic test pattern generation algorithm: Dalgorithm, PODEM – Built in self test.

UNIT V-ASIC CONSTURCTION

System partitioning – power dissipation – partitioning methods – floor planning and placement:– Routing: Global routing, detailed routing, special routing – Introduction to SOC.

TEXT BOOKS :

<mark>S.NO.</mark>	Author(s) Name	Title of the book	Publisher	Year of the publication
<mark>1.</mark>	M.J.S.Smith	Application Specific Integrated Circuits	Pearson Education Reprint	<mark>2006</mark>
<mark>2.</mark>	Wolf Wayne	FPGA based s ystem design	Pearson Education	<mark>2005</mark>

S.NO.	Author(s) Name	Title of the book	Publisher	Year of the publication
<mark>1.</mark>	M. Sarafzadeh and C.K. Wong	An Introduction to VLSIPh ysical Design	McGraw Hill	<mark>1996</mark>
<mark>2.</mark>	Jan M. Rabaey. Anantha Chandrakasan, Borivoje Nikolic	Digital Integrated Circuits	Prentice-Hall Publication	<mark>2002</mark>

15BEEC_E26

OBJECTIVES

To learn the basics of designing intelligent agents that can solve general purpose problems, represent and process knowledge, plan and act, reason under uncertainty and can learn from experiences INTENDED OUTCOMES:

Gain knowledge about the basics of designing intelligent agents that solves general purpose problems, represent and process knowledge, plan and act, reason under uncertainty

UNIT I PROBLEM SOLVING

Introduction – Agents – Problem formulation – uninformed search strategies – heuristics – informed search strategies – constraint satisfaction

UNIT II LOGICAL REASONING

Logical agents – propositional logic – inferences – first-order logic – inferences in firstorder logic – forward chaining – backward chaining – unification – resolution

UNIT III PLANNING

Planning with state-space search – partial-order planning – planning graphs – planning and acting in the real world

UNIT IV UNCERTAIN KNOWLEDGE AND REASONING

Uncertainty – review of probability - probabilistic Reasoning – Bayesian networks –inferences in Bayesian networks – Temporal models – Hidden Markov models

<mark>UNIT V LEARNING</mark>

Learning from observation - Inductive learning – Decision trees – Explanation based learning – Statistical Learning methods - Reinforcement Learning

TEXT BOOK

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, pearson Education, 2002

REFERENCES

 David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press, 2004.
 G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2002.
 J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 1998.

DISASTER MANAGEMENT

15BEEC_E27 OBJECTIVES

- □ To understand the six elements of disaster management.
- □ To understand the "relief system" and the "disaster victim."
- To understand traditional patterns of foreign assistance
- □ To understand the tools of post-disaster management

To gain knowledge about the organizations that are involved in natural disaster assistance

INTENDED OUTCOMES:

- □ Understand the six elements of disaster management.
- □ Understand the "relief system" and the "disaster victim."
- Understand traditional patterns of foreign assistance
- □ Understand the tools of post-disaster management
- Gain knowledge about the organizations that are involved in natural disaster assistance

UNIT I: INTRODUCTION

Introduction – Disaster preparedness – Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management –Alternative to dominant approach – disaster-development linkages -Principle of risk partnership

UNIT II: APPLICATION OF TECHNOLOGY IN DISASTER RISK REDUCTION

Application of various technologies: Data bases – RDBMS – Management Information systems – Decision support system and other systems – Geographic information systems – Intranets and extranets – video teleconferencing. Trigger mechanism – Remote sensing-an insight – contribution of remote sensing and GIS - Case study.

UNIT III: AWARENESS OF RISK REDUCTION

Trigger mechanism – constitution of trigger mechanism – risk reduction by education – disaster information network – risk reduction by public awareness

UNIT IV: DEVELOPMENT PLANNING ON DISASTER

Implication of development planning – financial arrangements – areas of improvement – disaster preparedness – community based disaster management – emergency response.

UNIT V: SEISMICITY

Seismic waves – Earthquakes and faults – measures of an earthquake, magnitude and intensity – ground damage – Tsunamis and earthquakes

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Amita sinvhal	Understanding earthquake disasters	ТМН	2010
2	Pardeep Sahni, Madhavi malalgoda and ari yabandu	Disaster risk reduction in south asia	РНІ	2003

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Pardeep sahni, Alka Dhameja and Uma medury	Disaster mitigation: Experiences and reflections	РНІ	2004

15BEEC_E28 OBJECTIVES

- □ To study about power electronic circuits for voltage and current control and protection.
- □ To learn the switching characteristics of transistors and SCRs. Series and parallel functions of SCRs, Programmable triggering methods of SCR.
- □ To learn controlled rectification AC supplies.
- \Box To study of converters and inverters.
- □ To learn about motor control, charges, SMPS and UPS.

INTENDED OUTCOMES:

- Gain knowledge about power electronic circuits for voltage and current control and protection.
- Gain knowledge about switching characteristics of transistors and SCRs. Series and parallel functions of SCRs, Programmable triggering methods of SCR.
- Gain knowledge about controlled rectification AC supplies.
- Gain knowledge about converters and inverters.
- Gain knowledge about motor control, charges, SMPS and UPS.

UNIT-I POWER ELECTRONICS DEVICES

Characteristics of power devices – characteristics of SCR, diac, triac, SCS, GTO, PUJT – power transistors – power FETs – LASCR – two transistor model of SCR – Protection of thyristors against over voltage – over current, dv/dt and di/dt.

UNIT-II TRIGGERING TECHNIQUES

Turn on circuits for SCR – triggering with single pulse and train of pulses – synchronizing with supply – triggering with microprocessor – forced commutation – different techniques – series and parallel operations of SCRs.

UNIT-III CONTROLLED RECTIFIERS

Converters – single phase – three phase – half controlled and fully controlled rectifiers – Waveforms of load voltage and line current under constant load current – effect of transformer leakage inductance – dual converter.

UNIT-IV INVERTERS

Voltage and current source inverters, resonant, Series inverter, PWM inverter. AC and DC choppers – DC to DC converters – Buck, boost and buck – boost.

UNIT-V INDUSTRIAL APPLICATIONS

DC motor drives – Induction and synchronous motor drives – switched reluctance and brushless motor drives – Battery charger – SMPS – UPS – induction and dielectric heating.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Muhamed H.Rashid	Power Electronics Circuits, Devices and Applications	PHI, New Delhi	2004
2.	M.D. Singh, K.B. Khanchandani	Power Electronics	TMH, New Delhi	1998

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	P.C. Sen	Power Electronics	TMH, New Delhi	1987
2.	Gopal K. Dube y	Thyristorised power controllers	Wiley Eastern, New York	1986
3.	Joseph Vithayathil	Power Electronics – Principles and applications	McGraw-Hill,New York	1995
4.	Cyril W. Lander	Power Electronics	McGraw-Hill,New York	1994

15BEEC_E29DIGITAL IMAGE PROCESSING3 0 0 3 100OBJECTIVES

- **To understand the Fundamentals of image processing.**
- □ To learn Various transforms used in image processing.
- □ To learn the Image processing techniques like image enhancement, reconstruction, compression and segmentation.

INTENDED OUTCOMES:

- Understand the Fundamentals of image processing.
- **Knowledge about various transforms used in image processing.**
- □ Knowledge about the Image processing techniques like image

enhancement, reconstruction, compression and segmentation.

UNIT I-DIGITAL IMA GE FUNDAMENTALS

Introduction-Elements of Digital Image Processing system- elements of visual perception – image sensing and acquisition – Image sampling and quantization - image representation -Some basic relationship between pixels.

UNIT II-IMAGE TRANSFORMS

Introduction - 2D Discrete Fourier Transform – Properties- Importance of Phase -Walsh – Hadamard – Discrete Cosine Transform, Haar, –KL transforms –Singular Value Decomposition.

UNIT III-IMAGE ENHANCEMENT

Enhancement through point operation- Histogram manipulation – Gray level transformation-Neighbourhood operation – Median filter - Image Sharpening- Bit plane slicing - Homomorphic Filtering – Zooming operation.

UNIT IV-IMAGE RESTORATION

Model of Image Degradation/restoration process – Inverse filtering - Least mean square (Wiener) filtering – Constrained least mean square restoration – Singular value decomposition-Recursive filtering.

UNIT V-IMAGE COMPRESSION AND SEGMENTATION

Image compression schemes – Information theory – Run length, Huffman and arithmetic coding – Vector quantization - JPEG. Image Segmentation – Classification – Thresholding – edge based segmentation – Hough transform – Active contour.

<mark>EXT BOOKS :</mark>

<mark>S.NO.</mark>	Author(s) Name	Title of the book	Publisher	<mark>Year of the</mark> publication
<mark>1.</mark>	Rafael C Gonzalez and Richard E Woods,	Digital Image Processing	Pearson Education, 3rd Edition	<mark>2003</mark>
<mark>2.</mark>	S. Jayarman, S. Esakkirajan and T. Veerakumar,	Digital Image Processing	Tata McGraw Hill	<mark>2010</mark>

<mark>S.NO.</mark>	Author(s) Name	Title of the book	Publisher	Year of the publication
<mark>1.</mark>	William K Pratt	Digital Image Processing	John Wille y	<mark>2001</mark>
<mark>2.</mark>	Millman Sonka, Vaclav Hlavac, Roger Boyle, and Broos Colic	Image Processing Analysis and Machine Vision	Thompson learning	<mark>1999</mark>
<mark>3.</mark>	A.K. Jain	Fundamentals of Digital Image Processing	Pearson Education	<mark>1989</mark>

15BEEC_E30 COMPUTER HARDWARE AND INTERFACING 3003100

OBJECTIVES

- □ To introduce issues related to CPU and memory.
- □ To understand the components on the motherboard
- □ To understand different storage media
- □ To introduce the features of different I/O peripheral devices and their interfaces

INTENDED OUTCOMES:

- □ Knowledge about issues related to CPU and memor y.
- Understand the components on the motherboard
- □ Understand different storage media
- □ Knowledge about the features of different I/O peripheral devices and their interfaces.

UNIT-I CPU AND MEMORY

CPU essentials – processor modes – modern CPU concepts – Architectural performance features – the Intel's CPU – CPU over clocking – over clocking requirements – over clocking the system – over clocking the Intel processors – Essential memory concepts – memory organizations – memory packages – modules – logical memory organizations – memory considerations – memory types – memory techniques – selecting and installing memory.

UNIT-II MOTHERBOARDS

Active motherboards – sockets and slots – Intel D850GB – Pentium4 mother board – expansion slots – form factor – upgrading a mother board – chipsets – north bridge – south bridge – CMOS – CMOS optimization tactics – configuring the standard CMOS setup – motherboard BIOS – POST – BIOS features – BIOS and Boot sequences – BIOS shortcomings and compatibility issues – power supplies and power management – concepts of switching regulation – potential power problems – power management.

UNIT-III STORAGE DEVICES

The flopp y drive – magnetic storage – magnetic recording principles – data and disk organization – floppy drive – hard drive – data organization and hard drive – sector la yout – IDE drive standard and features – Hard drive electronics – CD-ROM drive – construction – CDROM electronics – DVD-ROM – DVD media – DVD drive and decoder.

UNIT-IV I/O PERIPHERALS

Parallel port – signals and timing diagram – IEEE1384 modes – as ynchronous communication - serial port signals – video adapters – graphic accelerators – 3D graphics accelerator issues – DirectX – mice – modems – keyboards – sound boards – audio bench.

UNIT-V BUS ARCHITECTURE

Buses – Industry standard architecture (ISA), peripheral component Interconnect (PCI) – Accelerated Graphics port (AGP) – plug-and-play devices – SCSI concepts – USB architecture.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Stephen J.Bigelow	Trouble Shooting, maintaining and Repairing PCs.	Tata McGraw-Hill, New Delhi.	2001
2.	B.Govindarajul u	PC and Clones hardware trouble shooting and maintenance	Tata McGraw-Hill, New Delhi.	2002

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Craig Zacker & John Rourke.	The complete reference: PC hardware.	Tata McGraw- Hill, New Delhi.	2001
2.	Mike Me yers.	Introduction to PC Hardware and Trouble shooting	Tata McGraw- Hill, New Delhi.	2003

15BEEC_E31 OBJECTIVES

- □ To introduce about ATM and Frame relay.
- Overview of an up-to-date survey of developments in High Speed Networks.
- □ To know techniques involved to support real-time traffic and congestion control.
- □ To learn different levels of quality of service (Q.S) to different

applications. **INTENDED OUTCOMES:**

□ Knowledge about ATM and Frame relay.

- Knowledge on up-to-date survey of developments in High Speed Networks.
- Enable the students to know techniques involved to support real-time traffic and congestion control.
- \Box Understand different levels of quality of service (Q.S) to different applications.

UNIT-I HIGH SPEED NETWORKS

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL

High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements – Architecture of 802.11

UNIT-II CONGESTION AND TRAFFIC MANAGEMENT

Queuing Anal ysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT-III TCP AND ATM CONGESTION CONTROL

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO back off – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

UNIT-IV INTEGRATED AND DIFFERENTIATED SERVICES

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

UNIT-V PROTOCOLS FOR QOS SUPPORT

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	William Stallings	High Speed Networks And Internet	Pearson Education, New Delhi.	2002
2.	Irvan Pepelnjk, Jim Guichard and Jeff Apcar	MPLS and VPN architecture	CiscoPress, New york.	2003

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Warland & Pravin Varai ya	High Performance Communication Networks	Jean Harcourt Asia Pvt. Ltd	2001

15BEEC_E32ADVANCED DIGITAL SIGNAL PROCESSING3 0 0 3 100OBJECTIVES

- □ To study the parametric methods for power spectrum estimation.
- To study adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.
- To study multirate signal processing fundamentals.
- To study the analysis of speech signals.
- □ To introduce the student to wavelet transforms.

INTENDED OUTCOMES:

- Understand the parametric methods for power spectrum estimation.
- □ Knowledge about adaptive filtering techniques using LMS algorithm and the applications of adaptive filtering.
- □ Knowledge about multirate signal processing fundamentals.
- □ Knowledge about the analysis of speech signals.

UNIT-I PARAMETRIC METHODS FOR POWER SPECTRUM ESTIMATION

Relationship between the auto correlation and the model parameters – The Yule – Walker method for the AR Model Parameters – The Burg Method for the AR Model parameters – unconstrained least-squares method for the AR Model parameters – sequential estimation methods for the AR Model parameters – selection of AR Model order.

UNIT-II ADAPTIVE SIGNAL PROCESSING

FIR adaptive filters – steepest descent adaptive filter – LMS algorithm – convergence of LMS algorithms – Application: noise cancellation – channel equalization – adaptive recursive filters – recursive least squares.

UNIT-III MULTIRATE SIGNAL PROCESSING

Decimation by a factor D – Interpolation by a factor I – Filter Design and implementation for sampling rate conversion: Direct form FIR filter structures – Polyphase filter structure.

UNIT-IV SPEECH SIGNAL PROCESSING

Digital models for speech signal : Mechanism of speech production – model for vocal tract, radiation and excitation – complete model – time domain processing of speech signal:- Pitch period estimation – using autocorrelation function – Linear predictive Coding: Basic Principles – autocorrelation method – Durbin recursive solution.

UNIT-V WAVELET TRANSFORMS

Fourier Transform : Its power and Limitations – Short Time Fourier Transform – The Gabor Transform - Discrete Time Fourier Transform and filter banks – Continuous Wavelet Transform – Wavelet Transform Ideal Case – Perfect Reconstruction Filter Banks and wavelets – Recursive multi-resolution decomposition – Haar Wavelet – Daubechies Wavelet.

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	John G.Proakis, Dimitris. G.Manobakis	Digital Signal Processing, Principles, Algorithms and Applications	PHI, New Delhi.	2000
2.	Monson H.Ha yes.	Statistical Digital Signal Processing and Modeling.	Wiley, New Delhi.	2002

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	L.R.Rabiner and R.W.Schaber.	Digital Processing of Speech Signals.	Pearson Education, New York.	1979.
2.	Roberto Crist.	Modern Digital Signal Processing.	Thomson Brooks/Cole, New Delhi.	2004.
3.	Raghuveer. M. Rao, Ajit S.Bopardikar.	Wavelet Transforms, Introduction to Theory and applications.	Pearson Education, Asia, New Delhi.	2004.

PHOTONICS

15BEEC_E33 OBJECTIVES

- □ To study about Nature of light and the production of EM radiation for photonics application
- □ To study about the production of EM radiation for photonics application
- □ To study about applications & Trends and new directions in photonic applications

INTENDED OUTCOMES:

- □ Knowledge about Nature of light and the production of EM radiation for photonics application
- □ Knowledge about the production of EM radiation for photonics application
- □ Knowledge about applications & Trends and new directions in photonic applications

UNIT-I NATURE OF LIGHT AND THE PRODUCTION OF EM RADIATION FOR PHOTONICS APPLICATION

Wave descriptions (spectrum, superposition, interference effects), photon effects (photoelectric effect, momentum, interaction with matter). Sources of light: thermal, discharge lamps, lasers, solid-state sources (such as LED's and laser diodes).

UNIT-II THE PRODUCTION OF EM RADIATION FOR PHOTONICS APPLICATION

Characteristics of light (polarization, coherence, monochomaticity), ways to define these mathematically (Stokes parameters, Jones vectors & matrices) and how to determine these characteristics

UNIT-III TRANSMISSION & DETECTION OF LIGHT RADIATION

Ray optics ABCD matrix methods for transmission of light. Stability of a cavity. The q-parameter of a laser beam. Light detectors: photomultiplier tubes, Photo-diodes, thermal detectors, Bolometers, CCD's, single photon detectors. Generic system issues: sources of noise and signal-to-noise ratio, limitations on temporal response and effective bandwidth.

UNIT-IV IMPARTING INFORMATION ONTO EM RADIATION & COMMUNICATION TECHNIQUES

Acousto-optic and electro-optic techniques, LED switching, analogue and digital techniques using lasers, AM, FM, phase modulation techniques Delivery methods. Basics of optical fibre techniques: step index fibre; acceptance angles, single and multimode fibres, dispersion limitations, transmission characteristics.

UNIT-V APPLICATIONS

Spectroscopy using etalons, spectrometers, interferometers Display systems (LCD's, plasmas etc) Range-finding systems and applications (LIDAR etc) .More exotic applications (laser trapping, laser tweezering, different forms of measurements)

Trends and new directions in photonic applications :Laser safety, practical tips on experimental techniques, different forms of laser systems used in research.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Smith, F.G. and King.T.A,	Optics and Photonics	Wiley & Sons, Chichester,	2000
2	Wilson, J. and Hawkes, J.F.B.	Optoelectronics : An introduction	Prentice-Hall, New York	1983

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Harry J. R. Dutton	Understanding Optical Communications	Prentice Hall Series in Networking, New Delhi	1998
2.	Shoichi Sudo, Katsunari Okamoto	New photonics technologies for the information age	Technology & Engineering, New Delhi	2004

15BEEC_E34	ARTIFICIAL NEURAL NETWORKS	3003100
OBJECTIVE	<mark>S</mark>	
🗆 To	b learn the various architectures of building an ANN and its app	lications
🗌 Ad	vanced methods of representing information in ANN like self o	rganizing
net	works, associative and competitive learning	
	b learn architecture of Neocognitron	
INTENDED OU	JTCOMES:	
Gain ade	quate knowledge about the various architectures of building an A	ANN and
\Box Gain ade	quate knowledge about advanced methods of representing infor	mation
in ANN	like self organizing networks, associative and competitive learn	ning
🗌 Gain add	equate knowledge about the architecture of Neocognitron	

UNIT I INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS

Neuro-physiology - General Processing Element - ADALINE - LMS learning rule - MADALINE - MR2 training algorithm.

UNIT II BPN AND BAM

Back Propagation Network - updating of output and hidden layer weights -application of BPN – associative memory - Bi-directional Associative Memory - Hopfield memory - traveling sales man problem.

UNIT III SIMULATED ANNEALING AND CPN

Annealing, Boltzmann machine - learning - application - Counter Propagation network - architecture - training - Applications.

UNIT IV SOM AND ART

Self organizing map - learning algorithm - feature map classifier - applications - architecture of Adaptive Resonance Theory - pattern matching in ART network.

UNIT V NEOCOGNITRON

Architecture of Neocognitron - Data processing and performance of architecture of spacio - temporal networks for speech recognition.

TEXT BOOK:

<mark>S.NO.</mark>	Author(s) Name	Title of the book	Publisher	Year of Publication
<u>1.</u>	J.A. Freeman and B.M.Skapura	Neural Networks, Algorithms Applications and Programming Techniques	Wiley & Sons, Chichester,	<mark>2003</mark>
2	Laurene Fausett	Fundamentals of Neural Networks: Architecture, Algorithms and Applications	Prentice Hall	<mark>1994</mark>

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	S.N.Sivanandham Paulraj.M.P	Introduction to artificial neural networks	Vikas Publishers	2003
FPGA DESIGN

15BEEC_E35 OBJECTIVES

- □ To Provide an understanding of FPGA life c ycle
- □ To understand the concept of selecting a FPGA based on project specifications
- **To enable the student to understand the floor planning, place and route optimization techniques.**
- To introduce the lower power reduction techniques to analyze and design FPGA.

INTENDED OUTCOMES:

- Ability to understand FPGA life c ycle
- Understand the concept of selecting a FPGA based on project specifications
- Understand the floor planning, place and route optimization techniques.
- Knowledge on lower power reduction techniques to analyze and design FPGA.

UNIT 1 Introduction to Gate Array and CMOS Logic

Types of gate array – Design flow- CMOS logic - Combinational – Sequential – Data path – Transistor as resistor – Capacitance- Hardware description language.

UNIT 2 Field Programmable Gate Array

FPGA Architecture- Altera FPGA technologies- Xilinix FPGA technologies – Lattice FPGA technologies- Actel FPGA technologies.

UNIT 3 FPGA Implementation Issues

Look up tables – Memory availability- Fixed coefficient design technique – Distributed arithmetic.

UNIT 4 Floor Planning, Place and Route Optimization

Design partitioning- Optimal floor planning – Relationship between placement and routing – Logical replications- I/O registers – Register ordering- Placement seed.

UNIT 5 Low Power FPGA Implementation

Sources of power consumption-Power consumption reduction techniques-Voltage scaling FPGA's – Data reordering-Pipeling.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Steve Kilts	Advanced FPGA Design	Wiley Inter- Science,	2003
2	Roger Woods, John McAllister, Dr. Ying Yi, Gaye Lightbod	FPGA-based Implementation of Signal Processing S ystems	Wiley	2008

3 0 0 3 100

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	M.J.S.Smith	Application Specific Integrated Circuits	Pearson	2003

INTERNET AND JAVA

15BEEC_E36 OBJECTIVES

- □ To learn Internetworking with TCP/IP.
- □ To learn routing for high speed multimedia traffic
- To learn the fundamentals in WWW, HTML and XML.
- □ To learn Java for Networking application
- To understand the basic concepts in E-com, Network operating system and Web design.

INTENDED OUTCOMES:

- □ Thorough knowledge in Internetworking with TCP/IP.
- Thorough knowledge about routing for high speed multimedia traffic
- Thorough knowledge in WWW, HTML and XML.
- Thorough knowledge in Java for Networking application
- Understand the basic concepts in E-com, Network operating system and Web design.

UNIT-I INTERNETWORKING WITH TCP/ IP

Review of network technologies, Internet addressing, Address resolution protocols (ARP / RARP), Routing IP datagram's, Reliable stream transport service (TCP) TCP / IP over ATM networks, Internet applications - E-mail, Telnet, FTP, NFS, Internet traffic management.

UNIT-II INTERNET ROUTING

Concepts of graph theory, Routing protocols, Distance vector protocols (RIP), Link state protocol (OSPP), Path vector protocols (BGP and IDRP), Routing for high speed multimedia traffic, Multicasting, Resource reservation (RSVP), IP switching.

UNIT-III WORLD WIDE WEB

HTTP protocol, Web browsers netscape, Internet explorer, Web site and Web page design, HTML, XML, Dynamic HTML, CGI.

UNIT-IV JAVA PROGRAMMING

Language features, Classes, Object and methods, Subclassing and dynamic binding, Multithreading, Overview of class library, Object method serialization, Remote method invocation, Java script.

UNIT-V MISCELLANEOUS TOPICS

E-Commerce, Network operating systems, Web Design case studies.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
			Prentice Hall of	
1.	Dauglas E.Comer.	Internetworking with TCP/IP", Vol. I:	India, New Delhi.	1999
2.	William Stallings.	High Speed Networks.	Prentice Hall Inc, New Delhi.	1998

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Eric Ladd and Jim O'Donnell.	Using HTML 4, XML and Java 1.2, Que Platinum edition.	Prentice Hall of India, New Delhi.	1999

NANO ELECTRONICS

15BEEC_E37 OBJECTIVES

To learn and understand basic and advance concepts of nanoelectronics. **INTENDED OUTCOMES:**

□ The students should be able to understand basic and advanced concepts of nanoelectronic devices, sensors and transducers and their applications in nanotechnology

UNIT I :BASICS OF NANOELECTRONICS

Capabilities of nanoelectronics – physical fundamentals of nanoelectronics – basics of information theory – the tools for micro and nano fabrication – basics of lithographic techniques for nanoelectronics.

UNIT II :QUANTUM ELECTRON DEVICES

From classical to quantum physics: upcoming electronic devices – electrons in mesoscopic structure – short channel MOS transistor – split gate transistor – Electron wave transistor – Electron spin transistor – quantum cellular automate – quantum dot array – Principles of Single Electron Transistor (SET) – SET circuit design – comparison between FET and SET circuit design.

UNIT III: NANOELECTRONICS WITH TUNNELING DEVICES AND SUPERCONDUCTING DEVICES

Tunneling element technology - RTD: circuit design – Defect tolerant circuits - Molecual relectronics – elementary circuits – flux quantum devices – application of Superconducting devices – Nanotubes based sensors, fluid flow, gas, temperature, Strain – oxide nanowire, gas sensing (ZnO, TiO, SnO, WO), LPG sensor (SnO powder)- Nano 2 2 3 2 designs and Nanocontacts - metallic nanostructures.

UNIT IV :A SURVEY ABOUT THE LIMITS

Replacement Technologies – Energy and Heat dissipation – Parameter spread as Limiting Effect – Limits due to thermal particle motion – Reliability as limiting factor – Physical limits – Final objectives of integrated chip and systems.

UNIT V :MEMORY DEVICES AND SENSORS

Nano ferroelectrics – Ferroelectric random access memor y – Fe-RAM circuit design – ferroelectric thin film properties and integration – calorimetric sensors – electrochemical cells – surface and bulk acoustic devices – gas sensitive FETs – resistive semiconductor gas sensors –electronic noses – identification of hazardous solvents and gases – semiconductor sensor array.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	K.Goser, P.Glosekotter & J.Dienstuhl,	From Transistors to Molecular Quantum Devices	Springer	2004

2.	Rainer Waser	Nanoelectronics and Information Technology: Advanced Electronic Materials Novel and Devices	Wiley VCH	2005

S.NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Mick Wilson, Kamali Kannangara, Geoff smith	Nanotechnology: Basic Science and Emerging Technologies: Materials, Devices, Measurement Techniques	Springer	2010
2.	Branda Paz,	A Handbook on Nanoelectronics	Vedams books	2008

OPEN ELECTIVES

15BEEC_OE01REAL TIME EMBEDDED SYSTEMS3 0 0 3 100OBJECTIVES

□ 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

INTENDED OUTCOMES:

- Ability to understand embedded systems, its hardware and software.
- \Box Gain knowledge about devices and buses used for embedded networking.
- □ Gain knowledge about task management
- Gain knowledge about semaphore management and message passing
- □ Gain knowledge about memory management

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 – ARM 7

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 – Intertask 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 of μ C/OS-II - Hardware and Software Architecture – 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 at a Queue – Sending Message to a Queue – Flushing a Queue.

UNIT - V MEMORY MANAGEMENT

 $\begin{array}{ll} Memory\,Management:\,Memory\,Control\,Blocks-Creating\,Partition-Obtaining\,a\,Memory\,Block-Returning\,a\,Memory\,Block\,.Getting\,Started\,with\,\mu\,C/OS-II-Installing\,\mu\,C/OS-II-Porting\,\mu\,C/OS-II: Development\,Tools-Directories\,and\,Files-Testing\,a\,Port-IAR\,Workbench\,with\,\mu\,C/OS-II-\mu\,C/OS-II$ I Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Analyze the Multichannel ADC with help of μ C/OS-II.

REFERENCES

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Jean J. Labrosse	MicroC/OS – II The Real Time Kernel	CMP BOOKS	2009
2	David Seal	ARM Architecture Reference Manual.	Addison-Wesley	2008
3	Steve Furbe,	ARM S ystem-on-Chip Architecture,	Addison-Wesley Professional, California	2000

15BEEC_OE02 CONSUMER ELECTRONICS

OBJECTIVES

- □ 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 the various telephone networks

INTENDED OUTCOMES:

- Gain knowledge about various speakers and microphone
- Gain knowledge about the fundamental of television systems and standards
- Gain knowledge about the process of audio recording and reproduction
- Gain knowledge about the various telephone networks

UNIT I LOUDSPEAKERS AND MICROPHONES

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNIT – II TELEVISION STANDARDS AND SYSTEMS

Components of a TV system – interlacing – composite video signal. Colour TV – Luminance and Chrominance signal; Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL, SECAM - Components of a Remote Control.

UNIT – III OPTICAL RECORDING AND REPRODUCTION

Audio Disc – Processing of the Audio signal –read out from the Disc – Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems.

UNIT – IV TELECOMMUNICATION SYSTEMS

Telephone services - telephone networks – switching s ystem principles – PAPX switching – Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network. Wireless Local Loop. VHF/UHF radio s ystems, Limited range Cordless Phones; cellular modems

UNIT - V HOME APPLIANCES

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

Text Book:

1. S.P.Bali, "Consumer Electronics", Pearson Education, 2005.

15BEEC_OE03 FUNDAMENTALS OF NANOTECHNOLOGY 3 0 0 3 100

OBJECTIVES

- □ To familiar with the important concepts applicable to small electronic devices, their fabrication, characterization and application
- □ To have a solid understanding of Nanotechnology concepts.
- □ To introduce the basic concepts of Nanotechnology and its applications in various domain
- $\hfill\square$ To understand the molecular structure of carbon nano tube
- □ To educate how to use Nanotechnology to solve real-world problems
- □ To familiar with the structure and application of carbon nano tube

INTENDED OUTCOMES:

- □ Understand the basic concepts of Nanotechnology and its applications in various domain
- □ Ability to develop how to use Nanotechnology to solve real- world problems
- □ Understand solid understanding of Nanotechnology concepts
- Understand the important concepts applicable to small electronic devices, their fabrication, characterization and application
- □ Understand the molecular structure of carbon nano tube
- □ Familiar with the structure and application of carbon nano tube

UNIT I-LIMITATIONS OF CMOS

Fundamentals of MOSFET devices - Scaling of CMOS – Limitations – Alternative concepts in materials – **Structures of MOS devices:** SOI MOSFET, FINFETS, Dual Gate MOSFET, Ferro electric FETs.

UNIT II-MICRO AND NANO FABRICATION

Optical Lithograph y – Electron beam Lithograph y – Atomic Lithograph y – Molecular beam epitax y - Nano lithograph y.

UNIT III-CHARACTERIZATION EQUIPMENTS

Principles of Electron Microscope – Scanning Electron Microscope – Transmission Electron Microscope - Atomic Force Microscope – Scanning Tunneling Microscope.

UNIT IV-NANO DEVICES – I

Resonant tunneling diodes – Single electron devices – Josephson junction – Single Flux Quantum logic – Molecular electronics.

UNIT V-NANO DEVICES – II

Quantum computing: principles – Qbits – Carbon nanotubes (CNT): Characteristics, CNTFET, Application of CNT - Spintronics: Principle, Spin valves, Magnetic Tunnel Junctions, SpinFETs, MRAM

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Rainer Waser (Ed)	Nano electronics and information technology	Wiley-VCH. 3 rd Edition	2012

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Thomas Heinzel	A Microscopic Electronics in Solid State Nanostructure	Wiley VCH	2008
2	Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse	Nanotechnology – (Basic Science and Emerging Technologies	Overseas Press	2002
3	Mark Ratner, Daniel Ratner	Nanotechnology: A Gentle introduction to the Next Bigidea	Pearson education	2003

15BEEC_OE04IMAGE AND VIDEO PROCESSINGOBJECTIVES

- □ To study the image fundamentals and mathematical transforms necessary for image processing.
- □ To study the image enhancement techniques
- □ To study the image compression procedures.
- To study the image segmentation and representation techniques.
- To study the video processing fundamentals
- \Box To know the concepts of motion estimation

INTENDED OUTCOMES:

- □ Understand the image fundamentals and mathematical transforms necessary for image processing.
- □ Understand the image enhancement techniques
- □ Understand the image compression procedures.
- Understand the image segmentation and representation techniques.
- □ Understand the video processing fundamentals
- □ Understand motion estimation concepts

UNIT I FUNDAMENTALS OF IMAGE PROCESSING AND IMAGE TRANS FORMS Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels Image Transforms: 2 – D Discrete Fourier Transform, Discrete Cosine Transform, Discrete Wavelet transforms.

UNIT II IMAGE PROCESSING TECHNIQUES

Image Enhancement: Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters, Frequency Domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering.

UNIT III IMAGE SEGMENTATION AND COMPRESSION

Segmentation concepts, point, line and Edge detection, Thresholding, region based segmentation Image Compression Image compression fundamentals – coding Redundancy, spatial and temporal redundancy. Compression models : Loss y and Lossless, Huffmann coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding, predictive coding, wavelet coding, JPEG standards.

UNIT IV BASICS OF VIDEO PROCESSING

Analog video, Digital Video, Time varying Image Formation models : 3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals, filtering operations.

UNIT V 2-D MOTION ESTIMATION

Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding.

TEXTBOOKS

1. Gonzaleze and Woods, "Digital Image Processing ", 3rd edition Pearson

2. Yao wang, Joem Ostarmann and Ya – quin Zhang, "Video processing and communication ",1st edition PHI

REFERENCE BOOKS

1. M. Tekalp ,"Digital video Processing", Prentice Il International

2. Aner ozdemi R, "Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms", JohnWiley & Sons

3. Chris Solomon, Toby Breckon, "Fundamentals of Digital Image Processing A Practical Approach with Examples in Matlab", John Wiley & Sons,

15BEEC_OE05 VLSI TECHNOLOGY OBJECTIVES

- 3 0 0 3 100
- \Box To learn the processing steps in fabrication of VLSI devices.
- □ To learn the concepts of assembling and packaging for VLSI devices.
- □ To imparts a good knowledge in reactive plasma etching techniques and equipment.
- □ To familiarize the students with the NMOS and CMOS IC technology.
- □ To make the student acquire reactive Plasma Etching techniques and Equipment.
- □ To acquaint the student with the VLSI assembly technology and package fabrication technology

INTENDED OUTCOMES

- \Box List out various fabrication techniques
- □ Understand the etching principle in IC fabrication
- □ Gain knowledge on deposition and diffusion methods
- □ Understand the process simulation and integration.
- □ Assembling and packing techniques
- □ various technologies used for fabricating VLSI devices

UNIT 1

Introduction to MOS Technologies: MOS, CMOS, BiCMOS Technology, Trends and Projections. Basic Electrical Properties of MOS, CMOS & BiCMOS Circuits: Ids-Vds relationships, Threshold Voltage Vt, Gm, Gds and ωo, Pass Transistor, MOS, CMOS & Bi CMOS Inverters, Zpu/Zpd, MOS Transistor circuit model, Latch-up in CMOS circuits.

UNIT II:

La yout Design And Tools: Transistor structures, Wires and Vias, Scalable Design rules, La yout Design tools.

Logic Gates & La youts: Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates, Resistive and Inductive interconnect delays.

UNIT III:

Combinational Logic Networks: Layouts, Simulation, Network delay, Interconnect design, Power optimization, Switch logic networks, Gate and Network testing.

UNIT IV:

Sequential Systems: Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and testing.

UNIT V:

Floor Planning & Architecture Design: Floor planning methods, off-chip connections, High-level synthesis, Architecture for low power, SOCs and Embedded CPUs, Architecture testing.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems, K. Eshraghian Eshraghian. D, A. Pucknell, 2005, PHI.

2. Modern VLSI Design - Wayne Wolf, 3rd ed., 1997, Pearson Education.

1. Principals of CMOS VLSI Design – N.H.E Weste, K.Eshraghian, 2nd ed., Adisson Wesley.

15BEEC_OE06 FUNDAMENTALS OF MEMS

OBJECTIVES

- □ To study materials used for MEMS and its working
- □ To study the fabrication process used for MEMS
- □ To study the packaging process used for MEMS
- \Box To familiarize the students with various micro actuators and micro sensors.
- □ To learn the survey of materials central to micro engineering.
- □ To imparts good knowledge in micro system packaging materials

INTENDED OUTCOMES:

- □ Appreciate the underlying working principles of MEMS devices.
- □ Understand the working of Micro sensors and actuators
- □ Explain the IC fabrication processes
- □ Gain knowledge on bulk manufacturing
- □ Understand the Design of Micro systems.
- □ Design and model MEMS devices.

UNIT I-INTRODUCTION TO MEMS AND MICRO FABRICATION

Histor y of MEMS Development, Characteristics of MEMS-Miniaturization - Micro electronics integration - Mass fabrication with precision. Sensors and Actuators- Energy domain. Sensors, actuators Micro fabrication - microelectronics fabrication process- Silicon based MEMS processes-New material and fabrication processing- Points of consideration for processing. Anisotropic wet etching, Isotropic wet etching, Dry etching of silicon, Deep reactive ion etching (DRIE), and Surface micromachining process- structural and sacrificial material.

UNIT II-ELECTRICAL AND MECHANICAL CONCEPTS OF MEMS

Conductivity of semiconductors, crystal plane and orientation, stress and strain - definition -Relationship between tensile stress and strain- mechanical properties of Silicon and thin films, Flexural beam bending analysis under single loading condition- Types of beam- longitudinal strain under pure bending -deflection of beam- Spring constant, torsional deflection, intrinsic stress, resonance and quality factor.

UNIT III-ELECTROSTATIC AND THERMAL PRINCIPLE SENSING AND ACTUATION

Electrostatic sensing and actuation-Parallel plate capacitor - Application- Inertial, pressure and tactile sensor parallel plate actuator- comb drive Thermal sensing and Actuations-Thermal sensors-Actuators- Applications Inertial, flow and infrared sensors.

UNIT IV-PIEZORESISTIVE, PIEZOELECTRIC AND MAGNETIC PRINCIPLE SENSORS AND ACTUATOR

Piezoresistive sensors- piezoresistive sensor material- stress in flexural cantilever and membrane-Application-Inertial, pressure, flow and tactile sensor.Piezoelectric sensing and actuation- piezoelectric material properties-quartz- PZT-PVDF -ZnO- Application-Inertial, Acoustic, tactile, flow-surface elastic waves Magnetic actuation- Micro magnetic actuation principle- Deposition of magnetic materials-Design and fabrication of magnetic coil.

UNIT V-POLYMER AND OPTICAL MEMS

Pol ymers in MEMS- polymide-SU-8 Liquid crystal polymer(LCP) - PDMS - PMMA - Parylene -

Flurocorbon, Application-Acceleration, pressure, flow and tactile sensors. Optical MEMS-passive MEMS optical components-lenses-mirrors-Actuation for active optical MEMS.

TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Chang Liu	Foundations of MEMS	Pearson Indian Print, 1 st Edition	2012

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Gaberiel M. Rebiz	RF MEMS Theory, Design and Technology	John Wiley & Sons	2003
2	Charles P. Poole and Frank J. Owens	Introduction to Nanotechnology	John Wiley & Sons	2003
3	Julian W.Gardner and Vija y K Varadhan	Microsensors, MEMS and Smart Devices	John Wiley & sons	2001

OBJECTIVES

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.
- To provide students with a sound and comprehensive understanding of artificial neural networks and machine learning.
- To gain exposure in the field of neural networks and relate the human neural system into the digital world
- To provide knowledge of computation and dynamical systems using neural networks

INTENDED OUTCOMES:

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks
- Apply perception concept in design
- Design using ART phenomena
- Gain knowledge on SOM concepts
- Ability to develop the use of Soft Computing to solve real-world problems

Course Objectives

Course Outcomes

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

UNIT I: INTRODUCTION TO NEURAL NETWORKS

Introduction - biological neurons and their artificial models - learning, adaptation and neural network's learning rules - types of neural networks- single layer, multiple layer-feed forward, feedback networks

UNIT II LEARNING PROCESS

Error – correction learning – memory based learning - hebbian learning-competitive learning-Boltzmann learning- supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT III PERCEPTION

Single la yer perception-Adaptive filtering-unconstrained optimization-Least-mean square algorithm-Leaning curve-Annealing Technique-perception convergence theorem-Relationship between perception and Baye's classifier-Back propagation algorithm

UNIT IV ATTRACTOR NEURAL NETWORK AND ART

Hopfield model-BAM model-BAM stabilit y-Adaptive BAM -Lyapunov function-effect of gain-Hopfield design-Application to TSP problem-ART- layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP

UNIT V SELF ORGANIZATION

Self organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical vector Quantization. Applications of self-organizing maps: The Neural Phonetic Typewriter Learning Ballistic Arm Movements

1. Simon Haykin, "Neural Networks and Learning Machines" -3/E - Pearson/Prentice Hall 2009

2. Satish Kumar- "Neural Networks : A Classroom Approach"-TMH-2008

3. Freeman J.A., Skapura D.M."Neural networks, algorithms, applications, and programming techniques"-Addition Wesley, 2005.

4. Laurene Fausett, "Fundamentals of Neural Networks: Architectures, Algorithms, and Applications"

- Pearson/Prentice Hall 5. Robert J Schalkoff-"Artificial Neural Networks, McGraw Hill"-1997

15BEEC_OE08FUZZY LOGIC AND ITS APPLICATIONS3 0 0 3 100OBJECTIVES

- □ To introduce the basic concepts of Fuzzy logic and its applications in various domain
- □ To educate how to use Fuzzy computation to solve real-world problems
- □ To have a solid understanding of Basic fuzzy models.
- □ Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
- □ To learn about applications on Fuzzy based systems
- \Box To familiarize with fuzzy fiction and de fuzzy fiction procedures

INTENDED OUTCOMES:

- □ Understand the basic concepts of Fuzzy logic and its applications in various domain
- □ Gain knowledge on theory of Reasoning
- □ Develop fuzzy controllers
- □ Understand concepts of adaptive fuzzy control
- □ Ability to develop how to use Fuzzy computation to solve real- world problems
- □ Design fuzzy based model for any application

Course Objectives

Course Outcomes

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

UNIT - I

Basics Of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT – II

Theory Of Approximate Reasoning: Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference-fuzzy models

UNIT - III

Fuzz y Knowledge Based Controllers (Fkbc): Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzz yfication and defuzz yfication procedures – Design of Fuzz y Logic Controller

UNIT - IV

Adaptive Fuzz y Control: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

UNIT V

FUZZY BASED SYSTEMS

Simple applications of FKBC -washing machines- traffic regulations -lift control-fuzzy in medical applications-Introduction to ANFIS.

TEXT BOOKS:

- 1. An Introduction to Fuzzy Control- D. Diankar, H. Hellendoom and M. Reinfrank- Narosa Publishers India, 1996.
- 2. Fuzzy Sets Uncertainty and Information- G. J. Klir and T. A. Folger- PHI IEEE, 1995.

OPEN ELECTIVES (COURSES OFFERED TO OTHER DEPARTMENTS)

SCIENCE AND HUMANITIES INDUSTRIAL MATHEMATICS – I 300

3003100

15BESHOE01

OBJECTIVES:

- To develop analytical skills for solving engineering problems
- To teach the students the basic concepts of LPP, Transportation and Assignment problems
- □ To make the students to study about the Integer Programming and Network Analysis

INTENDED OUTCOMES:

- Be able to solve problems in different environments and develop critical thinking
- □ Be able to build and solve Transportation Models, Assignment Models, integer programming and Non linear programming

UNIT I LINEAR PROGRAMMING PROBLEM

Formulation of LPP - Graphical Method - Simplex Method - Artificial variable technique and two phase simplex method. Duality - Dual and simplex method - Dual Simplex Method.

UNIT II TRANSPORTATION PROBLEM

Transportation Model, finding initial basic feasible solutions, moving towards optimality, Degeneracy.

UNIT III ASSIGNMENT PROBLEM

Solution of an Assignment problem, Multiple Solution, Hungarian Algorithm, Maximization in Assignment Model, Impossible Assignment.

UNIT IV INTEGER PROGRAMMING

Integer Programming Problem – Gromory's fractional cut Method – Branch Bound Method

UNIT V NETWORK ANALYSIS

PERT & CPM- network diagram-probability of achieving completion date- crash time- cost analysis.

TEXT BOOKS:

S.	Author(s) Name	Title of the	Publisher	Year of
No.		book		Publication
1	Hamdy Taha. A.	Operations	Prentice – Hall of India	2010
		Research	Private Limited, New Delhi.	
2	Kanti Swarup,	Operations	Sultan Chand & Sons	2008
	Manmohan, Gupta	Research		

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Natarajan A.M., Balasubramani P., Thamilarasi A	Operations Research	Pearson Education,	2003
2	Srinivasan G	Operations Research	Eastern Econom y Edition	2007
3	Winston	Operations Research, Applications and Algorithms	Cengage Learning	2004

- 1. www.mathcentre.ac.uk
- 2. www.mathworld. Wolfram.com
- 3. www.mit.edu

15BESHOE02

INDUSTRIAL MATHEMATICS – II

OBJECTIVES:

- To kindle analytical skills for solving engineering problems
- □ To impact the knowledge about inventory models, replacement models and simulation models
- □ To provide techniques for effective methods to solve non linear programming and decision making

INTENDED OUTCOMES:

The students will

- □ be able to solve simple models in Inventory problems, Simulation problems and Replacement problems.
 - □ be able to understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.
 - understand how to model and solve problems using non integer programming.

UNIT – I INVENTORY MODELS

Economic order quantity models-techniques in inventory management-ABC analysis.

UNIT – II NON LINEAR PROGRAMMING

Khun-tucker conditions with non-negtive constraints- Quadratic programming- Wolf's modified simplex method.

UNIT – III SIMULATION MODELS

Elements of simulation model -Monte Carlo technique – applications. Queuing model: problems involving $(M\backslash M \): (\infty \backslash FIFO), (M\backslash M \): (\infty \backslash FIFO)$ Models.

UNIT-IV DECISION MODELS

Decision Analysis – Decision Making environment – Decisions under uncertainty – Decision under risk – Decision – Tree Analysis.

UNIT-V REPLACEMENT MODELS

Models based on models that gradually detoriate with time-whose maintenance cost increase with time-Replacement of items that fail suddenly and completely.

TEXT BOOKS:

S.	Author(s) Name	Title of the	Publisher	Year of
No.		book		Publication
1	Hamdy Taha. A.	Operations	Prentice – Hall of India	2010
		Research	Private Limited, New Delhi.	
2	Kanti Swarup,	Operations	Sultan Chand & Sons	2008
	Manmohan, Gupta	Research		

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Natarajan A.M., Balasubramani P., Thamilarasi A	Operations Research	Pearson Education,	2003
2	Srinivasan G	Operations Research	Eastern Economy Edition	2007
3	Winston	Operations Research, Applications and Algorithms	Cengage Learning	2004

- 1. www.mathcentre.ac.uk
- www.mathworld. Wolfram.com
 www.mit.edu

15BESHOE03

PROBABILITY AND RANDOM PROCESS3003100

OBJECTIVES:

- □ To gain knowledge in measures of central tendency.
- To provide necessary basic concepts in probability and random processes.

INTENDED OUTCOMES:

- □ Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
- □ The students will have an exposure of various distribution functions, correlation and spectral densities.

UNIT-I MEASURES OF CENTRAL TENDENCY AND PROBABILITY

Measures of central tendency – Mean, Median, Mode - Standard Deviation Probability - Random variable - Axioms of probability - Conditional probability - Total probability – Baye's theorem.

UNIT-II STANDARD DISTRIBUTIONS

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma(one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – Chebyshev's inequality.

UNIT-III TWO DIMENSIONAL RANDOM VARIABLES

Joint

distributions - Marginal and conditional distributions - Probability mass function - Probability density functions - Covariance - Correlation and regression

UNIT-IV CLASSIFICATION OF RANDOM PROCESS

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT-V CORRELATION AND SPECTRAL DENSITIES

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TEXT BOOK:

S.	Author(s) Name	Title of the book	Publisher	Year of
No.				Publication
1	Peebles Jr, P.Z	Probability Random	Tata McGraw-Hill	2002
		Variables and	Pubishers, New Delhi.	
		Random Signal		
		Principles		

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Henry Stark and John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002
2	Ochi, M.K	Applied Probability and Stochastic Process	John Wiley & Sons, New York	1990
3	Ross, S	A first Course in Probabilit y	Pearson Education, New Delhi (Chap 2 to 8)	2002
4	Gupta, S.C. and Kapur, V.K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2007
5	Veerarajan,T.	Probabilitiy, Statistics and Random process	Tata McGraw-Hill Publications, Second Edition, New Delhi	2002

- 1. www.cut-theknot.org/probability.shtml
- www.mathcentre.ac.uk
 www.mathworld. Wolfram.com

15BESHOE04

PROBABILITY AND STATISTICAL METHODS OBJECTIVES:

To gain knowledge in measures of central tendency and probability.

- To introduce the concept of random variable and functions of random variables.
- To understand the knowledge of testing hypotheses.

INTENDED OUTCOMES:

- The student gain the knowledge in measures of central tendency and probability
- □ They acquire skills in handling situations involving more than one random variable and functions of random variables

UNIT- I MEASURES OF CENTRAL TENDENCY AND PROBABILITY

Measures of central tendency – Mean, Median, Mode and Standard Deviation – SPSS Software Demonstration.

Probability - Random variable - Axioms of probability - Conditional probability - Total probability - Baye's theorem - Probability mass function - Probability density functions.

UNIT-II STANDARD DISTRIBUTIONS

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma, and Normal distributions - Moment generating functions, Characteristic function and their properties.

UNIT-III TWO DIMENSIONAL RANDOM VARIABLES

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

UNIT-IV TESTING OF HYPOTHESIS

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

UNIT- V DESIGN OF EXPERIMENTS

Analysis of variance – One way classification – CRD – Two way classification – RBD - Latin square. *Note: Use of approved statistical tables permitted in the examination.*

S.	Author(s)	Title of the book	Publisher	Year of
No.	Name			Publication
1	Gupta, S.C. and	Fundamentals of	Sultan Chand and Sons,	2007
	Kapur, V.K	Mathematical	New Delhi.	
		Statistics		

TEXT BOOKS:

2	Athanasios	Probability Random	McGraw-Hill	2002
	Papoulis and S	variables and	Publications, New Delhi.	
	Pillai	Stochastic Processes		

S.	Author(s)	Title of the book	Publisher	Year of
No.	Name			Publication
1	Walpole, R.E., M yers, R.H., M yers, R.S.L and Ye, K	Probability and Statistics for Engineers and Scientists	Pearsons Education, Delhi.	2002
2	Lipschutz,S. and Schiller, J	Schaum's outlines - Introduction to Probability and Statistics	McGraw-Hill, New Delhi.	1998
3	Ross,S	A first Course in Probabilit y	Pearson Education, Delhi (Chapters 2 to 8). New Delhi	2002
4	Johnson,R.A	Miller & Freund's Probability and Statistics for Engineers	Pearson Education, Delhi (Chapters 7, 8, 9, 12	2000

- www.cut-theknot.org/probability.shtml
 www.mathcentre.ac.uk
 www.mathworld. Wolfram.com

15BESHOE05

PROBABILITY AND QUEUEING THEORY 3003100

OBJECTIVES:

To understand the fundamental knowledge of probability theory.
To acquire skills in handling situations involving more than one random
variable and functions of random variables.
To introduce the concepts of random processes and Markov chain
To understand the different Queuing models and solve problems

INTENDED OUTCOMES:

- □ The students understand and characterize phenomena which evolve with respect to time in a probabilistic manner.
- They will be able to solve the Queuing models

UNIT-I PROBABILITY AND RANDOM VARIABLE

Axioms of probability - Conditional probability - Total probability - Baye's theorem- Random variable - Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties.

UNIT-II STANDARD DISTRIBUTIONS

Functions of a random variable - Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties.

UNIT-III TWO DIMENSIONAL RANDOM VARIABLES

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and regression - Transformation of random variables - Central limit theorem.

UNIT-IV RANDOM PROCESS AND MARKOV CHAINS

Classification - Stationary process - Markov process - Poisson process - Birth and death process - Markov chains - Transition probabilities - Limiting distributions.

UNIT-V QUEUEING THEORY

Markovian models - M/M/1, M/M/C, finite and infinite capacity - $M/M/\infty$ queues - Finite source model - M/G/1 queue (steady state solutions only) - Pollaczek - Khintchine formula - Special cases.

TEXT BOOKS:

S.	Author(s)	Title of the book	Publisher	Year of
No.	Name			Publication
1	Ross,S	A first course in probability	Pearson Education, Delhi	2002
2	Medhi,J	Stochastic Process	New Age Publishers ,New Delhi	2009

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Veerarajan,T	Statistics and Random Processes	Tata McGraw-Hill, 2 nd Edition, New Delhi.	2003
2	Allen,O	Probability, Statistics and Queuing Theor y	Academic press, New Delhi.	1999
3	Gross,D. and Harris, C.M	Fundamentals of Queuing theor y	John Wiley and Sons, New York.	1998
4	Taha,H.A	Operations Research - An Introduction	Pearson Education Edition Asia, Delhi.	2002

- 1. www.mathcentre.ac.uk
- 2. <u>www.mathworld</u>. Wolfram.com
- 3. www.mit.edu

15BESHOE06

FUZZY MATHEMATICS

OBJECTIVES:

- □ To know the fundamentals of fuzzy Algebra.
- To know the basic definitions of fuzzy theory
- □ To know the applications of fuzzy Technology.

INTENDED OUTCOME:

□ The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

UNIT I

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 [0,1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNIT IV

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures vs Possibility Measures

UNIT V

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

TEXT BOOKS:

S.	Author(s) Name	Title of the	Publisher	Year of
No.		book		Publication
1	George J Klir and Bo	Fuzzy Sets and	Prentice Hall NJ	1995
	Yuan	FuzzyLogic:		
		Theory and		
		Applications		

S.	Author(s) Name	Title of the book	Publisher	Year of
No.				Publication
1	H.J. Zimmermann	Fuzzy Set Theory and its Applications	Allied Publishers New Delhi	1991
2	Kevin M Passino and Stephen Yurkovich	FuzzyControl	Addison Wesley Longman	1998
3	Michal Bacz ynski and Balasubramaniam Jayaram	Fuzzy Implications	Springer Verlag, Heidelberg	2008

- 1. www.mathcentre.ac.uk
- <u>www.mathworld</u>. Wolfram.com
 <u>www.doc.ic.ac.uk</u>
- 4. www.calvin.edu/~pribeiro/othrlnks/Fuzz y/fuzzysets.htm

15BESHOE07

OBJECTIVES:

	To know the fundamentals of Tensors.
	To know the series solutions to differential equations.
	To introduce the concepts of special functions.
	To study about Calculus of variations and integral equations

INTENDED OUTCOME:

□ The students will have the knowledge on Mathematical Physics and that knowledge will be used by them in different engineering and technology applications.

UNIT I TENSORS

Definition of tensor - rank, symmetric tensors, contraction, quotient rule - tensors with zero components, tensor equations, metric tensors and their determinants - pseudo tensors

UNIT II DIFFERENTIAL EQUATIONS-SERIES SOLUTIONS

Series Solution : Classification of singularities of an ordinary differential equation - Series solution-Method of Frobenius - indicial equation - examples

UNIT III SPECIAL FUNCTIONS

Basic properties (Recurrence and Orthogonality relations, series expansion) of Bessel, Legendre, Hermite and Laguerre functions – Generating Function

UNIT IV CALCULUS OF VARIATIONS

Concept of variation and its properties – Euler's equation – Functional dependant on first and higher order derivatives – Functional dependant on functions of several independent variables – Variational problems with moving boundaries – Isoperimetric Problems – Direct methods – Ritz and Kantorovich methods.

UNIT V LINEAR INTEGRAL EQUATIONS

Introduction – conversion of a linear differential equation to an integral equations and vice versa – conversion of boundary value problem to integral equations using Green's function – solution of a integral equation – integral equations of the convolution type – Abel's integral equations – integral equations with separable kernels – solution of Fredholm equations with separable kernels.

S.	Author(s)	Title of the book	Publisher	Year of
No.	Name			Publication
1	Dr. Grewal	Higher Engineering	40 th edition, , Khanna	2011
	B.S.	Mathematics	Publishers	
2	Stephenson, G,	Advanced	Cambridge University	1999
	Radmore, P.M	Mathematical Methods	Press	
		for Engineering and		
		Science students		
3	Andrews,	Special Function for	Macmillan, New	1985
	Larry C.	Engineers and Applied	York	
		Mathematicians		
4	Murray R	Vector Anal ysis	Tata Mc Graw Hill	2010
	Spiegel,		Education Pvt. Ltd.,	
	Seymour		New Delhi	
	Lipschutz,			
	Dennis			
	Spellman			

- 1. http://www.doitpoms.ac.uk/
- 2. www.phys.uu.nl/~thooft/lectures/**special**fct.pdf
- <u>http://www.math.umn.edu/~olver/pdn.html</u>
 <u>http://tutorial.math.lamar.edu/classes/DE.aspx</u>
15BESHOE08

ADVANCED ENGINEERING MATHEMATICS 3003100

OBJECTIVES:

- □ To introduce the concepts of special functions.
- □ To find the solutions to partial differential equations and their applications
- □ To study about mathematical physics and perturbation techniques

INTENDED OUTCOMES:

- Students know the concepts of improper integrals, Beta and Gamma functions.
- □ The students acquire sound knowledge of techniques in solving PDE that model engineering problems.
- □ Identify the situations where singular perturbations are needed. They will be able to use various modifications of matched asymptotic expansions techniques to derive asymptotic solutions.

UNIT I INTRODUCTION TO SOME SPECIAL FUNCTIONS

Gamma function, Beta function, Bessel function, Error function and complementary Error function, Heaviside's function, pulse unit height and duration function, Sinusoidal Pulse function, Rectangle function, Gate function, Dirac's Delta function, Signum function, Saw tooth wave function, Triangular wave function, Half wave rectified sinusoidal function, Full rectified sine wave, Square wave function.

UNIT II PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS

Formation PDEs, Solution of Partial Differential equations f(x, y, z, p, q) = 0, Nonlinear PDEs first order, Some standard forms of nonlinear PDE, Linear PDEs with constant coefficients, Equations reducible to Homogeneous linear form, Classification of second order linear PDEs. Separation of variables use of Fourier series, D'Alembert's solution of the wave equation, Heat equation: Solution by Fourier series and Fourier integral

UNIT – III PERTURBATION TECHNIQUES

Singular perturbations (algebraic example). Notion of the boundary layer. Inner and outer solutions. Overlap region. Matching of the as ymptotic expansions. Ordinary differential equations with singular perturbations. Methods to determine location of the boundary layer.

UNIT-IV SIMULATION MODELS

Elements of simulation model -Monte Carlo technique – applications. Queuing model: problems involving $(M\backslash M \): (\infty \backslash FIFO), (M\backslash M \): (\infty \land FIFO)$ Models.

UNIT V DECISION MODELS

Decision Analysis – Decision Making environment – Decisions under uncertainty – Decision under risk – Decision – Tree Analysis.

REFERENCES:

S.	Author(s) Name	Title of the book	Publisher	Year of
No.				Publication
1	Kre yszig,E	Advan ced	John Wiley & Sons,	2007
		Engineering	New Delhi.	
		Mathematics		
2	Gupta, A.S.	Calculus of	Prentice Hall of India	1997
	_	Variations with	Pvt. Ltd., New Delhi	
		Applications		
3	Sankara Rao, K.	Introduction to	Prentice Hall of India	1997
		Partial Differential	Pvt. Ltd., New Delhi	
		Equations		
4	Ali H Na yfeh	Perturbation	John Wiley & Sons,	2008
		Methods	New Delhi.	
5	Hamdy Taha. A.	Operations	Prentice – Hall of India	2010
		Research	Private Limited, New	
			Delhi.	

WEBSITES:

- 1. www.phys.uu.nl/~thooft/lectures/specialfct.pdf
- www.maths.manchester.ac.uk/~bl/teaching/math34011/
 pubsonline.informs.org/journal/opre

OBJECTIVES:

- To know the fundamentals of linear Algebra.
- To study about the linear transformations
- To introduce the concepts of inner product spaces

INTENDED OUTCOMES:

The student will be able to

- □ Recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
- □ Visualize linear transformations as matrix form
- Articulate the importance of Linear Algebra and its applications in branches of Mathematics

UNIT I VECTOR SPACES

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

UNIT II EIGEN VALUES AND EIGEN VECTORS

Eigen values and Eigen vectors - diagonalization - Power method - QR decomposition

UNIT III SYSTEM OF LINEAR EQUATIONS

Direct methods, Gauss elimination method, Gauss Jordan method, Crout's method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNIT IV LINEAR TRANSFORMATIONS

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigenvectors - Diagonalization

UNIT V INNER PRODUCT SPACES

The Dot Product on \mathbb{R}^n and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kre yszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2007

REFERENCES:

2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition	2010
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill	2009

WEBSITES:

- <u>www.sosmath.com</u>
 www.linear.ups.edu
 www.mathworld.wolfram.com
- 4. www.tutorial.math.lamar.edu

15BESHOE10 30 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (ONLY FOR BE CSE STUDENTS)

OBJECTIVES:

- \Box To hone the analytical skills in the minds of Engineers.
- □ To provide sound foundation in the mathematical fundamentals necessary to formulate, solve and analyze Engineering problems.
- To study the basic principles of different transforms and Partial Differential Equations.

INTENDED OUTCOMES:

- □ The students will have a lucid idea about Fourier and Z-transforms.
- The Learners can equip themselves in the transform techniques.
- □ Better understanding in problems related to Heat conduction, communication systems, electro optics and electromagnetic theory, using the techniques will be learnt in this course.

UNIT-I FOURIER SERIES

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

UNIT-II FOURIER TRANSFORM

Fourier integral theorem (without proof) – Fourier transform pair –Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT-III PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT-IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT- V Z-TRANSFORM AND DIFFERENCE EQUATIONS

Z-transform - Elementary properties – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

TEXT BOOK:

S.	Author(s)	Title of the book	Publisher	Year of
No.	Name			Publication
1	Grewal, B.S.	Higher Engineering Mathematics	Khanna Publishers, Delhi.	2011
2	Kandasam y,P., Thilagavath y,K. and Gunavath y,K.	Engineering Mathematics Volume III.	S. Chand & Company Ltd., New Delhi.	1996

3003100

REFERENCES:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venkateswarlu S	Engineering Mathematics, Vol I	Anuratha Agencies and Publishers, Kumbakonam.	2003
2	Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G	Advanced Mathematics for Engineering Students. Volumes II and III,	Viswanathan S Printers and Publishers Pvt. Ltd. Chennai.	2002
3	Bali N P.	A text book of Engineering Mathematics	Lax mi Publications Pvt. Ltd.	1986
4	Ramana B V	Higher Engineering Mathematics	Tata Mc Graw Hill Publishing Co. Ltd. New Delhi.	2007

WEBSITES:

- 1. www.sosmath.com
- 2. <u>http://mathworld.wolfram.com/FourierSeries.html</u>
- 3. <u>http://www.math.umn.edu/~olver/pdn.html</u>
- 4. http://tutorial.math.lamar.edu/classes/DE/IntroPDE.aspx

15BESHOE11

TECHNICAL WRITING

1403100

PURPOSE:

It provides techniques of writing and also trains the students to write without their influence of mother tongue. In addition to honing their skills as professional writers, students will develop technical vocabularies that will aid writing research articles and discussing articles produces by their peers.

INTENDED OUTCOMES:

- Develop abilities to write technically and expressively,
- □ Recognize writing as a constructive, meaningful process,
- □ Practise using reading strategies for effective writing.

Introduction to Technical Writing – Importance of Writing – Characteristics of Writing– Audience Recognition/ Analysis – Appropriateness of language — Conciseness and Flow– Bias free and plain writing – Impersonal and Formal Language -Techniques of Technical Writing– Overcoming writer's block – Prioritizing for effective writing– Avoiding plagiarism.

UNIT – 2 PARAGRAPHS AND ESSAYS

Expressing Ideas – Paragraph construction – Cohesion and Coherence – Adequate development – Kinds of paragraphs – Writing drafts – Paragraph length and pattern – Types of Essays – Characteristics of Essays – Salient point of sentence constructions.

UNIT – 3 LETTERS, MEMOS AND EMAIL

Formal written correspondence – Types of messages – Business letters – Structure of letters – Language in letters – Tense in letters – Cover letters – Resumes – Curriculum vitae – Memos – Emails – Email Etiquette – Effectiveness and purpose.

UNIT - 4 THE ART OF CONDENSATION AND TECHNICAL PROPOSALS

Steps to Effective précis writing – Guidelines – Technical Proposals – Types of Proposals – Characteristics – Bod y of the Proposals – Style and appearance – Evaluation of proposals – Proof Reading – Book /Film Review – Travelogue – Dialogue Writing.

UNIT – 5 REPORTS AND RESEARCH ARTICLES

Discussion of newspaper articles -Objectives of Reports – Characteristics of Reports – Structure of Reports – Types of Reports – Writing an article – Writing research articles – Essential features of Dissertation – Organizing the structure of thesis and articles – Writing technical description.

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATIO
1	<u>V.N. Arora &</u> Lakshmi Chandra	Improve Your Writing: Revised First Edition	OUP	2014

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Crème, P. and M. Lea.	Writing at University. A guide for students.	OUP	2003
2	Graham King	Collins Improve Your Writing	Collins; First edition	2009
3	David Morle y	The Cambridge Intro. To Creative Writing	Cambridge	2008

15BESHOE12, 15BTSHOE12GEOPHYSICS3 0 0 3 100OBJECTIVE:3 0 0 3 100

□ To enrich the understanding of the solar s ystem, earth structure, Earthquake and the Physical Oceanography.

INTENDED OUTCOME:

□ The students will have the knowledge on the solar system, earth structure, Earthquake, Physical Oceanography and that knowledge will be used by them in different engineering and technology applications

UNIT I ORIGIN OF EARTH

A brief history of the development of Earth Sciences and of Geophysics in particular, An overview of Geophysical methods and their essential features, Problems of inversion and non-uniqueness in Geophysics, Origin & evolution of Solar system, Earth and Moon structure,. Kepler's law of planetary motion, A review of the Earth's structure and composition

UNIT II STRUCTURE OF EARTH

Chemical composition of Earth, Rheological behavior of crust and upper mantle, viscoelasticity and rock failure criteria, Geochronology: Radiometric dating and their advantages, meaning of radiometric ages, Major features of the Earth's gravitational field and relationship with tectonic processes in the crust and upper mantle, concept of isostasy, mathematical concept of Airy and Pratt hypotheses of isostasy

UNIT III MAGNETIC FIELD AND THERMAL DISTRUBUTION OF EARTH

Origin of geomagnetic field, polar wandering, secular variations and westward drift, reversals of geomagnetic field, sun spot, solar flares, geomagnetic storms, sea-floor spreading, Paleomagnetism and its uses, Thermal history of the Earth, sources of heat generation and temperature distribution inside the earth, convection in the mantle

UNIT IV SEISMOLOGY

Earthquake seismology, Earthquakes and its classifications, Global seismicity and tectonics, Earth's internal structure derived from seismology, Earthquake mechanism and Anderson's theory of faulting, Continental drift and plate tectonics: its historical perspective and essential features, present day plate motions, Triple junctions, oceanic ridges, Benioff zones, trenches and island arcs, hot spots, Mantle Plume, Mountain building, origin of Himalaya, Geodynamics of Indian subcontinent.

UNIT V OCEANS

Physical properties of seawater and methods of determination, distribution of salinity in the oceans, factors affecting salinity, water masses and water type, TS Diagram, Circulation of currents in major ocean waves. Tides: Dynamical and equilibrium theory of tides. Marine pollution, steps to control marine pollution, Laws of seas, Coastal zone management

TEXT BOOK:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	B.F. Howell	Introduction to Geoph ysics	McGraw-Hill	2012

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	W. Lowrie	Fundamentals of Geoph ysics	Cambridge University Press,	2007
2	J.A. Jacobs, R.D. Russel	Physics and Geology	McGraw-Hill	2002

WEBSITES:

- 1. www.ocw.mit.edu
- www.physicsclassroom.com
 www.nptel.ac.in
- 4. <u>www.physics.org</u>

OBJECTIVES:

- □ To provide mathematical basis for acoustics waves and the characteristic behaviour of sound in pipes, resonators and filters.
- □ To introduce the properties of hearing and speech

INTENDED OUTCOME:

The students will have the knowledge on acoustics waves, the characteristic behaviour of sound in pipes, resonators and filters and that knowledge will be used by them in different engineering and technology applications

UNIT I INTRODUCTION

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves -Energy density – Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales. Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence – method of images.

UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance -Fundamental properties of transducers. Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III PIPES RESONATORS AND FILTERS

Resonance in pipes - standing wave pattern absorption of sound in pipes - long wavelength limit - Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters - low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level - combing band levels and tones - detecting signals in noise - detection threshold - the ear - fundamental properties of hearing - loudness level and loudness - pitch and frequency - voice.

UNIT IV ARCHITECTURAL ACOUSTICS

Sound in endosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound

sources in live rooms – acoustics factor in architectural design. Environmental Acoustics: Weighted sound levels speech interference – highwa y noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

UNIT V TRANSDUCTION

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker – loudspeaker cabinets – horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

TEXT BOOK:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Lawerence E.Kinsler, Austin R.Frey,	Fundamentals of Acoustics	4ht edition, John Wiley & Sons	2013

REFERENCES:

S.No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	L. Beranek	Acoustics	Academic Press	2012

WEBSITES:

- www.acousticalsociety.org
 www.acoustics-engineering.com
 www.nptel.ac.in
 www.ocw.mit.edu

15BESHOE14, 15BTSHOE14 ALTERNATE FUELS AND ENERGY SYSTEMS

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OBJECTIVES:

- \Box To understand about the fuel
- □ To study about the alcohols and its importance in engine
- □ To gain knowledge on the fuel gas and oils
- □ To get the information on fuel cell

INTENDED OUTCOMES:

□ <u>Students will know about the basic concepts of alternate fuels and they can enrich their knowledge about the alternate fuels and energy s ystems</u>

UNIT I INTRODUCTION

Need for alternate fuel, availability and properties of alternate fuels, general use of alcohols, LPG, hydrogen, ammonia, CNG and LNG, vegetable oils and biogas, merits and demerits of various alternate fuels, introduction to alternate energy sources and significance.

UNIT II ALCOHOLS

Properties as engine fuel, alcohols and gasoline blends, performance in SI engines, methanol and gasoline blends, combustion characteristics in CI engines, emission characteristics, DME, DEE properties performance analysis, performance in SI & CI Engines.

UNIT III NATURAL GAS, LPG, HYDROGEN AND BIOGAS

Availabilit y of CNG, properties, modification required to use in engines, performance and emission characteristics of CNG & LPG in SI & CI engines, performance and emission of LPG. Hydrogen storage and handling, performance and safet y aspects. Production of Biogas and its applications

UNIT IV VEGETABLE OILS

Various vegetable oils for engines, esterification, performance in engines, performance and emission characteristics, biodiesel and its characteristics.

UNIT V ELECTRIC, HYBRID, FUEL CELL AND SOLAR CARS

La yout of an electric vehicle, advantage and limitations, specifications, system components, electronic control system, high energy and power density batteries, hybrid vehicle, fuel cell vehicles, solar powered vehicles.

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Richard.L.Bechfold	Alternative Fuels Guide Book	SAE International Warren dale	1997
2.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009

REFERENCE BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Nagpal	Power Plant Engineering	Khanna Publishers	1991
2.	Saeid Mokhatab William A Poe	Hand book of Natural Gas Transmission and Processing, 2 nd edition.	Gulf Professional Publisher, USA	2012

WEBSITES:

1.www.fao.org/docrep/t4470e/t4470e08.htm

2.http://www.exergy.se/goran/hig/ses/06/alternative%20fuels

3.<u>http://www.alternative-energy-news.info/technol ogy/transportation/h ybrid-cars/</u>

15BESHOE15, 15BTSHOE15 SOLID WASTE MANAGEMENT

OBJECTIVES:

- □ To understand about the solid waste
- \Box To study about the waste treatment
- □ To gain knowledge on the disposal of waste and waste management.
- \Box To get the information on energy conservation.

INTENDED OUTCOME:

□ The students will know solid waste and energy conservation. The y will understand the methodologies to disposal of solid waste and its management. _

UNIT I SOLID WASTE

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

UNIT II WASTE TREATMENT

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNIT III WASTE DISPOSAL

Sanitar y Land Fill Method of Solid Waste Disposal – Land Fill Classification, Types, Methods & Siting Consideration – La yout & Preliminar y Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfill Remediation

UNIT IV HAZARDOUS WASTE MANAGEMENT

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure, Remediaiton, risk assessment.

UNIT V ENERGY GENERATION FROM WASTE

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, energy recovery systems. Biological & chemical conversion technologies – Aerobic composting, low solids. Anaerobic digestion, high solids anaerobic digestion, Energy production from biological conversion products, other biological transformation processes. Chemical transformation processes.

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Dara.S.S,Mishra.D.D	A Text book of Environmental chemistry and pollution control	S.Chand and company Ltd	2011

REFERENCE BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	Nagpal H.Theisen, S. Vigil	Integrated Solid Waste management- Engg. Principles and management issues	George Tchobanoglous, McGraw Hill	1993
2.	Parker, Colin, & Roberts	Energy from Waste – An Evaluation of Conversion Technologies	Elsevier Applied Science, London	1985
3.	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall	1999

WEBSITES:

1.<u>www.iitk.ac.in/3inetwork/html/reports/ IIR2006/Solid_Waste</u>.

2.<u>http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/</u>

3.www.alternative-energy-news.info/technology/garbage-energy/

4.nzic.org.nz/ChemProcesses/environment/

15BESHOE16, 15BTSHOE16

OBJECTIVES:

- □ To understand about the green chemistry
- □ To study the atom efficient process and s ynthesis elaborately.
- □ To gain knowledge on the green technology and renewable energy resources.
- \Box To get the information on catal ysis

INTENDED OUTCOMES:

□ Students will know the chemistry and application of green technology for energy sources. They will understand the role of green catalyst in industries.

UNIT I

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.

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

Catal ysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catal ytic reactions including the use of heterogeneous catal ysis, zeolites, oxidation using molecular ox ygen.

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	V. K. Ahluwalia and M.Kidwai	New Trends in Green Chemistr y	Anama ya publishers.New delhi. Second Edition	2007
2.	Sanjay K. Sharma, Ackmez Mudhoo	Green Chemistry for Environmental Sustainability	CRC Press	2011

REFERENCE BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	K. R. Desai	Green Chemistr y	Himala ya Publishing House, Mumbai.	2005
2.	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons	2012
3.	A. S.Matlack	Introduction to Green Chemistry	Marcel Dekker: New York	2001
4.	Mukesh Doble	Green Chemistry and Engineering, 1st edition	Academic Press	2007

WEBSITES:

1. <u>http://www.organic-chemistry.org/topics/green-chemistry.shtm</u>

2.<u>http://www.essentialchemicalindustry.org/processes/green-chemistry.html</u>

3. http://www.chm.bris.ac.uk/webprojects2004/vicker y/green_solvents.htm

4. <u>http://www.epa.gov/research/greenchemistry/</u>

5. http://www.amazon.in/Green-Chemistry-Catal ysis

15BESHOE17

APPLIED ELECTROCHEMISTRY

OBJECTIVES:

- □ To get the information on electrochemical material.
- □ <u>To study about the conducting polymers</u>
- □ <u>To understand about the fuel</u>
- □ To gain knowledge on the batteries and power sources.

INTENDED OUTCOMES:

Students will understand about the fuel. They will get knowledge on the batteries and power sources.

UNIT I METAL FINISHING

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electroplating for electronic industry- Alloy plating, brass plating-Electro less plating of nickel- anodizing – Electroforming – Electro winning

UNIT II CONDUCTING POLYMERS AND ELECTROCHEMICALS

Electropolymerisation- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acet ylene-Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNIT III BATTERIES AND POWER SOURCES-I

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNIT IV BATTERIES AND POWER SOURCES-II

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

UNIT V ELECTROCHEMICAL MATERIAL SCIENCE

Solar cells- Preparation of CdS/Cu_2S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	D.Pletcher and F.C.Walsh	Industrial electrochemistry	Chapman and Hall, London	1990
2.	A.T.Khun	Industrial Electrochemistry	Elsevier Publishers	1972

REFERENCE BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	M.M.Baizer	Organic electrochemistr y	Dekker Inc. New York	1983
2.	M. Barak	Electrochemical power sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
3.	K.L. Chopra and I. Kaur	Thin film devices and their application	Plenum Press, New York.	1983
4.	Bruno Scrosati	Applications of Electroactive polymers	Chapman & Hall, London	1993

WEBSITES:

- 1. http://www.anoplate.com/finishes/
- http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html
 http://inventors.about.com/od/sstartinventions/a/solar_cell.htm

15BESHOE18, 15BTSHOE18

- \Box To understand about the fuel
- \Box To study about the abrasives and lubricants.
- □ To gain knowledge on inorganic chemicals and explosive materials.
- □ To get the information on agriculture chemicals.

INTENDED OUTCOMES:

□ The student will acquire basic knowledge on cement. The student will understand the interaction of engineering materials and their utilization in industries.

UNIT I CEMENT AND LIME

Manufacture of Portland cement – settling of hardening of Portland cement – regauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials- manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – magnesian lime – dolomitic lime – hydraulic lime.

UNIT II ABRASIVES AND REFRACTORIES

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories – definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

UNIT III INORGANIC CHEMICALS

Common salt and soda ash – Manufacture – Different grades – products – alkalis – Na_2CO_3 , Caustic soda and chlor-alkali industry – manufacture principles of electrolytic process – chlorine – storage. Hydrochloric acid – manufacture – absorption – uses, Sulphur and sulphuric acid – extraction of sulphur – manufacture of H_2SO_4 – chamber – contact processes – industrial uses.

UNIT IV EXPLOSIVES

Explosives – uses – properties and tests – explosives for war – nitrocellulose – picric acid and T.N.T. – industrial explosives – nitrogl ycerin and dynamites – black powder – smoke screens – incendiaries – gas mask.

UNIT V AGRICULTURE CHEMICALS

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

TEXT BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	B.K. Sharma	Industrial Chemistr y	Goel Publishing House, Meerut	2000
2.	D.Pletcher and F.C.Walsh	Industrial electrochemistr y	Chapman and Hall, London	1990

REFERENCE BOOKS:

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1.	B.N.Chakrabart y	Industrial Chemistr y	Oxford and IBH Publishing CO. New Delhi.	1998
1.	R.N. Sherve	Chemical process industries	McGraw-Hill, Kugakuisha Ltd., Tok yo.	1984
2.	James A. Kent	Hand Book of Industrial Chemistry, 9th edition	New York, Van Nostrand Reinhold.	1992
3.	S.D. Shukla and G.N. Pandy	A text book of chemical technology	Vikas publishing house pvt. Ltd, New Delhi.	1979

WEBSITES:

1. http://en.wikipedia.org/wiki/Cement	
2. http://www.hon.ch/HONselect/Selection/D01.html	

2. http://www.hon.ch/HOINselect/Selection/Dol.html 3. <u>http://fas.org/man/dod-101/navy/docs/fun/part12.htm</u> 4. http://toxics.usgs.gov/topics/agchemicals.html

COMPUTER SCIENCE ENGINEERING Python Programming

15BECSOE01

Course Objectives:

- □ To learn how to use and manipulate several core data structures: Lists, Dictionaries, Tuples, and Strings.
- □ To understand the process and skills necessary to effectively deal with problem solving in relation to writing programs.
- □ To understand the process and skills necessary to effectively deal with problem solving in relation to writing programs.

UNIT I Fundamentals

The Universal Machine-Program power- What is Computer Science? -Hardware Basics- Programming Languages-P ython-Inside P ython program-Software Development Process- Example program-Elements of programs- Output statements- Assignment Statements- Data types-Type conversions

UNIT II Decision Structures and Loops

Simple Decisions-Two-way decisions-Multi-way decisions-Exception handling-for loops-indefinite loops-common loop patterns-Booleans

UNIT III Functions

Function of functions-Functions and Parameters-Function that returns values-Function that modifies parameters-Functions and program structures

UNIT IV Sequences

String data type- String Processing-List as sequences-String Representation-String Methods-I/O as String manipulation-File Processing

UNIT V Objects and Graphics

Overview-Object of Objects-Simple Graphics Programming-Using Graphical Objects-Choosing Coordinates- Interactive Graphics-Graphics module reference

Total Hours: 45

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References:

- 1. John Zelle, "Python Programming: An Introduction to Computer Science", 2nd Edition, Franklin & Associates, 2009
- 2. Mark Lutz, "Learning Python", OReil y, 2013
- 3. David Beazly & Brian K. Jones, "Python Cookbook", OReily, 2013

Internet Programming

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Course Objectives:

- □ To introduce the Java programming langauge and explore its current strengths and weaknesses
- □ To study the way that object-oriented concepts are implemented in the Java programming language
- □ To write working Java code to demonstrate the use of applets for client side programming
- □ To study the way that exceptions are detected and handled in the Java programming language
- □ To write working Java code that demonstrates multiple treads of execution

UNIT I Introduction

Introduction - Network of Networks, Intranet, Extranet and Internet. World Wide Web- Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. TCP/IP- Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing- Classful and Classless Addressing, Subnetting

UNIT II HTML

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, La yout, CSS. Form, Iframe, Colors, Colorname, Colorvalue. Image Maps- map, area, attributes of image area- Extensible Markup Language (XML)- Introduction, Tree, S yntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts- Introduction- Environment Variable, GET and POST Methods.

UNIT III PERL

Introduction, Variable, Condition, Loop, Arra y, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling- JavaScript- Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, arra y, Boolean, reg-ex. Function, Errors, Validation. Cookies- Definition of cookies, Create and Store a cookie with example. Java Applets-Container Class, Components, Applet Life Cycle, Update method, Applications.

UNIT IV Client-Server programming

Client-Server programming In Java - Java Socket, Java RMI. Threats - Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks- Network security techniques- Password and Authentication- VPN, IP Security, security in electronic transaction, Secure Socket La yer (SS L), Secure Shell (SSH). Firewall- Introduction, Packet filtering, Stateful, Application layer, Prox y.

UNIT V Internet Telephony

Introduction, VoIP- Multimedia Applications- Multimedia over IP: RSVP, RTP, RTCP and RTSP-Streaming media, Codec and Plugins, IPTV- Search Engine and Web Crawler- Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

Total Hours: 45

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References:

- 1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.
- 2. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011.

Course Objectives:

- □ To study the graphics techniques and algorithms.
- □ To study the multimedia concepts and various I/O technologies.
- □ To enable the students to develop their creativity
- □ To impart the fundamental concepts of Computer Animation and Multimedia.

UNIT I Introduction

What is mean by Animation – Why we need Animation – History of Animation – Uses of Animation – Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects - Creating Animation.

UNIT II Creating Animation in Flash

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding La yers - Action script.

UNIT III 3D Animation & its Concepts

Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation.

UNIT IV Motion Caption

Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage – Different Language of Script Animation Among the Software.

UNIT V Concept Development

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

Total Hours: 45

References:

- 1. Principles of Multimedia Ranjan Parekh, 2007, TMH. (Unit I, Unit V)
- 2. Multimedia Technologies Ashok Banerji, Ananda Mohan Ghosh McGraw Hill Publication.
- 3. Computer Graphics, Multimedia and Animation-Malay K. Pakhira, PHI Learning PVt Ltd, 2010
- 4. Encyclopedia of Multimedia and Animations-Pankaj Dhaka, Anmol Publications-2011

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15BECSOE04

PC Hardware and Trouble shooting

Course Objectives:

- □ Assemble/setup and upgrade personal computer systems
- □ Perform installation, configuration, and upgrading of microcomputer hardware and software.
- □ Install/connect associated peripherals.
- Diagnose and troubleshoot microcomputer systems hardware and software, and other peripheral equipment.

UNIT I Introduction

UNIT II Peripheral Devices

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices – FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNIT III PC Hardware Overview

UNIT IV Installation and Preventive Maintenance

 $\begin{array}{l} Introduction-system \ configuration-pre\ installation\ planning-\ Installation\ practice-\ routine\ checks-PC\ Assembling\ and\ integration-\ BIOS\ setup-\ Engineering\ versions\ and\ compatibility-\ preventive\ maintenance-\ DOS-\ Virus-\ Data\ Recover\ y. \end{array}$

UNIT V Troubleshooting

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LS I's – Bus Faults – Faults Elimination process – S ystematic Troubleshooting – S ymptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.

Total Hours: 45

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References:

- 1. B. Govindarajalu, "IBM PC Clones Hardware, Troubleshooting and Maintenance", 2/E, TMH, 2002.
- 2. Peter Abel, Ni yaz Nizamuddin, "IMB PC Assembly Language and Programming", Pearson Education, 2007
- 3. Scott Mueller, "Repairing PC's", PHI, 1992

15BECSOE05

Game Programming

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Course Objectives:

- □ To understand the basic history and genres of games
- □ To demonstrate an understanding of the overall game design process
- □ To explain the design tradeoffs inherent in game design
- □ To design and implement basic levels, models, and scripts for games
- □ To describe the mathematics and algorithms needed for game programming
- □ To design and implement a complete three-dimensional video game

UNITI Introduction

Introducing Games with Java- Requirements-Installing Netbeans IDE-Structure of Java Program-Structure of Java GUI-Swing controls-Stopwatch Project-Creating Frames-Adding Controls-Adding Event methods-Writing Code

UNIT II Safecracker Project

Frame design-Grid Bag Layout Manager-Code Design-Adding Sounds-Tic Tac Toe Project-Frame Design-Code Design-Adding Events-Adding Sounds

UNIT III Match Game Project

Preview-Frame Design-Photo Selection-Code Design-Timer Objects- Adding Delays-one player Solitaire game-Computer Moves

UNIT IV Pizza Delivery Project

Preview- Frame Design-Adding Clock-Game Design-Multiple Frames GUI- Leap Frog Project-Preview-Frame Design-Code Design- Introduction to OOP-Sprite Class-Collision detection between objects- Updating Scores

UNIT V **Moon Landing Project**

Preview-Frame Design- Code Design- Graphics Methods- Graphics 2D Objects-Stroke and Paint Objects-Shapes and Drawing Methods-Line, Rectangle and Ellipse-Scrolling Background-Sprite Animation

Total Hours: 45

References:

- 1. Philip Conrod, Lou Tylee, "Programming Games with Java", 2013
- 2. Timothy M.Right, "Fundamental 2D Game Programming with Java", Cengage Learning PTR.2015
- 3. Wayne Holder, Doug Bell, "Java Game Programming for Dummies",

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OPEN ELECTIVES (COURSES OFFERED TO OTHER DEPARTMENTS)

ELECTRICAL AND ELECTRONICS ENGINEERING

15BEEEOE01ELECTRIC HYBRID VEHICLEL T P C 3 0 0 3

INTENDED OUTCOMES

- □ To understand the basic concepts of electric hybrid vehicle.
- □ To gain the knowledge about electric propulsion unit.
- □ To understand and gain the knowledge about various energy storage devices.

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.

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 BOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press	2003

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi	Modern Electric, H ybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	CRC Press	2004
2	James Larminie, John Lowr y	Electric Vehicle Technology Explained	Wiley	2003

15BEEEOE02 ENERGY MANAGEMENT AND ENERGY AUDITING L T P C 3 0 0 3

INTENDED OUTCOMES

- □ To gain the knowledge about energy management.
- □ To understand the basic concepts in economic analysis in energy management.
- □ To understand the basic principles of energy audit.

UNIT I ENERGY MANAGEMENT

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS

Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life c ycle costing analysis - Calculation of simple payback method, net present worth method.

UNIT III BASIC PRINCIPLES OF ENERGY AUDIT

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT IV ENERGY EFFICIENT MOTORS

Electric Motors: Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation –over motoring – motor energy audit-

Energy conservation: Importance-energy saving measures in DG set-fans and blowers pumps-air conditioning system- energy efficient transformers.

UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS

Power factor - methods of improvement, location of capacitors, p.f with non linear loads, effect of harmonics on p.f,- p.f motor controllers –Energy efficient lighting system design and practice-lighting control– Measuring Instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLCs.

Text Book

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Murph y W.R. and G.Mcka y Butter worth	Energy Management	Heinemann Publications	2007

Reference Books

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	John.C.Andreas	Energy Efficient Electric Motors	Marcel Dekker Inc Ltd – 3rd edition	2005
2	W.C.Turner Steve Doty	Energy Management Handbook	John Wiley and Sons, 7th Edition	2009
3	Paul o' Callagham	Energy Management	Mc-Graw Hill Book Company – 1st edition	1998

15BEEEOE03 SENSORS AND TRANSDUCERS

INTENDED OUTCOMES

- □ To gain the knowledge about various types of Sensors & Transducers and their working principle.
- □ To understand the concepts of Resistive, Capacitive and Inductive transducers.
- □ To gain knowledge about characteristics of transducers.

UNIT I INTRODUCTION OF TRANSDUCERS

Transducer – Classification of transducers – Basic requirement of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS

Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs.

UNIT III RESISTIVE TRANSDUCERS

Potentiometer – Loading effect – Strain gauge – Theory, types, temperature compensation – Applications – Torque measurement – Proving Ring – Load Cell – Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer.

UNIT IV INDUCTIVE AND CAPACITIVE TRANSDUCER

Self inductive transducer – Mutual inductive transducers– LVDT Accelerometer – RVDT – S ynchros – Micros yn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone.

UNIT V MISCELLEANEOUS TRANSDUCERS

Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers.

TEXT BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of
				Publication
1	Sawhney A.K	A Course in Electrical and	18th Edition,	2007
	-	Electronics Measurements and	Dhanpat Rai &	
		Instrumentation	Company Private	
			Limited	
2	Renganathan. S	Transducer Engineering	Allied Publishers,	2003
			Chennai	

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of
				Publication
1	Doebelin. E.A	Measurement S ystems –	Tata McGraw Hill,	2000
		Applications and Design	New York	
2	Patranabis. D	Sensors and Transducers	Prentice Hall of	1999
			India	
3	John. P, Bentley	Principles of Measurement	III Edition, Pearson	2000
		S ystems	Education	
4	Murth y.D.V.S	Transducers and Instrumentation	Prentice Hall of	2001
			India	
15BEEEOE04 PROGRAMMABLE LOGIC CONTROLLER L T P C 3 0 0 3

INTENDED OUTCOMES

- □ To understand the basic principles of PLC systems.
- □ To gain the knowledge about data handling functions.
- \Box To understand the principles of PID.

UNIT I INTRODUCTION

PLC Basics PLC s ystem, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

of

S. Title of the book Author(s) Publisher Year No. Name **Publication** JR Hackworth Programmable Logic 1 Pearson 2006 Controllers – Programming and F.D Method and Applications Hackworth – Jr

TEXT BOOKS

REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	
2	W.Bolton	Programmable Logic controller	Elsevier Newnes Publications, Fourth Edition	2006

WEBSITE

<u>http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,-</u> Introduction to programmable Logic controller

RENEWABLE ENERGY SOURCES L T P C 3 0 0 3 15BEEEOE05 INTENDED OUTCOMES

- To gain the knowledge about environmental aspects of energy utilization.
- □ To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
- □ To understand the basic principles fuel cell, Geo thermal power plants.
- To gain the knowledge about hydro energy.

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 thermal conversion 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.

HYDRO ENERGY UNIT IV

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power 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.

TEXT BOOKS

<mark>S. No.</mark>	Author(s) Name	Title of the book	Publisher	Year of Publication
<mark>1</mark>	Rai.G.D	Non-conventional resources of energy	Khanna publishers ,Fourth edition	<mark>2010</mark>
<mark>2</mark>	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	<mark>2009</mark>

<mark>S. No.</mark>	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rao.S. & Parulekar	Energy Technology	Khanna publishers, Fourth edition	<mark>2005</mark>

2	Godfrey Boyl	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
<mark>3</mark>	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis	<mark>2006</mark>
<mark>4</mark>	Mittal K.M	Non-Conventional Energy S ystems	Wheeler Publishing Co. Ltd	<mark>1997</mark>

WEBSITES

1. <u>www.energycentral.com</u> 2. <u>www.catelelectricpowerinfo.com</u>

15BEEEOE06 ADVANCED CONTROL SYSTEMS

INTENDED OUTCOMES

- □ To understand the concept of state variable analysis.
- □ To understand time domain and frequency domain analysis of control systems required for stability analysis.
- □ To understand the concept of optimal control.

UNIT 1 STATE VARIABLE ANALYSIS

Concept of state – State Variable and State Model – State models for linear and continuous time systems – Solution of state and output equation – controllability and observability - Pole Placement – State observer Design of Control S ystems with observers

UNIT II PHASE PLANE AND DESCRIBING FUNCTION ANALYSIS

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearising non-linear systems - Construction of phase portraits – Singular points – Limit cycles Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – Conditions for stability – Stability of oscillations.

UNIT III Z-TRANSFORM AND DIGITAL CONTROL SYSTEM

Z transfer function – Block diagram – Signal flow graph – Discrete root locus – Bode plot.

UNIT 1V STATE-SPACE DESIGN OF DIGITAL CONTROL SYSTEM

State equation – Solutions – Realization – Controllability – Observability – Stability – Jury's test.

UNIT V OPTIMAL CONTROL

Introduction -Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design.

S.	Author(s)	Title of the book	Publisher	Year of
No.	Name			Publication
1	I.J. Nagrath and	Control Systems Engineering	New Age International	2003
	M. Gopal		Publishers	
2	Ashish Tewari	Modern control Design with	John Wiley, New	2002
		Matlab and Simulink	Delhi	
3	Benjamin C.	Digital Control Systems	Oxford University	1992
	Kuo		Press	
4	George J. Thaler	Automatic Control Systems'	Jaico Publishers	1993

TEXT BOOKS

S.	Author(s) Name	Title of the book	Publisher	Year of
No.				Publication
1	George J. Thaler	Automatic Control Systems	Jaico Publishers	1993
2	M.Gopal	Modern control system	New Age International	2002

		theory	Publishers	
3	Gene F. Franklin, J.	Feedback Control of	Fourth edition, Pearson	2002
	David Powell and	Dynamic	Education, Low price	
	Abbasemami-	S ystems	edition	
	Naeini			
4	Raymond T. Stefani	Design of feedback Control	Oxford University	2002
	& Co	systems		

OPEN ELECTIVES (COURSES OFFERED TO OTHER DEPARTMENTS) BIO TECHNOLOGY

BIOREACTOR DESIGN

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ISBIDICEO	DIOREACTOR DESIGN	5005100
INTENDED C	DUTCOMES	
	To understand the basic design of bioreactors	
	To understand the principle of heat transfer inside a bioreactor	
	To understand the principle of heat transfer inside a bioreactor	
	To design bioreactors for various operations	
UNIT I E Introduction t of cylindrical	NGINEERING PROPERTIES AND STORAGE TANK o various mechanical properties of material to be used material of cons storage tank.	(9) truction, design
UNIT II	REACTOR DESIGN	(9)

Design of Airlift fermentor, Bubble column reactor and Continuous stirred tank reactor.

UNIT III HEAT TRANSFER EQUIPMENTS

Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulation evaporator.

UNIT IV MASS TRANSFER EQUIPMENTS

Design of Bollmann extractor, fractionating column, packed tower and spray tray absorber

UNIT V SEPERATION EQUIPMENTS

Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rotart drum drier and Swenson –walker crystallizer.

TEXT BOOKS:

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S.No	Author(s) Name	Title of the book	Publisher	Year o Publications
1	James Edwin Bailey, David F. Ollis	Biochemical Engineering Fundamentals	McGraw- Hill	2007
2	Don W. Green, Robert H. Perry	Chemical Engineer Hand book	The McGraw- Hill Companies	2008

REFERENCE BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Pauline. M. Doran	Bioprocess Engineering Principles	Academic Press	2013

FOOD PROCESSING AND PRESERVATION 3003100 **15BTBTOE02**

INTENDED OUTCOMES

The students are exposed to

- Properties of food material
- Various methods used for preserving fruits and vegetables.

UNIT I SCOPE AND IMPORTANCE OF FOOD PROCESSING (9)

Properties of food- Physical, thermal, mechanical, sensory. Raw material Preparation - Cleaning, sorting, grading, peeling.

PROCESSING METHODS UNIT II

Heating- Blanching Pasteurization. Freezingand Dehydrationcanningextrusion cooking- hydrostatic pressure cookingadditives- fermentationdielectric micro wave processing and aseptic processing - Infra red radiation processingheating-Concepts and equipment used.

UNIT III FOOD CONVERSION OPERATIONS (9)

Size reduction-Fibrous foods, dry foods and liquid foods-Theor y and equipments- membrane separation- filtration- equipment and application.

UNIT IV FOOD PRESERVATION BY COOLING

Freezing-Theor y, freezing time calculation, methods of freezing. Refrigeration, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Water activity, methods to control water activity.

UNIT V **PRESERVATION METHODS FOR FRUITS AND VE GETABLES (9)**

Pre processing operations - preservation by reduction of water content: drying / dehydration and concentration – chemical preservation – preservation of vegetables by preservation with sugar - Heat preservation- Food irradiation- Combined acidification. preservation techniques.

TEXT BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of Publications
1	R. Paul Singh, Dennis R. Heldman	Introduction to food engineering.	Academic Press	2001
2	P.Fellows.	Food Processing Technology, Principles and practice.	Wood head Publishing Ltd	2000

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3	Mircea Enachescu Dauthy	Fruit	and	Vegetable	FAO	1995
		Proces	ssing		agricultural	
					services	
					bulletin	

REFERENCE BOOKS

S.No	Author(s) Name	Title of the book	Publisher	Year of
				Publications
1	M.A. Rao, Syed S.H.	Engineering properties	CRC	2005
	Rizvi, Ashim K. Datta	of foods	Press	
2	B. Sivasankar	Food processing and	PHI	2002
		preservation	Learning	
			Pvt. Ltd	

15BTBTOE03

INTENDED OUTCOMES

To learn various forcefields, simulation methods in molecular modeling

□ To have better understanding on molecular docking and ligand based drug design methods

UNIT-I MOLECULAR MODELLING

Introduction to concept of molecular modeling, molecular structure and internal energy, applications of molecular graphics, coordinate systems, potential energy surfaces, discussion of local and global energy minima

UNIT-II **QUANTUM MECHANICS**

Introduction to the computational quantum mechanics; one electron atom, ply electronic atoms and molecules, Hartree Fock equations; calculating molecular properties using ab initio and semi empirical methods.

UNIT-III **MOLECULAR MECHANICS**

Molecular mechanics; general features of molecular mechanics force field, bond stretching, angle bending, torsional terms, non – bonded interactions; force field parameterization and transferability, energy minimization; derivative and non-derivative methods, applications of energy minimization.

UNIT-IV **MOLECULAR DYNAMCS**

Molecular dynamics simulation methods; molecular dynamics using simple models, molecular dynamics with continuous potential, setting up and running a molecular dynamic simulation, constraint dynamics; Monte Carlo simulation; Monte Carlo simulation of molecules.

MODELLING AND DRUG DESIGN **UNIT-V**

Macromolecular modeling, design of ligands for known macro molecular target sites, Drugreceptor interaction, classical SAR /QSAR studies and their implications to the 3 D modeler, 2-D and 3-D database searching, pharmacophore identification and novel drug design, molecular docking, Structure-based drug design for all classes of targets.

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Andrew Leach	Molecular Modelling: Principles and Applications	Prentice Hall	2001
2	N. Claude Cohen	Guidebook on Molecular Modeling in Drug Design	Academic Press	1996

TEXT BOOKS

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REFERENCE BOOKS

S.No.	Author(s)	Title of the book	Publisher	Year	of
	Name			Publications	
1	Yvonne C.	Designing bioactive	Washington,	1998	
	Martin, editor,	molecules : three- dimension	DC :		
	Peter Willett	techniques and applications	American		
			Chemical		
			Society		
2	Matthew F.	Molecular Modeling on the	Wiley-	1998	
	Schlecht	PC	Blackwell; H		

BIOREMEDIATION

INTENDED OUTCOMES

- □ To understand the consequences of pollution
- □ To study the various techniques and methods used for bioremediation

UNIT-I OVERVIEW OF BIOREMEDIATION

Pollution : Types and its consequences, History of bioremediation, Sources of contamination, Bioremediation processes, Environments where bioremediation is used, Microbiology of bioremediation.

UNIT-II BIOFILMPROCESSES

Trickling Filters and Biological Towers, Rotating Biological Contactors, Granular Media Filters, Fluidized-bed Reactors, Hybrid Biofilm Processes

UNIT-III BIOREMEDIATION FOR SOIL ENVIRONMENT (9)

Environment of Soil Microorganisms, Soil Organic Matter and Characteristics, Soil Microorganisms Association with Plants, Pesticides and Microorganisms, Petroleum Hydrocarbons and Microorganisms, Industrial solvents and Microorganism, Biotechnologies for Ex-Situ Remediation & in-Situ Remediation of Soil Phytoremediation Technology for Soil Decontamination

UNIT-IV BIOREMEDIATION FOR AIR AND WATER ENVIRONMEN (9)

Atmospheric Environment for Microorganisms, Microbial Degradation of Contaminants in Gas Phase, Biological Filtration Processes for Decontamination of Air Stream-Biofiltration, Biotrickling Filtration, Bioscrubbers, Contaminants in Groundwater, Landfill Leachate Biotreatment Technologies, Industrial Wastewater Biotreatment Technologies, Biotreatment of Surface Waters

UNIT-V BIOREMEDIATION OF METALS

(9)

Microbial Transformation of Metals, Biological Treatment Technologies for Metals Remediation, Bioleaching and Biobenificiation, Bioaccumulation, Oxidation/Reduction Processes, Biological Methylation

TEXT BOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year Publications	of
1	Rittmann, B.E., and McCart y, P.L.,	Environmental Biotechnology : Principles and Applications.	McGraw Hill,	2001	

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2	John Cookson	Bioremediation Engineering: Design and Applications	McGraw- Hill Education	1995

REFERENCE BOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year Publications	of
1	Prescott, L M., Harle y, and Klein, D. A	Microbiology	McGraw- Hill Higher Education	2008	

BIOPHYSICS

INTENDED OUTCOMES

- □ To gain structural knowledge of biological systems.
- □ To understand transport and dynamic properties of biological systems.

UNIT I MOLECULAR STRUCTURE OF BIOLOGICAL SYSTEMS (9) Intramolecular bonds – covalent – ionic and hydrogen bonds – biological structures general features – water structure – hydration – interficial phenomena and membranes – self assembly and molecular structure of membranes.

UNIT II CONFORMATION OF NUCLEIC ACIDS

Primar y structure – the bases – sugars and the phosphodiester bonds- double helical structure – A, B and Z forms – properties of circular DNA – topology – polymorphism and flexibility of DNA – structure of ribonucleic acids – hydration of nucleic acids.

UNIT III CONFORMATION OF PROTEINS

Conformation of the peptide bond – secondar y structures – ramachandran plots – use of potential functions – tertiary structure – folding – hydration of proteins – hydropathy index.

UNIT IV ENERGETICS & DYNAMICS OF BIOLOGICAL SYSTEMS (9)

Kinetics of ligand interactions; Biochemical kinetics studies, uni-molecular reactions, simple bi molecular multiple intermediates, stead y state kinetics, catalytic efficiency, relaxation spectrometry, ribonuclease as an example.

UNIT V APPLIED TECHNIQUES

Techniques for the stud y of biological structure & function: Size and shape of macromolecules – methods of direct visualization macromolecules as hydrod ynamic particles – macromolecules diffusion – ultra centrifugation – viscometr y x-ray crystallograph y determination of molecular structures, X-ray fibre diffusion electron microscop y neutron scattering – light scattering.

TEXT BOOKS:

S.No	Author(s) Name	Title of the book	Publisher	Year of
				Publications
1	Roland Glaser	Bioph ysics	Springer	2001
			Science &	
			Business	
			Media	
2	Michel Daune	Molecular Biophysics:	Oxford	1999
		Structures in Motion	Universit y	
			Press	

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3	Charles R. Cantor	Bioph ysical Chemistr y W. H. 1980
		Part 2: Techniques for Freeman and
		Study of Biologi Company
		Structure and Function

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- □ To enable the students to get aware of available tools and databases for performing research in bioinformatics.
- □ To provide the thorough understanding of protein structure in detail.

UNIT I OVERVIEW OF BIOINFORMATICS

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 (9)

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 & famil y relationships; protein families & pattern databases; protein domain families.

UNIT III PHYLOGENETICS

Phylogenetics, cladistics & ontology, building phylogenetic trees; evolution of macromolecular sequences. Sequence annotation: principles of genome annotation; annotation tools & resources.

UNIT IV STRUCTURAL BIOINFORMATICS

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: CATH & SCOP; introduction to protein structure prediction; structure prediction by comparative modeling; secondary structure prediction; advanced protein structure prediction & predictionstrategies.

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UNIT V MICROARRAY DATA ANALYSIS

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Microarra y data, analysis methods; microarra y data, tools & resources; sequence sampling & SAGE.Bioinformatics in pharmaceutical industry: informatics & drug discover y, pharmainformatics resources.Basic principles of computing in bioinformatics: running computer software; computer operating s ystems; software downloading & installation; database management.

TEXTBOOK

S. No.	Author (s) Name	Title of the book	Publisher	Year of Publication
1	Dan E. Krane, Micha L. Ra yme	Fundamental Concepts of Bioinformatics	Pearson education	2004
2	Andreas D. Baxevanis, B. F. Francis Ouellette	Bioinformatics: A Practical Guide to the Anal ysis of Genes and Proteins	Wiley-Interscience	2004
3	David W. Mount	Sequence and Genome Analysis	Cold Spring Harbor Laborator y	2004
4	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

REFERENCE BOOKS

S. No.	Author (s) Name	Title of the book	Publisher	Year of Publication
1	Michael J. Korenberg	Microarray Data Analysis: Methods and Applications	Springer Science & Business Media	2007

- □ To develop skills of the students in the field of nano biotechnology and its applications in various fields.
- □ The course will serve as an effective course to understand Socio-economic issues of nanobiotechnology.

UNITI INTRODUCTION

Introduction, Scope and Overview, Length scales, Importance of Nanoscale and Technology, History of Nanotechnology, Future of Nanotechnology: Nano Technology Revolution, 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 Microscop y, Self assembled monola yers/ Dip- pen Nanolithograph y, Soft Lithograph y, PDMS Molding, Nano Particles, Nano wires and Nanotubes.

UNIT III APPLICATIONS

Nanomedicine, Nanobiocensor 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 systems for in vivo drug delivery-Future nanomachine.

UNIT IV NANOBIO TECHNOLOGY

Clinical applications of nanodevices. Artificial neurons. Real-time nanosensors- Applications in cancer biology. Nanomedicine. S ynthetic retin yl chips based on bacteriorhodopsins. High throughput DNA sequencing with nanocarbon tubules. 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

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Nieme yer, C.M. and Mirkin, C.A	Nanobiotechnology: Concepts, Applications and Perspectives	Wiley- VCH	2004
2	Goodsell, D.S.	Bionanotechnology	John Wiley and Sons, Inc	2004

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REFERENCE BOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Shoseyov, O. and Lev y, I	Nanobiotechnology: Bioinspired Devices and Materials of the Future	Humana Press	2007
2	Bhushan, B.	Springer Handbook of Nanotechnology	Springer- Verlag Berli Heidelberg	2004
3	FreitasJr R.A	Nanomedicine	Landes Biosciences	2004
4	Kohler, M. and Fritzsche, W.	Nanotechnology – An Introduction to Nanostructuring Techniques	Wiley- VCH	2004

MECHANICAL ENGINEERING OPEN ELECTIVES (COURSES OFFERED TO OTHER DEPARTMENTS)

15BEMEOE01

INTRODUCTION TO MEMS

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INTENDED OUTCOMES

- 1. Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.
- 2. Ability to understand and analyse, linear and digital electronic circuits.

UNIT I INTRODUCTION

Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication - Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending- Torsional deflection.

UNIT II SENSORS AND ACTUATORS-I

Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Micro Grippers – Micro Motors - Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors – Thermal Bimorph - Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators- Actuation using Shape Memory Alloys

UNIT III SENSORS AND ACTUATORS-II

Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT IV MICROMACHINING

Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies - Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS – Foundry process.

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.

TEXT BOOKS

- 1. Chang Liu, "Foundations of MEMS", Pearson Education Inc., 2006.
- 2. Stephen D Senturia, "Microsystem Design", Springer Publication, 2000.
- 3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.

- 1. Nadim Maluf," An Introduction to Micro Electro Mechanical System Design", Artech House,2000.
- 2. Mohamed Gad-el-Hak, editor, "The MEMS Handbook", CRC press Baco Raton, 2000
- 3. Julian w. Gardner, Vijay K. Varadan, Osama O. Awadelkarim, "Micro Sensors MEMS andSmart Devices", John Wiley & Son LTD,2002
- 4. James J.Allen, "Micro Electro Mechanical System Design", CRC Press Publisher, 2010
- 5. Thomas M.Adams and Richard A.Layton, "Introduction MEMS, Fabrication and Application,"Springer 2012.

1. Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics

UNIT I FUNDAMENTALS OF ROBOT

Robot – Definition, Need for Robots, Robot Anatomy, Co-ordinate systems, Work Envelope, types and classification – specifications – Pitch, yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and their functions, grippers types. Forward kinematics, inverse kinematics-Manipulators with two, three degrees of freedom in 2D - Derivations and problems.

UNIT II DRIVES AND SENSORS

Drives- hydraulic, pneumatic and electrical. Force sensing, touch and tactile sensors, proximity sensors, non contact sensors and Machine vision sensors. Safety considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance mechanism.

UNIT III PROGRAMMING AND APPLICATIONS

Robot programming languages – VAL programming – Motion Commands, Sensorscommands. Role of robots in inspection, assembly, material handling, underwater, space, nuclear, defence and medical fields.

UNIT IV MACHINE VISION

Machine Vision - Sensing - Low and higher level vision - Image acquisition and digitization - Cameras, CCD,CID, CPD, etc., - Illumination and types - Image processing and analysis - Feature extraction - Applications.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS

RGV, AGV; Implementation of Robots in Industries-Various Steps; Safet y Considerations for Robot Operations - Economic Analysis of Robots.

TEXT BOOKS

- 1. Klafter R.D., Chmielewski T.A and Negin M., "Robotic Engineering An Integrated Approach", Prentice Hall, 2003.
- 2. Groover M.P., "Industrial Robotics -Technology Programming and Applications", McGraw Hill, 2001.

- 1. Craig J.J., "Introduction to Robotics Mechanics and Control", Pearson Education, 2008.
- 2. Deb S.R., "Robotics Technology and Flexible Automation" Tata McGraw Hill Book Co., 1994.
- 3. Koren Y., "Robotics for Engineers", Mc Graw Hill Book Co., 1992.
- 4. Fu.K.S., Gonzalz R.C. and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw Hill Book Co., 1987.
- 5. Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill, 1995.
- 6. Rajput R.K., "Robotics and Industrial Automation", S.Chand and Company, 2008.
- 7. Surender Kumar, "Industrial Robots and Computer Integrated Manufacturing", Oxford and IBH Publishing Co. Pvt. Ltd., 1991.

1. Upon completion of this course, the students can able to understand the role of logistics and understand the phases of supply chain

UNIT I INTRODUCTION TO LOGISTICS

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNIT II PHASES OF SUPPLY CHAIN

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAIN MODELS

Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain with customer.

UNIT IV SUPPLY CHAIN ACTIVITIES

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNIT V SCM ORGANISATION AND INFORMATION SYSTEM

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERP Software's

TEXT BOOKS

- 1. Shari.P.B and Lassen.T.S, "Managing the global supply chain", Viva books, New Delhi, 2000.
- 2. Ayers.J.B, "Hand book of supply chain management", The St. Lencie press, 2000.

- 1. Nicolas.J.N, "Competitive manufacturing management continuous improvement", Lean production, customer focused quality, McGrawHill, New York, 1998.
- 2. Steudel.H.J and Desruelle.P, "Manufacturing in the nineteen How to become a mean, lean and world class competitor", Van No strand Reinhold, New York, 1992.

1. Upon completion of this course, the students can able to understand the relationship between free energy, entropy, internal energy, and enthalpy

UNIT I INTRODUCTION AND BASIC CONCEPTS

General overview of transport phenomena including various applications, Transport of momentum, heat and mass, Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II PROPERTIES, UNITS AND OTHER PHYSICAL PARAMETERS

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III MOMENTUM TRANSPORT

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNIT IV ENERGY TRANSPORT

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heat transfer

UNIT V MASS TRANSPORT

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion-Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and ox ygen transport, Air stripping

- 1. Geankoplis, C. J. 2003. Transport Processes and Separation Processes Principles. 4th Edition. Prentice Hall.
- 2. <u>https://laulima.hawaii.edu/portal</u>

15BEMEOE05 INTRODUCTION TO BIOMECHANICS

INTENDED OUTCOMES

1. Biomechanics provides key information on the most effective and safest movement patterns, equipment, and relevant exercises to improve human movement.

UNIT I INTRODUCTION

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury -Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNIT II KEY MECHANICAL CONCEPTS

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY

Gross (Whole-Bod y) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups -Anthropometric Data

UNIT IV ANATOMICAL DESCRIPTION

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNIT V MECHANICS OF THE MUSCULOSKELETAL SYSTEM

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit - Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle - Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control

- 1. Duane Knudson, "Fundamentals of Biomechanics", Springer Science+ Business Media, LLC, 2007
- 2. C. Ross Ethier Craig A. Simmons, "Introductory Biomechanics", Cambridge University Press, 2007

OPEN ELECTIVES (COURSES OFFERED TO OTHER DEPARTMENTS)

AUTOMOBILE ENGINEERING AUTOMOBILE ENGINEERING 3003 100

INTENDED OUTCOMES:

15BEAEOE01

□ This course enables the students to know about all the main and auxillary systems of automobile with its base construction and working.

UNIT-I ENGINE AND FUEL FEED SYSTEMS

Classification of Engine, construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburettor working principle, requirements of an automotive carburettor, Petrol injection S ystems (MPFI, TBI), Diesel fuel injection s ystems (CRDI)

UNIT-II TRANSMISSION SYSTEMS

Requirements of transmission system.Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. Objective of the gearbox - Determination of gear ratios for vehicles. Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propellar Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

UNIT-III SUSPENSION SYSTEM

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension - Pneumatic suspension - Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

UNIT-IV BRAKES

Necessit y of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theoryBrake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System (ABS).

UNIT-V ELECTRICAL SYSTEM

Principle and construction of lead acid battery. Lighting s ystem: details of head light and side light, LED lighting s ystem, head light dazzling and preventive methods – Horn, wiper s ystem and trafficator. Starting S ystem and charging s ystem.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF
				PUBLICATION
1.	Young U.P and	Automotive Electrical	ELBS & New	1999
	Griffiths L	Equipment	Press	
2.	Ganesan.V	Internal Combustion	Tata McGraw-	2003
		Engines	Hill Publishing	
			Co., New Delhi	
3.	Dr.Kirpal Singh	Automobile Engineering	Standard	2011
			Publishes	

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt .P.M	The Automotive Chassis	Literar y Licensing,LLC	2012
2.	Crouse.W.H	Automobile Electrical Equipment", 3 rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAE Inc	2001

□ The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.

UNIT I INTRODUCTION

Classifications - design considerations – weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS

2 stoke and 4 stoke S I engines and C I engines design criteria– design of c ylinders, c ylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor t ypes and design. Batter y coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHES AND TRANSMISSION

Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS

Autorickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Irving P.E.	Motor C ycle Engineering.	Temple Press Book, London.	1992.
2.	Srinivasan.S.	Motor c ycle, Scooter, Mobeds.	New century book house.	1988.

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M.M.Griffin.	Motor c ycles from inside and outside.	Prentice Hall Inc, New Jerse y.	1978.
2.	Bruce A. Johns, David D.Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

15BEAEOE03

INTENDED OUTCOMES:

□ The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic s ystems in Automobile.

UNIT I MAINTENANCE OF RECORDS AND SCHEDULES

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE

Testing methods for checking electrical components, checking batter y, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF
				PUBLICATION
1.	John Doke	Fleet Management	McGraw Hill Co	1984
2.	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011
3.	Service Manuals from Different Vehicle Manufacturers			

15BEAEOE04 INTRODUCTION TO MODERN VEHICLE TECHNOLOGY

3003100

INTENDED OUTCOMES:

□ This course enables the students to have a knowledge about the recent technologies that is in use in automobile.

UNIT I TRENDS IN POWER PLANTS

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles - Electric propulsion with cables - Magnetic track vehicles.

UNIT II DRIVER ASSISTANCE SYSTEMS

Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNIT III SUSPENSION BRAKES AND SAFETY

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safet y cage - air bags - crash resistance - passenger comfort.

UNIT IV NOISE & POLLUTION

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catal ytic converters and filters for particulate emission.

UNIT V TELEMATICS

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICAT ION
1.	Ljubo Vlacic, Michae Saren and Fumic Harashima	Intelligent Vehicle Technologies	Butterworth- Heinemann publications, Ox ford	2001
2.	Ronald K.Jurgen	Navigation and Intelligent Transportation S ystems – Progress in Technology	Automotive Electronics Series,SAE, USA.	1998

TEXT BOOKS

SL.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO		BOOK		PUBLICATION
1.	William B Riddens	"Understanding	Butterworth	1998
		Automotive	Heinemann	
		Electronics", 5 th Edition	Woburn.	
2.	Bechhold,	"Understanding	SAE	1998
		Automotive		
		Electronics"		
3.	Robert Bosch,	"Automotive	SAE	2000
		HandBook", 5 th Edition		

OPEN ELECTIVES (COURSES OFFERED TO OTHER DEPARTMENTS)

CIVIL ENGINEERING15BECEOE01HOUSING, PLAN AND MANAGEMENT3 0 0 3 100

INTENDED OUTCOMES

At the end of the this course the students should have learnt the basic terms of housing programmes, planning and designing of housing projects, construction techniques and cost effective materials and housing finance and project appraisal 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, Bye-laws 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, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS

Formulation of Housing Projects - Site Analysis, Layout Design, Design of Housing Units

(Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 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).

TEXT BOOKS

- 1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 1999.
- 2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 1997.

- 1.
- Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 1994. National Housing Policy, 1994, Government of India. 2.
- 3.
15BECEOE02BUILDING SERVICES3 0 0 3 100

INTENDED OUTCOMES

At the end of this courses the students should have learnt various machineries of construction, electrical systems in building, design and principle of illumination, refrigeration principle application and various fire safety installations.

UNITI 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 safet y – Types of earthing – IS I specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – S ynthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – 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 special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS

Thermod ynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water 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 V FIRE SAFETY INSTALLATION

Causes of fire in buildings – Safet y regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special 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

TEXT BOOKS

- 1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 1968.
- 2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 1968.

- 1. Philips Lighting in Architectural Design, McGraw-Hill, New York, 1964.
- 2. R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London, 1969.
- 3. William H.Severns and Julian R.Fellows, "Air-conditioning and Refrigeration", John Wiley and Sons, London, 1988.
- 4. A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 1980.
- 5. National Building Code.

15BECEOE03COASTAL ZONE MANAGEMENT3 0 0 3 100

INTENDED OUTCOMES

At the end of this courses the students should have learnt the different land forms of coastal zone, wave dynamics, methods of wave forecasting, coastal process and harbour maintenance

UNIT I COASTAL ZONE

Coastal zone – Coastal zone regulations – Beach profile – Surf zone – Off shore – Coastal waters – Estuaries – Wet lands and Lagoons – Living resources – Non living resources.

UNIT II WAVE DYNAMICS

Wave classification – Airy's Linear Wave theory – Deep water waves – Shallow water waves – Wave pressure – Wave energy – Wave Decay – Reflection, Refraction and Diffraction of waves – Breaking of waves – Wave force on structures – Vertical – Sloping and stepped barriers – Force on piles.

UNIT III WAVE FORECASTING AND TIDES

Need for forecasting - SMB and PNJ methods of wave forecasting – Classification of tides – Darwin's equilibrium theory of tides – Effects on structures – seiches, Surges and Tsunamis.

UNIT IV COASTAL PROCESSES

Erosion and depositional shore features – Methods of protection – Littoral currents – Coastal aquifers – Sea water intrusion – Impact of sewage disposal in seas.

UNIT V HARBOURS

Types of classification of harbours – Requirements of a modern port – Selection of site – Types and selection of break waters – Need and mode of dredging – Selection of dredgers.

TEXT BOOKS

- 1. Richard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Scientific Publishing Co., 1999
- 2. Quinn, A.D., "Design & Construction of Ports and Marine Structures", McGraw-Hill Book Co., 1999

- 1. Ed. A.T. Ippen, "Coastline Hydrodynamics", McGraw-Hill Inc., New York, 1993
- 2. Dwivedi, S.N., Natarajan, R and Ramachandran, S., "Coastal Zone Management in Tamilnadu"

15BECEOE04 EXPERIMENTAL METHODS AND MODEL ANALYSIS 3 0 0 3 100 INTENDED OUTCOMES

At hte end of this course the students should have learnt the concept of measurement, gauging, recording devices, non destructive testing techniques and laws of similitude

UNIT I MEASUREMENTS

Basic Concept in Measurements, Measurement of displacement, strain pressure, force, torque etc, Type of strain gauges (Mechanical, Electrical resistance, Acoustical etc..).

UNIT II GAUGING

Strain gauge circuits – The potentiometer and Wheatstone bridge – use of lead wires switches etc. Use of electrical resistance strain gauges in transducer applications.

UNIT III RECORDING DEVICES

Indicating and recording devices - Static and dynamic data recording –Data (Digital and Analogue) acquisition and processing systems. Strain analysis methods – Rosette analysis. Static and dynamic testing techniques. Equipment for loading-Moire's techniques.

UNIT IV NON DESTRUCTIVE TESTING TECHNIQUES

Non destructive testing techniques. Photoelasticity – optics of photoelasticity – Polariscope – Isoclinics and Isochromatics - methods of stress separation.

UNIT V LAWS OF SIMILITUDE

Laws of similitude - model materials - model testing - testing large scale structures - holographic techniques

TEXT BOOKS

- 1. Dally J W and Riley W.F, Experimental stress Analysis, McGraw-Hill, Inc. New York, 1991.
- 2. Srinath L S et al, Experimental Stress Analysis, Tata McGraw-Hill Publishing co., Ltd., New Delhi, 1984.

REFERENCE BOOKS

1. Rangan C S et al., Instrumentation – Devices and Systems, Tata McGraw-Hill

Publishing Co., Ltd., New Delhi, 1983.

2. Sadhu Singh, Experimental Stress Analysis, Khanna Publishers, New Delhi, 1996.

15BECEOE05 MANAGEMENT OF IRRIGATION SYSTEMS 3 0 0 3 100 INTENDED OUTCOMES

At the end of this courses the students should have learnt the irrigation system requirements, irrigation scheduling, strategies in water use management, canal operation places and involvement of stake holder

UNIT I. IRRIGATION SYSTEM REQUIREMENTS

Irrigation s ystems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNIT II. IRRIGATION SCHEDULING

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III. MANAGEMENT

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV. OPERATION

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V. INVOLVEMENT OF STAKE HOLDERS

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participator y irrigation management

TEXT BOOKS

- 1. Dilip Kumar Majumdar, "Irrigation Water Management Principles and Practice", Prentice Hall of India Pvt. Ltd., New Delhi, 2000
- 2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi

- 1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 1990
- 2. Maloney, C. and Raju, K.V., "Managing Irrigation Together", Practice and Policy in India, Stage Publication, New Delhi, India, 1994

15BECEOE06COMPUTER AIDED DESIGN OF STRUCTURE3 0 0 3 100INTENDED OUTCOMES:

At the end of this course, the students should have learnt the fundamentals of CAD, computer graphics, fundamentals of finite elements analysis, design and optimization and expert systems.

ÚNIT I INTRODUCTION

Fundamentals of CAD - Hardware and software requirements -Design process - Applications and benefits.

UNIT II COMPUTER GRAPHICS

Graphic primitives - Transformations -Wire frame modeling and solid modeling -Graphic standards –Drafting packages

UNIT III STRUCTURAL ANALYSIS

Fundamentals of finite element analysis - Principles of structural analysis - Analysis packages and applications.

UNIT IV DESIGN AND OPTIMISATION

Principles of design of steel and RC Structures -Applications to simple design problems – Optimisation techniques - Algorithms - Linear Programming – Simplex method

UNIT V EXPERT SYSTEMS

Introduction to artificial intelligence - Knowledge based expert systems -Rules and decision tables –Inference mechanisms - Simple applications.

TEXT BOOKS

- 1. Groover M.P. and Zimmers E.W. Jr., "CAD/CAM, Computer Aided Design and Manufacturing", Prentice Hall of India Ltd, New Delhi, 1993.
- 2. Krishnamoorth y C.S.Rajeev S., "Computer Aided Design", Narosa Publishing House, New Delhi, 1993

- 1. Harrison H.B., "Structural Analysis and Design", Part I and II Pergamon Press, Ox ford, 1990.
- 2. Rao S.S., "Optimisation Theory and Applications", Wiley Eastern Limited, New Delhi, 1977.
- 3. Richard Fors yth (Ed), "Expert S ystem Principles and Case Studies", Chapman and Hall, London, 1989.

15BECEOE07PAVEMENT ENGINEERING3 0 0 3 100INTENDED OUTCOMES:

At the end of this course, the students should have learnt the pavement types, design of flexible & rigid pavements, performance evaluation and maintenance and stabilization of highway and rural roads.

UNIT I TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM

Introduction - Pavement as layered structure - Pavement types - rigid and flexible -Stress and deflections in pavements under repeated loading

UNIT II DESIGN OF FLEXIBLE PAVEMENTS

Flexible pavement design - Empirical - Semi empirical and theoretical Methods - Design procedure as per latest IRC guidelines – Design and specification of rural roads

UNIT III DESIGN OF RIGID PAVEMENTS

Cement concrete pavements - Modified Westergard approach - Design procedure as per latest IRC guidelines - Concrete roads and their scope in India.

UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE

Pavement Evaluation [Condition and evaluation surveys (Surface Appearance, Cracks, Patches And Pot Holes, Undulations, Ravelling, Roughness, Skid Resistance), Structural Evaluation By Deflection Measurements, Present Serviceability Index] Pavement maintenance. [IRC Recommendations Only]

UNIT V STABILISATION OF PAVEMENTS

Stabilisation with special reference to highway pavements - Choice of stabilisers -Testing and field control –Stabilisation for rural roads in India -use of Geosynthetics (geotextiles & geogrids) in roads.

TEXT BOOKS

- 1. Kadiyali, L.R., "Principles and Practice of Highway Engineering", Khanna tech. Publications, New Delhi, 1989.
- 2. Croney, D., Design and Performance of Road Pavements, HMO Stationary Office, 1979.
- 3. Wright, P.H., "Highway Engineers", John Wiley & Sons, Inc., New York, 1996
- 4. Design and Specification of Rural Roads (Manual), Ministry of rural roads, Government of India, New Delhi, 2001

- 1. Yoder R.J and Witczak M.W., "Principles of Pavement Design", John Wiley, 1975.
- 2. Guidelines for the Design of Flexible Pavements, IRC:37 2001, The Indian roads Congress, New Delhi.
- 3. Guideline for the Design of Rigid Pavements for Highways, IRC:58-1998, The Indian Roads Congress, New Delhi.

15BECEOE08

ROCK ENGINEERING

INTENDED OUTCOMES:

At the end of this course, the students should have learnt the classification of rock masses and index properties, rock strength and failure criteria, estimation of engineering and rock bolt system.

UNIT I CLASSIFICATION AND INDEX PROPERTIES OF ROCKS

Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose.

UNIT II ROCK STRENGTH AND FAILURE CRITERIA

Modes of rock failure – Strength of rock – Laboratory and field measurement of shear, tensile and compressive strength – Stress strain behaviour in compression – Mohr-coulomb failure criteria and empirical criteria for failure – Deformability of rock.

UNIT III INITIAL STRESSES AND THEIR MEASUREMENTS

Estimation of initial stresses in rocks – influence of joints and their orientation in distribution of stresses – technique for measurements of insitu stresses.

UNIT IV APPLICATION OF ROCK MECHANICS IN ENGINEERING

Simple engineering application – Underground openings – Rock slopes – Foundations and mining subsidence.

UNIT V ROCK BOLTING

Introduction – Rock bolt systems – rock bolt installation techniques – Testing of rock bolts – Choice of rock bolt based on rock mass condition.

TEXT BOOKS

- 1. Goodman P.E., "Introduction to Rock Mechanics", John Wiley and Sons, 1999.
- 2. Stillborg B., "Professional User Handbook for rock Bolting", Tran Tech Publications, 1996.

- 1. Brow E.T., "Rock Characterisation Testing and Monitoring", Pergaman Press, 1991.
- 2. Arogyaswam y R.N.P., "Geotechnical Application in Civil Engineering", Oxford and IBH, 1991.
- 3. Hock E. and Bray J., "Rock Slope Engineering, Institute of Mining and Metallurgy", 1991.

15BECEOE09

STORAGE STRUCTURES

INTENDED OUTCOMES:

At the end of this course, the students should have learnt the design of various steel water tanks, concrete water tanks, steel bunkers and silos, concrete bunkers and silos and prestressed concrete water tanks

UNIT I STEEL WATER TANKS

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays –Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder – Design of staging and foundation.

UNIT II CONCRETE WATER TANKS

Design of Circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of under ground tanks – Design of base slab and side wall – Check for uplift.

UNIT III STEEL BUNKERS AND SILOS

Design of square bunker – Jansen's and Air y's theories – **IS** Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of c ylindrical silo – Side plates – Ring girder – stiffeners.

UNIT IV CONCRETE BUNKERS AND SILOS

Design of square bunker – Side Walls – Hopper bottom – Top and bottom edge beams – Design of c ylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction.

UNIT V PRESTRESSED CONCRETE WATER TANKS

Principles of circular prestressing – Design of prestressed concrete circular water tanks. **TEXT BOOKS**

1. Rajagopalan K., Storage Structures, Tata McGraw-Hill, New Delhi, 1998.

2. Krishna Raju N., Advanced Reinforced Concrete Design, CBS Publishers and Distributors, New Delhi, 1998.

15BECEOE10

WIND ENGINEERING

INTENDED OUTCOMES:

At the end of this course, the students should have learnt the terminology of wind data, effect of wind in structures, chimneys, towers, bridges, application to design and introduction to wind tunnel.

UNIT I INTRODUCTION

Terminology – Wind Data – Gust factor and its determination - Wind speed variation with height – Shape factor – Aspect ratio – Drag and lift.

UNIT II EFFECT OF WIND ON STRUCTURES

Static effect – Dynamic effect – Interference effects (concept only) – Rigid structure – Aeroelastic structure (concept only).

UNIT III EFFECT ON TYPICAL STRUCTURES

Tail buildings – Low rise buildings – Roof and cladding – Chimneys, towers and bridges.

UNIT IV APPLICATION TO DESIGN

Design forces on multistorey building, towers and roof trusses.

UNIT V INTRODUCTION TO WIND TUNNEL

Types of models (Principles only) – Basic considerations – Examples of tests and their use.

TEXT BOOKS

- 1. Peter Sachs, "Wind Forces in Engineering, Pergamon Press, New York, 1992.
- 2. Lawson T.V., Wind Effects on Buildings, Vols. I and II, Applied Science and Publishers, London, 1993.

- 1. Devenport A.G., "Wind Loads on Structures", Division of Building Research, Ottowa, 1990.
- 2. Wind Force on Structures Course Notes, Building Technology Centre, Anna University, 1995.

15BECEOE11ADVANCED CONSTRUCTION TECHNOLOGY3 0 0 3 100INTENDED OUTCOMES:

At the end of this course, the students should have learnt the modern construction methods, methods for special structures, modern equipments used for excavation, conveyance etc and principles and practices of temporary structures.

UNIT I MODERN CONSTRUCTION METHODS

Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES

Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines

UNIT III MODERN CONSTRUCTION EQUIPEMENTS -I

Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting, Tunneling and hoisting

UNIT IV MODERN CONSTRUCTION EQUIPEMENTS -II

Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant

UNIT V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES

Principles and Practices of Temporary structures, Shoring, and Strutting, Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipments

TEXT BOOKS

1. Peurifoyu, R. L., Ledbette, W.B., Construction Planning, Equipment and Methods,

Mc Graw Hill Co., 1985

2. Antill J.M., PWD, Civil Engineering Construction, Mc Graw Hill Book Co., 1982

REFERENCE

1.Varma, M Construction Equipment and its Planning & Applications, Metropoltian

Book Co., 1979

2.Nunnaly, S.W., Construction Methods and Management, Prentice-Hall, 1987

3. Ataev, S.S., Construction Technology, MIR, Pub. 1985